No. 648,977. Patented May 8, 1900.

F. R. McBERTY.

SIGNAL FOR SELECTIVE CALLING APPLIANCES.

(Application filed Sept. 14, 1898.)

(No Model.)

Fig. 3

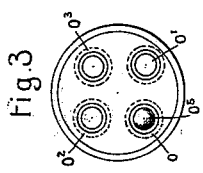


Fig. 2

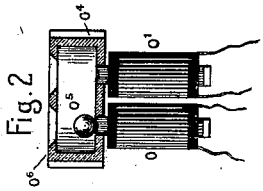
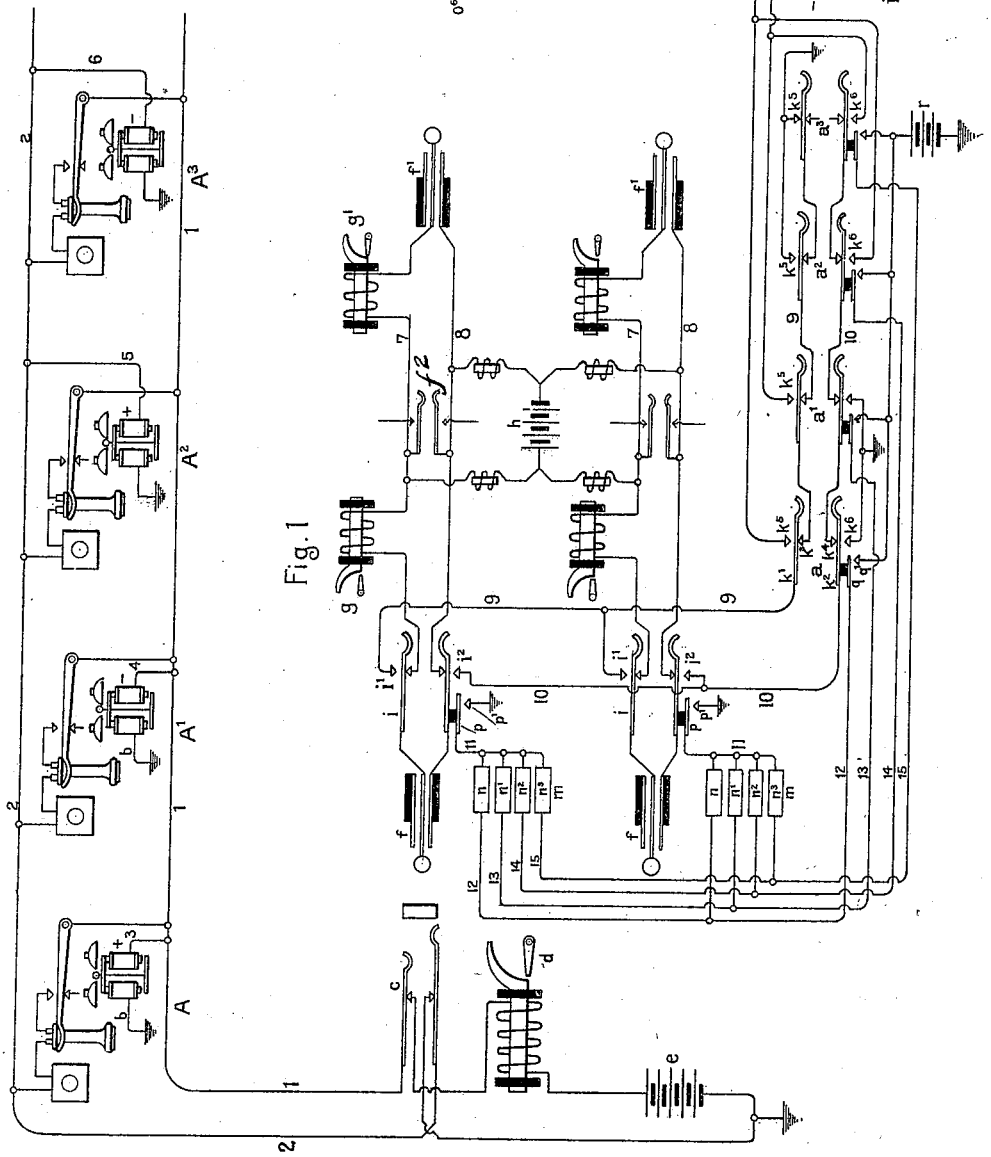


Fig. 1



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UNITED STATES PATENT OFFICE.

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SIGNAL FOR SELECTIVE CALLING APPLIANCES.

SPECIFICATION forming part of Letters Patent No. 648,977, dated May 8, 1900.

Application filed September 14, 1898. Serial No. 690,984. (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 Signals for Selective Calling Appliances, (Case No. 60,) 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.

This invention applies to telephone-lines centering in central offices equipped with means for selectively calling the different stations. It concerns particularly the operator's calling-keys or equivalent apparatus in a telephone-switchboard for switching such lines, being a device for indicating to the operator the identity of the station to which a signal has been sent in any particular instance.

It is customary in providing means in a switchboard for selectively calling different stations on party telephone-lines to provide a key for each plug-circuit employed by the operator in uniting lines with a single group of special-call-transmitting keys, each key adapted for operating the selective signal at a particular station, the group of special-call-transmitting keys being adapted for connection through the agency of a key in each plug-circuit with the corresponding plug-circuit to send a special call. It is found, however, in operating such switchboards, especially in those switchboards which are provided with supervising-signals controlled automatically in the use of substation apparatus of united lines, that the operator is hampered in her work by the necessity of keeping in mind or of ascertaining by oral communication with a calling subscriber the identity of a station of a party-line to which she has made connection and sent a call, but from which no response has been received. In case of need of a second signal or of any other action on the part of the operator requiring the identification of the particular station on the party-line with which connection has been or is to be obtained she has no efficient means for obtaining the required information.

In a former application, Serial No. 568,672, filed November 12, 1895, (Case No. 32,) I have described a system of calling-keys and signals therefor in which a group of special-call-transmitting keys is associated with each pair of plugs in the switchboard, and each key is associated with an indicator, which is set in the operation of the key to indicate the identity of the key used in calling a particular station. Such large groups of keys encumber the switchboard, however, besides being costly and troublesome to maintain.

The present invention is an improvement on the former invention; and it consists in the combination, with plug-circuits for use in making connection with party-lines, an appliance or group of appliances for transmitting specialized calling-currents for selectively calling the different stations, and a key for each plug-circuit to connect the call-sending appliance with any plug-circuit, of an indicator for each call associated with each such key and plug-circuit, means for actuating the particular indicator in the operation of sending a particular call-signal, and intermediate mechanism between the indicator and the controlling device therefor made operative in the use of the key of the plug-circuit, whereby the use of the signaling appliance sets an indicator designating the particular call transmitted in connection with the plug-circuit over which the call has been sent.

Figure 1 of the attached drawings represents a form of the invention in which the indicators are electrically operated, the controlling mechanism being circuit-changing switches. This drawing shows a telephone-line entering four stations and equipped at the different stations with means for selectively signaling the stations in combination with two plug-circuits in the switchboard for making connection with such party-lines, the plug-circuits being equipped with signals and call-transmitting appliances in accordance with the invention. Fig. 2 of the drawings represents a transverse vertical section of an indicator for association with a pair of plugs and their plug-circuit, and Fig. 3 is a plan of the same.

The telephone-line comprises conductors 1 and 2, which lead to stations A, A′, A^2, and

A^3. At each station the usual telephones are provided with a telephone-switch for closing the circuit in the use of the telephone and a call-bell *b*. The call-bells at two stations are connected in ground branches 3 and 4 from one line conductor 1 of the line, while the bells at the remaining stations are located in similar branches 5 and 6 from the other line conductor. The bells connected with the same line conductor are adapted for operation by pulsating currents of opposite polarity. Thus the bell at station A may be rung by positively-directed current applied to line conductor 1, while the bell at station A′ necessitates a negative current applied to the same conductor for its operation. The bell at station A^2 will ring with a positive current on line conductor 2 and bell at station A^3 with a negative current on the same conductor. This arrangement of bells for selective signaling is well known in the art to which this invention pertains.

Line conductors 1 and 2 are led to the contact-terminals of a spring-jack *c* in a telephone-switchboard, from which extensions are made to earth and to the pole of a battery *e*, respectively, a line-signal *d* being connected in the conductor 1 to respond to current created in the line by the removal of a telephone from its switch at any station of the party-line. The bells at the substation should have so high resistance as to prevent the operation of signal *d* by current through them.

The operator is provided with pairs of plugs *f* and *f′*. The members of each pair of plugs are united by two conductors 7 and 8, which constitute the plug-circuit. This plug-circuit is equipped with an operator's telephone-key f^2, with contact-anvils forming the terminals of the operator's telephone for connecting the telephone with the circuit with two supervising-signals *g* and *g′*, and with a source of current *h* in a bridge of the circuit intermediate of the signals for operating them in response to changes in the resistance of the line-circuit with which the signals may happen to be associated.

Each plug-circuit is provided with a calling-key *i*, whose switch-springs normally rest on contact-anvils, which complete a circuit between the plugs *f* and *f′*, but which may be thrust against the contact-anvils i' i^2 when the plunger of the key is depressed. Each operator is provided with a single appliance for transmitting calling-currents suitably modified to selectively operate the bells at the different stations. In this instance this appliance comprises four keys *a*, *a′*, a^2, and a^3. Each of these keys consists of levers k' k^2, normal resting-contacts k^3 k^4, and alternate contacts k^5 k^6. The switch-levers k', with their normal resting-anvils, are connected serially in a conductor 9, which is branched to one outer contact-anvil i' of each of the keys *i*, while the levers k^2 and their resting-anvils are included in a similar conductor 10, leading to the other contact-anvils i^2 of the same keys. The external contact-anvil k^5 of key *a* and the anvil k^6 of key a^2 are connected with the positive terminal of a grounded generator *l* of pulsating current of positive direction, while the contact-anvil k^6 of key *a* and anvil k^5 of key a^2 are grounded. Similarly external anvil k^5 of key *a′* and anvil k^6 of key a^3 extend to the negative pole of a similar generator *l′* of current, while the remaining external anvils are grounded. Thus keys *a* and *a′* are adapted to apply positively and negatively directed current to conductor 9, respectively, while keys a^2 and a^3 are arranged to apply in the one case a positively and in the other case a negatively directed current to the conductor 10, so that when these conductors are brought into connection with the conductors 7 and 8 of the plug-circuit, and thus into union with line-wires 1 and 2 of the line-circuit, the different keys *a*, *a′*, a^2, and a^3 may be used to operate the bells at the different stations A, A′, A^2, and A^3, respectively.

Near each key *i* is a group *m* of indicators, comprising four, designated *n*, *n′*, n^2, and n^3, respectively. These appliances may be of any suitable nature adapted in mode of operation and in number of possible designations to the construction and arrangement of the call-sending keys. I have found the mechanism represented in Figs. 2 and 3 a suitable device for this purpose. This comprises four small electromagnets *o*, *o′*, o^2, and o^3, having their pole-pieces projecting through the bottom of a shallow cup o^4, the poles being nearly flush with the bottom of the cup. A small ball o^5 of magnetic material rests in the cup. The poles of the magnets are very slightly recessed to form resting-places for this ball, which is in other respects free to move about within the cup. The cup is provided with a cover o^6, having apertures formed in it opposite the poles of the magnets through which the ball may become visible. The interior of the cup may be painted black, the ball being silvered, in which case the ball will be visible over any magnet on the pole of which it may have come to rest. The excitement of any magnet causes its pole to attract the ball, which thereupon rolls into the recess of the attracting-magnet, remaining in that position after the attraction has ceased and until another magnet exerts attraction upon it.

It is designed that one of the windings of each indicator should become excited when a particular one of the signal-transmitting keys is actuated. Hence the indicator should have as many possible indications as there are signaling-keys. The control of the indicators by the signaling-keys is, however, effective only as respects indicators associated with keys *i*, which are in use in sending a call. The agency through which this operation is attained is as follows: The terminals of all the magnets *o*, *o′*, o^2, and o^3 of one indi-

cator are connected by a wire 11 with an auxiliary switch-spring p on the key i, with which it is associated, which spring has a contact p', against which it is brought in the act of calling. The contact p' is connected to ground. The terminals of all magnets o of the different indicators are led to a common wire 12, whose continuity is controlled by auxiliary switch-contacts q q' of the key a, these contacts being adapted to be thrust together when the key is operated to send a call and being arranged to complete circuit to a grounded battery r. The terminals of all magnets o' are similarly led through a conductor 13 to the pole of the battery, similar switch-contacts on key a' being interposed in this conductor. Wire 14, controlled by switch-contacts on key a^2, leads to the terminals of magnets o^2. Wire 15, controlled in key a^3, leads to the terminals of magnets o^3. Thus the magnets o o' o^2 o^3 are adapted for association through the intermediate circuits controlled by key i with the call-sending keys a, a', a^2, and a^3, respectively. In selectively operating a bell at a required station of the party-line the operator having inserted plug f into the spring-jack of the line whereon the required station is located depresses first the key i and then the proper key of the special group to send the specially-modified calling-current for operating the bell at the required station. The act of depressing key i completes the local circuit through all the magnets of the indicator associated with that key. The subsequent act of operating one of the calling-keys completes the local circuit of the corresponding indicator-magnet of the said indicator, whereby a permanent indication is made in association with the plug-circuit to show which station of the party-line has been called. Subsequent calls may be made to the same station or necessary charges or other notes may be made without further reference than this indication. The subsequent transmission of a different call by means of the same plug and key effaces the first indication and sets an indicator in correspondence with the call last sent. Thus, for example, assume that the operator having made connection with the party-line wishes to call the subscriber at station A′. To operate the bell at station A′ requires a negative current applied to line conductor 1. The operator depresses key i of the plug used in making connection and then key a' to send the required calling-current. These acts complete a circuit extending from battery r through conductor 13, which is completed at the auxiliary contacts q q' of key a' through magnet o' to conductor 11, which is completed at the switch-contacts of key i and thence to earth. The current in this circuit excites magnet o', which draws the target-ball o^5 into position in the recess in the pole of magnet o'. After sending the calling-current the operator releases keys i and a'. The ball o^5 remains visible, however, at n' to indicate that key a' has been operated last, and hence that station A′ of the party-line has been called.

It will be apparent that other forms of the invention might readily be constructed to meet special conditions or for adaptation to special modes of calling. Hence I do not limit my claims to the device herein specifically described.

I claim as new—

1. The combination with telephone-lines and apparatus connected therewith adapted for selective operation, link conductors for making connection with the lines, an appliance for selectively operating said apparatus, and a switch for connecting said appliance with any link conductor, of an indicator associated with each switch, means actuated by the said appliance controlling the indicator adapted to move the indicator to correspond with the apparatus operated thereby, and intermediate mechanism between the indicator and said actuating device controlled by the switch; whereby the identity of the apparatus actuated is indicated in association with the switch whereby its actuation was determined, as described.

2. In combination with party telephone-lines adapted for selective calling, link conductors for making connection with the lines, a group of calling-keys each adapted to send a specialized calling-current to operate the calling appliance at one substation, and a key in each link conductor adapted to connect the said group of calling-keys with the link conductor, of an indicator associated with each link conductor having a number of indications equal to the number of calling-keys, and intermediate mechanism adapted to connect the calling-keys with the indicators, to make the operation of any calling-key give a corresponding indication, said intermediate mechanism being controlled by the key in the link conductor, as described.

3. The combination with telephone-lines and apparatus in connection therewith adapted for selective operation, link conductors for making connection with the lines, a group of appliances adapted for selectively operating said apparatus, and a key in each link conductor for connecting the said group of appliances with the link conductor, of an indicating appliance associated with each link conductor, circuits including the said indicating appliance, and switches on the said appliances for operating the selective apparatus, each adapted to cause the indicator to give a corresponding indication, and a switch connected with the key in the corresponding link conductor controlling the said circuit connections to make them operative when the key is used to connect the group of appliances with the corresponding plug-circuit, as described.

4. The combination with telephone-lines having calling apparatus adapted for selective operation, link conductors for making connection with the lines, a group of calling-

keys each adapted to send current specially modified to operate one call-bell on any line, and a key in each link conductor for connecting the said group of calling-keys with the link conductor, of indicators equal in number to the number of such calling-keys associated with each link conductor, a circuit of each indicator, and a switch on each calling-key adapted to control the circuit of one of said indicators, and a switch in each key in a link conductor controlling the circuit connections of the corresponding indicators; whereby the identity of a called station is registered in association with the link conductor in connection with the line thereto, as described.

5. As a signal-indicator in combination two or more electromagnets, a rolling body of magnetic material, and a track therefor passing the pole of each of the magnets, a screen covering the said magnets and rolling body having openings therein opposite the poles of the magnet, as described.

6. In a signal-indicator the combination with several vertically-disposed electromagnets, of a cell having a floor, the said floor being substantially in the plane of the poles of the magnets, and a rolling body of magnetic material in the cell, the floor of the cell being depressed over the magnet-poles to permit the said body to take a stable position under the influence of a magnet, a covering for said cell having openings therein opposite the poles of the magnet, through which the rolling body may be visible, as described.

In witness whereof I hereunto subscribe my name this 11th day of November, A. D. 1897.

FRANK R. McBERTY.

Witnesses:
ELLA EDLER,
DUNCAN E. WILLETT.