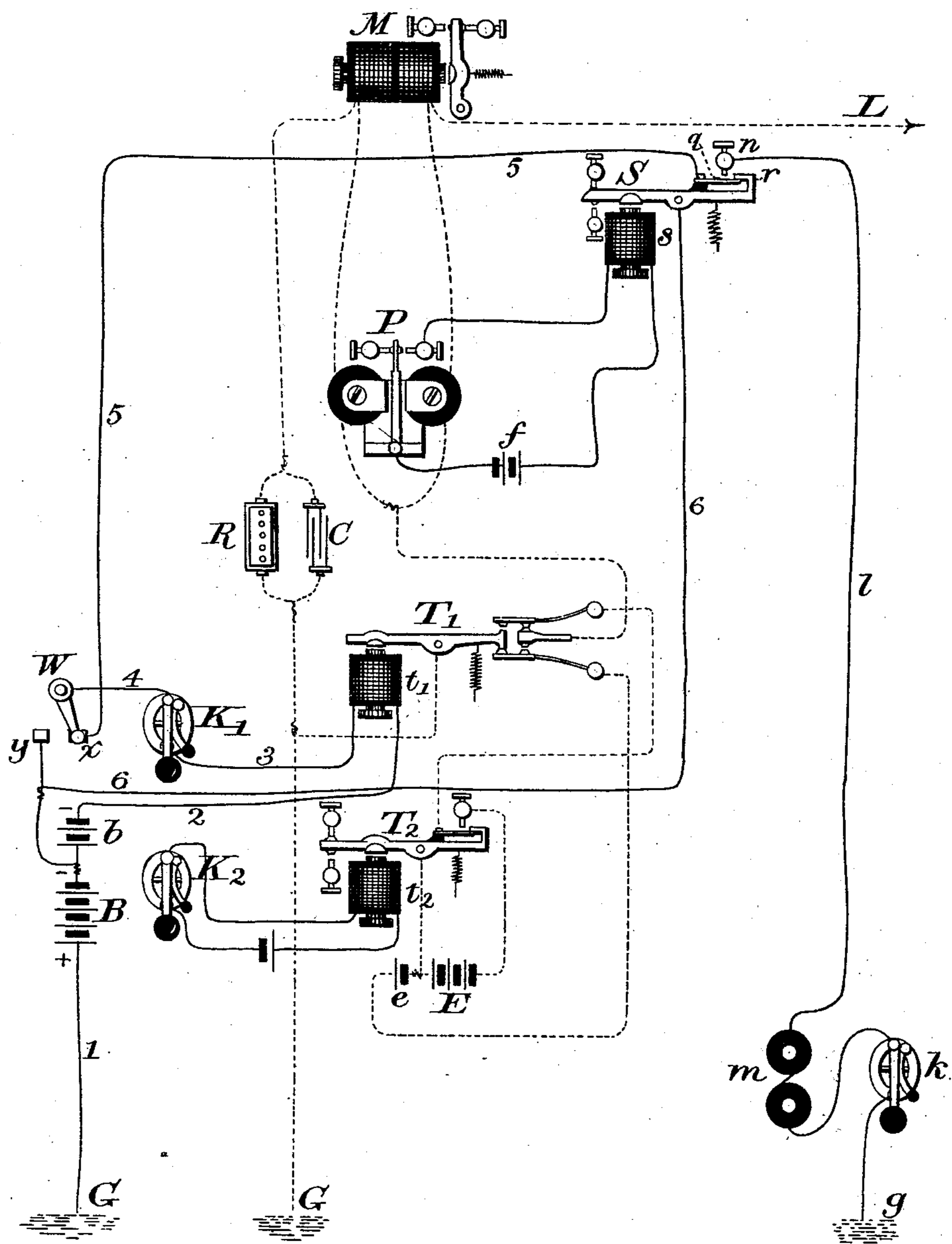


(No Model.)

D. R. DOWNER.
Duplex Telegraph Repeater.

No. 243,530.

Patented June 28, 1881.



Witnesses;

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UNITED STATES PATENT OFFICE.

DAVID R. DOWNER, OF ELIZABETH, NEW JERSEY.

DUPLEX-TELEGRAPH REPEATER.

SPECIFICATION forming part of Letters Patent No. 243,530, dated June 28, 1881.

Application filed April 30, 1881. (No model.)

To all whom it may concern:

Be it known that I, DAVID R. DOWNER, a citizen of the United States, residing at Elizabeth, in the county of Union and State of New Jersey, have invented certain new and useful Improvements in Duplex and Quadruplex Telegraphs, of which the following is a specification.

My invention consists in a method of and apparatus for combining a branch or auxiliary line with the transmitting and receiving apparatus at the terminal station of a duplex or quadruplex telegraph, whereby the operator at an auxiliary station may transmit or receive communications over a single branch wire, and directly through the duplex or quadruplex circuit, without the necessity of retransmission at the terminal station, and in providing means whereby the branch line may be disconnected from the apparatus at the terminal station of the duplex or quadruplex line when required.

The accompanying drawing is a diagram representing the apparatus at one terminal station of a quadruplex line and the combination of a branch line and of the apparatus at a branch station therewith in accordance with the principles of my invention.

In the drawing I have shown the ordinary arrangement of apparatus for working quadruplex at one terminal station of a main line, the circuit-connections being shown in dotted lines.

L represents the main line; M, the non-polarized differential receiving-instrument; P, the polarized differential receiving-instrument; T', the pole-changing transmitter; T², the single-current transmitter; E and e, the greater and the lesser sections, respectively, of the main battery; R, the rheostat in the artificial line; C, the condenser connected with the same, and G the ground-connection. K' and K² are the transmitting-keys, which respectively operate the transmitters T' and T². All the parts thus far referred to are well known and in common use, and by themselves constitute no part of my invention, which relates solely to the combination therewith of apparatus and circuits by means of which an operator at an auxiliary station upon a branch line is enabled to work directly without man-

ual retransmission over the duplex or quadruplex circuit. I have represented such a branch line as connected with one transmitting-instrument, T', and one receiving-instrument, P, of a quadruplex apparatus, which of themselves constitute a duplex apparatus only; but it is to be understood that another branch line might be attached in the same manner to the second transmitter, T², and a second receiver, M, of the quadruplex without any modification other than a mere duplication of the apparatus.

In the drawing the polarized receiving-instrument P is represented as opening and closing the circuit of a local battery, f, through an electro-magnet, s. In the ordinary arrangement the armature-lever S of the electro-magnet s is employed simply to produce sounds, the apparatus constituting, in fact, an ordinary Morse sounder. Without in the least interfering with its usefulness for this purpose, I have placed upon the said lever an insulated spring, q, which normally rests against a stop, r, formed upon the end of the lever. When the electro-magnet s attracts its armature the spring q is brought against the fixed stop n, making electrical contact therewith and at the same time breaking the normally existing contact with the stop r. This portion of the apparatus as thus arranged performs the double office of a receiving-sounder for the terminal station and a transmitter, whereby the signals are automatically repeated into the branch line, as will be hereinafter shown. The battery of the branch line is divided into two sections, B and b, the latter, which is the smaller section, may be composed of two or three cells, the number required being no greater than that ordinarily used for the local battery for operating the transmitter. The number of cells required for the larger section, B, will depend upon the length or resistance of the branch line of which it constitutes the main battery.

W is a switch, by means of which the branch line may conveniently be placed in connection with the apparatus or disconnected therefrom at the will of the operator at the terminal duplex station, as hereinafter explained.

The apparatus at the auxiliary or branch station consists of an electro-magnet, m, which

may constitute a portion of a receiving-instrument of any suitable character. k is the transmitting-key, and g is the ground-connection. l is the branch line extending from the terminal station of the duplex or quadruplex line to the branch or auxiliary station. This may be of any required length. When the hand-switch W is placed upon the contact-point x , as shown in the figure, the apparatus is in readiness for use. In this case the circuit of the branch line may be traced as follows: From the ground at G by the wire 1, battery-section b , and wire 2 to electro-magnet t' of transmitter T' , thence by wire 3, through key K' , and by wire 4 to switch W , thence by contact-point x and wire 5 to contact-spring q . The spring q will, therefore, be in permanent connection with the battery Bb .

It will be understood from the foregoing description that when a communication is to be sent directly to the branch station from the station at the distant end of the main line L the operator at the latter point has only to transmit the same by means of his double-current transmitter. The signals so sent will be received upon the polarized relay P and repeated through the local circuit upon the electro-magnet s . The armature-lever S of this electro-magnet acts, in turn, as a key, and retransmits the signals into the branch line L by bringing the spring q into contact with the stop n each time that a signal is sent. The signals are received by the operator at the branch station and read from his instrument in the usual manner.

In order to prevent the breaking and closing of the circuit of the branch line from actuating the transmitter T' , which would have the effect of retransmitting the received signals to the distant station, a conductor consisting of a wire, 6, is connected with the resting contact-stop r upon the lever S of the branch-line transmitter, which conductor extends to a point within the branch-line battery, or intermediate between its poles, it being preferably attached at the same point as the wire leading from the contact-point y of the switch W . Thus, whenever the electro-magnet s of the branch-line transmitter releases its armature, and thus breaks the circuit of the branch line l , the contact-spring q at the same instant touches its resting contact r and closes the circuit of the battery-section b through the wires 2, 3, 4, 5, and 6, including the actuating electro-magnet of the transmitter T' , and thus keeps the main-line transmitter closed whenever the branch-line transmitter is open, by which means the unnecessary repetition of the signals over the main line in the opposite direction is prevented.

When a communication is to be sent directly from the branch station to the distant station upon the line L , the operator at the distant station first closes the key of the pole-changing transmitter to his own instrument, which, in turn, closes the local circuit of the local battery f by means of the polarized relay P , and

thus causes the electro-magnet s to attract its armature S . This brings the contact-spring q into contact with the stop n , at the same time breaking its previously-existing contact with the stop r . This will cause a continuous current from the battery Bb to traverse the branch line and instrument. If, now, the operator at the branch station transmits a communication by manipulating his key k , his signals will pass over the line l , wire 5, switch W , wires 4 and 3, and through the electro-magnet t' . The latter electro-magnet operates the transmitter T' as usual, and thus repeats the signals from the key k over the line L to the distant station.

Whenever it is desired to disconnect the branch line from the apparatus it is only necessary for the operator at the terminal main station to turn the hand-switch W from the contact x to the contact y . This places the key K' and the electro-magnet t' of the double-current transmitter T' in a local circuit consisting of wires 2, 3, and 4, and including only the smaller section, b , of the battery, the larger section, B , being thrown out of circuit.

When the operator at the branch station is transmitting to the distant station over the line L the latter may interrupt him at any time by using his pole-changing key, which will instantly break the circuit of the branch line by means of the armature-lever S .

It is obvious that any required number of stations may be placed upon the branch line l , each being provided with a key, k , and a receiving-instrument, m ; and if the line is of sufficient length to render it necessary or desirable, a main battery may be placed at its remote terminal, g .

I claim as my invention—

1. In a duplex or quadruplex telegraph, the combination, substantially as hereinbefore set forth, of a main-line transmitter, an electro-magnet for actuating said transmitter, a main-line receiving-instrument, a branch-line transmitter actuated by said receiving-instrument, and a branch line which includes within its circuit the electro-magnet that actuates the main-line transmitter and also the circuit controlling attachments of the branch-line transmitter.

2. In a duplex or quadruplex telegraph, the combination, substantially as hereinbefore set forth, of a main-line transmitter, an electro-magnet for actuating said transmitter, a branch line, including said electro-magnet in its circuit, a battery connected with said branch line, having one of its poles to earth, a key, and a hand-switch connected with said key for disconnecting the latter from the branch line and connecting it with a local branch, including a section of the battery.

3. In a duplex or quadruplex telegraph, the combination, substantially as hereinbefore set forth, of a branch-line transmitter provided with a contact-spring playing between a resting and a working contact, a branch line connected with said working contact, a conductor

extending from said contact-spring to a branch-
line battery, a main-line transmitter actuated
by an electro-magnet included in the circuit of
said conductor, and a conductor extending
5 from the resting contact on the branch-line
transmitter to an intermediate point between
the terminals of said battery.

In testimony whereof I have hereunto sub-
scribed my name this 29th day of April, A. D.
1881.

DAVID R. DOWNER.

Witnesses:

JOHN J. TRACY,
MILLER C. EARL.