(No Model.)

F. B. RAE.

PRINTING TELEGRAPH.

No. 443,111. Patented Dec. 23, 1890.

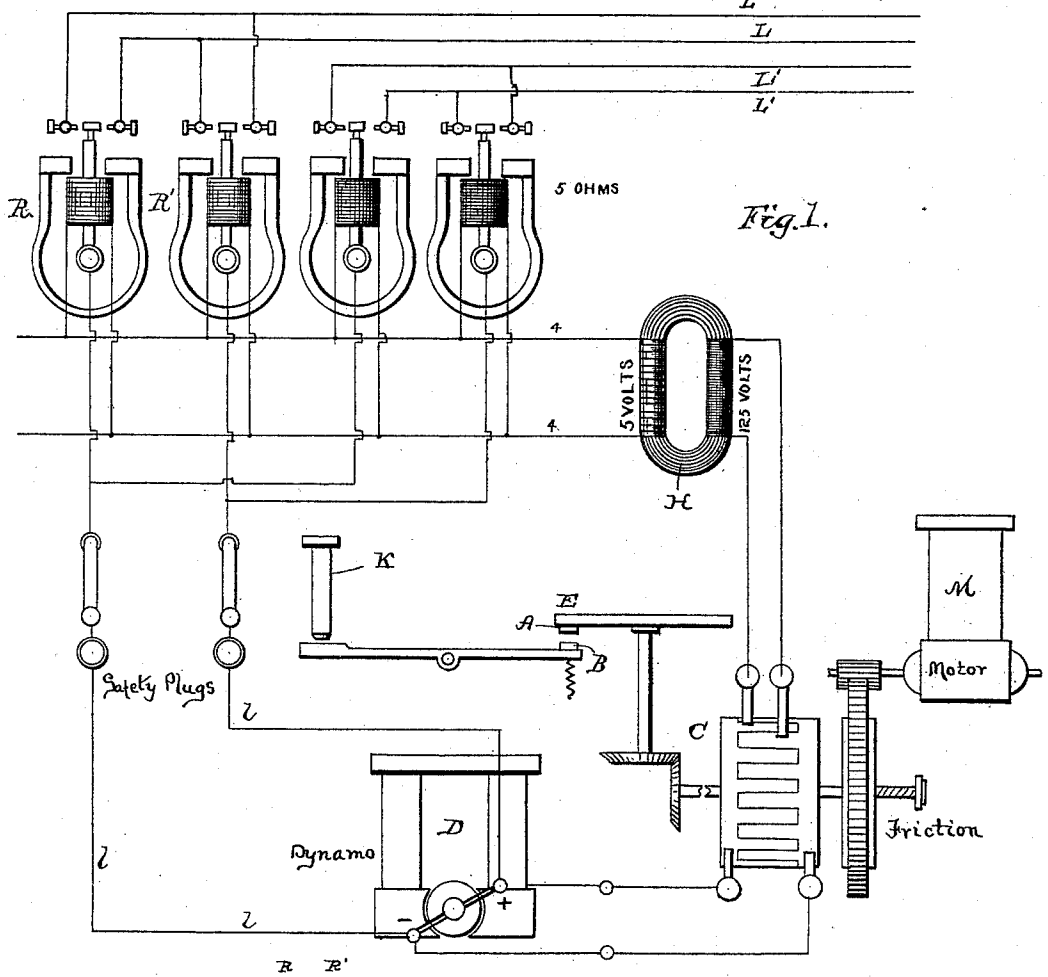

Fig. 1.

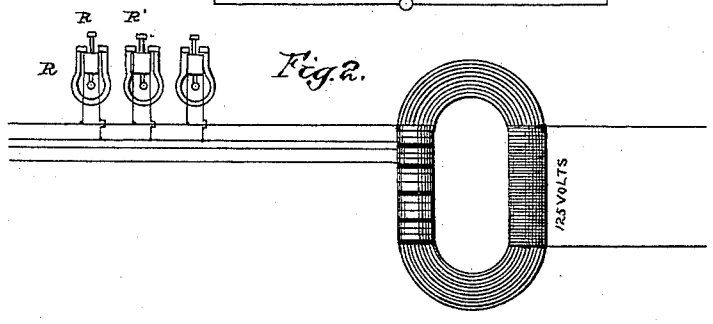

Fig. 2.

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PRINTING-TELEGRAPH.

SPECIFICATION forming part of Letters Patent No. 443,111, dated December 23, 1890.

Application filed August 9, 1888. Renewed April 15, 1890. Serial No. 347,954. (No model.)

To all whom it may concern:

Be it known that I, FRANK B. RAE, a citizen of the United States, and a resident of Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Printing-Telegraph, of which the following is a specification.

My invention relates to that class of telegraph apparatus requiring rapid to-and-fro or alternating currents upon a line-circuit, which currents must be capable of being arrested at any stage in order to produce the desired signals.

My invention relates more particularly, however, to printing-telegraph apparatus in which currents of the kind stated are employed, the arrest of the reversals being followed or accompanied by a prolonged current of the sign last flowing.

The object of my invention is to provide a simple and efficient transmitting apparatus by means of which messages may be sent to a number of lines at once through the operation of a single key-board.

In the operation of printing-telegraphs in which the printing-instrument is controlled by reversals of current it is customary to produce the reversals by a pole-changing device consisting of a rotating cylinder having contact-pieces arranged upon its periphery and a set of springs (usually eight) bearing thereon, which springs all connect the line with one dynamo-pole or the other, as they are connected by one or the other contact upon the cylinder. In this method it is necessary to provide a set of eight springs for each circuit operated, and mechanical considerations prevent more than ten circuits being successfully worked from one transmitter. This necessitates in many cases several transmitting-cylinders, which are costly and subject to excessive wear. As the success of a system of this kind depends greatly upon the careful adjustment of these springs in order that the alternations of current shall be uniform, the most careful and expert attention is necessary. There are many other objectionable features in the transmitters of this class, both electrical and mechanical.

In order to arrest the printer type-wheels at any given point, the transmitter-cylinders must be arrested at such point, while they must also be able to start again from a point of rest at full speed. This is accomplished by driving the cylinders through a friction-plate wheel and mechanically stopping the cylinders by interposing a stop-pin in the path of a revolving arm attached to the cylinder, this stop-arm extending beyond the balanced part of the revolving portion of the machine, weighs about three and one-half pounds, and has a speed of five hundred feet per minute. To suddenly arrest this arm at this velocity, as well as the momentum of the balanced part, results in a heavy blow and severe shock to the entire apparatus. The parts receiving this blow are frequently broken and the adjustment of the whole often disturbed. To overcome these difficulties, I have invented a method of reversing the line-currents by means of relays, such relays being operated by current derived from the secondary winding of a transformer or converter. I am aware that others have used relays for this purpose; but they have not been successful, because of the manner in which they were applied. The cause of failure heretofore has been the difficulty experienced in operating a number of relays from a single set of springs, the relays being connected one after the other in the circuit. Relays so connected introduce in the circuit in which they are placed an amount of self-induction and dynamic induction opposed to the working-current, and in order that they shall respond to the rapid alternations of current positiveness they must be absolutely alike in point of construction and adjustment—features difficult to realize and impossible to maintain. If it is attempted to overcome this by making them of high resistance and connecting them with the springs in multiple, as has been suggested, a point is soon reached where the amount of current passing through the springs becomes too great, and a worse condition obtains, because of burning and alteration of adjustment due thereto. I propose to avoid these difficulties by interposing a converter between the reversing-springs or other source of alternating currents and the relays, the primary of which converter is capable of carrying, say, one ampère of current at a potential of, say, one hundred and twenty-five volts. The dynamo when made to develop continu-

ous currents is connected with this primary, winding through a commutator, and as this commutator is revolved by the motor a series of reversals takes place, due to a current of one ampère at a pressure of one hundred and twenty-five volts. The energy expended here is therefore one hundred and twenty-five watts. The secondary of the converter is wound to give, say, five volts, and is capable of delivering one hundred and twenty-five watts minus loss of conversion, or, say, twenty ampères at five volts. To this secondary the relay-pole changers are connected. These relays, under above conditions, would have a resistance of five ohms, and take, therefore, one ampère each. We may then work twenty relays or (two relays being used for each current) ten circuits from one converter and one set of springs, each relay being practically in a separate circuit and unaffected by any other relay. In a system thus arranged the reversing-commutator for the converter may be a part of the key-board and its revolution arrested by the direct action of the keys. It could be driven by a small motor consuming but a few watts of energy. The cost of an installation of this kind would be over fifty per cent. less than the present method. It would be less liable to break down, require less expert attention, and give better results.

Having described the general principles of my invention, I will proceed to describe in detail an arrangement embodying the invention in the form shown diagrammatically in Figure 1 of the accompanying drawings. Fig. 2 illustrates a modification.

L L indicate one of the printer-circuits containing a printing-telegraph receiver of the messages sent by the key-board, one of the keys of which is indicated at K. L′ L′ indicate a second circuit of the same nature. The line-connections of L L with wires 1 1 lead from a source of continuous currents D and are reversed by means of apparatus included at R R′, consisting of two electro-magnets adapted to respond to reversed currents and having their armatures connected with the lines 1 1, while their stops connect to the circuit L. The relays R R′ operate in obvious ways when vibrating together to reverse the current from the dynamo source D upon the line L L.

H indicates the induction-coil, the secondary of which supplies alternating currents to wires 4 4, between which the relays R R′ are connected in multiple, as indicated.

The line-connections of the circuits L′ L′ are reversed by means of similar electro-magnets polarized to respond to reversed currents of the local circuit 4.

It is obvious that any number of lines might be operated in the same way by the reverse currents developed in the secondary of the induction-coil H.

The primary of the induction-coil H is traversed by reversed or to-and-fro currents supplied from a pole-changer C of any desired character, which pole-changer connects, as shown, with a source of continuous currents, such as the dynamo D. The pole-changer C may be driven by a motor M, connected through a friction-gear or otherwise with the pole-changer.

The flow of alternating currents in the primary circuit of the induction-coil is arrested by means of the keys of an ordinary key-board instrument, the revolving disk or member of which E gears with the pole-changer and carries a stop, (indicated at A,) which is adapted to engage with a stop, such as B, carried by the levers actuated by the push-buttons K, one only of which is indicated for the sake of simplicity.

The transmitting key-board and the mechanical connections of the same with the pole-changer may be of the usual or any desired character, as well understood in the art. In the particular arrangement shown the arrest of the pole-changer C may take place at any stage of the alternations of current produced thereby, and will obviously result in a cessation of the alternating currents on the circuit 4 and of the vibrations of the pole-changing apparatus R R′. On the stoppage of the latter apparatus current will flow continuously to the lines from the source D or other source and with a polarity depending upon the polarity of the current which last operated the relays R R′.

While I have shown one particular form of pole-changing apparatus for reversing the line-connections of each line, I do not limit myself to such form, inasmuch as this portion of the apparatus may be of any desired character adapted to be actuated or controlled by electro-magnets responsive to reversals of current.

I have described and shown a pole-changer C as the means for producing the alternations of current on the primary of the induction-coil H, but do not wish to be understood as limiting myself to such device under all circumstances, since it is obvious that the desired reversals of current upon the secondary of the coil might be obtained by means of to-and-fro currents in the primary produced from any source or in any desired manner, it only being necessary that the transmitter should be of the proper character, as well understood in the art, to arrest the alternations at any stage. It is also to be observed that any character of transmitter suitable for controlling the flow of alternating currents from a pole changer or reverser may be used. I prefer, however, a device which will produce the desired effect by mechanically arresting the pole-changer, as shown, such pole-changer being frictionally connected with its driving-power.

I have shown the source of continuous currents supplied to reverser C as consisting of the same dynamo D which supplies the lines 1; but it is obvious that my invention is not limited to the character of the source of the continuous currents. I show the same source

for the pole-changer C and for the line 1, inasmuch as that is the simpler arrangement.

In Fig. 2 I have illustrated a modification in the manner of supplying a number of pole-changing relays R R′ from the secondary of the induction-coil. In this instance the secondary is subdivided, and each section supplies the relays R R′ of one or more printing-circuits. The results obtained by this arrangement are obviously the same as with the arrangement shown in Fig. 1.

What I claim as my invention is—

1. In a telegraph transmitting apparatus, the combination, substantially as described, of a number of separate telegraph-lines, a converter or induction-coil, pole-changing apparatus for each line electro-magnetically operated or controlled from a secondary circuit of said converter, and a primary circuit of said converter carrying to-and-fro or reversed currents supplied from any source and governed or arrested at any stage by a transmitter common to the lines.

2. The combination, substantially as described, of two or more telegraph-lines, an induction-coil having its secondary connected to polarized electro-magnets for reversing the line-connections, a source of continuous currents connected to the reversing-contacts, and a primary circuit for the induction-coil carrying reversed or alternating currents supplied from any source and governed or arrested at any stage by means of a transmitter common to the lines.

3. The combination, substantially as described, of two or more telegraph-lines, pole-changing apparatus for each line operated by a polarized electro-magnet, an induction-coil the secondary of which supplies the said electro-magnets of the various lines in multiple, a primary circuit for said induction-coil carrying alternating or to-and-fro currents from any desired source, and a printing or dial telegraph key-board common to said lines for arresting the alternations of the primary circuit at any stage.

4. The combination, substantially as described, of two or more printing-telegraph circuits, an induction-coil common to the same and having its secondary connected to polar-relays supplied in multiple from said secondary, a source of continuous current connected to the pole-changing contacts of the relay, a pole-changer connected to the primary of the induction-coil, and a key-board transmitter for arresting the pole-changer at any stage in the flow of the alternating currents on the primary circuit.

Signed at Chicago, in the county of Cook and State of Illinois, this 28th day of July, A. D. 1888.

FRANK B. RAE.

Witnesses:
STELLA V. STURGES,
MABEL CRONISE.