

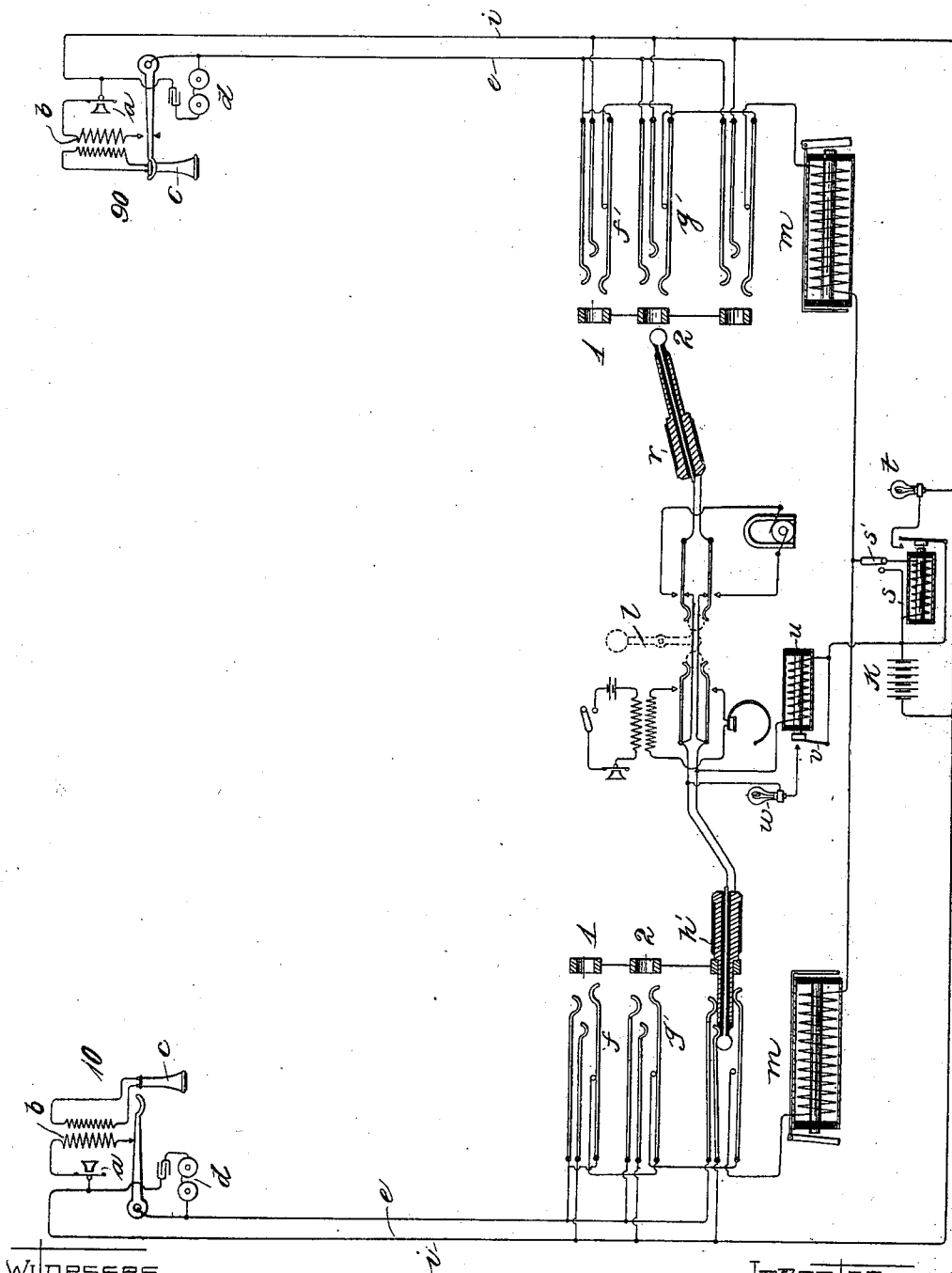
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Patented Oct. 8, 1901.

W. E. McCORMICK.
TELEPHONE EXCHANGE SYSTEM.

(Application filed Dec. 6, 1899.)

(No Model.)



WITNESSES—
C. J. Schmidt
C. J. Schmitt

INVENTOR
WILLIAM E. McCORMICK
BY— Charles A. Brown & Cragg
ATTORNEYS

UNITED STATES PATENT OFFICE.

WILLIAM E. McCORMICK, OF CHICAGO, ILLINOIS, ASSIGNOR TO THE STROMBERG-CARLSON TELEPHONE MANUFACTURING COMPANY.

TELEPHONE-EXCHANGE SYSTEM.

SPECIFICATION forming part of Letters Patent No. 683,969, dated October 8, 1901.

Application filed December 6, 1899. Serial No. 739,389. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM E. McCORMICK, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Telephone-Exchange Systems, (Case No. 1,) of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

My invention relates to telephone-exchange systems, and has for its object the provision of improved means for operating signals. More particularly, my invention has for its object the provision of improved clearing-out signaling apparatus and an improved signaling apparatus that may be associated with a number of lines of an exchange when a limited number of operators is employed—as, for example, at night or holidays and Sundays—to supplement the line signals or indicators, this supplemental signaling apparatus when brought into service being operated by a subscriber in initiating a call. This signal may be also constantly retained in service to act as a supervising-signal, if desired.

Heretofore difficulty has been experienced in providing a suitable automatically-operated clearing-out indicator. Signaling-lamps constitute the preferred form of clearing-out indicators; but I do not wish to be limited to this precise instrumentality. In order to have the signaling-lamp glow when connected, subscribers have replaced their receivers upon the switch-hooks. It has been proposed to provide, in connection with each clearing-out lamp, a relay, which partly controls a local circuit including the lamp, the relay when deenergized serving to bring contacts in the said local circuit together, a plug-seat switch being also employed for controlling contacts included in the said local circuit which are separated through the agency of a plug when seated to prevent the local circuit from being closed when the cord-circuit is idle. By means of my invention I am enabled to cause the signal-lamp to glow or other suitable instrumentality to be operated upon the replacement of receivers upon their switch-hooks without having to employ a

plug-seat switch normally to open the circuit, including the said signal, when the cord-connecting apparatus is not in use. To this end in the preferred embodiment of my invention I include a signaling-lamp in a circuit the continuity of which is jointly controlled by a relay, a line-jack, and a plug adapted for insertion within the jack. The said relay in the preferred embodiment of the invention when deenergized closes contacts included in the lamp-circuit, and if the cord-connecting apparatus is idle the lamp-circuit is incomplete, as it depends partly for its completion upon the engagement of a plug with a line-jack, so that normally the lamp will not glow; but if the cord-connecting apparatus is in circuit between the lines the lamp will glow if the relay is deenergized, which occurs when both subscribers are through conversation, they having replaced their receivers upon the telephone-hooks to open or render ineffective the circuit including the relay. The signal-lamp does not glow when either of the telephones is removed from its hook, so that no clearing-out signal can be manifested unless both subscribers have finished.

The auxiliary line-signaling apparatus comprising a feature of my invention employs in its preferred embodiment a supplemental relay which may be connected with a number of telephone-lines, preferably by means of a manual switch. This supplemental relay preferably controls the continuity of a circuit including a signal-lamp. This relay when included in circuit with the telephone-line upon the removal of a subscriber's receiver from its telephone-hook serves to close contacts included in the lamp-circuit to cause the lamp to glow. I prefer to employ a lamp; but I do not wish to be limited to this particular instrumentality.

I will explain my invention more particularly by reference to the accompanying drawing, which diagrammatically illustrates a multiple switchboard telephone-exchange system equipped in accordance with my invention.

The apparatus at substations 10 and 90 is well known to those skilled in the art. A battery-transmitter *a*, with its coil *b* and the re-

ceiver *c*, is illustrated at each of these stations, a secondary coil at each station in this particular instance being included in a local or short circuit with the telephone-receiver thereat, while the primary coil in circuit with the transmitter is placed in circuit with both limbs of the corresponding telephone-line upon the removal of the receiver from its spring-switch-hook. The transmitter primary winding of the induction-coil at station 10 is thus shown in series with the telephone-line, the telephone-receiver at this station being removed from its hook. The transmitter-circuit at station 90 is open, the receiver at said station being upon its hook. I do not, however, wish to be limited to the precise arrangement of the telephone apparatus at the subscribers' stations that I have shown. There is also provided at each station a call-bell *d*, preferably responsive to alternating current, which bell is in bridge with a condenser of the corresponding telephone-line. Other connections for the call-bells, however, may be employed.

The metallic-circuit telephone-lines extend from the substations to an exchange. One limb *e* of each metallic line is normally connected with the two longer line-springs of line-jacks *f* and *g* at sections 1 and 2 of the multiple switchboard and also with the two longer line-springs of the answering-jack at section 2. The remaining limbs *i* of the metallic lines are connected with the shortest line-spring of each line and answering-jack at each section of the board and also with one terminal of the common battery *k*. The limbs *e* of the telephone-lines are continued through the spring-jacks when the lines are idle, each of the said limbs then including a line-indicator *m*, one of whose terminals is connected with the jacks, the remaining terminal of each line-indicator being permanently connected with the remaining terminal of the common battery. Upon the insertion of a plug in any of the jacks the line-indicator connected with the said jack is cut out of circuit, the longest line-spring of each jack normally engaging a back contact, the longest line springs and the back contacts engaging the same being included in the line-annunciator branch.

A subscriber when initiating a call by removing his receiver from its switch-hook completes a circuit which includes the common battery and his line-indicator. In response to the line-signal the operator inserts an answering-plug *h'* within the answering-jack of the calling subscriber—say No. 10—and thereby opens the circuit through the indicator *m* to cause its restoration. I provide an operator's telephone and ringing-key *l* in connection with each cord set. By operating the key the operator may include her telephone in telephonic communication with the calling subscriber or with connected subscribers. Calling subscriber No. 10 desiring connection, for example, with called subscriber No. 90,

the operator inserts the connecting-plug *r* within the line-jack *g* of the called subscriber. The operator by manipulating her key *l* may signal the called subscriber. The apparatus that I have thus generally described with reference to the accompanying drawing is familiar to those skilled in the art.

I will now describe my improved clearing-out indicating apparatus and my improved auxiliary or supervising line signaling apparatus.

I preferably associate with a group of lines a single relay *s*, the continuity of the circuit including the same being controlled by a switch *s'*, which is thrown to close the circuit through the relay when the single signal *t*, associated with the group of lines, is to be operated when one of the subscribers of that group initiates a call. When the switch *s'* is thrown to an alternative position, circuit through the relay *s* is opened. The supervising-signal *t* is preferably in the form of an incandescent lamp, although I do not wish to be limited to the precise signal that is employed.

The clearing-out relay *u* is preferably supplied with current from the common battery *k*, the continuity of the circuit including this relay being controlled by the telephone switch-hooks at the subscribers' stations and the plugs inserted within the line-jacks, this relay being preferably included in bridge between the sides of the telephonic circuit. One terminal of the relay is connected, preferably, with one of the cord-strands of the cord-circuit—in this instance the sleeve-strand—and thereby with one side of the telephone-line, while the other is preferably connected permanently with the remaining side of the telephone-line through the common battery. The relay *u* is provided with a contact-arm *v*, which is also connected with the common battery. The contact-arm *v* is adapted when released upon deenergization of the relay *u* to engage a contact-terminal connected with the signaling-lamp *w*, this signaling-lamp thereupon being included in a local circuit whose continuity is jointly controlled by the arm *v* and the answering-plug with its engaging jack and also in a second local circuit whose continuity is controlled by the arm *v* and the connecting-plug with its engaging jack—that is, the lamp in this instance is common to two local circuits. The battery *k* is included in each of these circuits. In the present instance one local circuit includes a portion of the tip-strand, the tip of the answering-plug, the line-spring engaging the same, the line conductor extending from the line-spring to the battery *k*, the conductor extending from the battery *k* to the arm *v*, and the conductor, including the lamp *w*, having one end connected with the tip-strand, while the other end constitutes the contact against which the arm *v* rests when the relay *u* is deenergized. The second local circuit may be similarly described, with the exception that

the tip of the connecting-plug and the line-spring engaging the same serve in part to close it. I thus provide two local circuits which are independent of the telephone-lines, each adapted to include the clearing-out lamp *w*, these circuits being independent of the telephone-lines in so far as it is impossible to open and close the same by means of the telephone switch-hooks of the connected subscribers' stations.

I use the term "common battery" in the claims in the sense of any suitable source of electricity.

It is obvious that changes may be made in the embodiment of my invention herein shown and particularly described, and I do not therefore wish to be limited to the precise apparatus illustrated; but,

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

1. In a telephone-exchange system, the combination with a plurality of telephone-lines extending from subscribers' stations to an exchange, a switch-hook being provided at each of the subscribers' stations for supporting the telephone-receiver thereat, a line-indicator for each telephone-line, a signal-relay common to said telephone-lines and normally in circuit with said line-indicators, and a common battery connected with said relay and line-indicators, any of said switch-hooks serving when the receiver supported thereby is removed to include the common battery in circuit with said relay and the line-signal corresponding to the switch-hook from which the receiver is removed, whereby the said relay and the line-signal of the calling-line are simultaneously operated, substantially as described.

2. In a telephone-exchange system, the combination with a plurality of telephone-lines extending from subscribers' stations to an exchange, a switch-hook being provided at each of the subscribers' stations for supporting the telephone-receiver thereat, a line-indicator for each telephone-line, a signal-relay common to said telephone-lines and normally in circuit with said line-indicators, a common battery connected with said relay and line-indicators, any of said switch-hooks serving when the receiver supported thereby is removed to include the common battery in circuit with said relay, and the line-signal corresponding to the switch-hook from which the receiver is removed, whereby the said relay and the line-signal of the calling-line are simultaneously operated, and jack-switches provided with separable contacts included serially in the telephone-lines, the jack-switches being located between the line-indicators and the substations, substantially as described.

3. In a telephone-exchange system, the combination with two telephone-lines extending from substations to an exchange, of cord-connecting apparatus for uniting the same for conversation, a plug forming a part of said cord-connecting apparatus, a jack-switch adapted for engagement with the said plug and connected with the telephone-line with which the plug is to effect connection, a common battery, a switch-hook at each of the subscribers' stations for supporting the receiver thereat, the said plug serving to include the relay in bridge of the telephone-circuit and both telephone-lines, whereby an operative change in the circuit of the relay can only be effected upon similar changes in the switch-hooks of the connected subscribers, and a clearing-out signal having a circuit for operating the same, the said relay serving to close the latter circuit at one point, while the plug and the engaging jack-switch serve to complete the clearing-out-signal circuit at another point, either switch-hook serving to close circuit through the relay and battery to effect the operation of the said relay, substantially as described.

4. In a telephone-exchange system, the combination with two telephone-lines extending from substations to an exchange, of cord-connecting apparatus for uniting the same for conversation, a plug forming a part of said cord-connecting apparatus, a jack-switch adapted for engagement with the said plug and connected with the telephone-line with which the plug is to effect connection, a common battery, a switch-hook at each of the subscribers' stations for supporting the receiver thereat, the said plug serving to include the relay in bridge of the telephone-circuit and both telephone-lines, whereby an operative change in the circuit of the relay can only be effected upon similar changes in the switch-hooks of the connected subscribers, and a clearing-out signal having a circuit for operating the same, the said relay serving to close the latter circuit at one point, while the plug and the engaging jack-switch serve to complete the clearing-out-signal circuit at another point, said switch-hooks being provided with contacts and circuit connections which cooperate therewith to close circuit through the common battery and the relay upon the elevation of the switch-hooks, or either of them, when the telephones are removed therefrom, substantially as described.

In witness whereof I hereunto subscribe my name this 1st day of December, A. D. 1899.

WILLIAM E. McCORMICK.

Witnesses:

GEORGE L. CRAGG,
CHARLES E. HUBERT.