(No Model.) 2 Sheets—Sheet 1.

A. STROMBERG, A. CARLSON & H. L. KNIGHT.

TELEPHONE EXCHANGE APPARATUS.

No. 545,921. Patented Sept. 10, 1895.

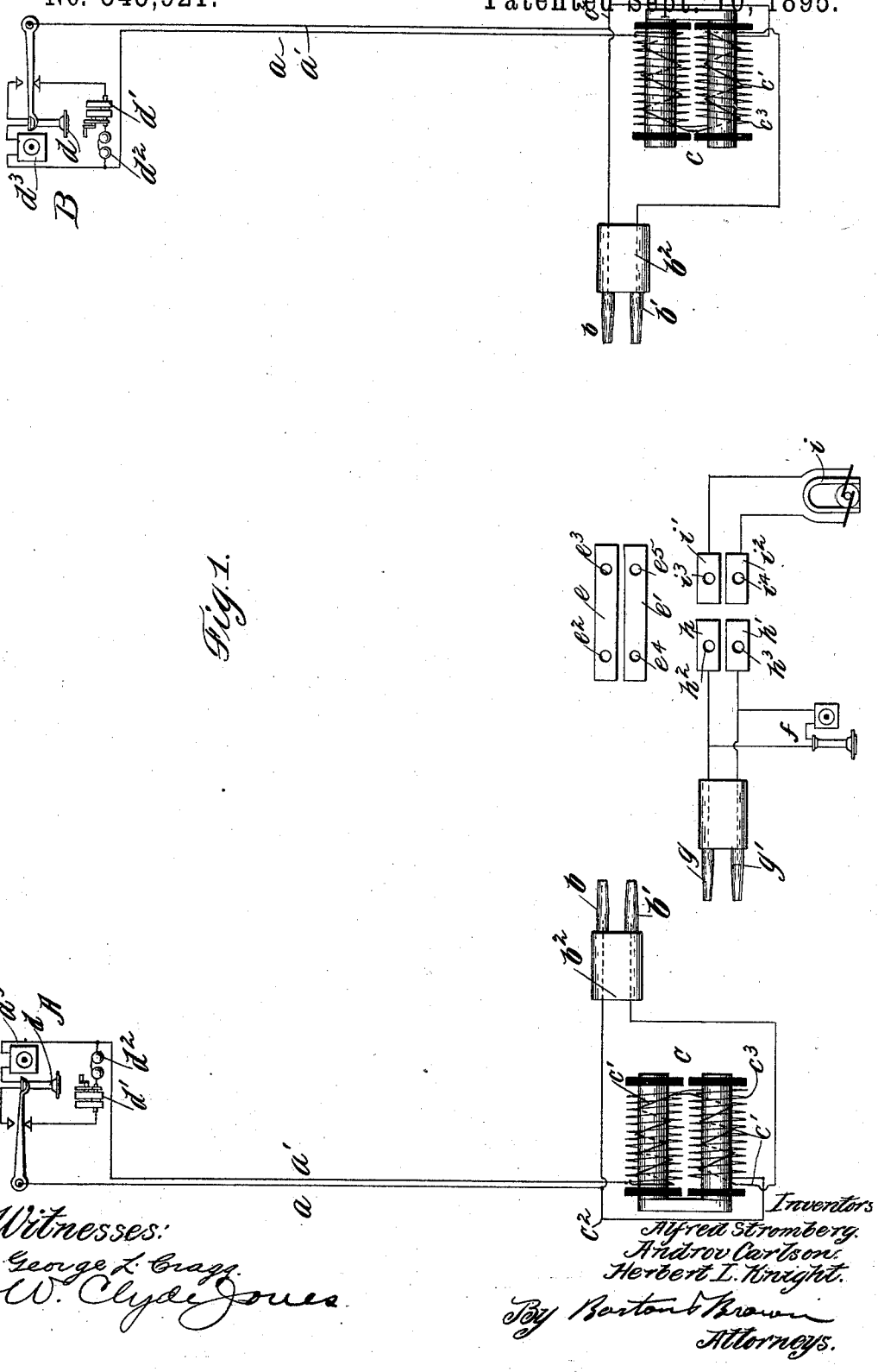

Fig. 1.

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(No Model.) 2 Sheets—Sheet 2.

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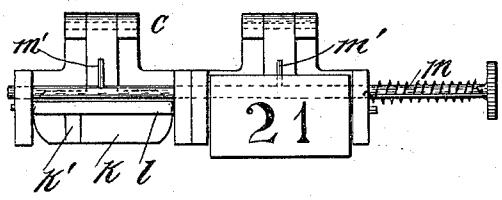
Fig. 2.



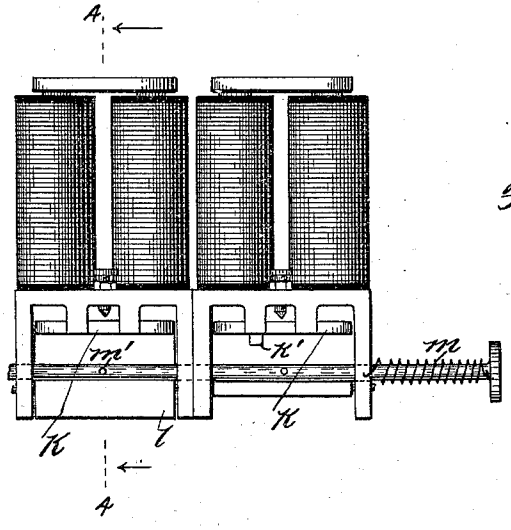


Fig. 3.

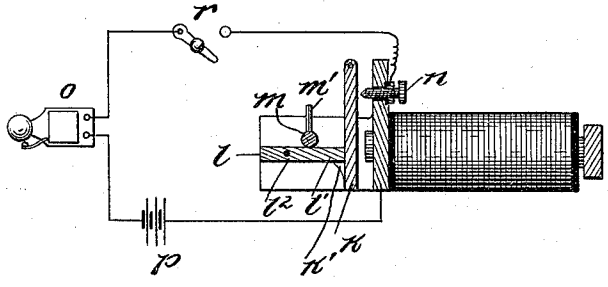


Fig. 4.

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UNITED STATES PATENT OFFICE.

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TELEPHONE-EXCHANGE APPARATUS.

SPECIFICATION forming part of Letters Patent No. 545,921, dated September 10, 1895.

Application filed February 28, 1895. Serial No. 540,037. (No model.)

To all whom it may concern:

Be it known that we, ALFRED STROMBERG, ANDROV CARLSON, and HERBERT L. KNIGHT, 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 Apparatus, (Case No. 19,) 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.

Our invention relates to a telephone system and apparatus; and its object is to provide improved means for connecting two subscribers' lines together for conversation through the central station.

In accordance with our invention each subscriber's line extends to the central station and terminates in a plug, by means of which connection may be made with another line. Upon the board at which the line terminates is provided an annunciator having two windings, one included in series in the talking-circuit and the other included in a shunt branch between the two sides of the talking-circuit. The series coil is made with but few turns, so as to offer as little retardation as possible to the passage of the voice-currents, while the shunt-winding is provided with a large number of turns to afford a retardation and prevent the shunting of the voice-currents. At the subscriber's station is provided a generator or other source of current for sending a calling-current through the annunciator at the central station. Normally the shunt-coil of the annunciator is alone in circuit, so that the subscriber by ringing his generator may send current through the shunt-winding of the annunciator, to thereby actuate the same and call the attention of the operator. Upon each board are provided a number of connecting-bars carrying sockets, into which the plugs belonging to the telephone-lines may be inserted to complete circuit between two telephone-lines. The operator's telephone is connected with a plug adapted to be inserted in the sockets of the connecting-bar, to thereby include the operator's telephone in circuit with that of the subscriber. The calling-generator at the central station terminates in contact-plates provided with sockets, into which the connecting-plug of the called subscriber may be inserted to send a ringing-current over his line and through the bell at his sub-station. The subscribers' annunciators also serve as clearing-out annunciators, a portion of the ringing-current traversing the series coil, while the remainder passes through the shunt-winding, the two windings thus coacting to cause the drop to fall.

The annunciator which we preferably employ comprises an armature suspended in front of the poles of the electromagnet and provided with a projection upon which the end of the drop is adapted to rest, the drop normally occupying a horizontal position and pivoted to one side of its center, so that the end resting upon the armature predominates in weight. When the armature is attracted, the catch is withdrawn from beneath the end of the horizontally-maintained drop and the drop assumes a vertical position, thus conveying the signal to the operator. The annunciators are arranged upon the board in parallel rows, and in order to restore the annunciators without the necessity of grasping each drop individually we provide a rotatable bar, situated to the side of the drops as they rest in their vertical positions, the bar carrying pins, one opposite each drop, so located that when the bar is rotated upon its axis the pins engage the drops and return them to their horizontal positions.

We will describe our invention more in particular by reference to the accompanying drawings, in which—

Figure 1 is a diagram illustrating our invention. Fig. 2 is a view of several annunciators as they appear upon the board, the drop of one of the annunciators being shown in its vertical position. Fig. 3 is a plan view of several annunciators. Fig. 4 is a sectional view on line 4 4 of Fig. 3, which also illustrates means for conveying a night signal.

Like letters refer to like parts throughout the several figures.

We have illustrated our invention in Fig. 1 in connection with the metallic circuit-lines; but it will be understood that our invention is equally applicable to grounded circuit-lines.

The telephone-line of subscriber A, as illustrated, extends in two limbs *a a'* to the cen-

tral station, where the limbs terminate in terminals b b', respectively, the terminals being in the form of plugs or pins carried upon a common handle b^2. In the limb a' is included the series winding c' of the individual annunciator c, while in a shunt branch c^2, between the two limbs, is included the shunt-winding c^3 of the annunciator. At the subscriber's station we have illustrated the usual switch-hook, upon which the receiver d hangs to close circuit through the generator d' and bell d^2, the removal of the receiver from its hook serving to cut out the bell and generator and complete circuit through the receiver d and transmitter d^3. The subscriber B is similarly connected with the central station and is provided with similar apparatus, and we have designated the like parts by the same reference-letters.

Upon the board at the central station are provided a number of pairs of connecting-bars e e', one pair only being shown in the figure. The bar e is provided with sockets e^2 e^3 at its ends and the bar e' with sockets e^4 e^5, situated opposite those provided upon the bar e. The operator's telephone set f terminates in plugs g g', mounted upon a common handle, and also in plates h h', provided with sockets h^2 h^3, respectively. The calling-generator i is connected with plates i' i^2, carrying sockets i^3 i^4, respectively.

Supposing that subscriber A is desirous of conversing with subscriber B, he removes his telephone-receiver from its hook and actuates his generator, thus sending ringing-current over limb a, through branch c and the shunt-winding c^3 of the annunciator c, and back by limb a'. The annunciator is thus actuated, calling the attention of the operator, who inserts the pins b b' of the plug of the calling subscriber in the sockets e^3 e^4 of the connecting-bars e e'. She then inserts the pins g g' of the plug of her telephone set in the sockets e^3 e^5 of the connecting-bars e e', the operator's telephone set being thus included in circuit with the calling subscriber. Having received the number of the called subscriber B, she inserts the pins b b' of the plug of subscriber B in the sockets i^3 i^4 of the circuit containing the generator i, and thus sends ringing-current over the limbs a a' of the line of subscriber B and through his bell. The ringing-current also traverses the windings of the individual annunciator of subscriber B, thus causing the drop to fall. The operator then removes the pins g g' of her telephone-plug from the sockets e^3 e^5 and the pins b b' of the plug of subscriber B from the sockets of the ringing-circuit and inserts the pins b b' of the plug of subscriber B in sockets e^3 e^5 of the connecting-bars, thus connecting the two subscribers' lines together for conversation. She then restores the drops of the individual annunciators, in order that they may serve for clearing-out annunciators. When the subscribers are through conversation, they, one or both, send ringing-current over the line, which traverses the series and the shunt-windings of the individual annunciators, causing the drops to fall and indicating the signal for disconnection. The series winding c' and the shunt-winding c^3 of the individual annunciators should be so proportioned, relatively, as to resistance, that the currents traversing the two coils will be sufficient to operate the annunciator.

Referring to Figs. 2, 3, and 4, the armature k of the annunciator c is pivoted at its upper end and hangs in front of the poles of the electromagnet of the annunciator. Upon the armature k is provided a catch or shelf k', upon which the end l' of the annunciator-drop l is adapted to rest, the drop being pivoted at l^2 to one side of the center, so that the end l' of the drop resting upon the catch k' predominates in weight. When current traverses the annunciator, the armature k is attracted and the catch k' withdrawn from beneath the end l' of the drop and the drop assumes a vertical position. As soon as the current through the annunciator ceases, the armature k moves back to its original position. In order to restore the drops without grasping each drop individually, we provide a rod m, which occupies a position above the drop when in its horizontal position and to one side of the drop as it rests in its vertical position. Upon the rod m are provided pins m', one opposite each drop, the pins being adapted, when the rod is rotated, to engage the upper end of the drop as it rests in its vertical position and rotate it into its horizontal position with the end l' of the drop resting upon the catch k'.

As illustrated in Fig. 4, a contact-anvil n is mounted upon the frame of the annunciator, but insulated therefrom, being situated just back of the armature, so that the armature, when attracted, will make contact therewith. The contact-anvil n is connected with a bell o and battery p, the opposite side of the circuit being connected with the frame of the annunciator, which is electrically in communication with the armature. At night the switch r is closed and the actuation of the annunciator completes the circuit through the bell o and battery p, thus ringing the bell. A number of the annunciators will be connected in the bell-circuit in parallel, so that the single bell would serve as the night-signal for all or a large number of the annunciators of the exchange.

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

1. The combination with two telephone lines connected together for conversation, of an individual annunciator in connection with each of said lines, each of said annunciators being provided with a winding included in a bridge or shunt between the two sides of the telephone circuit, each of said annunciators being also provided with a winding included in series with the telephone circuit, said series windings being included in circuit between the two bridges containing the shunt wind-

ings; whereby the individual annunciators may serve as clearing out annunciators, substantially as described.

2. The combination with a telephone line extending to the central station and terminating thereat in a connecting or switching device, of an individual annunciator at the central station having two windings, one included in a bridge or shunt between the two sides of the telephone circuit, the other included in series with one side of the telephone circuit and situated between said switching device and the bridge containing the shunt winding, substantially as described.

In witness whereof we hereunto subscribe our names this 21st day of February, A. D. 1895.

ALFRED STROMBERG.
ANDROV CARLSON.
HERBERT L. KNIGHT.

Witnesses:
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