

No. 654,747.

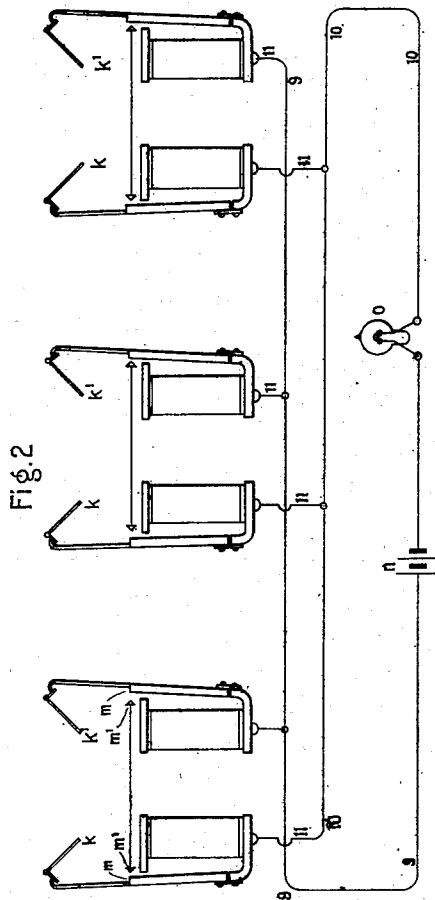
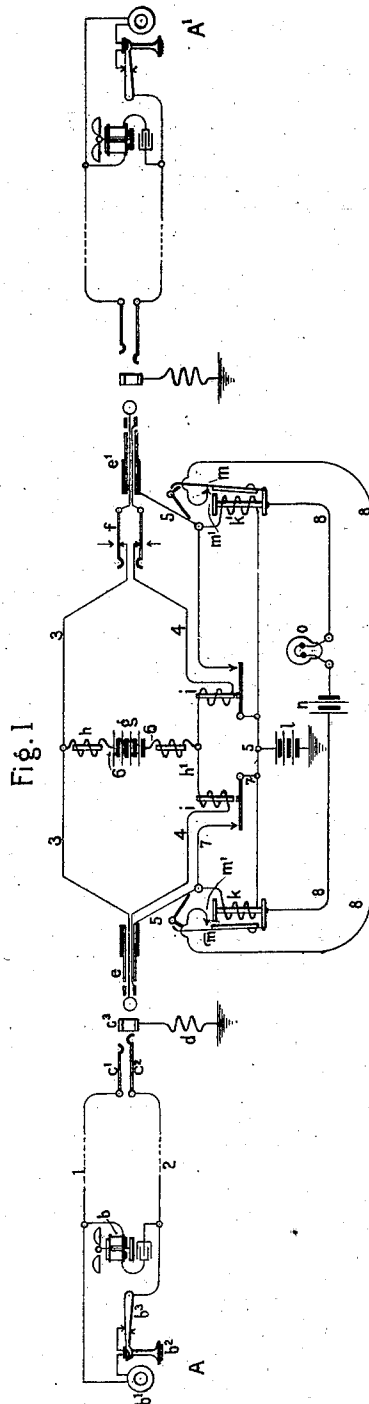
Patented July 31, 1900.

F. R. McBERTY.

SUPERVISORY SIGNAL FOR TELEPHONE SWITCHBOARDS.

(Application filed Nov. 13, 1897.)

(No Model.)



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UNITED STATES PATENT OFFICE.

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SUPERVISORY SIGNAL FOR TELEPHONE-SWITCHBOARDS.

SPECIFICATION forming part of Letters Patent No. 654,747, dated July 31, 1900.

Application filed November 13, 1897. Serial No. 658,398. (No model.)

To all whom it may concern:

Be it known that I, FRANK R. McBERTY, a citizen of the United States, residing at Downer's Grove, in the county of Du Page and State of Illinois, have invented a certain new and useful Improvement in Supervisory Signals for Telephone-Switchboards, (Case No. 55,) 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 is a general or pilot signal for use in telephone-switchboards in association with supervisory signals referring to united lines.

In certain well-known types of switchboard for switching telephone-lines into connection with each other each line is provided at its substation with means for changing the strength of a signalling-current in the line incidentally in the use of the telephone, and the link-conductor employed for uniting lines in the switchboard are equipped with signals responsive to such currents through each of two united lines, which accordingly indicate to the operator the condition of use or disuse of the station instruments of the lines. The simultaneous indication of the signals that the station-telephones of two united lines are no longer in use is accepted by the attendant as a "clearing-out signal," and the connection between the lines is broken.

The object of this invention is to provide for a bank or equipment of such pairs of supervisory signals attended by one operator a general or pilot signal whose display is conditioned by the simultaneous operation of both supervisory signals associated with one link-conductor, or, in effect, with one pair of united lines.

To this end it consists in the combination, with two or more supervisory signals, of a general signal and mechanism made operative through the simultaneous operation of the supervisory signals to actuate the general signal, and in the combination, with several pairs or groups of supervisory signals, of a general signal and mechanism made operative through the simultaneous operation of the members of any group of supervisory signals to actuate the general signal. In the

form more convenient for use in switchboards the general signal may be included in a circuit having multiple open branches or bridges, each of which bridges is controlled by serially-connected switch-contacts, one pair for each member of a group of supervisory signals, so that the closing of the general circuit is contingent upon the simultaneous closure of all the breaks in some one bridge by the operation of all the signals in the corresponding group.

The attached drawings are illustrative of the invention.

Figure 1 of the drawings represents two telephone-lines extending from substations to a central station and terminating there in spring-jacks, in connection with a pair of plugs and their uniting plug-circuit for linking the lines into a continuous circuit. Two supervisory signals are associated with the plug-circuit and these control a general signal. Fig. 2 illustrates in a simplified manner the mode of bringing the general signal under the control of a number of pairs of supervisory signals of different plug-circuits.

Referring to Fig. 1, each substation A is equipped with a bell *b*, a transmitting-telephone *b'* and receiving-telephone *b''*, and a switch *b'''* for closing the circuit of the line through the telephones during their use. These appliances are connected by line conductors 1 and 2 with a spring-jack *c* in the switchboard, the two line conductors being led to two contact-terminals *c'* and *c''* of the spring-jack. The spring-jack is equipped also with a third contact-piece *c'''*, which is represented as being grounded. The appliances by means of which the subscriber may initiate a call in the switchboard are not shown, inasmuch as they are well known, and, further, the devices which are usually included in the ground connection of the local contact-piece *c'''* of the spring-jack are also omitted from the drawings, being represented by the coil *d*. Pairs of plugs *e* and *e'* are provided for the use of the operator in uniting lines by means of their spring-jacks. Each plug consists of three contact-pieces, which are designed to register with the local contact *c'''* and the line-contacts *c'* and *c''*, respectively, of a spring-jack. Like contact-pieces of the

two plugs are united by conductors 3, 4, and 5, respectively, the first two of which constitute the plug-circuit. The switch-contacts of a calling-key f are interposed in the conductors of the plug-circuit. It will be understood, further, that the plug-circuit would in practice be equipped with an operator's listening-key for bringing a telephone into connection with the plug-circuit. A conductor 6, which forms a bridge of the plug-circuit, includes a battery g . Impedance-coils h and h' are interposed between the poles of the battery and the corresponding conductors of the plug-circuit. The conductor 4 is formed in part of the magnet-windings of two relays i and i' , one winding being at each side of the bridge 6 of the plug-circuit, so that each relay is responsive only to current through the telephone-line with which it is immediately connected. These relays control each a secondary supervisory signal, these signals being designated k and k' , respectively, in the following manner: The windings of the signals k and k' are included in the conductor 5. The middle point of this conductor between these windings is connected with a pole of a battery l , whose other pole is grounded. The signal k is designed to refer to the plug e or to the line with which that plug is connected, while the signal k' refers to the plug e' . The supervisory relay i controls a short circuit 7 about the magnet-winding of signal k , while the relay i' similarly controls a short circuit of the signal k' , the relays being adapted to close the short-circuits about the signals when the relays are excited.

The signal k may be of any well-known type having an indicator which becomes displayed when the magnet of the signal is excited. I have found the signal described in Patent No. 536,104, dated March 19, 1895, to Theodore Spencer, eminently suitable for this use.

In applying the present invention to these supervisory signals I add to the signal k a contact-piece m , connected with its armature or some other portion which is moved in the excitement of the magnet, which is designed to impinge upon the contact-anvil m' when the armature is attracted. These switch-contacts of the two supervisory signals k and k' of a single pair of plugs are included in a local circuit 8, together with a battery n , which includes also the general or pilot signal o . The most efficient pilot-signal is an incandescent lamp.

I do not deem it necessary to describe in detail the well-known steps of signaling to the central office from a substation and making connection at the central office between the calling line and the line called for by means of plugs e and e' inserted in the spring-jacks of the respective lines. After the connection has been established the battery g in the bridge 6 of the plug-circuit tends to produce a flow of current in each of the lines to stations A and A', the flow of current in these lines being determined, however, by

the position of the switches at the respective stations, the current being permitted to flow only when the substation-telephone is removed from its switch-hook for use. The act of placing the plugs e and e' in the spring-jacks of the lines completes not only the connection between the lines through the agency of the plug-circuit, but also local circuits made up of conductors 5, terminating in the sleeves of plugs e and e' and the conductors terminating in the corresponding ring-contacts c' of the spring-jacks. The complete local circuit of battery l , closed in the contact-pieces of each plug and spring-jack, tends to cause the excitement of the signal k or k' in the same circuit. In the ordinary course of events, however, the telephone at the calling station A, for example, will have been removed from its switch-hook in the process of signaling to the exchange for connection, so that when the plug is inserted in the spring-jack of the calling line current from battery g immediately finds circuit through the line conductors, the switch being closed at the station, whereby the relay i is excited and closes a short circuit of the signal k . This signal accordingly remains inert and concealed. Since its armature is not attracted to its magnet, the local circuit 8 remains open at the switch-contacts $m m'$ of signal k and the pilot-signal o is not lighted. Until the subscriber at the called station takes his telephone for use the relay i' referring to that line is not excited, so that current from battery l through the local circuit 5 corresponding to that line excites the signal k' and keeps its indicator in view. During conversation between the subscribers, however, the line-circuits are of course closed at their respective stations and both signals k and k' are short-circuited, their indicators being thereby hidden. When at the termination of conversation both station-telephones are replaced on their switches and the line-circuits are opened at the stations, the relays i and i' are deprived of current, they release their armatures, breaking the shunts about signals k and k' , the magnets of the signals are excited, the armatures are drawn forward, and the signals are displayed, while at the same time the two breaks in the local circuit 8 are closed and the pilot-signal o becomes lighted by current thus created in the circuit. The operator's attention will be first attracted to the pilot-signal, and thus directed to the pair of supervisory signals k and k' , which are displayed. Acting upon this call for disconnection she will then remove the plugs from the spring-jacks and return the appliances to their normal positions.

It is understood that each operator at a telephone-switch is equipped with a considerable number of pairs of plugs, each pair with its associated signals k and k' , the entire bank of signals being in connection with a single pilot-signal o . The circuit of a pilot-signal thus associated with a considerable number

of supervisory signals is shown in Fig. 2. The local circuit, which was designated 8 in the description of Fig. 1, consists, in fact, of two main conductors 9 and 10, which include the pilot-signal *o*, and are connected with the poles of a battery *n*. These conductors are connected together by several branches or bridges 11, one for each pair of supervisory signals. Each bridge 11 traverses in series the switch-contacts *m m'* of both supervisory signals *k* and *k'* of one pair. Obviously the completion of both breaks in any bridge 11 of the circuit, including the pilot-signal in the simultaneous display of both members of the pair of supervisory signals to call for disconnection, will cause the display of the pilot-signal *o* and call the attention of the operator to the particular pair of supervisory signals thus displayed, whereupon she will disconnect the corresponding lines.

This mode of controlling a pilot-signal in association with pairs or groups of supervisory signals referring to different pairs of plugs is of course not confined to its use in connection with supervisory signals of the particular arrangement herein described, consisting of a special visible signal and a relay controlling the signal.

Various changes in the arrangement of parts may be made without departing from the spirit of the invention.

The invention is defined in the following claims:

1. The combination with united telephone-lines and a signal associated with each line and controlled by current in the line, of a pilot-signal and mechanism actuated in the simultaneous operation of the said signals adapted to cause the display of the pilot-signal, as described.

2. The combination with united telephone-lines, each provided with means for determining the flow of current in the line in the

use thereof, of an electromagnet controlled by current in each line, and switch-contacts actuated by each magnet to be closed when the said magnet is excited, a signal, and a circuit including serially the contacts of both of said magnets, together with said signal and a source of current, as described.

3. The combination with pairs of united telephone-lines, and a supervisory signal for each line controlled by current therein determined in the use of the line, of a pilot-signal, a circuit including the pilot-signal, different bridges in multiple of the said circuit, and switch-contacts on each supervisory signal adapted to be closed thereby in one position, the switch-contacts of both members of a pair of supervisory signals being included serially in each of said bridges, substantially as described.

4. The combination with telephone-lines each having a switch at its substation for closing the line during the use of the telephone, of plugs and plug-circuits uniting the lines in pairs, a bridge of each plug-circuit including a source of current, a relay in the circuit of each line, a supervisory signal associated with each line in a local circuit controlled by the corresponding relay, a pair of switch-contacts on each supervisory signal actuated thereby to be closed when the signal is displayed, a general or pilot signal, a local circuit including the pilot-signal, together with a source of current, and normally-open bridges adapted to complete the said local circuit, each of said bridges including serially the switch-contacts of supervisory signals of united telephone-lines, as described.

In witness whereof I hereunto subscribe my name this 10th day of September, A. D. 1897.

FRANK R. MCBERTY.

Witnesses:

JOHN W. SINCLAIR,
A. L. LAWRENCE.