

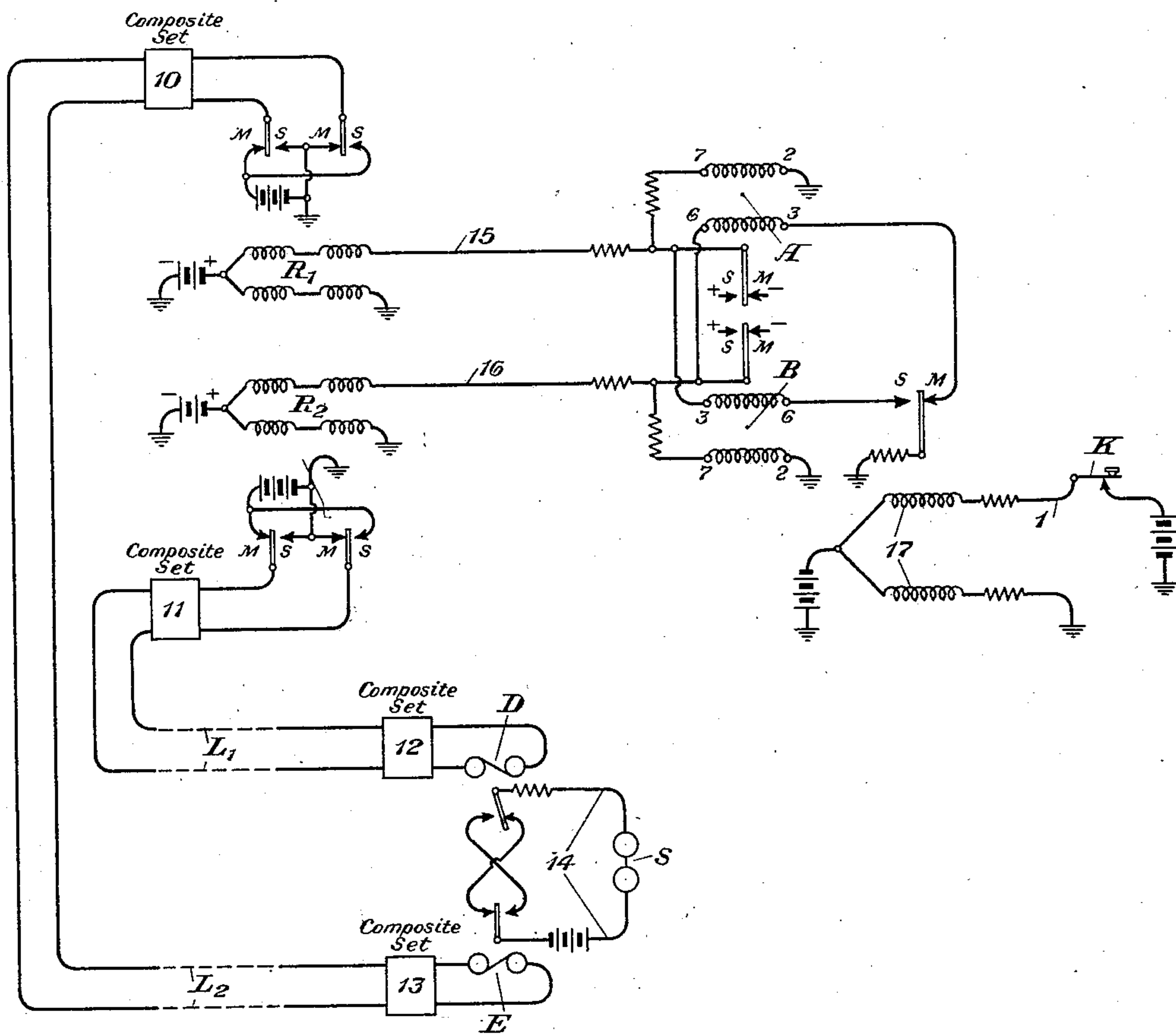
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S. I. CORY

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TRANSMISSION SYSTEM

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INVENTOR
S. I. Cory
BY *g. w. 402*
ATTORNEY

UNITED STATES PATENT OFFICE

SAMUEL I. CORY, OF TOWACO, NEW JERSEY, ASSIGNOR TO AMERICAN TELEPHONE AND TELEGRAPH COMPANY, A CORPORATION OF NEW YORK

TRANSMISSION SYSTEM

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This invention relates to telegraph systems, and more particularly to improved arrangements whereby signals may be originated and received on such systems at a high signaling speed and whereby such high speed signals may be transmitted between stations over lines suitable only for low speed signals.

To distinguish between low speed and high speed telegraph signals and low speed and high speed telegraph lines for the purpose of this invention, it is pointed out that the speed of the signals may be defined as the number of dots or impulses originated per second. The shortest impulse of a set of message impulses would be utilized to fix the maximum speed of the message signals. The number of these shortest impulses that could be transmitted per second could be termed the speed of the signals or could be characterized as the maximum fundamental frequency of the signaling current.

A telegraph line interconnecting two stations would usually have associated therewith certain selective devices, such as filters or composite sets, and these filters or composite sets might be designed to cut off frequencies above 60 to 70 cycles. Accordingly, such a circuit might be suitable for the transmission of telegraph signals having a maximum speed of 60 to 70 impulses per second or, in other words, for a signaling current below such frequencies. This type of circuit might, for the purpose of illustrating this invention, be termed a low speed telegraph circuit. Obviously, it may be desirable to originate and receive signals at a speed faster than 60 to 70 impulses per second and this would result in the utilization of a current of a higher frequency. The use of a higher frequency current would not be possible on the type of circuit heretofore termed a low speed circuit because of the cut-off characteristics of the filters or other apparatus associated with the line. Accordingly, to accommodate high speed signals, the filters or other devices in the line

would have to be redesigned to have a higher frequency cut-off characteristic so that the line might be termed a high speed circuit. Obviously, this would necessitate the reconstruction or redesign of the low speed circuit into a high speed circuit.

One of the primary objects of the arrangements of the invention is to make it possible to utilize the low speed circuit without any change therein for the transmission of high speed telegraph signals. In the arrangements of the invention this is accomplished by resolving a series of high speed signals into a plurality of series of signals of approximately half the original frequency. The signals of this lower frequency may then be transmitted over a plurality of low speed telegraph circuits and may be recombined at the other end of the line to form the original high speed signals.

In the present invention the arrangements for translating the high speed signals into low speed signals for transmission over the lines comprises a circuit arrangement including a number of polar relays. Other objects and features of the invention will appear more fully from the detailed description thereof hereinafter given.

The invention may be more fully understood from the following description, together with the accompanying drawing in the figure of which the invention is illustrated.

In the drawing is shown a telegraph system in which two stations are interconnected by the lines L_1 and L_2 . These lines might be used for both telephone and telegraph purposes and might have included therein selective devices such as filters or the composite sets 10, 11, 12 and 13. If the lines L_1 and L_2 were used as composited telephone and telegraph lines, the selective devices might be designed to have a cut-off frequency of 60 or 70 cycles and, accordingly, telegraph signals having a greater maximum speed

than 60 or 70 dots per second, or in other words requiring a signaling current with maximum frequency above 60 or 70 cycles, could not be sent over such lines. Lines of this type may, for the purpose of illustrating this invention, be termed low speed telegraph circuits. At the sending end of the system is shown a sending circuit 1 with the key K and the relay 17. Controlled by the relay 17 is a circuit including the polar relays A and B. These relays will resolve the high speed signals originating in the loop circuit 1 into two series of low speed signals for transmission over the lines L_1 and L_2 . At the receiving end of the system are provided the relays D and E. These relays will be responsive to the low speed signals transmitted over the lines and will combine these signals into a series of high speed signals to actuate the sounder S in the receiving loop circuit 14.

The operation of the arrangements of the invention is as follows: Assume the key K to be closed and the relays A, B and 17 to be in the marking condition, as shown in the drawing. Assume also that when current flows from terminal 6 to terminal 3 in winding 6—3 of either relay it moves the armature to the marking contact. The holding windings 2—7 are poled to effectively hold the relay armature on either the marking or spacing contact. If key K is opened the armature of relay 17 will be operated to its spacing contact, thereby applying ground to terminal 6 of winding 3—6 of relay B. With negative battery connected over the armature of relay A to terminal 3 of winding 3—6 of relay B, relay B will be caused to operate to its spacing contact. It will be maintained on its spacing contact by current flowing from spacing battery and armature of relay B through the holding winding 7—2 to ground. This will apply positive or spacing battery to conductor 16 and will cause relays R_2 to operate to spacing. This will transmit spacing current over the line L_1 and operate the relay D. This will close the loop circuit 14 and operate the sounder S. If the key K is now closed again, the armature of relay 17 will move to its marking contact. This applies ground to terminal 3 of winding 6—3 of relay A and causes the armature of said relay to operate to its spacing contact. This is because spacing battery is applied from the armature of relay B to terminal 6 of winding 6—3 of relay A. The armature of relay A will be maintained on its spacing contact by the spacing current transmitted through the holding winding 7—2 to ground. Positive or spacing battery is thereby applied to conductor 15 and operates relays R_1 . This will apply spacing current to the line L_2 and operate relay E. This will open the loop circuit 14 and release the sounder S at the receiving station. If the key K is again opened, ground is again ap-

plied to terminal 6 of winding 3—6 of relay B, and since this winding now has positive battery connected to its other terminal the relay B will operate to its marking contact. This will apply negative or marking battery to conductor 16 and operate the relays R_2 to apply marking current to the line L_1 , thereby operating relay D. This operation of relay D will close the loop circuit 14 and operate the sounder S. If the key K is again closed, relay 17 will be operated to its marking contact, thereby applying ground to terminal 3 of winding 6—3 of relay A. Relay A, having negative battery connected to the other terminal of this winding, will be operated to its marking contact. This will apply marking current to conductor 15 and will operate relays R_1 so as to apply marking current to the line L_2 and thereby operate relay E. This operation of relay E will again open the loop circuit 14 and release the sounder S.

Thus it may be seen that when the key K is opened for the first time, relays B and D will be operated and the sounder S actuated. When key K is closed again, relays A and B and relays D and E will be operated so that the sounder S will not be actuated. When the key K is opened for the second time, relay D will be operated to close the loop circuit 14 and actuate the sounder S. When key K is closed for the second time, the relays A and B and the relays D and E will assume the position shown in the drawing and the sounder S will not be actuated and the frequency of the signals over lines L_1 and L_2 will be approximately one-half that of the original signaling frequency.

The principles embodied in the arrangements of the invention, whereby low speed circuits may be combined to form a high speed circuit, are not limited to the use of two circuits. By varying the relay combinations at the sending and receiving ends of the transmission system a greater number of circuits may be utilized in the combination if necessary. The principles of the invention may furthermore be utilized in connection with secret transmission systems, since the transmitted signal is not understandable except in the presence of all of its components. The arrangements of the invention may be utilized on lines which do not include filters or composite sets if the frequency characteristics of the lines themselves make it desirable. The arrangements of the invention are furthermore applicable to other types of telegraph systems from those illustrated, such for example as carrier telegraph and radio systems.

While the invention has been disclosed as embodied in certain specific forms which are deemed desirable, it is understood that it is capable of embodiment in many and other widely varied forms without departing from

the spirit of the invention as defined by the appended claims.

What is claimed is:

1. The combination of a high speed telegraph circuit with two low speed telegraph circuits, a translating device for resolving the original high speed signals into two series of low speed signals for transmission over said low speed circuits, said translating device comprising two polar relays for controlling the application of signals to said low speed circuits and controlled by the high speed signals, each of said polar relays having operating windings oppositely poled with respect to each other and connected to the armatures of the other of said relays, and each of said polar relays having holding windings connected to their own relay armatures.

2. The combination of a high speed telegraph circuit with two low speed telegraph circuits, a translating device for resolving the original high speed signals into two series of low speed signals for transmission over said low speed circuits, said translating device comprising two polar relays for controlling the speed of application of signals to said low speed circuits and controlled by the high speed signals, each of said polar relays having armatures associated with said low speed circuits and contacts with marking and spacing battery connected thereto, one of said relays having an operating winding connected to the armature of the other relay and so poled that the application of marking battery thereto will cause it to move its armature to the spacing contact, the second of said relays having an operating winding connected to the armature of the first relay and so poled that the application of spacing battery thereto will cause it to move its armature to spacing, and holding windings for each of said relays connected to their own relay armatures.

3. The combination of a high speed telegraph circuit with two low speed telegraph circuits, a translating device for resolving the original high speed signals into two series of low speed signals for transmission over said low speed circuits, said translating device comprising two polar relays controlled by the high speed signals for controlling the application of signals to said low speed circuits whereby the frequency of the signals in each of said low speed circuits will be approximately one half the frequency of the original high speed signals, each of said polar relays having operating windings oppositely poled with respect to each other and connected to the armatures of the other of said relays, and each of said polar relays having holding windings connected to their own relay armatures.

4. The combination of a high speed telegraph circuit with two low speed circuits, a translating device for resolving the original

high speed signals into two series of low speed signals for transmission over said low speed circuits, said translating device consisting of two polar relays each having single armatures for directly applying signals to said low speed circuits, and operating circuits for said relays controlled by switching means and completed over said single armatures and said switching means.

In testimony whereof, I have signed my name to this specification this 22nd day of June 1931.

SAMUEL I. CORY.

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