

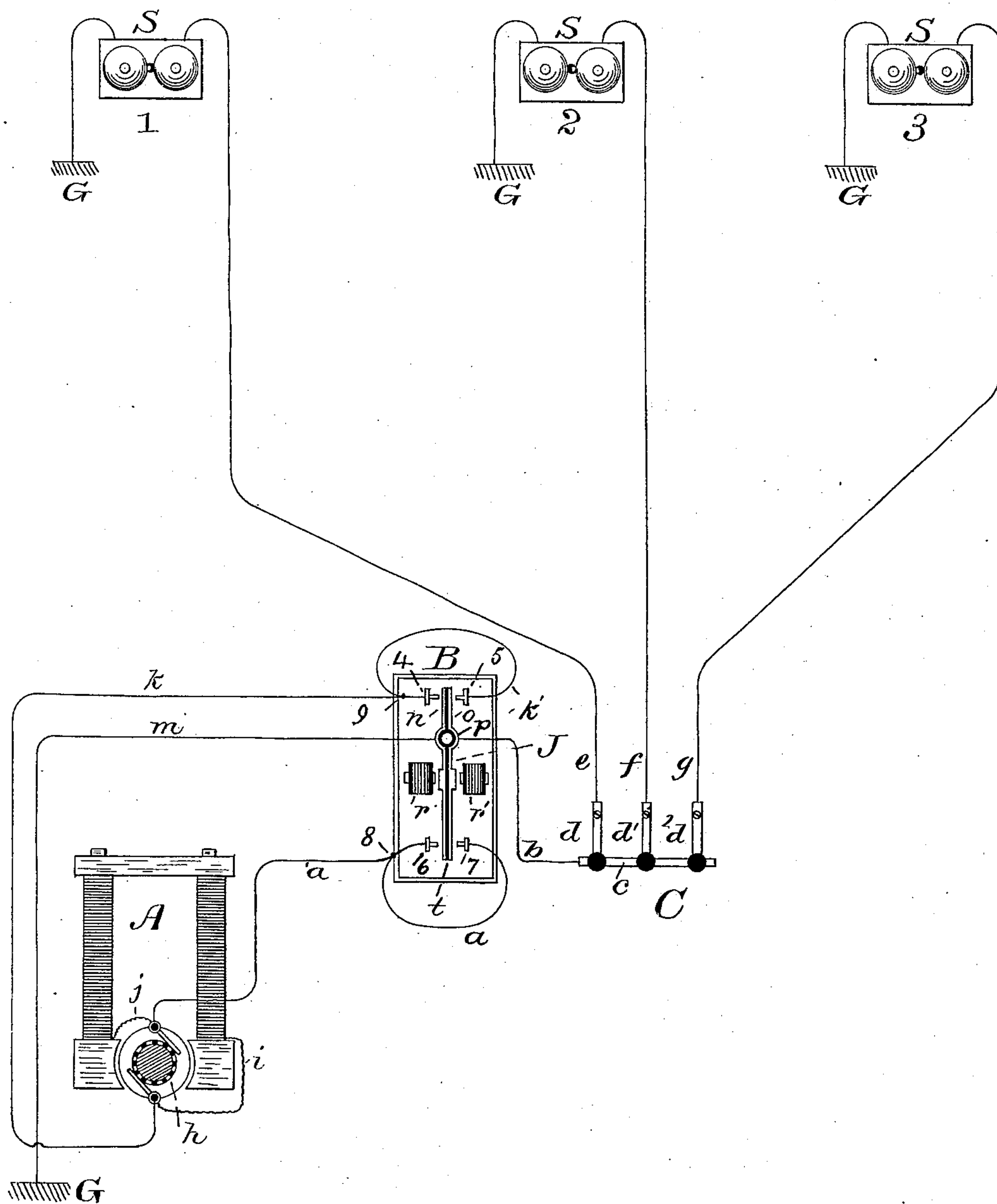
(No Model.)

T. D. LOCKWOOD.

SIGNALING APPARATUS FOR TELEPHONE EXCHANGES.

No. 283,626.

Patented Aug. 21, 1883.



Witnesses.

Geo. Willis Pierce -
Fred. F. Schwarz.

Inventor

Thos D Rockwood

UNITED STATES PATENT OFFICE.

THOMAS D. LOCKWOOD, OF MALDEN, MASSACHUSETTS.

SIGNALING APPARATUS FOR TELEPHONE-EXCHANGES.

SPECIFICATION forming part of Letters Patent No. 283,626, dated August 21, 1883.

Application filed May 3, 1883. (No model.)

To all whom it may concern:

Be it known that I, THOMAS D. LOCKWOOD, of Malden, in the county of Middlesex and State of Massachusetts, have invented certain Improvements in Signaling Apparatus for Telephone-Exchanges, of which the following is a specification.

My invention is adapted for use in telephone signaling, particularly the signaling of the sub-stations of a telephone-exchange system from the central office of the said system. Its object is to provide stronger signaling-currents and electric currents of considerable volume, whereby two objects may be gained—namely, first, the ability to ring a signal-bell over a much longer line or a line of higher resistance than heretofore; and, second, the furnishing of a current which, owing to its greater volume or quantity, is capable of being split or divided, so that it may be used by more than one operator at the same time.

To this end it consists in arranging at the central station, or at any suitable and convenient place, a dynamo-electric generator capable of furnishing a steady current of continuous direction and combining it with a pole-changing or current-reversing apparatus, continuing the circuit from the said pole-changer outwardly, by as many branch lines as may be necessary, to the several operating switches or tables, there to be connected at the will of the operator to any subscriber's line.

It has long been customary in telephone-exchanges to provide a constantly-operating magneto-generator, or to provide a battery and pole-changer, the main circuit in either case being branched to the different switch-boards; but I have found defects in both of these methods. When an ordinary magneto-generator is used supplying alternating currents, the said currents are, though possessing high electro-motive force, usually deficient in volume, owing to the great internal resistance of the machine, and to produce a magnetic field of the strength which is desirable very large permanent magnets are requisite, and these, although very costly, and, moreover, bulky, are by no means so efficient as a dynamo-electric machine, by which I mean one whose field-magnets are self-excited. If a voltaic battery is used, the constant care

which is required by it militates against its usefulness, and while the currents produced by it have more power to split between several circuits at the same time by reason of the greater quantity of electricity produced per second, the electro-motive force is lower than that of the magneto-currents, and consequently have not the same power of overcoming resistance.

I have with the purpose of overcoming these objections devised my present invention. By using a dynamo-electric machine with electro field-magnets excited by the currents developed in their own armature, I obtain a current of any desired electro-motive force, depending upon the number of convolutions in the machine-armature and the speed with which the said armature is rotated. If I use a machine furnishing alternating currents, I find it useless to increase the speed to any great extent, because the polarized armatures of the bells cannot travel beyond a certain well-defined rate of speed from side to side, or, in other words, cannot respond to more than a certain number of changes of polarity per minute. I therefore prefer a machine furnishing currents of constant direction, and am thus enabled to work the said machine at the highest possible rate of speed, and I produce the necessary changes of polarity by inserting a pole-changer in the circuit of the leading wires of the machine, between the developing-armature and the work to be done.

The drawing which accompanies and forms a part of this specification shows a diagram of a telephone-exchange system of circuits fitted with my invention.

C represents a central station, from which radiate any number of telephone-lines, *e f g*, extending to sub-stations S, which are provided each with polarized bells 1, 2, and 3. The lines, after passing through the bell-magnets, terminate in ground-wires G.

Although in practice each line terminates at the central-office end thereof in a switch-board, annunciator, and ground-wire, I have not regarded it as necessary to show here any such instrumentalities, as they form no part of my invention.

I have represented the lines at the central-station end as terminating in a calling-key,

the line *e* being connected with the key *d*, the line *f* with the key *d'*, and the line *g* with the key *d''*. These keys are furnished with a common anvil or front contact-bar, *c*.

5 A dynamo-electric machine, *A*, produces, by means of the commutator *h*, a current of constant direction, and, as shown, its field-magnets are energized by the current developed in the machine, a portion of which is
10 shunted therefrom by the wires *i* and *j*. The leading-out wires *a* and *k* are also connected with the commutator-brushes, and when the circuit of the said wires is closed by any of the keys *d* the remainder of the current gen-
15 erated flows through them and through the pole-changer *B* to the line connected with the depressed key, ringing the sub-station bell on the said line.

The wire *b*, connecting with the key-anvil, 20 may of course be extended, in a manner well understood, to any number of similar anvils, for use in connection with any number of switch-boards.

The pole-changer *B* may be of any well- 25 known construction. In the form I show, which is symbolic, *J* represents a pivoted bar, oscillating upon the fixed point *p* and alternately attracted in either direction by the electro-magnets *r* *r'*, which are alternately
30 magnetized and demagnetized by a local battery and circuit breaking and closing springs operating automatically and continuously, which, forming no part of my invention, are not herein shown.

35 The electric circuits may be traced as follows: From the ground *G* a wire, *m*, leads to one of the metallic faces, *n*, of the oscillating bar *J*, which bar consists of two metallic or conducting faces, *n* and *o*, completely insu-
40 lated from one another by a non-conducting partition, *t*. The upper end of the bar has two contact-screws, 4 and 5, the screw 4 being on one side and the screw 5 on the other, and the lower end is similarly provided with
45 other two screws, 6 and 7. The face *o* of the bar *J* connects by wire *b* with the switch-board plate *c*. One of the wires, *a*, from the generating-armature divides at the point 8, one branch leading to the contact-screw 6 and
50 the other branch, *a'*, leading to the contact-screw 7. The second main wire, *k*, leading from the generating-armature, bifurcates at the point 9, one branch leading to the screw 4, and the other, *k'*, to the upper screw, 5. It
55 will be obvious now that the straight current furnished by the machine *A* will be thrown, by means of the oscillations of the pole-changer *J*, into alternations, which, when the circuit is completed by the depression of one or more
60 of the keys *d*, will pass to line and ring the polarized bells at the distant stations.

The operation of the pole-changer is as follows: When, in the progress of its oscillations, the lower end of the bar makes contact with

the left-hand screw 6, the course of the cur- 65 rent is from the ground by wire *m*, metal face *n*, contact-screw 6, wire *a*, commutator *h*, and through the generating-armature to return-wire *k*, branch *k'*, contact-screw 5, face *o*, and
70 wire *b* to plate *c*, and thence to line. When the oscillating bar is at its opposite limit of progress, the ground-wire *m* and surface *n* make contact with the upper screw, 4, and the circuit continues, *via* wire *k*, commutator
75 and armature wire *a*, screw 7, face *o*, and wire *b*, to anvil-plate *c* and out. Thus the current is continually reversed. The speed of the pole-changer can readily be adjusted so that the alternations of direction of the current
80 need not exceed a definite number per second, while the strength of current can be readily intensified by increasing the speed of the armature of the dynamo-machine.

I make no claim herein to the combination, with a central-office switch, of a series of main 85 lines and devices for signaling on each line by reversals of the current charging said line, the essence of my invention consisting in the fact that by the use of a dynamo-machine I am enabled to greatly increase the current
90 strength by increasing the speed and the strength of the magnetic field, while by the introduction of the pole-changer I am enabled to throw the current developed into alternations, which succeed one another at a
95 rate of speed which is not too great to be responded to by the bell-armatures.

I claim—

1. The combination of a dynamo-electric machine, a pole-changer in the main circuit 100 thereof, a series of line-circuits, including polarized signaling-bells, and devices for completing the circuit of the said dynamo-machine through the said pole-changer, by connecting thereto one or more of the said line-circuits, 105 whereby alternating currents of great strength may be generated by the said machine and transmitted over the said lines for the purpose specified.

2. The combination, with a dynamo-electric 110 machine adapted to produce a current of constant direction, a series of line-circuits, including polarized bells, and means, substantially as described, for connecting the said line-circuits with the leading-out wire of the 115 said dynamo-electric machine, of a pole-changing apparatus included in the circuit between the dynamo-electric machine and the line-circuits, whereby the original current of constant direction is transformed into alterna- 120 tions, for the purpose specified.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, this 30th day of April, 1883.

THOS. D. LOCKWOOD.

Witnesses:

GEO. WILLIS PIERCE,
FRED J. F. SCHWARTZ.