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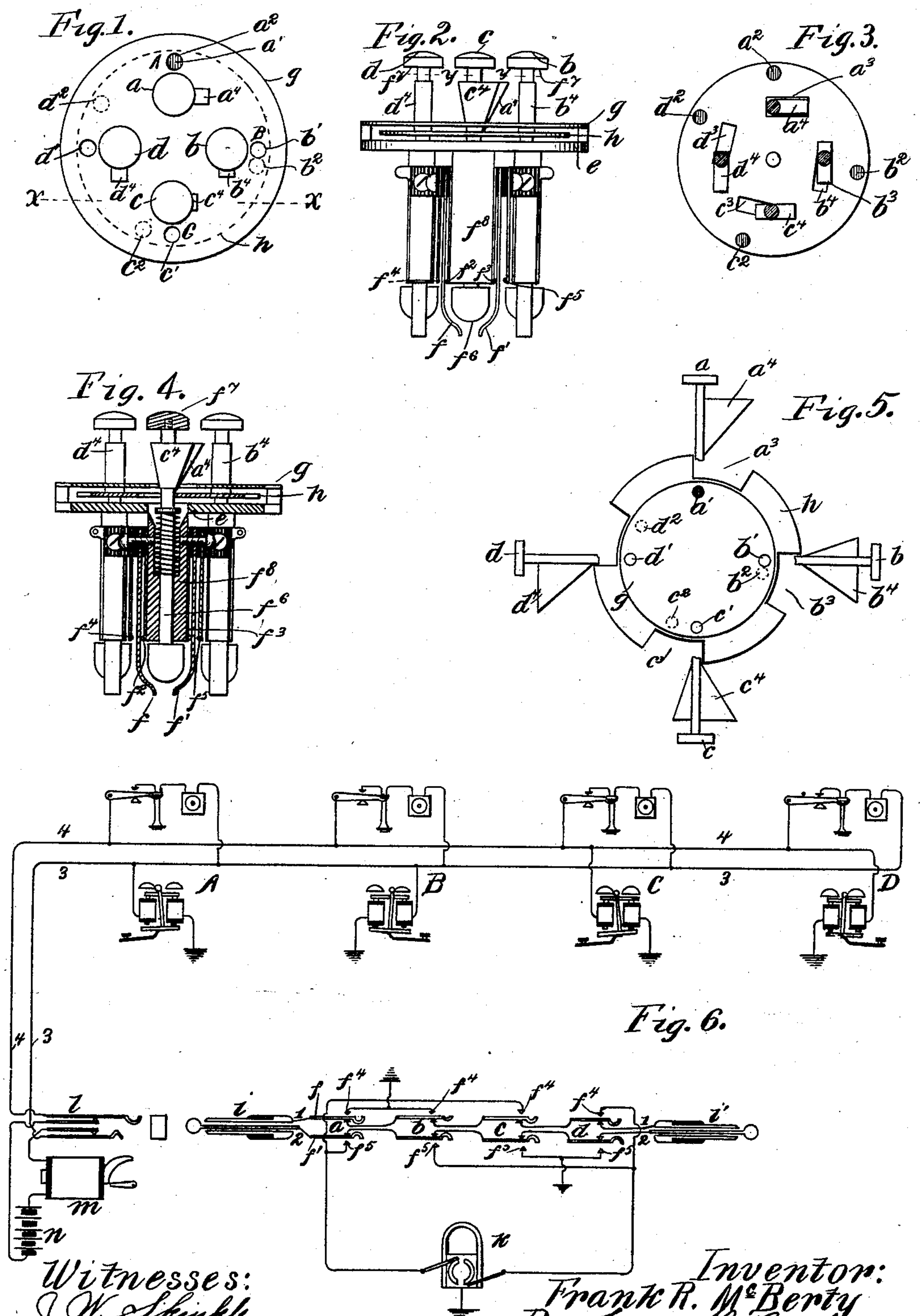
F. R. McBERTY.

SIGNALING APPARATUS FOR TELEPHONE LINES.

(Application filed June 7, 1899.)

(No Model.)



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SIGNALING APPARATUS FOR TELEPHONE-LINES.

SPECIFICATION forming part of Letters Patent No. 648,978, dated May 8, 1900.

Application filed June 7, 1899. Serial No. 719,659. (No model.)

To all whom it may concern.

Be it known that I, FRANK R. McBERTY, a citizen of the United States, residing at Evanston, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Signaling Apparatus for Telephone-Lines, (Case No. 32,) of which the following is a full, clear, concise, and exact description.

My invention relates to signaling apparatus for telephone-lines, and more particularly to apparatus for selectively operating any one of a plurality of instruments which are connected with a single electric circuit—for example, ringing-keys for selectively transmitting signals to a substation of a party telephone-line.

My object is to provide means associated with the several ringing-keys of a party-line telephone system for indicating to the operator which one of a particular set of keys has been last operated—that is, for indicating which one of the substations of a party telephone-line has been signaled—so that should it be desired to transmit a second signal to the same station, as when the subscriber has failed to respond to the first signal, the identity of that particular station upon the party-line may be indicated to the operator and the proper ringing-key selected without hesitation or dependence upon memory.

In party telephone-lines it is common to provide responsive instruments at each of the substations adapted for operation by currents of distinctive character or in circuits capable of permutation to secure different circuits including the different instruments and to provide for the selective actuation of these instruments as many keys as there are stations or instruments, each key being constructed or connected to transmit current or change the circuit connections to determine the actuation of a particular responsive instrument. In applying the present invention to apparatus of this type an indicator is associated or connected with each signaling-key at the central office, adapted to be moved, set, or displayed by the actuation of the corresponding key and to be restored to its initial condition or position in the movement of another key of the group. When furnished with such appliances, an operator is obviously enabled to transmit any number of signals over a particular line at intervals without risk of mistake and without effort of memory.

A particularly simple and efficient system of selective signaling to which my invention has been applied involves the use of a metallic circuit from the central station to the various substations, the two sides of the line being normally separate, a separate return-circuit for the line, and polarized signal-bells, two bells of opposite polarity being included in branches from each wire of the metallic circuit. For operating these four bells four keys are employed, adapted to connect with either of the line conductors signaling current of either positive or negative polarity.

In accordance with my invention a rotatable disk is associated with a group of calling-keys connected with a given cord-circuit at the central-office switchboard, said disks carrying a number of targets corresponding to the selective-signaling keys, the said disk being adapted to display a target whenever the key corresponding to such target is actuated, the target remaining displayed until another one of the group of keys is operated, whereupon such target will be concealed and another one corresponding to the key last operated will be displayed.

In the accompanying drawings I have illustrated a group of ringing-keys, the switching mechanism of each key being operated by a plunger connected with a button upon the top of the switchboard, which may be manually depressed by the operator to actuate the key. The rotatable disk, which is placed near them, is provided with openings through which wedges upon the plungers or buttons of the keys are adapted to pass to rotate the disk, the relation of the wedges and openings being such that the depression of any key rotates the disk into a particular position determined by the slope and breadth of the wedge associated with that key, the wedges, and consequently the positions assumed by the disk, being different for different keys. The disk carries four targets moving past four windows corresponding to the keys, the arrangement being such that only

one target may be seen at a time. The depression of any key causes the target to appear at the corresponding window. The depression of another key effaces this signal and causes a target to appear at another window associated therewith. In a telephone-switchboard a set or group of such keys is placed in the circuit of each pair of connecting-plugs, so that when a connection has been established with a party-line by means of the plug-circuit and the required key has been operated to send a call-signal the visible target of the keys in that circuit denotes the station which has been signaled and is in use.

In the drawings, Figure 1 is a plan view of the keys and indicator. Fig. 2 is a side elevation of the same. Fig. 3 is a horizontal sectional view on line $y\,y$ of a portion of the apparatus. Fig. 4 is a vertical sectional view of the device, taken on line $x\,x$. Fig. 5 represents the disk carrying the targets and the plungers of the keys laid out in a horizontal plane to show the relations of the wedges to the plungers and openings of the disk; and Fig. 6 is a diagram representing a party-line with four stations terminating in a spring-jack at the telephone-switchboard of the central office and a pair of plugs with their cord-circuit, switch-keys, and accessories.

Similar letters and figures of reference are used to designate the same parts wherever they are shown.

The device shown in Figs. 1 to 4 is a group of four similar keys a, b, c, and d, of ordinary character, operated by separate buttons associated with a single indicator or registering device. These four keys are fixed to a common base e. Each key comprises a pair of switch-springs f and f', with their normal resting-anvils f^2 and f^3 and alternate contacts f^4 f^5, and a spring-retracted plunger f^6, adapted to be thrust between the curved extremities of the switch-springs to alter their position, the plunger being furnished with a button or push f^7. The parts are carried by a block f^8, of insulating material, which is fixed to the base-plate e. The keys are arranged at equal distances from each other and from the center of the plate e. Above the base-plate e is a disk g, perforated by four openings or windows a', b', c', and d', respectively, a window appearing near each button. Between the disk or cover g and the base-plate e is a disk h, pivoted at the center of plate e. This revolving disk h has four targets a^2, b^2, c^2, and d^2 in position to appear at the windows a' b' c' d' as the disk is rotated, the targets being disposed about the disk so that only one of them can appear at a time. The windows are spaced ninety degrees apart. The target b^2 is then spaced an angular distance from target a^2 equal to ninety degrees plus the width of a window. Target c^2 is placed an equal distance in advance of target b^2 and target d^2 an equal distance in advance of target c^2. Thus if the window subtend ten degrees the center of target b^2 will be one hundred degrees from the center of a^2, c^2 will be two hundred degrees from a^2, and d^2 will be three hundred degrees from a^2. When the targets are thus spaced, obviously two of them cannot appear simultaneously.

The disk h is perforated by four rectangular openings a^3 b^3 c^3 d^3 at equal distances from its center, through which pass the stems of the plungers of the keys. Each of these openings has an angular width equal to thrice the angular width of a window—that is, thirty degrees plus the angular width of the plunger of the key which passes through it, the latter being perhaps fifteen degrees, making forty-five degrees in all. The openings are spaced about the center of the disk at equal distances.

The plungers of the four keys a, b, c, and d carry cams or wedges a^4, b^4, c^4, and d^4 of the same width as the openings a^3, b^3, c^3, and d^3, adapted to register with the sides of these openings. The wedge a^4 is placed on one side only of its plunger, extending at its thickest portion, as stated, to a distance therefrom equal to thirty degrees on the circle through the openings a^2 b^2 c^2 d^2. For convenience the width of wedge corresponding to the angular width of one window—ten degrees—may be termed a "step" and the movement which is imparted to the disk through the agency of this wedge a "stage" of the travel of the disk. The wedge a^4 then projects three steps from its stem. The wedge b^4 is of equal total width, but projects from the stem one step in the direction of key a and two steps in the direction of key c. Wedge c^4 extends two steps toward key b and one step toward key d. Wedge d^4 lies altogether on the side of its stem toward key c. The relative arrangement of parts of this contrivance and its operation may be best seen in the diagrammatic sketch, Fig. 5. In the figure the target-disk is in the position in which it was placed by the depression of key a. Obviously the downward movement of this wedge a^4 would bring the opening or recess a^3 into coincidence with the wedge. The target a^2 should then appear at the window a'. All the other targets are concealed. Now if the key b be operated the upper step of wedge b^4 will engage recess b^3 and will rotate the target-disk backward through one stage of ten degrees, whereby the target a^2 will be withdrawn from coincidence with window a' and target b^2 will be displayed at window b', corresponding to the key depressed. If now key c be pressed, the target-disk will be moved through an additional stage and target c^2 will appear, and finally the operation of key d will revolve the target-disk still another stage and will bring target d^2 into view. It is clear that the manipulation of the keys need not take place in this order, however. If, for example, while the device is in the position shown key c be pressed, the disk will be moved backward or to the left through two stages and target c^2 will ap-

pear. The subsequent movement of key b will move the target-disk forward one stage, so that target b^2 will be seen, and then the use of key d will bring target d^2 into view. Thus in whatever order the keys may be used the depression of any key will bring into view a target at a corresponding window, and the target will remain in view until the subsequent use of another key. The target-disk, with its targets, is an indicator which is set in the operation of any key to denote the key used and retains its special significance until it is set to another position in the use of another key. In the use of these keys and the register in association with the system of selective signals mentioned (represented in diagram Fig. 6) the members of the different pairs of switch-springs and their resting-anvils of the four keys a, b, c, and d are connected serially in the two conductors 1 and 2 of a plug-circuit, uniting plugs i and i'. The alternate anvils f^4 of keys a and b are grounded, while the anvils f^5 of the same keys are connected, respectively, with the sources of signaling-current of opposite polarity. The anvils f^5 of keys c and d are grounded, and the anvils f^4 are led to the same sources of current. In practice the current-supply may be a generator k, having one terminal grounded and having two contact-springs, to which intermittent or pulsating currents of opposite polarity are delivered.

The selective-signaling instruments employed in this system are polarized bells, to whose armatures a "bias" or tendency to remain in one position is imparted by light springs. Four such bells are located at four stations A, B, C, and D. The bells at stations A and B are included in ground branches from one conductor 3 of the line-circuit. The bells at stations C and D are in similar branches from the other conductor of the line. The bells at stations A and C are constructed to ring when traversed by positively-directed current and those at stations B and D only when excited by current of the other direction. It is plain that a bell at any station and at that station only may be operated by applying to a particular line conductor a source of current of particular polarity. The line-wires are led at the central station through the usual spring-jack l, annunciator m, and battery n. The annunciator is operated by the closing of a bridge containing the telephone at any substation of the line. After the plug i has been inserted in spring-jack l in the usual process of making connection with the telephone-line the depression of any of the keys a, b, c, or d will operate the bell at the corresponding station A, B, C, or D. Thus if key a be used a positively-directed current will flow to line conductor 3 and thence to earth at stations A and B, operating the bell at the former station, but not that at the latter. To reiterate, the use of any of these keys in selectively signaling a corresponding station sets an indicator, which constitutes a record of the signal sent, by means of which the operator is enabled to repeat the signal without mistake.

It is evident that the contrivance of this invention may be applied without modification to any set or group of keys whose individual movement it is desired to register and that it may be easily modified to adapt it to any group of instruments or devices for transmitting distinctively-modified currents or for effecting permutation of circuits to permit the selective operation of instruments.

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

1. The combination with a system of instruments adapted for selective operation, and a group of appliances, one for each such instrument, each adapted to determine the operation of a particular instrument, of a movable part h adapted to display a distinctive target or indicator for each of said appliances, and mechanism actuated in the use of any one of said appliances adapted to move said part to display the corresponding indicator and to conceal the indicators of the other appliances, as described.

2. The combination with a system of instruments adapted for selective operation, and a group of appliances, one for each such instrument, each adapted to determine the operation of a particular instrument, a rotatable disk adapted to display a target or indicator corresponding to each of said appliances, openings in said disk, and wedges, one associated with each of said appliances for engaging with the said openings to rotate the disk, each of said wedges being adapted to rotate the disk through a different and characteristic arc, whereby the actuation of any one of said appliances causes the display of the corresponding indicator and the concealment of the indicators of the other appliances, as described.

3. The combination with a group of pushers or plungers, of wedges carried by the plungers, a rotatable target-disk having perforations or openings adapted to register with the wedges, each wedge being adapted to move a target-disk to a distinctive position, and each target being adapted to be displayed when a corresponding wedge is operated, as described.

4. The combination with an electric circuit and a plurality of responsive instruments connected with said circuit and adapted for selective operation by electric currents of distinctive character, a group of keys, each adapted to transmit over said circuit current adapted to actuate a particular one of said responsive instruments, a movable part associated with said keys and carrying a number of targets, one for each key, target openings or windows wherein said targets are adapted to be displayed, and mechanism associated with each of said keys for moving the part through a distinctive and characteristic arc, whereby

the target of a particular key is displayed at its window when such key is actuated, and the targets of the other keys concealed, substantially as set forth.

5. The combination with a telephone-line connected with a plurality of subscribers' stations and terminating at the switchboard of a central office, responsive instruments connected with the telephone-line at each of said subscribers' stations, each of said instruments being adapted to respond to electric currents of a distinctive character, a plug and cord circuit at the central office adapted for connection with the telephone-line, a group of ringing-keys associated with said cord-circuit, one for each substation, means, controlled by said ringing-keys, for transmitting over the telephone-line electric currents of a character to operate any one of said responsive instruments according to the key operated, a rotatable disk, means associated with each of said keys for rotating the disk a characteristic distance, and indicators, one for each key, adapted to be set by the rotation of said disk, whereby the actuation of any key causes the display of a corresponding indicator and the concealment of the other indicators, substantially as set forth.

In witness whereof I hereunto subscribe my name this 17th day of May, A. D. 1899.

FRANK R. McBERTY.

Witnesses:

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