(No Model.)

4 Sheets—Sheet 1.

C. A. BARRON, R. T. REID & J. L. McDONNELL.

TELEPHONE SYSTEM.

No. 598,172. Patented Feb. 1, 1898.

FIG. 1.

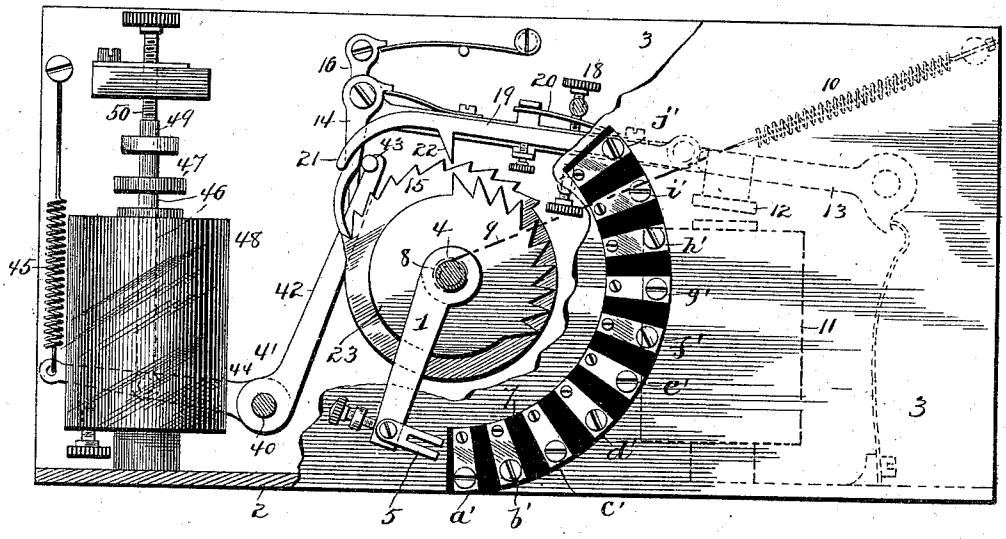
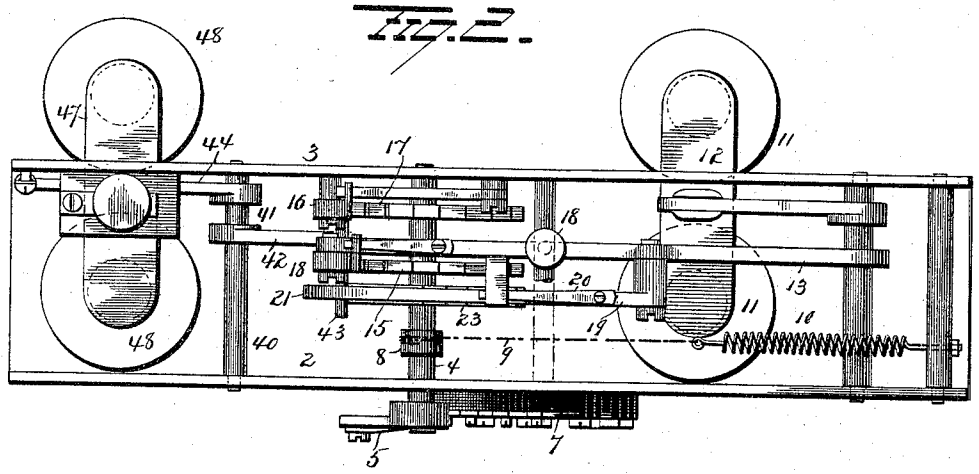


FIG. 2.



Witnesses
E. J. Nottingham
G. F. Downing.

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TELEPHONE SYSTEM.

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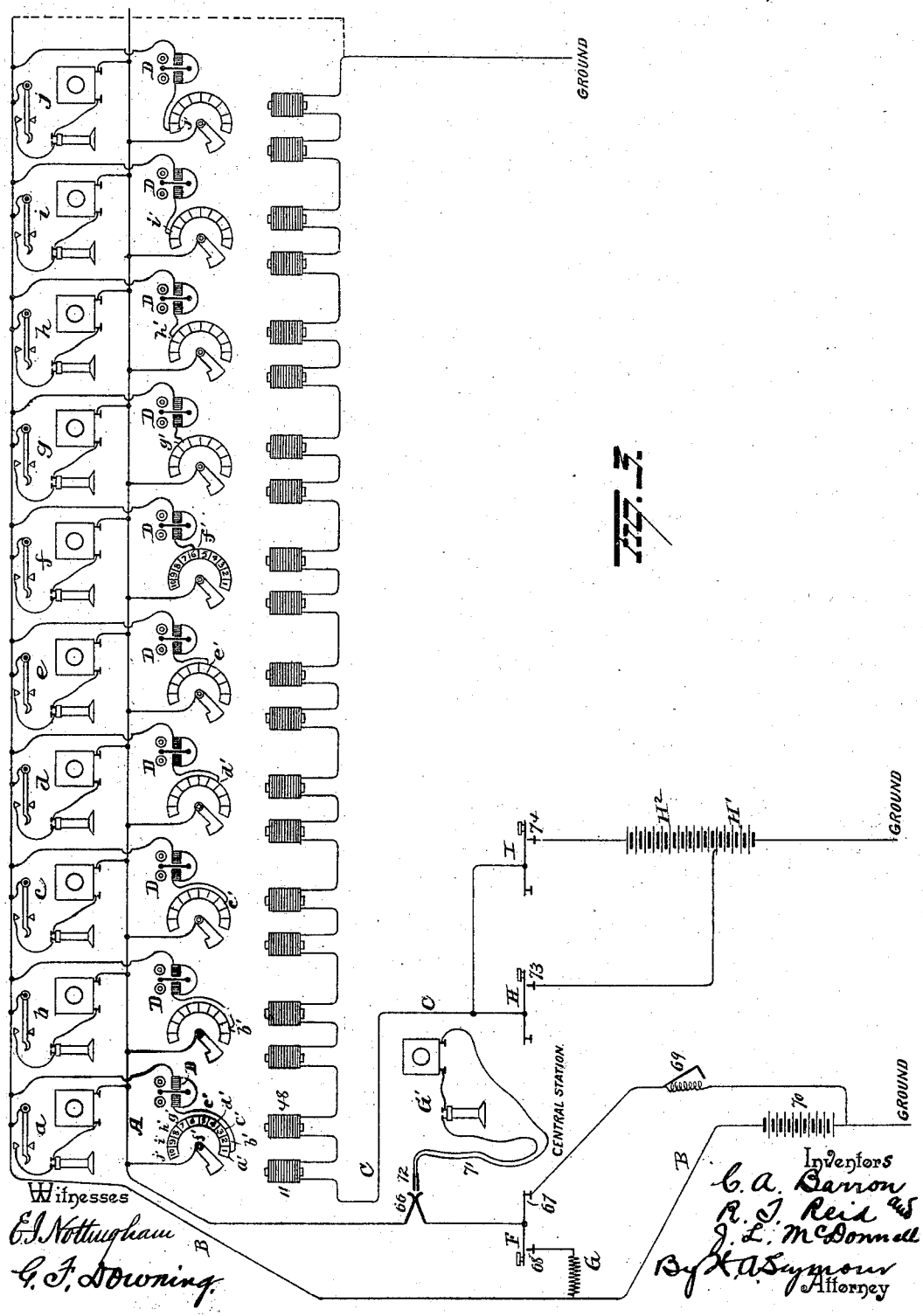


Fig. 2.

Witnesses
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C. A. BARRON, R. T. REID & J. L. McDONNELL.

TELEPHONE SYSTEM.

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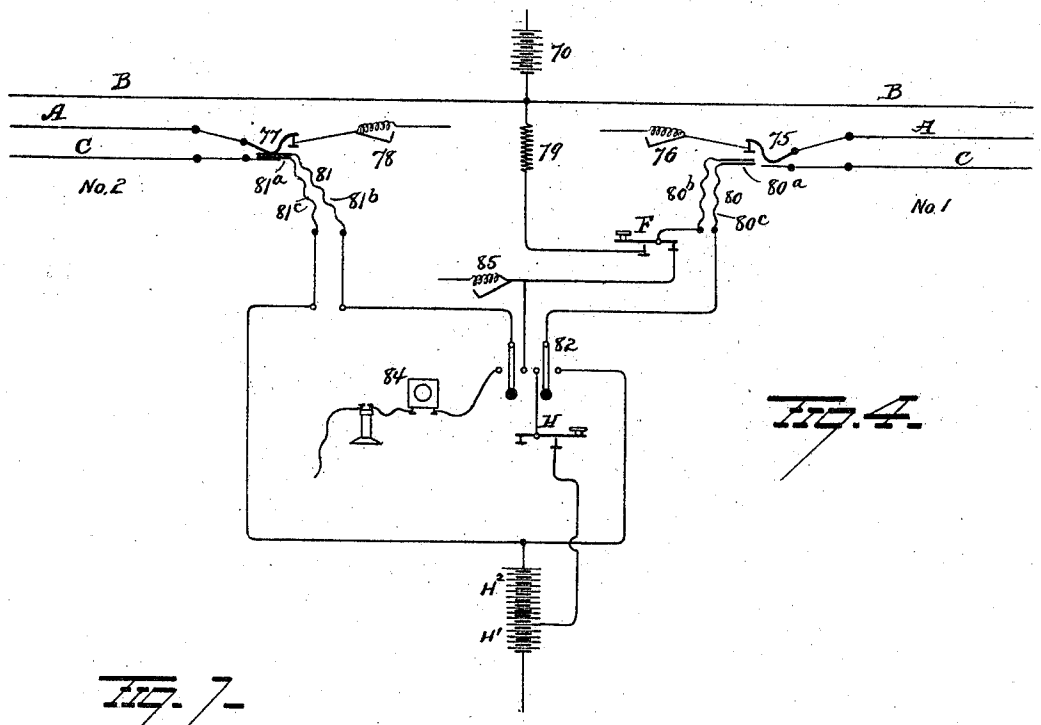
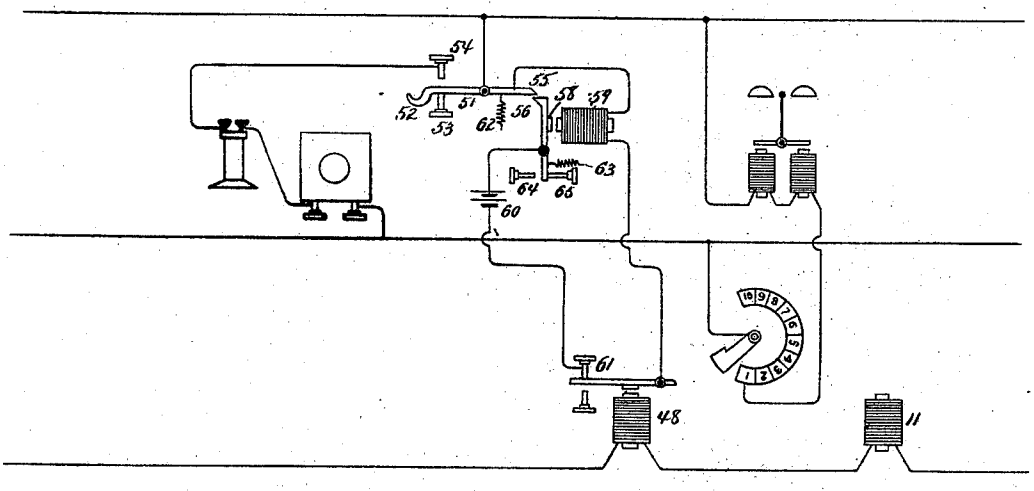


Fig. 4.

Fig. 7.



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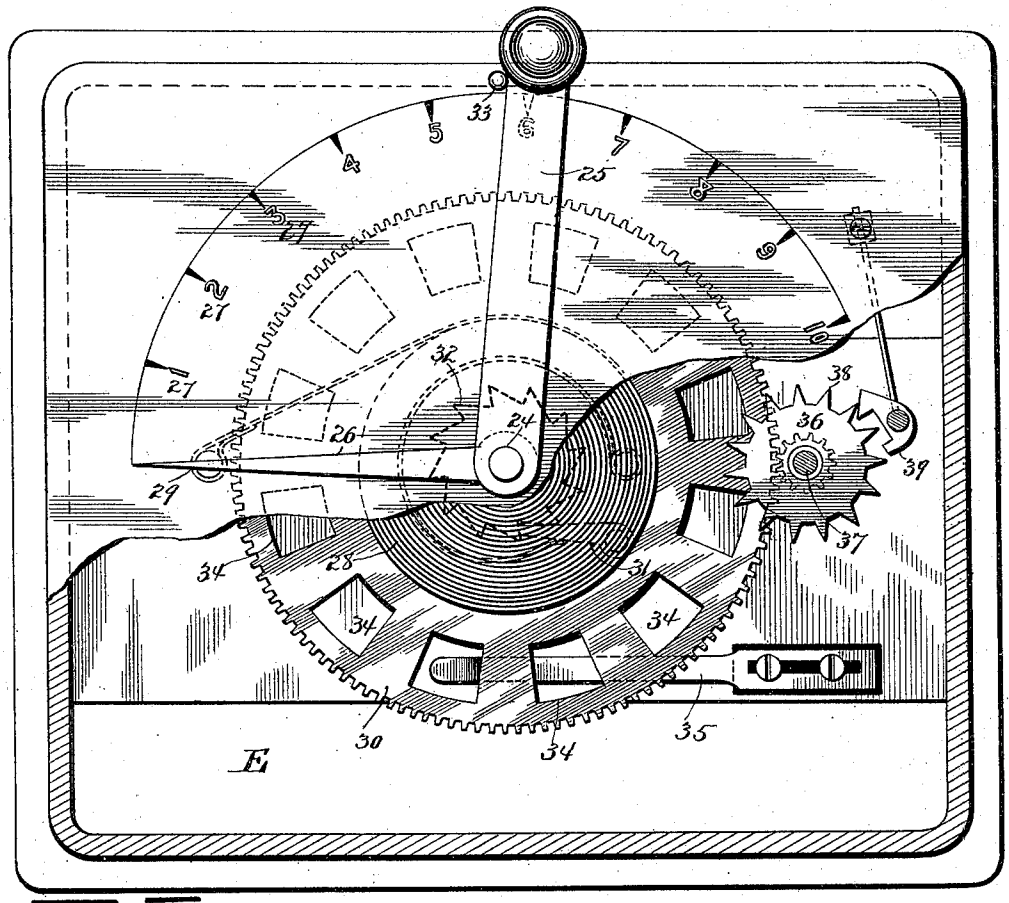


FIG. 5.

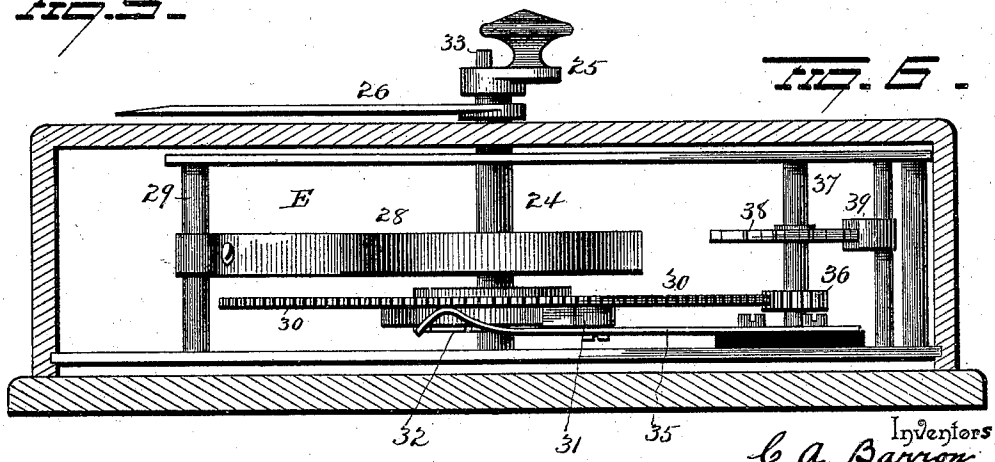


FIG. 6.

Witnesses
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UNITED STATES PATENT OFFICE.

CHARLES A. BARRON, ROBERT T. REID, AND JAMES L. McDONNELL, OF TACOMA, WASHINGTON, ASSIGNORS TO SAID REID AND McDONNELL AND FRANK C. CARDIN AND JOHN T. BIBB, OF SAME PLACE.

TELEPHONE SYSTEM.

SPECIFICATION forming part of Letters Patent No. 598,172, dated February 1, 1898.

Application filed April 5, 1897. Serial No. 630,824. (No model.)

To all whom it may concern:

Be it known that we, CHARLES A. BARRON, ROBERT T. REID, and JAMES L. McDONNELL, of Tacoma, in the county of Pierce and State of Washington, have invented certain new and useful Improvements in Telephone Systems; and we do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

Our invention relates to an improvement in telephone systems, and more particularly to such as employ "party-lines."

The object of our invention is to enhance the efficiency of telephone party-lines so that a considerable number of subscribers can be placed on one party-line and with less interference from each other than with present systems of which we are aware.

A further object is to provide means whereby the operator at the central office can cause the signal of any one subscriber on a party-line to be sounded without sounding any other signal on the line.

A further object is to provide simple and efficient means whereby to prevent the use of more than one telephone at a time on a party-line, so that when the line is in use by one subscriber he cannot be interrupted or have his conversation heard by other subscribers on the line.

A further object is to provide simple apparatus whereby the results above enumerated can be quickly and accurately accomplished.

A further object is to provide a telephone system which shall be comparatively simple in construction and effectual in all respects in the performance of its functions.

With these objects in view the invention consists in the combination, with a party-line, a series of subscribers' telephones thereon, and a signal for each telephone, of a controller in circuit with each signal, electrical circuits including said controllers, and devices at the central office whereby to set each controller and close one signal-circuit at a time, and means under the control of a central-office operator whereby to cause an electric current to flow through the signal-circuit which has been closed.

Our invention also consists in the combination, with a party-line, a series of telephones on said line, and a signal for each telephone, of a controller for each signal, each controller having as many contact-plates as there are signals on the line, a contact-arm, and electromagnetic devices for operating said contact-arm, a circuit including the contact-arm and one of said contact-plates, a circuit including said electromagnetic operating devices of all the controllers on the line, and a device at the central office for controlling the operation of the electromagnetic devices of all the controllers on the line simultaneously.

Our invention further consists in the combination, with a party-line and a series of telephones thereon, of a switch for each telephone, an electromagnetic locking device for each switch, and means for maintaining said locking devices open-circuited whereby to prevent all of said switches except the one belonging to the telephone in use from being closed.

Our invention also consists in certain novel features of construction and combinations and arrangements of parts, as hereinafter set forth, and pointed out in the claims.

In the accompanying drawings, Figure 1 is a face view (with part of the casing removed) of the controller we employ at each subscriber's telephone to control the operation of the signaling or call bell. Fig. 2 is a plan view of the same. Fig. 3 is a diagrammatical view of a party-line, showing ten subscribers' telephones and exemplifying the method of sounding any one of said signals without signaling any other subscriber on the line, no means of connecting two lines at the central office being shown, the purpose of the diagram being merely to illustrate the signaling apparatus. Fig. 4 is a diagrammatical view showing circuits and connections at the central office for signaling and making connections between subscribers' instruments on different party-lines. Figs. 5 and 6 are views of the apparatus at the central office for operating the controllers. Fig. 7 is a diagram

illustrating the manner of locking the telephones while one subscriber is using the line, so that no other subscriber can hear his conversation or in any way interfere with him.

In the present party-line system three wires are used. One is usually termed the "ground" wire, one the "black" wire, and one the "red" wire. It has been the custom to connect five (more or less) subscribers' signals in parallel between the red wire and the ground wire, and five (more or less) subscribers' signals have been connected in parallel between the black wire and the ground wire. The telephones have usually been connected in parallel between the black wire and the red wire. With such arrangement when the central-office operator rings up a subscriber on the black wire all bells connected between that wire and the ground wire will be sounded and each subscriber on the line will hear the signal. The same is true of the red wire in case the central-office operator uses that wire in signaling. Any one or all of the subscribers on the party-line can hear any conversation that might be taking place.

We prefer to employ three wires for each party-line; but we utilize said lines in a manner differing from the present system.

A represents the "phone-wire," B the "return-wire," and C the "controller-wire."

In Fig. 3 ten telephones *a b c d e f g h i j* are shown arranged in parallel between the wires A and B, this number of telephones being of course taken arbitrarily for purpose of illustration. Each subscriber is provided with an electromagnetic signal D of usual construction and with a signal-controlling apparatus comprising electromagnetic devices, a series of contacts *a' b' c' d' e' f' g' h' i' j'*, and a contact-arm 1 to be actuated by said electromagnetic devices.

One contact-plate of each controller and the contact-arm of each controller are connected in series with the coöperating signaling device in a multiple-arc circuit between the lines A and B. It will be observed that while each controller is provided with a series of contact-plates corresponding in number with the number of telephones and their signaling devices employed on the party-line the respective signaling devices are each connected with but one contact-plate of its coöperating controller and that no signaling device is connected in circuit with a contact-plate corresponding with a contact-plate of another controller which is included in circuit with a signaling device. In other words, the signal of telephone *a* is included in a multiple-arc circuit with contact-plate *a'* of its controller. The signal of telephone *b* is connected in a multiple-arc circuit with contact-plate *b'* of its controller, and so on throughout the entire series of signaling devices and controllers on the party-line. Should it be desired to signal subscriber *a*, the controller will be operated (by the manipulation of devices at the central office, as hereinafter described) to cause the contact-arms 1 of the controllers to move one point and rest on the first contact-plate *a'*. As the signaling device D of only one telephone is connected in circuit with contact-plate *a'* of the coöperating controller, only one signal-circuit will be closed, the signal-circuits of all the other telephones being still open, as will be readily understood. The operator will now (by means hereinafter explained) cause a current to flow over the lines A B, and the signal-circuit of telephone *a* being closed said signal alone will be sounded. Should the subscriber at telephone *j* be wanted, the contact-arms 1 of the controllers will be made to move to the contact-plates *j'*, so as to close the signal-circuit of telephone *j*, and the signal will then be sounded in the same manner as before. Any one of the intermediate subscribers can of course be signaled in the same manner to the exclusion of all others.

The various signal-controllers are the same in construction and a detailed description of one will suffice for all.

The casing of the controller may comprise a suitable base 2 and parallel plates 3 3 disposed at right angles to the base and held suitably spaced apart in any desired manner. A transverse shaft 4 is mounted in the plates 3, and to one end of this shaft the contact-arm 1 is secured, said contact-arm being preferably provided at its free end with a brush or finger 5 to pass over the contact-plates *a' b'*, &c. These contact-plates may be conveniently supported by means of a block 7, of insulating material, secured to one of the plates 3. A small drum or chain wheel 8 is secured to the shaft 4 and has secured to it and adapted to be wound upon it a chain or cord 9, to the free end of which latter one end of a spiral spring 10 is attached, the other end of said spring being secured to the framework. These devices constitute a motor for moving the contact-arm in one direction—viz., to return it after it shall have been moved forwardly over the contact-plates by means of the devices now to be explained. An electromagnet 11 is mounted on the base, and the armature 12 of said magnet is connected with a pivoted lever 13, the movements of which will be limited by adjustable stops 18. A spring-actuated dog 14 is pivotally attached to the free end of the lever 13 and adapted to engage the teeth of a spur or ratchet wheel 15, secured to the shaft 4, so that when the magnet 11 is energized motion will be imparted to said shaft and to the contact-arm 1 against the resistance of the spring 10. When the shaft and contact-arm shall have been thus moved, retrograde movement thereof will be prevented by means of a spring-actuated dog 16, which engages the teeth of a ratchet-wheel 17, also secured to the shaft 4. It is important in order to insure a proper step-by-step movement of the contact-arm 1 over the contact-plates that the shaft 4 be prevented from moving more than one tooth

of the ratchet-wheel 15 each time the lever 13 is actuated by the magnet. For this purpose an arm 19 is pivotally connected at one end to the lever 13 and held in its normal position by means of a stiff spring 20, said arm being provided at its free end with a curved finger 21 and rearwardly of said finger with a tooth 22, adapted to engage the teeth of a ratchet or stop wheel 23, secured to the shaft 4. Thus it will be seen that when the free end of the lever 13 is depressed by the action of the magnet 11 the shaft 4 will be moved one tooth of the ratchet-wheel 15 and the brush or finger on the contact-arm 1 will be moved from one contact-plate to the next. Further movement of the shaft 4 will be prevented by the engagement of the tooth 22 with the ratchet or stop wheel 23, and retrograde movement of the shaft 4 and parts connected with it will be prevented by engagement of the dog 16 with the ratchet-wheel 17.

From the construction and arrangement of parts above described it is apparent that each time the circuit through the helix of magnet 11 is closed the contact-arm will be moved forward one point, and thus by successively closing and opening the circuit the contact-arm will move forwardly step by step over the contact-plates. The circuit through the magnet can be opened and closed by the operator at the central office with the use of an ordinary telegraph-key, which can be depressed a sufficient number of times to cause the contact-arm to advance over the contact-plates until the contact-plate of a particular controller which is included in circuit with a signal is reached. We prefer, however, to accomplish the step-by-step advance of the contact-arms over the contact-plates of the controllers by means of a specially-constructed circuit-closer E, which can be quickly and accurately operated to set the controller at the telephone of the subscriber to be called. The circuit-closing apparatus E comprises a suitable casing in which a spindle 24 is mounted and provided on its upper end with a handle 25 and a pointer 26, the latter being adapted to register with a series of figures 27 on the casing.

A spring 28 is coiled on the spindle 24 and secured at one end thereto, the other end of said spring being secured to a post 29 within the casing. A spur-wheel 30 is loosely mounted on the spindle 24. A spring-pressed dog 31 is pivoted to the spur-wheel and adapted to engage a ratchet-wheel 32, secured to the shaft 24, whereby to lock the spur-wheel to the shaft when the latter is turned in one direction and permit the shaft to move independently of the spur-wheel when turned in the other direction. The parts are maintained in their normal position with the pointer at zero by the engagement of the handle 25 with a pin 33 on the casing, or by means of any other suitable stop desired. The spur-wheel 30 is made with an annular series of openings 34, with intervening contact-surfaces for a contact-arm 35, secured to and insulated from the frame. It is evident that instead of providing the wheel 30 with openings said wheel may be provided with a series of insulating-pieces between the contact-faces. The spur-wheel 30 and contact-arm 35 are included in circuit with the magnets 11 of the controllers, so that when the circuit-closer is operated the passage of the contact-arm 35 over the contact-faces of the spur-wheel will cause the controller to operate step by step, as above explained. The spur-wheel 30 is made to mesh with a pinion 36 on a shaft 37, and the latter is provided with an escapement-wheel 38, with which latter a pallet 39 engages to regulate the speed of the spur-wheel. When the operator desires to signal a particular subscriber, he will turn the handle until the pointer registers with the proper number, during which movement the spring 28 will be wound and the spur-wheel remain stationary. The operator will now release the handle and permit the parts to return to their normal position, thus causing the spur-wheel to turn (by means of its ratchet connection with the spindle 24) and the circuit, including the magnets 11 of the controllers, to be opened and closed and the controllers to act in the manner above explained, after which a current will be caused to flow over the lines A B to ring the signal, the multiple-arc circuit of which has been closed by the coöperating controller.

Each controller is provided with means whereby to enable the central-office operator to cause the switch-arms of all the controllers to return to their normal positions after a subscriber has been signaled. In constructing these devices a shaft 40 is mounted in the framework of each controller and provided with a bell-crank lever 41. The upwardly-projecting arm 42 of the bell-crank lever is provided at its free end with a cross-head 43, disposed behind the dogs 14 and 16 and the finger 21 of arm 19. To the free end of the arm 44 of bell-crank lever one end of a spring 45 is attached, the other end of said spring being connected with the framework, and thus serves to normally retain the cross-head 43 out of the path of movement of the dogs 14 16 and finger 21. A rod 46 is pivotally attached to the arm 44 of bell-crank lever 41 and carries an armature 47 for an electromagnet 48. The electromagnet 48 is arranged in series with the magnet 11, but is constructed to be energized by a strong current, while the magnet 11 is adapted to be controlled by weak currents. Thus when the magnet 48 is energized by a strong current it will effect an operation of the bell-crank lever and cause the dogs 14 16 and the arm 19 to be moved away from the respective ratchet-wheels and permit the spring 10 to act to rotate the shaft 4 and return the contact-arm 1 to its normal position. It is true that when magnet 48 is thus energized the magnet 11 will also be energized, but as the magnet 48 will serve to set the mechanism free, as above explained,

the operation of the magnet 11 will not be effective.

The rod 46 (or the armature 47 carried thereby) is made with an extension 49, having a platinum point to engage a similar point on a screw 50, supported by but insulated from the framework. The circuit-closer thus formed is intended to control a local circuit, (by means of which devices now to be described are actuated,) whereby to prevent the conversation of one subscriber being heard by the other subscribers on the same party-line. In Fig. 7 a subscriber's telephone, signal, and controller are shown diagrammatically for the purpose of exemplifying the devices whereby subscribers on a party-line, except the one using the line, will be prevented from interfering with the line or hearing any conversation held by one of the subscribers with a subscriber on another line. The telephone is included in a multiple-arc circuit between the wires, as above explained, but in this circuit the switch-lever 51 is included.

The switch-lever 51 is pivotally supported between its ends and made at one end with a hook 52 for the reception of the hand-phone, the hooked arm of the lever being adapted to play between contact-screws 53 54. The screw 53 is merely intended to limit the downward movement of the hooked arm of the lever, but the screw 54 forms a part of the multiple-arc circuit including the telephone and the switch-lever. Thus when the switch-lever is in the position shown in Fig. 7 the local telephone-circuit will be open. The rear arm of the switch-lever is beveled, as at 55, and is disposed over a beveled tooth 56 at the upper end of a vertically-disposed lever 57. The lever 57 is pivotally supported (preferably at a point below its center) and is provided with an armature 58 to be attracted by an electromagnet 59. The electromagnet 59 forms a part of a local circuit, which also includes a local battery 60, the levers 51 and 57, and the circuit-closer 61, controlled by the magnet 48, as above explained. The weight of the hand-phone on the hooked switch-lever 51 holds said lever in the position shown in Fig. 7 and the lever is moved in the other direction when the hand-phone has been removed by means of a spring 62. The lever 57 is normally held at its farthest position from the magnet and with its upper end under the beveled end of lever 51 by means of a spring 63, the movements of said lever being limited by means of screws 64 65, against the latter of which the lever 57 is maintained normally held by the spring 63.

Now it will be seen that when the subscriber who has been called removes his telephone from the switch-lever 51 the latter will be turned on its fulcrum by the spring 62 and the rear end of the lever 51 will make contact with the lever 57, thus closing the local circuit through magnet 59. The lever 57 will be promptly withdrawn by the action of magnet 59, and thus set the lever 51 free, so as to permit the hooked end thereof to complete its upward movement and close the multiple-arc telephone-circuit. The subscriber's telephone is then in communication with the central office. As soon as the subscriber who has been called answers and the necessary connections have been made by the operator the latter will cause a strong current to flow over the line C, whereby to actuate the magnets 48 and return the arms of the various controllers. By thus actuating the magnets 48 of all the controllers on the party-line the circuit-closers 61 will be opened. Each local circuit will thus be opened as soon as one of the subscribers begins to use the line, and consequently each lever 57 will remain under the lever 51 of the telephones not in use. The magnets 48 will be kept energized as long as the line is in use, and thus the local circuits will be kept open at the circuit-closers 61, so that if another subscriber should remove his hand-phone from the switch-lever 51 the rear end of the lever will engage the lever 57, as above described; but as the local circuit is open at another point (at circuit-closer 61) the magnet 59 will not be energized, and consequently the lever 57 will remain in the path of movement of the rear end of lever 51 and prevent said switch-lever 51 from closing the multiple-arc circuit including the telephone. When the hand-phone which has been in use is replaced on the hook of the switch-lever 51, the rear beveled end of the latter will ride past the tooth on the lever 57 and assume its normal position.

The transmitter-battery may be used for the battery 60.

In Fig. 3 we have shown a diagram of a party-line with central-office circuits and devices for operating the signaling devices and communicating with the subscribers on the line. In this diagram the far end of the controller-wire C is shown connected with the ground; but it may, if desired, be connected with the return-wire B. The wire A is shown connected through a jack 66 with a key F, with which contact-points 67 68 coöperate. The contact-point 67 is connected through an annunciator 69 with the ground end of a battery 70. With the other end of this battery the return-wire B is connected. A generator G, of any preferred form of construction, is arranged in a circuit between the contact-point 68 of key F and the return-wire B. An operator's telephone G′ is provided with the usual cord 71, having a plug 72 to be inserted into the jack 66. The controller-wire C is connected with the circuit-breaker, hereinbefore described; but for clearness of illustration we have shown in the diagram Fig. 3 the circuit-closer made in the form of an ordinary key H, to which the controller-wire C is connected. The contact-point 73 of the key H is connected with one end of a small battery H′, the other end of which is connected with the ground. One end of a larger battery H^2 is connected with a contact-point 74 of a key I, and the latter is connected with the controller-wire in

advance of the key H. Thus when the key H is closed the small battery H′ will be included in circuit with the controller-wire, and when the key I is closed the larger battery will be switched into the controller-circuit. Now, assuming that the key F is normally in contact with the contact-point 67 and that a subscriber on the line removes his hand-phone, the circuit through the wires A B, subscriber's telephone, key F, battery 70, and annunciator 69 will be closed, and the annunciator will drop. By inserting the plug 72 into the jack 66 the operator can converse with the subscriber. The principal purpose, however, of the diagram shown in Fig. 3 is to illustrate the signaling apparatus, no attempt being made in this view to show means for making central-office connections between two lines. Suppose then that the operator desires to call subscriber *c*. He will first depress key H, (or operate the circuit-closer, hereinafter described,) so as to cause three comparatively feeble electrical impulses to pass from the small battery H′ over the controller-circuit C. This will cause the magnets 11 of the various controllers to be actuated to move the controller-arms 1 three points. The contact-arms of all the controllers will now be on the contact-plates *c′*; but as the signal-circuit of telephone *c* alone includes contact-plate *c′* of the corresponding controller that signal-circuit only will be closed. The central-office operator will now press the key F and thus include the generator G in circuit with the wires A and B and the signal and controller of telephone *c*, thus sounding the signal of telephone *c* without sounding any of the other signals on the party-line. When the signal of telephone *c* shall have thus been sounded and the subscriber shall have answered, the central-office operator will press the key I, whereupon the larger battery H^2 will be included in controller-wire C and all the controllers on said circuit. The comparatively large amount of current now passing over the line C will energize the magnets 48 of all the controllers and permit all the switch-arms to be returned to their normal positions, at the same time opening the circuit-closers 61 to prevent another subscriber from interfering with the line or hearing the conversation conducted by the subscriber having use of the line.

The key I may be of any preferred form of construction whereby the circuit including the large battery can be kept closed during the use of the line, so that the local circuits which control the devices for preventing the use of the line by more than one subscriber at a time can be maintained open, as above explained, until the line becomes idle. It is evident that one large battery may be made to answer the purpose of two batteries H′ and H^2 by using the entire battery for the battery H^2 and only a portion of it for the small battery H′.

In Fig. 4 we have represented by means of a diagram the circuits at the central office, whereby two party-lines may be connected when a subscriber on one party-line is desirous of conversing with a subscriber on another party-line. The manner of signaling shown in Fig. 4 is practically the same as that shown more simply and specifically in Fig. 3, the diagram Fig. 4 being intended to show theoretically the means for connecting two lines as well as signaling subscribers.

In the diagram Fig. 4 the batteries 70, H′, and H^2 are shown slightly differently disposed from the arrangement shown in Fig. 3, but their functions are exactly the same, and they may, if desired, be arranged as shown in Fig. 3. The spring-jack for one party-line is indicated at 75 and the annunciator at 76, while the spring-jack and annunciator for the other party-line are represented at 77 and 78, respectively. The source of magneto or other vibratory current for ringing the signal-bells is indicated at 79. There may be several pairs of connecting-cords used on each switch-board; but in the diagram Fig. 4 we have only shown one pair, as indicated at 80 and 81, each cord having a plug or wedge 80^a 81^a. At 82 a double-throw double-pole switch is illustrated, which switch may be made in any convenient form. For convenience of illustration we have shown the switch 82 in the diagram as two three-point switches; but these will be treated as one switch in the following description. One of these double-throw double-pole switches is used with every pair of cords, and all of them are connected with the operator's telephone 84, the key H, the battery H′, and the battery H^2, as shown. An annunciator 85 is provided for each pair of cords, the magnet of said annunciator being connected with the ground. In order to use any one pair of cords for making a connection, the operator will throw the switch 82 belonging to that pair to the left.

If some subscriber on party-line No. 2 takes down his hand-phone, he will connect wires A and B, as above explained, thus closing the circuit of battery 70 and causing the annunciator 78 to drop. The operator will now throw the switch 82 to the left, so that cords 80 81 can be used to make the desired connection. The operator will then insert the plug or wedge 81^a into the spring-jack 77. This wedge is so constructed that when inserted into a spring-jack it always connects the wire A with the conductor 81^b of cord 81 and the controller-wire C with the conductor 81^c of said cord 81. This connects the phone-wire A with the ground through the conductor 81^b of cord 81, the switch 82, (which has been thrown to the left,) and the operator's telephone 84. The operator is now able to converse with the subscriber and ascertain the number of the subscriber wanted. If the number required be on the party-line No. 1, the plug or wedge 80^a will be inserted into the jack 75. This will connect the wire A of party-line No. 1 with the ground through conductor 80^b of cord 80, the ringing-key F, and

the annunciator 85. The controlling-wire C of line No. 1 is connected with the controller-key H through a conductor 80ᶜ of the cord 80 and switch 82, which latter is still turned to the left. If the controller-key H be now depressed, it places a current on controller-wire C of line No. 1. By means of the circuit-closer, which will be used in practice instead of key H, as before explained, all the controllers on wire C of line No. 1 will be actuated and the proper bell placed in circuit between the wires A and B of said line No. 1. The ringing-key H will then be depressed by the operator, disconnecting the wire A of line No. 1 from the annunciator 85 and placing the source of magneto or other vibratory current in the circuit between the wires A and B of line No. 1, ringing the bell which has just been placed in circuit, as before explained. When the operator releases the ringing-key H, the wire A of line No. 1 will be again connected with the ground through the annunciator 85. If the subscriber who has been called takes down his hand-phone, the annunciator 85 will drop, denoting the fact to the operator, who then turns the switch 82 to the right, which cuts out the operator's telephone, connecting the wires A A of the two lines through the switch 82, and connecting controller-wire C of line No. 1 with battery H^2, (also through switch 82,) which actuates the releasing-magnets on the said controller-wire C of line No. 1 and brings all the switch-arms of the controllers on that wire to their normal positions, dispensing with the key I. (Shown in Fig. 3.) The wires A of both lines are grounded through annunciator 85, but as it has a high self-inductive capacity it will not interfere with the conversation of the subscribers. When the subscribers hang up their hand-phones, the annunciator 85 will be actuated in the usual manner, announcing to the operator that the connection of the two lines is no longer required.

It will be observed that while wires A of the two lines are connected together controller-wire C, line No. 1, remains connected with battery H^2, keeping the release-magnets of the controllers on said wire closed; also, that controller-wire C of line No. 2 is connected with the same battery all the time that plug or wedge 80ᵃ is inserted in jack 77. This is done to keep all the releasing-magnets on the two party-lines in use closed, thereby maintaining the local circuits controlling the locking devices at the various telephones open to prevent interruption by other subscribers, as hereinbefore explained.

Various changes in details of construction and in arrangement of circuits and batteries might be made without departing from the spirit of our invention or limiting its scope, and hence we do not wish to limit ourselves to the precise details herein set forth.

Having fully described our invention, what we claim as new, and desire to secure by Letters Patent, is—

1. In a telephone system, the combination with a party-line and a series of telephones thereon, of a switch for each telephone, an electromagnetic locking device for each switch and included in a normally closed local circuit and means whereby to maintain the circuit of said locking device open-circuited when the lever is in use, whereby to prevent all of said switches except the one belonging to the telephone in use, from being closed, substantially as set forth.

2. In a telephone system, the combination with a party-line telephones thereon and a switch for each telephone, of a local circuit including an electromagnet and said switch, a pivoted lever normally in the path of movement of said switch and adapted to be actuated by said electromagnet, said lever being also included in said local circuit, and means under the control of the central office for maintaining said local circuits open-circuited when the line is in use, substantially as set forth.

3. In a telephone system, the combination with a party-line comprising three wires, telephones in parallel between two of said wires and circuit-breakers in series on the third wire, a normally open switch in each multiple-arc telephone-circuit, a pivoted lever normally disposed under and out of a contact with one end of the switch-lever, a magnet for actuating said pivoted lever to move it out of the path of the switch-lever, and a local circuit at each telephone, including a battery, the switch-lever, the pivoted lever, said magnet and one of said circuit-breakers, substantially as and for the purpose set forth.

4. A telephone system comprising three wires extending from a central office, a series of subscribers' telephones arranged in parallel between two of said wires, a series of contact-plates at each subscriber's station, a contact-arm to be moved over each series of contacts, one of said contacts, said contact-arm and a signal at each subscriber's station being included in parallel with said telephones, two magnets of different strengths at each subscriber's station and included in series on the third line-wire, intermediate mechanism between the weaker magnets and the contact-arms whereby to propel the latter and devices controlled by the stronger magnet to release said contact-arm, a battery at the office in circuit with said third wire, and switches at the central office arranged to include a large or a small portion of the battery in the circuit of said third wire, substantially as set forth.

5. In a telephone system, the combination with a party-line comprising a telephone-wire, a return-wire and a controller-wire, of telephones included in parallel between the telephone-wire and the return-wire, a normally open switch in each local telephone-circuit, a signal for each telephone, a controller, substantially such as described for each signal, electromagnets on the controller-wire for actuating said controllers, releasing-electromagnets for

said controllers also on said controller-wire, means under the control of the central office for actuating said magnets, circuit-breakers controlled by said releasing-magnet, a pivoted lever normally disposed under and out of contact with each switch-lever of the local telephone-circuits, electromagnets for actuating said pivoted levers, and local circuits including said last-mentioned electromagnet, switch-lever, pivoted lever and circuit-breakers, substantially as set forth.

6. A telephone system comprising two party-lines, each line comprising three wires, telephones included in parallel between two wires of each line, signals and circuit-closers included in parallel between said two wires of each line, electromagnetic devices included in series on each third wire of each line, jacks at the central station connected with two wires of each line, generators common to one wire of each pair of both lines, a double-throw switch, a circuit including one of the contact-points of said switch, a circuit-closer and one of said generators, a cord comprising two conductors and having a plug to enter one of said jacks, one of said conductors being connected with the last-mentioned circuit-closer and the other conductor of the cord being connected with an arm of the double-throw switch, a conductor between one of the contact-points of the circuit-closer and a contact-point of the double-throw switch, a circuit including another contact-point of said switch, a battery and a circuit-closer included in said last-mentioned circuit, another cord comprising two conductors and having a plug to enter the other jack, one of said last-mentioned cord conductors being connected with an arm of said double-throw switch and the other conductor of said cord being connected with a battery and with a contact-point of said switch, and a telephone connection with a contact-point of said switch, substantially as set forth.

7. In a signal-controller for a telephone system, the combination with a frame, a shaft mounted therein, a series of contact-plates, a contact-arm secured to said shaft and adapted to move over said contact-plates, a ratchet-wheel secured to said shaft, a pivoted lever, a dog carried by said pivoted lever and engaging said ratchet-wheel, an electromagnet, having its armature connected with said pivoted lever, another ratchet-wheel secured to said shaft, a dog to engage said last-named ratchet-wheel, a releasing-magnet, an arm connected with the armature of the releasing-magnet a cross-head on said arm and normally disposed behind both of said dogs and adapted to move them away from the ratchet-wheels and a motor for returning the parts to their normal positions substantially as set forth.

8. In a signal-controller for a telephone system, the combination with a frame, a shaft mounted therein, a series of contact-plates and a contact-arm secured to said shaft and adapted to move over said contact-plates, of a ratchet-wheel secured to said shaft a pivoted lever, a dog carried by said lever and engaging the ratchet-wheel, an electromagnet for actuating said pivoted lever, a stop-wheel secured to said shaft, a spring-pressed arm attached to said pivoted lever and having a tooth to engage said stop-wheel, a releasing-magnet, an arm connected with the armature of said releasing-magnet and adapted to move the dog away from the ratchet-wheel and the toothed arm away from the stop-wheel and means for returning the parts to their normal positions, substantially as set forth.

9. In a telephone system, the combination with a party-line, and a series of signals, of a controller for each signal each controller comprising a series of contact-plates and a contact-arm, said contact-arm and one of the contact-plates being included in circuit with the signal, electromagnetic devices for each controller, a step-by-step circuit-closer at the central office, included in circuit with said electromagnetic devices of the controllers, said circuit-closer comprising a plate having holes therein, a contact-arm to engage said plate, means for rotating said plate in one direction, a pointer connected with said plate, an index, a spring for rotating said plate in the reverse direction and means for controlling the speed of rotation of said plate, substantially as set forth.

In testimony whereof we have signed this specification in the presence of two subscribing witnesses.

CHARLES A. BARRON.
ROBERT T. REID.
JAMES L. McDONNELL.

Witnesses:
FREDERICK H. BARRON,
ROBERT WINGATE.