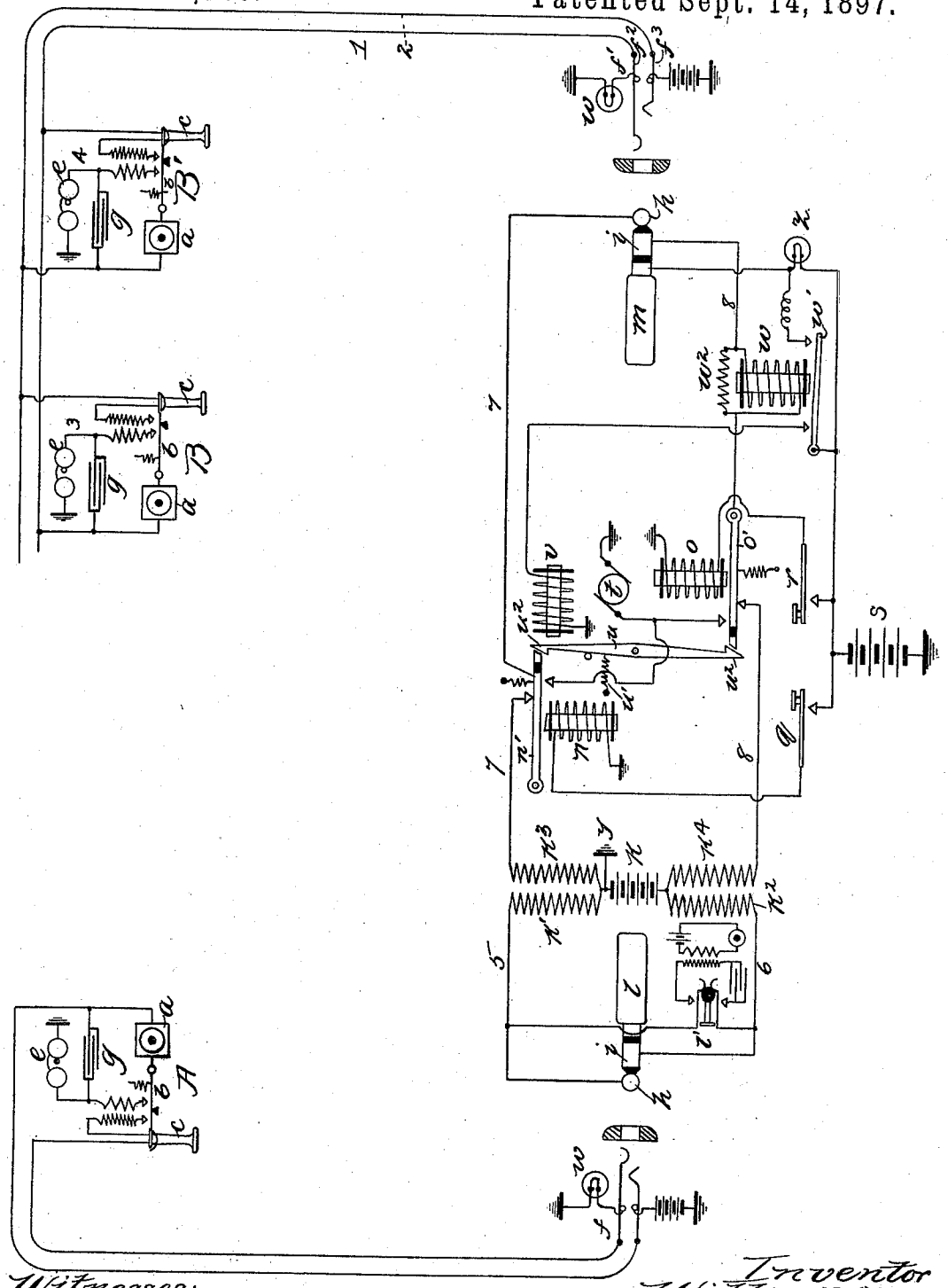
(No Model.)

W. W. DEAN.

TELEPHONE SYSTEM.

No. 590,186. Patented Sept. 14, 1897.



Witnesses:
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UNITED STATES PATENT OFFICE.

WILLIAM W. DEAN, OF ST. LOUIS, MISSOURI, ASSIGNOR TO THE BELL TELEPHONE COMPANY OF MISSOURI, OF SAME PLACE.

TELEPHONE SYSTEM.

SPECIFICATION forming part of Letters Patent No. 590,186, dated September 14, 1897.

Application filed July 12, 1897. Serial No. 644,240. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM W. DEAN, a citizen of the United States, residing at St. Louis, in the State of Missouri, have invented a certain new and useful Improvement in Telephone Systems, (Case No. 24,) 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 particularly to switching mechanism employed at the central office of a telephone-exchange system for including the calling-generator in circuit with the signal-bells at the subscribers' stations and removing the generator from line.

In my applications Serial No. 643,190, filed July 2, 1897, and Serial No. 607,126, filed September 28, 1896, I have shown and described relay switching apparatus included in a circuit independent of the telephone-lines, switching apparatus at the exchange for connecting subscribers for conversation and associating the relay switching apparatus with the called-subscriber's line, in combination with means for operating said relay mechanism to include the generator in circuit with the called-subscriber's line, and a second relay controlled by the called-subscriber's switching apparatus adapted to remove the generator from line.

My invention herein has for its object the accomplishments of the results secured by the aforesaid systems by means of improved interlocking mechanism controlling the association of the generator with the telephone-line.

I will explain my invention by reference to the accompanying drawing, which illustrates the preferred embodiment thereof.

Upon the left of the drawing I have illustrated a single metallic-circuit telephone-line connected with the substation A, while at the right of the drawing I have shown a party metallic-circuit telephone-line having stations B B'. At each of the substations is provided a transmitter *a*, telephone switch-hook *b*, receiver *c*, and a call-bell *e*, preferably of high resistance—as, for example, five thousand ohms. The telephone-lines terminate in spring-jacks *f f'*, limbs 1 and 2 of the party line leading to the stations B B' being connected, respectively, with line-springs f^2 f^3. The limbs of the telephone-line leading to subscribers' station A are similarly connected with the line-springs of spring-jack *f*. The signal-bells at stations B B' are included in ground branches 3 4, which are respectively connected with limbs 1 and 2 of the line. Two alternate contact-anvils are provided in connection with each of the telephone-hooks which form the terminals of a bridge-conductor across the limbs 1 and 2 of the telephone-line, the bridge-conductor at either station being closed upon the removal of the telephone from its hook thereat. Condensers *g* are included in said bridge-conductors. The circuits and apparatus at station A are similar to those at stations B B'.

At the central office a pair of switch-plugs is shown, each plug being provided with a tip *h* and a sleeve *i*, adapted to engage the short and long line-springs of the line switches or jacks, respectively. Strands 5 and 6 connect the centralized battery *k* with the tip and sleeve of the answering-plug *l*, while strands 7 and 8 connect the tip and sleeve of connecting-plug *m* with the same battery, whereby the transmitters at the subscribers' stations may be supplied with battery-current. Repeating-coils k' k^2 are included in circuit with strands 5 and 6, while repeating-coils k^3 k^4 are included in circuit with strands 7 and 8. The association of the repeating-coils and centralized battery shown is well known to those skilled in the art. Strands 7 and 8 also include armatures n' and o' of magnets *n* and *o* with their normal contact-anvils, said armatures being in the nature of calling-switches controlled by said magnets. One terminal of each of the magnets is grounded. The remaining terminals of the magnets *n* and *o* are connected, respectively, with ringing keys or switches *q* and *r*, preferably of the form shown. A grounded battery *s* is adapted to be included in circuit with magnet *n* or magnet *o* upon the depression of keys *q* or *r*, respectively, whereby either armature may be attracted to include the calling-generator *t* in circuit with strand 7 or 8, whereby signaling-current may be directed over limb 2 of the party-telephone line to signal the bell at station B', or over

limb 1 to signal the bell at station B. The ends of each of the armatures are preferably insulated and beveled, as shown. A centrally-pivoted catch-lever u is disposed between the armatures and normally held against a stop by a retractile spring u'. A detent or catch u^2 is provided upon each end of the catch-lever, which engages its armature as it is attracted, and maintains the same in contact with the alternate contact-anvil of the armature which constitutes the terminal of the generator. A magnet v is adapted to actuate the catch-lever to release the armature and thereby remove the generator from line. An armature w', constituting a switch, is adapted to control the circuit through magnet v, this armature being in a normally open circuit with the battery s and said magnet. A magnet w, controlling the switch w', is included in the strand 8, a non-inductive resistance w^2 being provided about said magnet.

Supposing that subscriber A desires communication with subscriber B, subscriber A signals the central office and informs the operator, who depresses her listening-key l' in response to the signal, of the connection he desires. The operator, having previously inserted the answering-plug l into the calling-subscriber's spring-jack, inserts the connecting-plug m into the spring-jack of the called subscriber of the party-line and depresses the key r, whereby circuit is closed through magnet o, the armature whereof is attracted to include the generator in circuit with conductor 8, limb 1 of the telephone-line, and the signal-bell at the called station. The armature of said magnet upon being thus attracted is engaged by the adjacent catch u^2, whereby the armature is maintained in contact with its alternate contact-anvil. The called subscriber B upon removing his telephone from its switch-hook closes the bridge between the limbs 1 and 2 of the telephone-line, whereby current from generator t finds path from limb 1 at the substation across the bridge to limb 2, thence through conductor 7 and coil k^3 to ground y. The new path for current from the generator is of low resistance, whereby sufficient current is diverted through magnet w to cause the attraction of its armature w', whereby circuit from battery s is completed through magnet v, said magnet thereupon rotating the catch-lever to disengage the catch from the engaging armature. The armature thereupon is disengaged from its alternate contact-anvil by its retractile spring and the generator removed from line.

If the calling subscriber desires connection with subscriber B′ of the party-line, the operator depresses key q, whereby circuit is closed through magnet n, the armature whereof is attracted to include the calling-generator in circuit with conductor 7, limb 2 of the telephone-line, and the signal-bell at station B′. The armature of this magnet is likewise engaged by its catch u^2 after being attracted to maintain the generator in circuit with the signal-bell at station B′. Subscriber B′ upon removing his telephone from its switch closes the bridge-conductor between the limbs 1 and 2 of the telephone-line, whereby current from the generator is diverted from limb 2 to limb 1, thence to conductor 8 and coil k^4 to ground. The new path for the generator-current offers less resistance thereto, additional current being thus diverted through magnet w, whereby its armature is attracted to close circuit through magnet v. The magnet v disengages the catch from the armature, which then frees itself from the generator-contact.

A clearing-out annunciator z is illustrated whose operation will be readily understood by those skilled in the art.

In the claims I use the term "signal-bell" in the sense of any signal-receiving apparatus at the subscribers' stations.

It is obvious that changes may be readily made from the embodiment of my invention herein shown and described without departing from its spirit, and I do not therefore desire to be limited to the precise apparatus and circuits shown and described; but,

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

1. In a telephone-exchange system, the combination with a plurality of telephone-lines extending from subscribers' stations to an exchange, each subscriber's station being provided with a signal-bell, of switching apparatus at the exchange for uniting subscribers' lines for conversation, a calling-generator, a calling-switch adapted upon being actuated to include the generator in circuit with the bell at the called-subscriber's station, a detent adapted to engage and maintain the calling-switch in the position to which it has been actuated, whereby the generator is maintained in circuit with the called-subscriber's bell, means for disengaging said detent and calling-switch, apparatus provided at each station, each apparatus being adapted when its station is the called station to operate said means to disengage the detent and switch, and means for restoring the calling-switch to its normal idle position when thus disengaged, substantially as described.

2. In a telephone-exchange system, the combination with a plurality of telephone-lines extending from subscribers' stations to an exchange, each subscriber's station being provided with a signal-bell, of switching apparatus at the exchange for uniting subscribers' lines for conversation, a calling-generator, a calling-switch adapted upon being actuated to include the generator in circuit with the bell at the called-subscriber's station, a detent adapted to engage and maintain the calling-switch in the position to which it has been actuated, whereby the generator is maintained in circuit with the called-subscriber's bell, an electromagnet for withdrawing the detent from engagement with the switch, and switches at the subscribers' stations, each

switch being adapted when its station is the called station to operate said magnet, the calling-switch being adapted when thus disengaged from its detent to resume its normal idle position to remove the generator from line, substantially as described.

3. In a telephone-exchange system, the combination with a plurality of telephone-lines extending from subscribers' stations to an exchange, each subscriber's station being provided with a signal-bell, of switching apparatus at the exchange for uniting subscribers' lines for conversation, a calling-generator, a calling-switch adapted upon being actuated to include the generator in circuit with the bell at the called-subscriber's station, a detent adapted to engage and maintain the calling-switch in the position to which it has been actuated whereby the generator is maintained in circuit with the called-subscriber's bell, an electromagnet adapted to actuate said switch, means for including said magnet in circuit with a source of current, a second electromagnet for withdrawing the detent from engagement with the switch, and switches at the subscribers' stations, each switch being adapted when its station is the called station to close circuit through the latter magnet, the calling-switch being adapted when thus disengaged from its detent to resume its normal idle position to remove the generator from line, substantially as described.

4. In a telephone-exchange system, the combination with a plurality of telephone-lines extending from subscribers' stations to an exchange, each subscriber's station being provided with a signal-bell, of switching apparatus at the exchange for uniting subscribers' lines for conversation, a calling-generator, a calling-switch adapted upon being actuated to include the generator in circuit with the bell at the called-subscriber's station, a detent adapted to engage and maintain the calling-switch in the position to which it has been actuated, whereby the generator is maintained in circuit with the called-subscriber's bell, an electromagnet adapted to actuate said switch, an operator's key or switch adapted to close circuit through said magnet to operate the calling-switch, a second electromagnet for withdrawing the detent from engagement with the switch, and switches at the subscribers' stations, each switch being adapted when its station is the called station to close circuit through the latter magnet, the calling-switch being adapted when thus disengaged from its detent to resume its normal idle position to remove the generator from line, substantially as described.

In witness whereof I hereunto subscribe my name this 8th day of July, A. D. 1897.

WILLIAM W. DEAN.

Witnesses:
W. E. HARKNESS,
FRED R. MOTT.