No. 701,499. Patented June 3, 1902.

N. E. NORSTROM.

AUTOMATIC TELEPHONE EXCHANGE.

(Application filed Aug. 27, 1900.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 2.

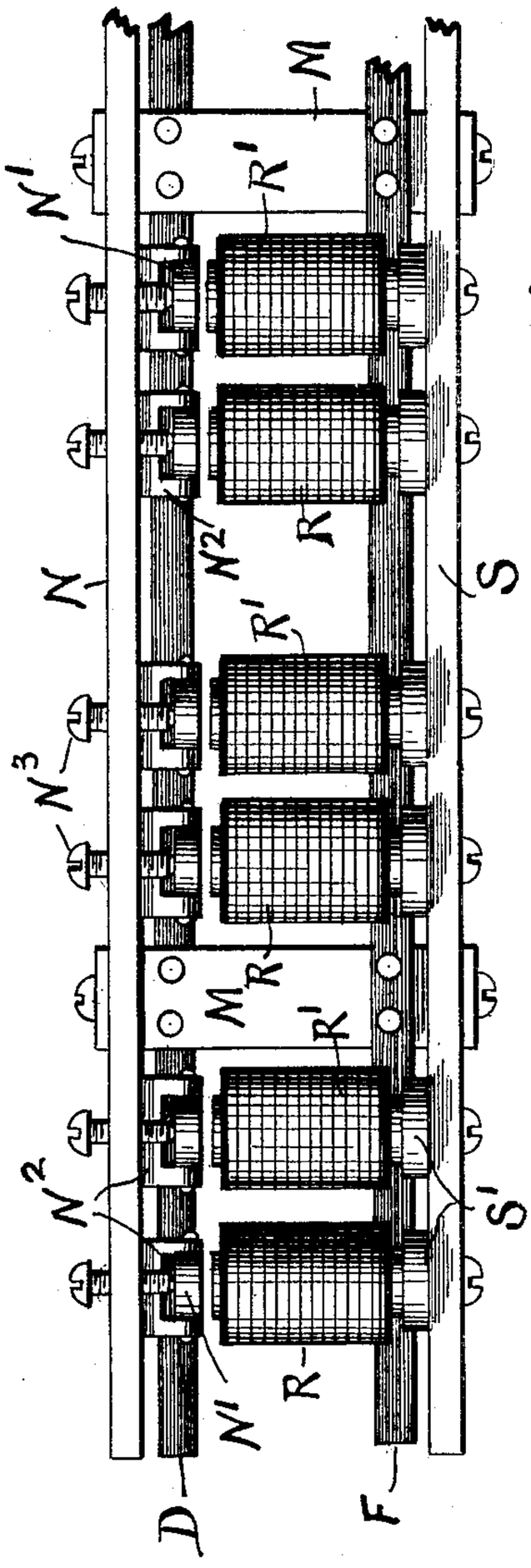
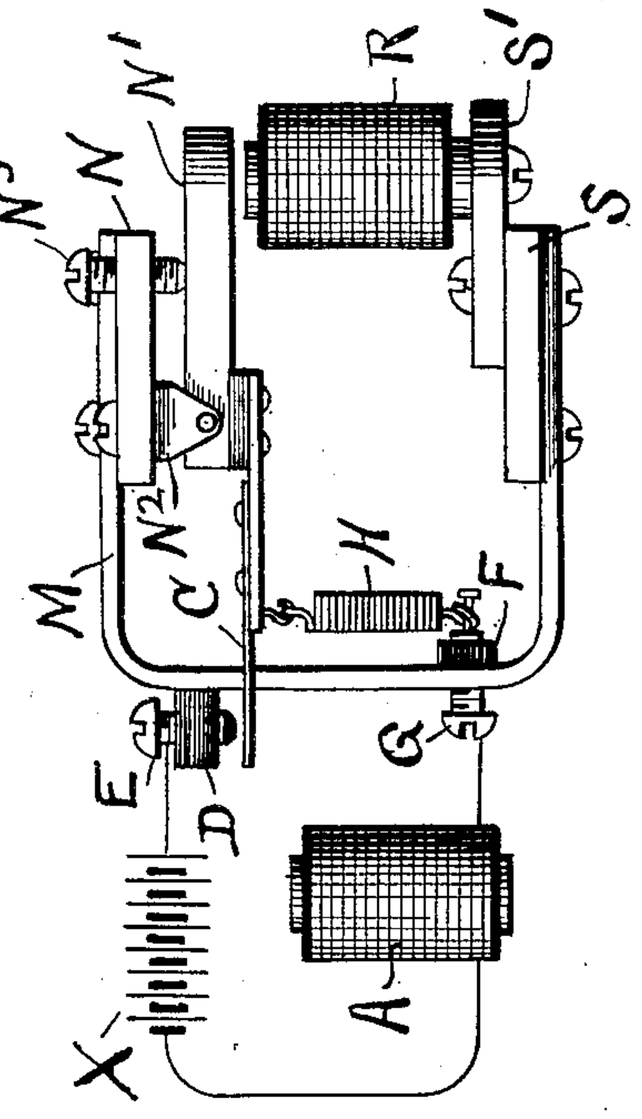


Fig. 1.



WITNESSES:

Howard A. Redfield

Carlos Escobar.

INVENTOR

N. Emel Norstrom

BY

Casper L. Redfield

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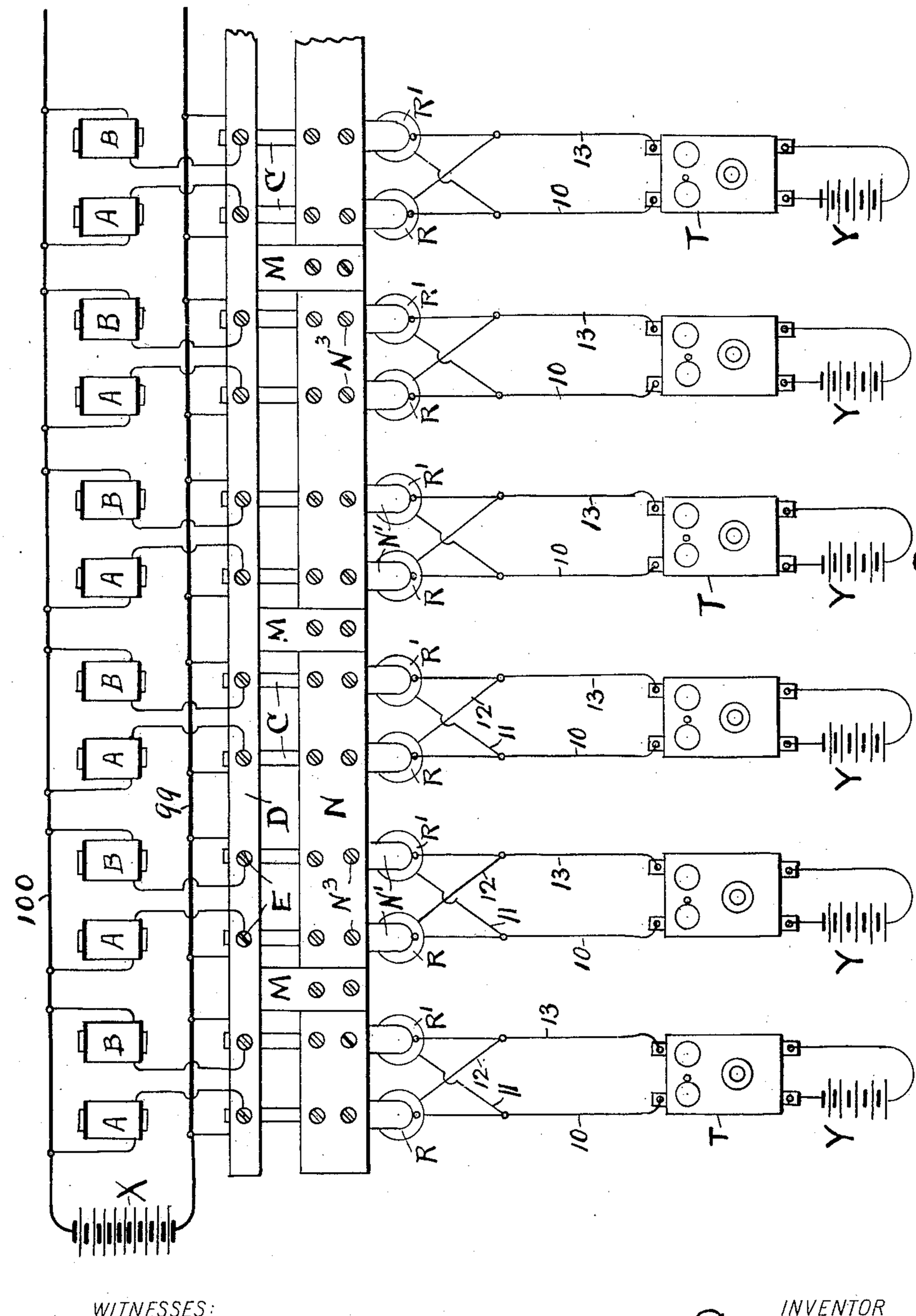

Fig. 3.

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AUTOMATIC TELEPHONE-EXCHANGE.

SPECIFICATION forming part of Letters Patent No. 701,499, dated June 3, 1902.

Application filed August 27, 1900. Serial No. 28,110. (No model.)

To all whom it may concern:

Be it known that I, NILS EMEL NORSTROM, a citizen of the United States of America, and a resident of Chicago, county of Cook, and State of Illinois, have invented certain new and useful Improvements in Automatic Telephone-Exchanges, of which the following is a specification.

My invention relates to automatic telephone-exchanges, and has for its object certain improvements in the manner of operating them.

In an application filed by me March 31, 1900, and given serial number 18,519 I have illustrated an automatic telephone-exchange in which there is an automatic switch for each telephone in the exchange, and each switch is provided with a relay which controls the operating-magnets of the connected switch, and which relay in turn is controlled by the direction of electrical impulses sent from the connected telephone.

In the present application the general arrangement is similar to that in the application just mentioned; but the construction of the devices around and connected to the relays is modified, as will be herein described.

In the accompanying drawings, Figure 1 is a side elevation showing the relay and the connected mechanism, together with connection to a battery and one magnet of an automatic switch. Fig. 2 is a front elevation of the same, and Fig. 3 is a plan connected in diagram to a series of telephones and the magnets which operate the connected switches.

I provide two long bars of soft iron N and S and connect these bars together by a series of permanent magnets M, having their poles similarly placed, so that the bar N becomes a long pole-piece of north polarity and the bar S becomes a similar pole-piece of south polarity. Secured on the bar S are a series of blocks S′, on each of which is mounted a magnet R or R′, a pair of which constitutes a relay for one switch. On the pole-piece N are a series of pivoting-blocks N^2, in which are mounted armatures N′ for the relay-magnets R and R′. On the rear end of each armature N′ is insulatingly attached a contact-spring C, which is adapted to make electrical connection with a contact-point E, secured in a strip of insulation supported in any convenient manner—as, for example, on the back of the permanent magnets M. The spring-contact C is held normally away from E by a spring H, which spring is in electrical connection with a screw G, supported in a bar F. From the screws E and G an electrical circuit passes through a switch-operating magnet and a battery marked X. In Fig. 3 a pair of magnets A and B represent the two moving magnets of each switch. From each pair of relay-magnets R and R′ there are electrical connections to a telephone T, and at each telephone there is a battery or other source of electrical energy Y. From one point at each telephone a wire 10 runs to the relay R and through the branch 11 to the relay R′. Similarly from another point at the telephone a wire 13 runs to the magnet R′ with a branch to the magnet R. If a contact be made at the telephone sending an impulse over line 10, it will pass through R and back through 12 and 13 to the telephone. A branch from the same current passes through 11 and R′ to the line 13. The connections to the relay-magnets R and R′ are so arranged that when a current passes out from the telephone over the line 10 in one case it connects to the inner coil of the magnet, and in the other case it connects to the outer coil of the magnet. The result of this is that the current passing out through the line 10 and through the two relay-magnets R and R′ causes the upper end of one to be of north polarity and the other to be of south polarity. As the armatures N′ are all in metallic connection with the pole-piece N, they all have the same polarity—that is, north polarity. It therefore follows that if a current passes through the line 10 as just described it causes the upper end of the magnet R to be of south polarity and the magnet R′ to be of north polarity. It will be obvious that the armature of the magnet R will be attracted and that of the magnet R′ will not be attracted. The attraction of the armature of the magnet R closes electrical connection through C and E to the magnet A of the switch. If, on the other hand, the cur-

rent from Y be sent out through the line 13, the direction through magnets R and R′ will be reversed, and consequently the armature of the magnet R′ will be attracted, which will result in closing the electrical connection over the magnet B of the same switch.

By the arrangement which I have just shown and described I am enabled to set up the relay-magnets in a convenient and condensed form; also, by making a series of permanent magnets M to support the long pole-pieces there is less danger of demagnetization. This results from the fact that the polarity of the long pole-pieces N and S are maintained by a permanent magnet which is divided up into a series of units M, distributed along the bars N and S. If for any reason the magnets M become weakened, it is a very simple matter to add some more permanent magnets M or to remove those which have become weakened one at a time and remagnetize them without endangering the usefulness of the exchange.

What I claim is—

1. In a magnet, pole-pieces N and S formed of a pair of parallel bars, the polarity of which pieces is maintained by a series of permanent magnets M distributed at intervals along said bars substantially as described.

2. A series of permanent magnets, pole-pieces consisting of parallel bars secured to the ends of the permanent magnets, a series of relay-magnets supported on one pole-piece, and a corresponding series of armatures supported on the other pole-piece.

3. A pair of parallel bars, means for maintaining an N polarity throughout the length of one bar and an S polarity throughout the length of the other bar, a series of relay-magnets supported on one bar, and a corresponding series of armatures supported on the other bar.

4. A pair of parallel bars, means for maintaining opposite polarity throughout the lengths of the bars, a series of pairs of relay-magnets supported on one bar, corresponding armatures supported on the other bar, and means by which an electrical impulse may be sent through a pair of magnets.

5. A pair of parallel bars having opposite polarity, a series of pairs of relay-magnets supported on one bar, corresponding armatures supported on the other bar, a contact-closing device for each armature arranged to be operated thereby, and means by which an electrical impulse may be sent through a pair of magnets so as to attract one armature and not the other.

6. A pair of parallel bars, means for maintaining opposite polarity throughout the lengths of the bars, a series of pairs of relay-magnets supported on one bar, corresponding armatures supported on the other bar, a contact-making device connected to and operated by each armature, a switch-operating magnet connected to each contact-making device, and a telephone for and connected to each pair of relay-magnets.

7. A series of pairs of relay-magnets, an armature for each magnet, means for maintaining a similar polarity in all of the armatures, and electrical connections to each pair of magnets, said connections being so arranged that upon sending an electrical impulse through a pair of magnets the poles adjacent to the armatures will be of opposite polarity in respect to each other.

Signed at Chicago, Illinois, this 6th day of August, 1900.

N. EMEL NORSTROM.

Witnesses:
CHAS. O. HATCH,
CASPER L. REDFIELD.