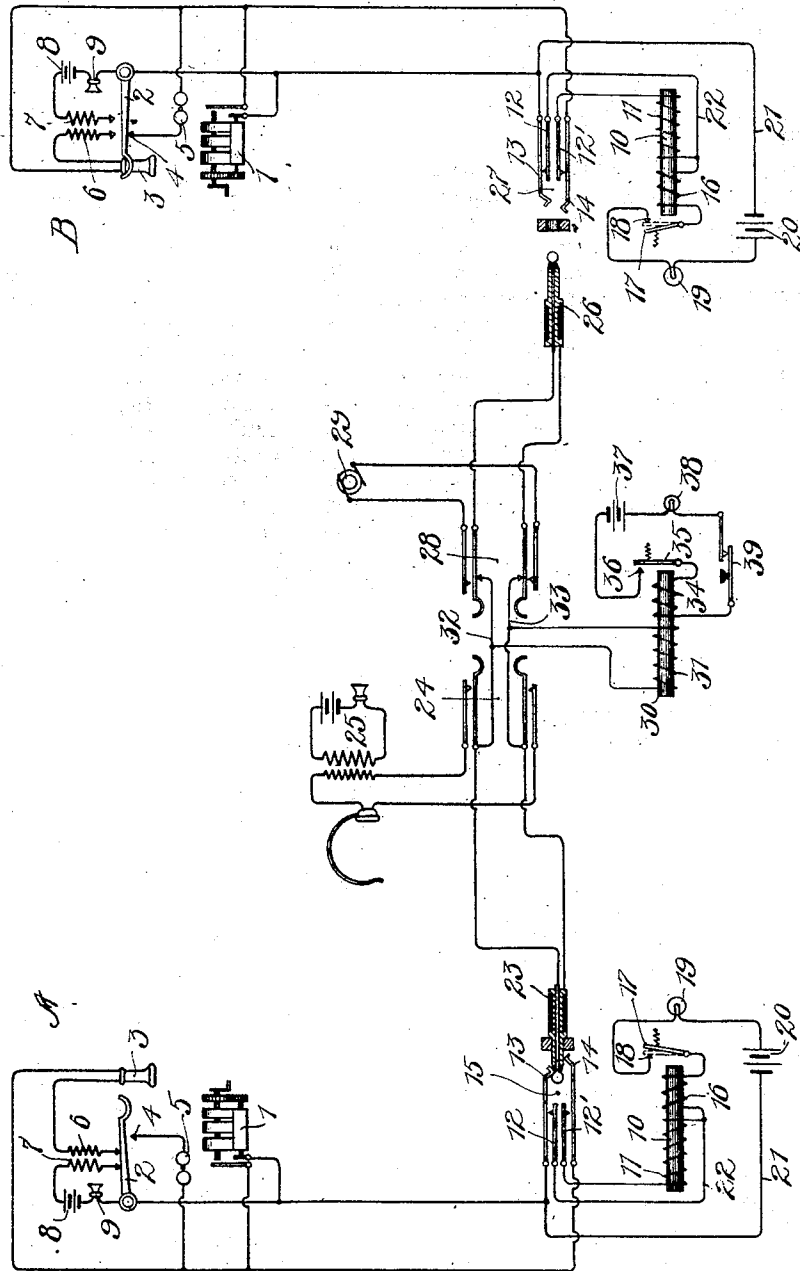


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PATENTED JULY 3, 1906.

S. B. FOWLER.
TELEPHONE SYSTEM.
APPLICATION FILED DEC. 10, 1903.



Witnesses:

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TELEPHONE SYSTEM.

No. 824,856.

Specification of Letters Patent.

Patented July 3, 1906.

Application filed December 10, 1903. Serial No. 184,607.

To all whom it may concern:

Be it known that I, SAMUEL B. FOWLER, a citizen of the United States, residing at La Fayette, in the county of Tippecanoe and State of Indiana, have invented a certain new and useful Improvement in Telephone Systems, 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.

My invention relates to telephone systems, particularly to those known as "local-battery" systems, in which the talking-circuit at the subscriber's substation is supplied from a local battery and from which substation calling-current is sent into the line usually from a hand-generator. Heretofore in such systems the current from the substation-generator passed through the windings of an indicator-signal at the central exchange to attract the armature, which was mechanically associated with a drop or locking mechanism. Usually an armature-lever was provided with a hook at its end to normally engage the top of the shutter, and upon the attraction of the armature the lever was raised to allow the shutter to fall to display a signal. In some cases also a target or shutter was secured to the end of the armature-lever, which shutter was associated with locking or detent mechanism which, upon raising of the target when the armature was attracted, served to prevent restoration of the target until the operator either mechanically or electrically removed this locking or detent mechanism. As the shutter and locking or detent mechanism are in mechanical connection or contact with the armature parts, great current strength was necessary to attract the armature against the mechanical resistance offered by the shutter or other mechanism, and operation of the signal was not always certain.

In my improved system I employ a relay provided with a winding normally bridged between the limbs of the line and connected directly in circuit with the substation-generator when actuated. This winding is preferably composed of many turns, and a very slight actuation of the substation-generator will sufficiently energize the relay-core to attract an armature against a contact to close a local circuit through a source of current and an indicating device, such as a lamp. This local circuit also includes a winding con-

sisting of a comparatively few number of turns also disposed about the relay-core, and as the armature is attracted to close the local circuit upon actuation of the substation-generator this auxiliary coil then energizes the core to retain the armature in its closed position. Both the local circuit and the circuit through the energizing-winding connected with the substation-generator are connected with jack-springs, and upon insertion of the plug into the jack the circuit through the energizing-winding is interrupted, and the local circuit is also opened to release the armature to extinguish the signal. The same principle may be applied to provide for a clearing-out signal.

I shall more clearly describe my invention by reference to the accompanying drawing, in which I have illustrated two substations A and B to be connected for conversation through an operator's cord-circuit C. The subscriber A is shown as just having notified central of a desired connection. Each substation is provided with a hand-generator 1, which is normally disconnected from the line, but upon actuation automatically connecting itself in circuit, as is well known in the art. A switch-hook 2 when supporting the receiver 3 rests against a contact 4, which is included in circuit with signal-bells 5, normally connected in bridge of the line-limbs. Upon removal of the receiver from the hook the receiver is included serially in circuit with the secondary winding 6 and the line-limbs, and a local talking-circuit is closed through the primary winding 7, battery 8, transmitter 9, and the switch-hook 2. At the central exchange I provide an indicating-relay 10, provided with a winding 11, composed, preferably, of a great many turns and connected with contact-springs 12 12', which normally engage the tip and sleeve springs 13 and 14 of the spring-jack 15. An auxiliary coil 16 of comparatively few turns also surrounds the core of the relay 10 and is adapted for inclusion in a local circuit containing the relay-armature 17, the contact 18, signal-lamp 19, battery 20, conductor 21, tip-spring 13, inner spring 12, and conductor 22.

Substation subscriber A now wishes to signal the central operator. The switch-hook will be down, as shown, at substation B, and upon actuation of the generator 1 a current will be sent over the line-limbs through the

sleeve, tip, and contact springs 12, 12', through the winding 11, and the armature 17 will be attracted to engage its contact 18. Upon such attraction, however, current from the source 20 will immediately flow through the winding 16, and the energization of the relay-core will be maintained. The lamp 19 will now glow and signal the central operator, who inserts the answering-plug 23 in the spring-jack 15, thereupon disconnecting the springs 12, 12' to disconnect the winding 11 from circuit and to open the local circuit to extinguish the indicating-lamp 19. The operator actuates the listening-key 24 to connect her telephone apparatus 25 in circuit, and the subscriber A, having removed his receiver from the hook after actuation of the generator 1, notifies central of the desired connection—as, for instance, with the subscriber B. The operator may then insert the calling-plug 26 into the spring-jack 27, connected with the line leading to substation B, and upon actuation of ringing-key 28 may send current from the generator 29 to actuate the signal-bell 5 at substation B. After subscriber at substation B has removed his receiver from the hook the two substations will be in telephonic communication. A relay 30 may be similarly employed as the relay 10 to perform the functions of a clearing-out relay, the winding 31 being in this case bridged across the cord conductors 32 and 33, while the auxiliary winding 34 is included in a local circuit containing the armature 35, contact 36, battery 37, and lamp 38. When the subscribers have concluded their conversation, a slight actuation of either substation-generator will send current through the coil 31 to attract the armature 35 against the contact 36 to close the local circuit through the lamp 38, thus notifying the operator that the conversation has terminated. To restore this local circuit, I include therein a key 39, which may be placed in the most convenient position for the operator, and upon withdrawal of the plugs from the jacks after termination of the conversation a slight tap on the key 39 will open the local circuit to extinguish the lamp 38, and the system is now again normal.

As the windings energized from the substation-generators consist of a great many turns, very little current is necessary to cause attraction of the relay-armature, and actuation of the indicating-signal will be assured through a wide range of line resistance or disturbances. The auxiliary energizing-coil, upon attraction of the armature, is included in local circuit, the resistance of which is constant, and consequently activity of the lamp 19 will be maintained independent of line resistances and conditions, thus assuring a more efficient indicating-signal or clearing-out signal for local-battery systems. Again, as the resistance of the main winding is very

high and that of the auxiliary winding comparatively low the local circuit and the main circuit currents will not interfere or detract from each other.

I do not wish to be limited to the precise arrangement of apparatus and circuits as shown, as changes could easily be made without departing from the scope of the invention.

I claim as new and desire to secure by Letters Patent—

1. In a telephone-exchange system, the combination with a central exchange, of a telephone-line extending therefrom and terminating in a substation, a current-generator at said substation adapted for connection with the telephone-line, a spring-jack at the central exchange having the line-contacts connected with the limbs of the telephone-line, a relay at the central exchange, a main winding for said relay connected with auxiliary jack-springs normally in connection with the line jack-springs, an additional winding for said relay, a local circuit including said winding and having its terminals connected with one of said jack-line springs and one of said auxiliary springs normally in contact; the armature of said relay, a source of current, and a signal also included in said local circuit, actuation of the substation-generator causing current-flow through said main winding during the connection of said generator with the line, said armature upon such energization of the relay serving to close the local circuit, whereby said source of current becomes active to maintain energization of said relay and closure of said local circuit, and a cord-circuit at the central exchange provided with plugs, insertion of a plug into the spring-jack causing disengagement of the line-springs from the auxiliary springs whereby both windings of the relay become inert and the local-circuit opened.

2. In a telephone-exchange system, the combination with a central exchange, of a telephone-line extending therefrom and terminating in a substation, an alternating current at the substation normally disconnected from the line but adapted for connection therewith, a spring-jack at the central exchange, line-springs for said spring-jack permanently connected with the limbs of the telephone-line, auxiliary springs for said spring-jack normally connected with the line-springs, a relay at the central exchange, a main winding for said relay having its terminals connected with the auxiliary contacts and normally connected therethrough with the telephone-line limbs, an auxiliary winding for said relay having one terminal connected with the auxiliary spring, and its other terminal connected with the relay-armature, a local circuit at the central exchange having its terminal connected with the armature-contact and with one of the line-

5 springs, a source of current, and a signal in
said local circuit, actuation of the generator at
the substation causing current-flow through
the line-limbs and through the main relay-
winding to cause energization thereof during
actuation of the generator, whereby the relay-
armature is attracted to close the local circuit
to cause actuation of the signal, and a cord-
circuit at the central exchange having plugs,
10 insertion of a plug in the spring-jack causing

the relay-windings to be entirely disconnected from circuit, whereby said relay becomes inert and the local circuit opened.

In witness whereof I hereunto subscribe
my name this 7th day of December, A. D. 15
1903.

SAMUEL B. FOWLER.

Witnesses:

HENRY S. BULLOCK,

H. ED DENIG.