

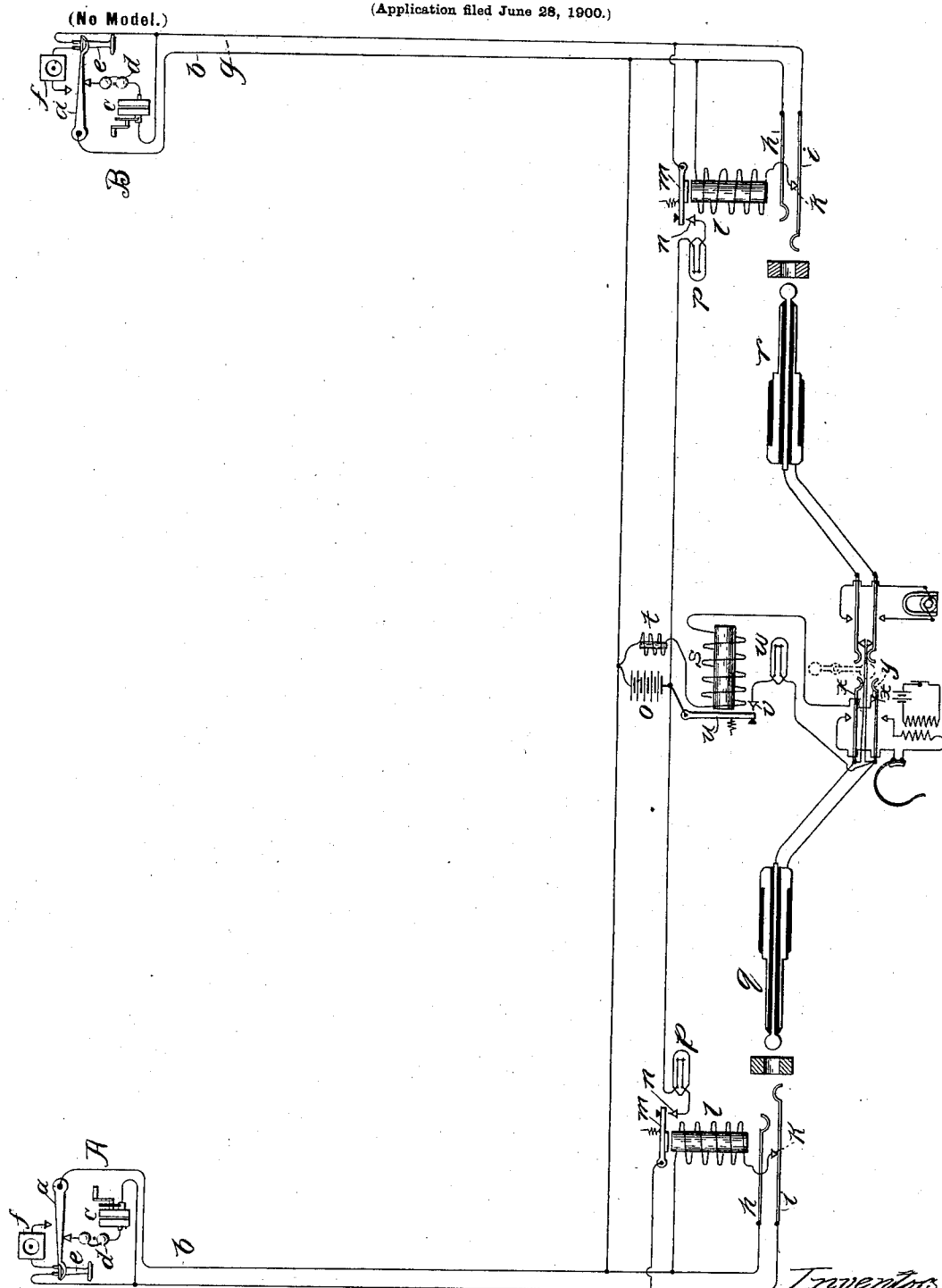
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A. STROMBERG & W. M. DAVIS.
TELEPHONE EXCHANGE SYSTEM.

(Application filed June 28, 1900.)

(No Model.)



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UNITED STATES PATENT OFFICE.

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ASSIGNORS TO THE STROMBERG-CARLSON TELEPHONE MANUFACTURING COMPANY, OF SAME PLACE.

TELEPHONE-EXCHANGE SYSTEM.

SPECIFICATION forming part of Letters Patent No. 662,988, dated December 4, 1900.

Application filed June 28, 1900. Serial No. 21,894. (No model.)

To all whom it may concern:

Be it known that we, ALFRED STROMBERG and WILLIAM M. DAVIS, citizens 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. 3,) of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawing, forming a part of this specification.

Our invention relates to telephone-exchange systems, and is particularly adapted for use in connection with those systems in which the telephone-lines extend from the central office to subscribers' stations equipped with call-sending generators for operating signals at the exchange, although the invention is capable of other use, and has for its object the provision of an improved clearing-out annunciator that will, after being operated, be automatically restored upon the manipulation of the operator's apparatus.

In accordance with our invention we associate the magnet of a clearing-out annunciator with the cord-circuit in such a way that it may be traversed by current transmitted from the signaling-generator operated at a subscriber's station that is connected with another through the agency of said cord-circuit. The armature of the magnet when attracted serves to close a circuit including a battery or other source of current that serves to maintain the clearing-out signal, this second circuit including the separable contacts of a switch controlled by the operator, this switch when operated serving to open this latter circuit and restore the clearing-out indicator to its normal idle condition of use. In the preferred embodiment of our invention we prefer to include the separable contacts of the operator's listening-key in this second or subsidiary clearing-out-indicator circuit, so that the operator in testing the line upon the manifestation of the clearing-out signal will at the same time open the subsidiary circuit and cause the restoration of the indicator.

We will explain our invention more particularly by reference to the accompanying drawing, illustrating the preferred embodiment thereof, in which a telephone-exchange

system including two subscribers' stations connected with the exchange is diagrammatically indicated.

We have illustrated a well-known form of substation apparatus at each of the stations A and B, comprising a telephone switch-hook *a*, connected with the limb *b* of each telephone-line, a magneto calling-generator *c* constituting the preferred source of signaling-current, a call-bell *d*, telephone-receiver *e*, and a transmitter *f*, in this instance a magneto-transmitter or a local-battery transmitter, the switch-hook *a* serving to include either the telephone or the generator and bell in circuit, according to its position.

The limbs of the telephone-lines *b* and *g* extend to the exchange and are there connected, respectively, with the short and long line-springs *h* and *i*, the longer line-spring being provided with a back contact *k*. Each line is provided with a line-indicator *l*, whose helix is preferably bridged between the limbs *b* and *g*, the contacts *i* and *k* being included in series with said helix. The armature *m* is connected with limb *g*, and the contact *n*, which is adapted to be engaged by the armature when actuated, is connected with one terminal of a battery *o*, the other terminal of which is connected with the limb *b*. The battery *o* is thus normally in open circuit with the helix of each line-indicator, this circuit being normally broken at the contacts *m* and *n*. The indicator proper is preferably in the form of an incandescent lamp *p*, that is included in circuit with the battery *o* and the contacts *m* and *n*. When a calling subscriber signals the exchange, the magnet of his line-indicator is operated and circuit is closed through the lamp *p*. The circuit through the lamp may be traced in detail from one pole of the battery *o* or other equivalent source of current to one limb *b* of the telephone-line, the helix of magnet *l*, the back contact *k*, line-spring *i*, engaging the same, the armature *m*, connected with the limb *g* of the telephone-line that extends to the line-spring *i*, the contact-anvil *n*, engaged by the actuated armature, the lamp *p*, back to the remaining terminal of the battery *o*. The operator in answering the call inserts the answering-plug *q*, and thereby separates con-

tacts *h* and *i* to open the circuit through the indicator *p*. She completes the connection by the insertion of the connecting-plug *r*.

So much of the apparatus as has been specifically described with reference to the drawing we do not claim as our own invention.

The cord-circuit is provided with a clearing-out indicator, the helix of whose operating-magnet *s* is included in series with an impedance-coil *t*, and together with said impedance-coil in bridge between one terminal of the battery *o*, connected with the limbs *b* of the telephone-lines, and the sleeve-strand of the cord-circuit adapted for connection with the line-springs *i*, whereby the helix of the indicator is adapted to be operated by current from the signaling-generator at a connected subscriber's station. The helix of said magnet is also included in a normally open local circuit with the impedance-coil *t*, the battery *o*, the armature *u*, the contact *v*, normally separated therefrom, the lamp *w*, that constitutes the preferred form of clearing-out signal, a key-lever spring *x*, and its normal contact *y*. The contacts *x*, when moved against their alternate contacts, serve to include the operator's telephone set in bridge of the telephone-circuit between subscribers' stations. In the preferred practice the operator when a clearing-out signal is manifested bridges her telephone-set into the circuit to ascertain whether the subscribers have finished conversation. Thus after the signal *w* is operated upon a closing of the local circuit including the battery *o* the operator manipulates her listening-key to include her telephone in circuit and at the same time to separate the contacts *x* and *y*, whereupon the local circuit, including the helix of the magnet *s*, is broken, the said magnet deenergized, and the clearing-out signal *w* restored.

We do not wish to be limited to the precise apparatus herein shown and particularly described nor to the location of the signaling-generators at the subscribers' stations; but,

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

1. In a telephone-exchange system, the combination with subscribers' lines extending from substations to an exchange, of a source of calling-current at each subscriber's station, a clearing-out indicator at the exchange, associated with united telephone-lines, a battery included in a normally open circuit with the helix of the clearing-out-indicator magnet, the armature of said magnet serving to close circuit through the battery and helix when actuated through the agency of the source of current at a subscriber's station, and an operator's switching appliance having normally closed separable contacts also included in circuit with the said battery and helix, the said contacts of the operator's switching appliance serving, when separated,

to open the circuit previously closed by the armature of the clearing-out-indicator magnet to cause a restoration of the clearing-out indicator, substantially as described.

2. In a telephone-exchange system, the combination with subscribers' telephone-lines extending from substations to an exchange and there united in a telephonic circuit, of a source of calling-current at each substation, a clearing-out indicator at the exchange adapted to be operated by current from a substation, a battery, the magnet of the clearing-out indicator serving when actuated to include said battery in circuit with its helix to maintain said clearing-out indicator in an actuated condition, and an operator's listening-key adapted to exclude the battery from circuit with the clearing-out-indicator magnet, whereby the clearing-out indicator is restored, substantially as described.

3. In a telephone-exchange system, the combination with subscribers' lines extending from substations to an exchange, of a source of calling-current at each subscriber's station, a clearing-out indicator at the exchange, associated with united telephone-lines, a battery included in a normally open circuit with the helix of the clearing-out-indicator magnet, the armature of said magnet serving to close circuit through the battery and helix when actuated through the agency of the source of current at a subscriber's station, and an operator's listening-key having normally closed separable contacts also included in circuit with the said battery and helix, the said contacts of the operator's listening-key serving, when separated, to open the circuit previously closed by the armature of the clearing-out-indicator magnet to cause a restoration of the clearing-out indicator, substantially as described.

4. In a telephone-exchange system, the combination with telephone-lines extending from substations to an exchange and there united in a telephonic circuit, of a source of calling-current at each substation, a line-indicator for each line, a clearing-out indicator at the exchange adapted to be operated by current transmitted over the telephone-line from a substation, a battery, means whereby the magnet of the clearing-out indicator may include its helix in circuit with said battery when said magnet is operated to maintain the clearing-out indicator in an actuated condition, and an operator's switching appliance adapted to exclude the said battery from circuit with the clearing-out-indicator magnet, substantially as described.

5. In a telephone-exchange system, the combination with subscribers' lines extending from substations to an exchange, of a source of calling-current at each subscriber's station, a line-indicator associated with each line, a clearing-out indicator at the exchange, associated with united telephone-lines, a battery included in a normally open circuit with the helix of the clearing-out-indicator magnet,

the armature of said magnet serving to close circuit through the battery and helix when actuated through the agency of the source of current at a subscriber's station, and an operator's switching appliance having normally closed separable contacts also included in circuit with the said battery and helix, the said contacts of the operator's switching appliance serving, when separated, to open the circuit previously closed by the armature of the clearing-out-indicator magnet to cause a restoration of the clearing-out indicator, substantially as described.

6. In a telephone-exchange system, the combination with telephone-lines extending from substations to an exchange and there united in a telephonic circuit, of a source of calling-current at each substation, a line-indicator for each line, a clearing-out indicator at the exchange adapted to be operated by current transmitted over the telephone-line from a substation, a battery, means whereby the magnet of the clearing-out indicator may include its helix in circuit with said battery when said magnet is operated to maintain the clearing-out indicator in an actuated condition, and an operator's listening-key adapted to exclude the battery from circuit with the magnet of the clearing-out indicator, substantially as described.

7. In a telephone-exchange system, the combination with subscribers' lines extending from substations to an exchange, of a source of calling-current at each subscriber's station, a line-indicator associated with each line, a clearing-out indicator at the exchange, associated with united telephone-lines, a battery included in a normally open circuit with the helix of the clearing-out-indicator magnet, the armature of said magnet serving to close circuit through the battery and helix when actuated through the agency of the source of current at a subscriber's station, and an operator's listening-key having normally closed separable contacts also included in circuit with the said battery and helix, the said contacts of the operator's listening-key serving, when separated, to open the circuit previously closed by the armature of the clearing-out-indicator magnet to cause a restoration of the clearing-out indicator, substantially as described.

8. In a telephone-exchange system, the combination with subscribers' telephone-lines extending from substations to an exchange and there united in telephonic circuit, of a clearing-out indicator at the exchange, a battery, means controlled by the magnet of the clearing-out indicator for including the helix of said magnet in circuit with said battery to maintain the clearing-out indicator in its actuated condition, and an operator's listening-key adapted to exclude the battery from circuit with the helix of said magnet to restore the clearing-out indicator, substantially as described.

9. In a telephone-exchange system, the com-

bination with subscribers' telephone-lines extending from substations to an exchange and there united in telephonic circuit, of a clearing-out indicator at the exchange, a battery, means controlled by the magnet of the clearing-out indicator for including the helix of said magnet in circuit with said battery to maintain the clearing-out indicator in its actuated condition, and an operator's switching appliance adapted to exclude the said battery from circuit with the helix of the said magnet, substantially as described.

10. In a telephone-exchange system, the combination with a subscriber's telephone-line extending from a substation to an exchange, of an indicator at the exchange, a battery, means controlled by the magnet of said indicator for including the helix of said magnet in circuit with said battery to maintain the said indicator in its actuated condition, and an operator's listening-key adapted to exclude the battery from circuit with the helix of said magnet to restore said indicator, substantially as described.

11. In a telephone-exchange system, the combination with subscribers' telephone-lines extending from substations to an exchange and there united in a telephonic circuit, of a source of calling-current, a clearing-out indicator at the exchange having an operating-helix and adapted to be operated at a substation, an operator's listening-key at the exchange, and means whereby the said listening-key may deenergize said helix to restore the clearing-out indicator after actuation, substantially as described.

12. In a telephone-exchange system, the combination with a subscriber's telephone-line extending from a substation to an exchange, of a source of calling-current, an indicator at the exchange having an operating-helix and adapted to be operated from a substation, an operator's listening-key at the exchange, and means whereby the said listening-key may deenergize said helix to restore the indicator after actuation, substantially as described.

13. In a telephone-exchange system, the combination with subscribers' telephone-lines extending from substations to an exchange and there united in a telephonic circuit, of a source of calling-current, a clearing-out indicator at the exchange having an operating-helix and adapted to be operated at a substation, an operator's switching appliance at the exchange, and means whereby the said switching appliance may deenergize said helix to restore the clearing-out indicator after actuation, substantially as described.

In witness whereof we hereunto subscribe our names this 18th day of June, A. D. 1900.

ALFRED STROMBERG.
WILLIAM M. DAVIS.

Witnesses:

GEORGE L. CRAGG,
HARVEY L. HANSON.