

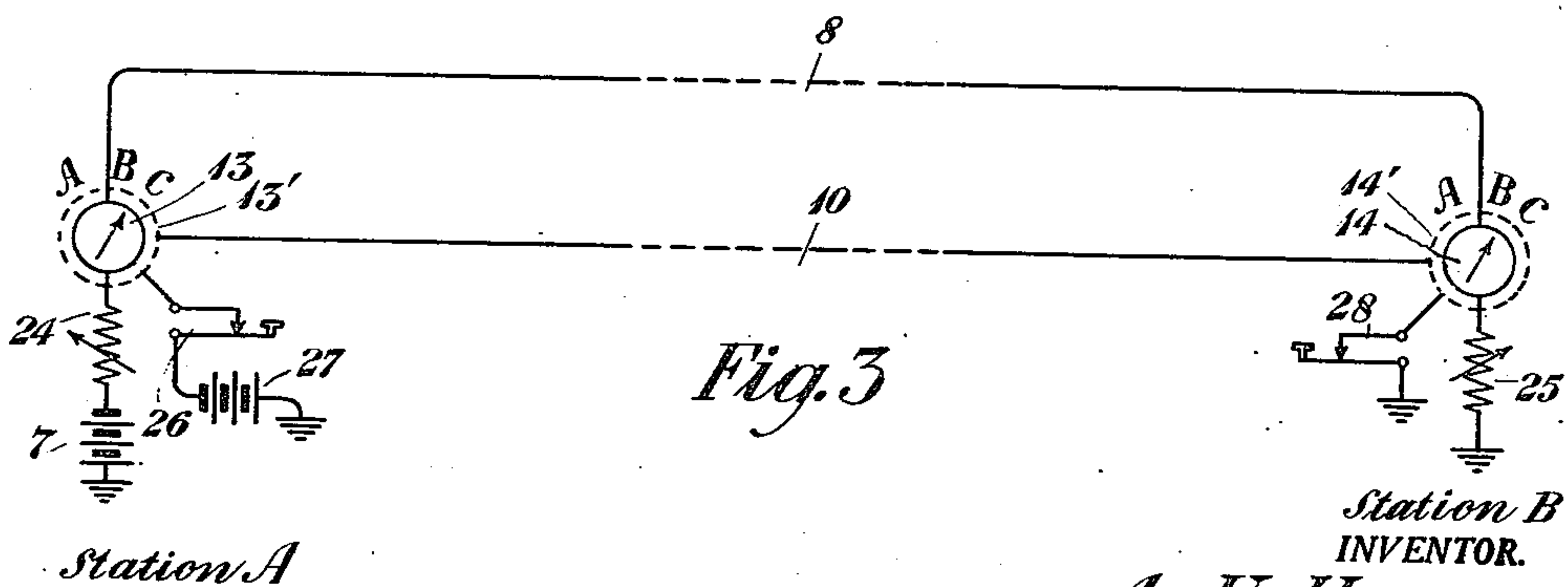
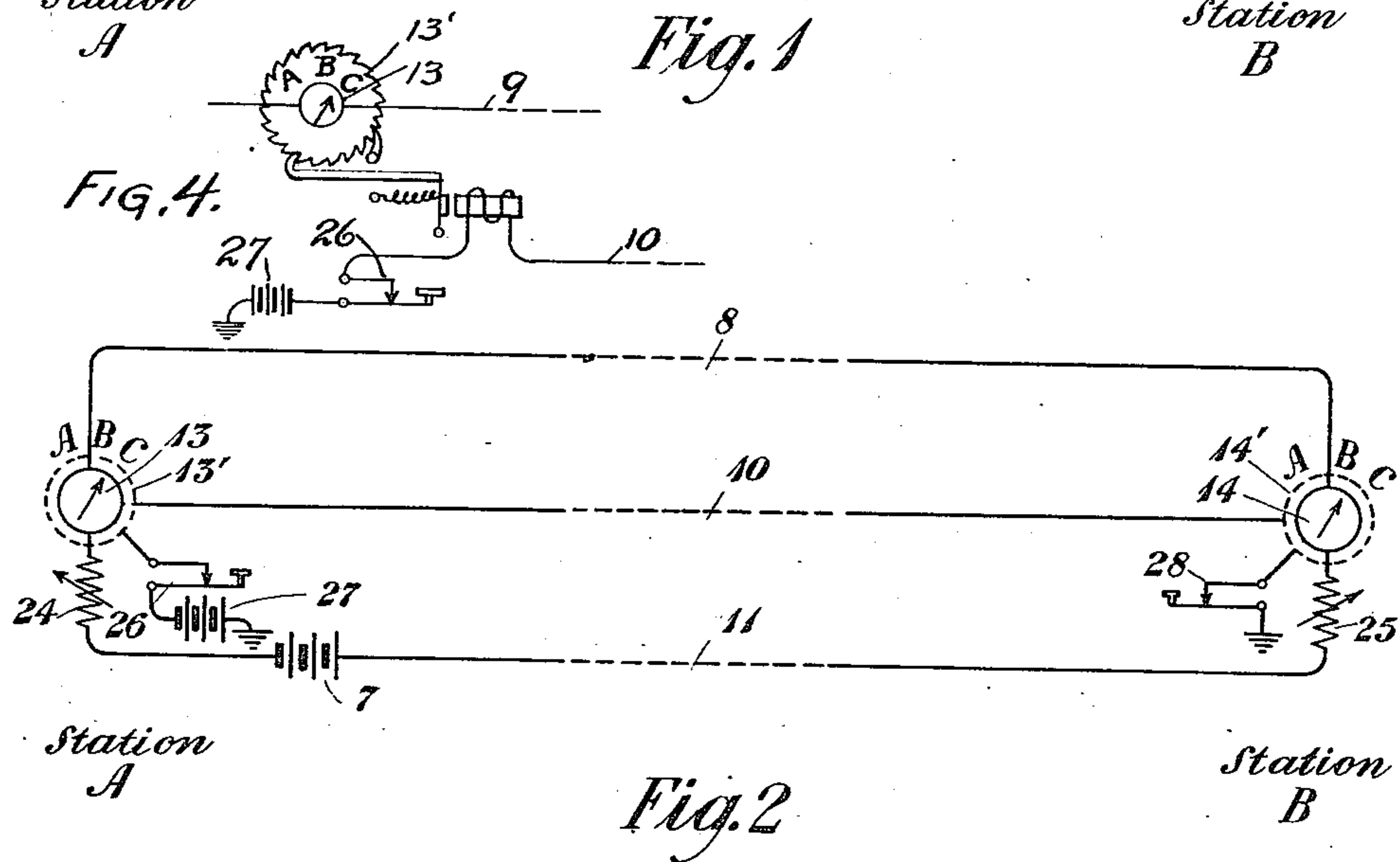
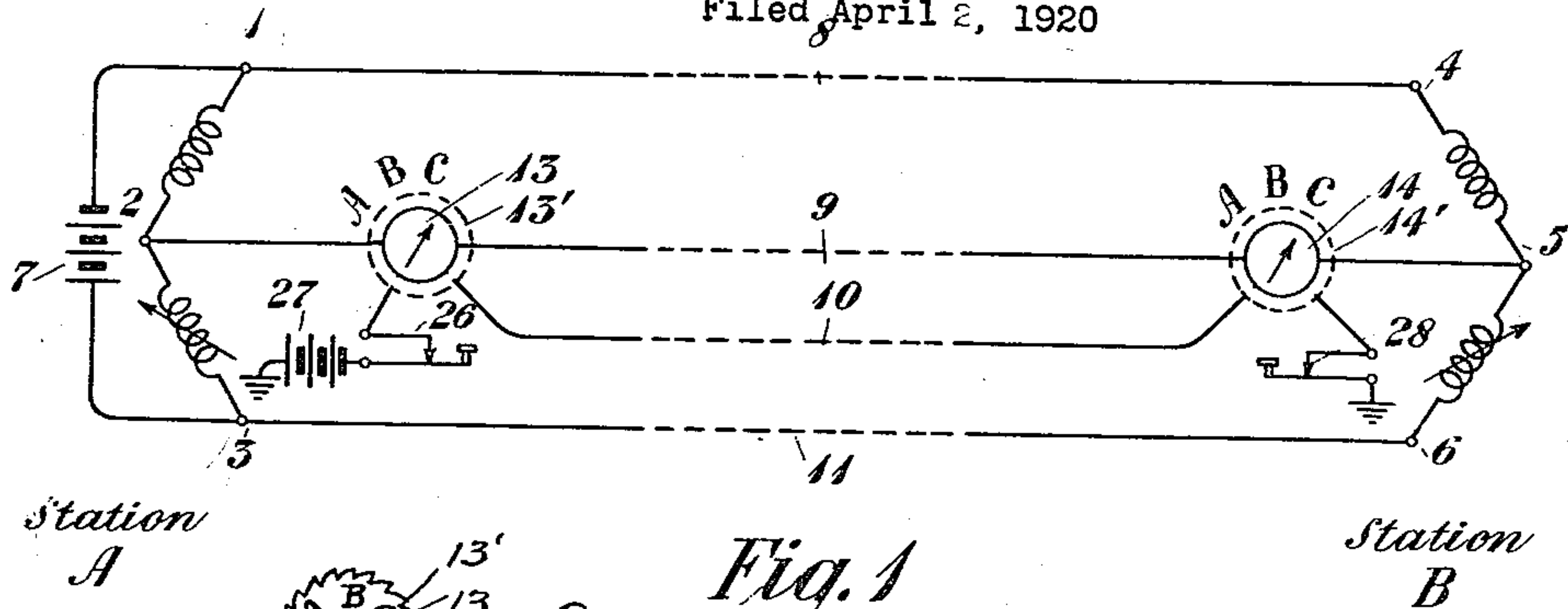
March 17, 1925.

1,529,786

A. U. HARPER

SECRET COMMUNICATION SYSTEM

Filed April 2, 1920



Station B  
INVENTOR.

BY *A. U. Harper*  
*g v 402*  
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1,529,786

# UNITED STATES PATENT OFFICE.

ALFRED U. HARPER, OF EVANSTON, ILLINOIS, ASSIGNOR TO AMERICAN TELEPHONE AND TELEGRAPH COMPANY, A CORPORATION OF NEW YORK.

## SECRET COMMUNICATION SYSTEM.

Application filed April 2, 1920. Serial No. 370,803.

*To all whom it may concern:*

Be it known that I, ALFRED U. HARPER, residing at Evanston, in the county of Cook and State of Illinois, have invented certain  
5 Improvements in Secret Communication Systems, of which the following is a specification.

This invention relates to transmission systems and more particularly to arrangements for transmitting messages over such  
10 systems.

It is one of the objects of the invention to provide arrangements whereby messages may be transmitted over a system of communication in such a manner that an unauthorized person who may have access to the line wire or medium over which the messages are being transmitted will be unable to obtain the information contained in said  
15 messages and accordingly provide for secrecy in the transmission of such messages. Other objects of the invention are to provide a system of communication which will be exceedingly accurate in operation, will be  
20 direct reading, and which will not be affected by variations in the potential of the source of current supply associated with the system. Other and further objects and features of the invention will appear more  
25 fully from the detailed description hereinafter given.

In the system of communication herein disclosed there is provided at each of the stations between which the messages are  
35 transmitted a direct current reading instrument provided with a dial calibrated with letters or characters. These direct current reading instruments are connected in series in a circuit and at each station is provided  
40 means for varying the resistance of the circuit so that the indicating members of the instruments may be caused to register as desired with the characters or letters on the dial to produce the message. A separate  
45 control circuit is furthermore provided between the direct current reading instruments. In order to provide for secrecy in the transmission of messages between the two stations this control circuit may be operated  
50 to constantly change the positions of the calibrated dials with respect to the direct current instruments, so that the signaling currents transmitted over the system will not at all times have fixed and certain values  
55 for certain characters.

The invention may be more fully understood from the following description together with the accompanying drawing in the Figures 1, 2, 3 and 4 of which are illustrated a preferred form and modifications of the invention. Similar reference characters have  
60 been used to denote like parts in all the figures of the drawings. In Figure 1 the stations are shown in a circuit, the conductors of which are arranged in the form of a  
65 Wheatstone bridge. In Figure 2 the stations are illustrated in a two-wire series circuit. In Figure 3 the stations are illustrated in a series grounded circuit. In Figure 4 are shown details of the ratchet mechanism  
70 in the control circuit.

In the arrangement illustrated in Fig. 1 the stations A and B are interconnected by the conductors 8, 9 and 11, which conductors are arranged in the form of a Wheatstone  
75 bridge. These conductors may be run together over the same route or may be widely separated over different routes for greater safety in regard to secrecy. The arms of the bridge consist of the resistances 1, 2, and  
80 2, 3, and the total resistance of conductor 8 and resistance 4, 5, and the total resistance of conductor 11 and resistance 5, 6. These resistances may be termed  $r_1$ ,  $r_2$ ,  $r_3$ , and  $r_4$   
85 respectively. The conductor 9 connects the junction point of  $r_1$  and  $r_2$  with the junction point of  $r_3$  and  $r_4$ . Battery from source 7 is applied at points 1 and 3. The resistances may be so adjusted that no current will flow over conductor 9, under which  
90 condition  $R_3 : R_1$  as  $R_4 : R_2$ . If this relation is disturbed by changes in any of the resistances, current will flow over conductor 9, and accordingly the resistances 2, 3, and  
95 5, 6, have been illustrated as variable. Connected in series in conductor 9 are the direct current reading instruments 13 and 14. These instruments are each provided with a calibrated dial, such as 13' and 14', including letters or characters for spelling out the  
100 message.

In sending a message from station A to station B the sender would vary the resistance of one of the arms of the bridge. This might be done by manipulating a lever controlling the variable resistance 2, 3, which  
105 in turn would cause currents of different amounts to flow over conductor 9 and through the direct current instruments. The resistance 2, 3, might be varied, for example,  
110



until the needle of the instrument pointed to letter A on the calibrated dial at station A. As the instruments of both stations are connected in series, the needle of the instrument at station B would also point to letter A on the calibrated dial thereat. It is pointed out that the calibration of the dials 13' and 14' should be the same initially. The resistance 2, 3, might be varied so that the needles of the instruments would designate any desired one of the characters and letters on the dials, and in this manner a message might be spelled out which would be received at station B and also would be checked while being sent at station A. Furthermore the above process might be reversed and a message sent in this manner from station B to station A by manipulating the variable resistance 5, 6, at station B. While only one of the resistance arms at each station has been indicated as variable, it is understood that either of the arms or both of the arms at each station might be utilized in this regard.

In both of the indicating instruments 13 and 14 there is provided a ratchet mechanism, as illustrated in Fig. 4, connected in series in the control circuit 10, which includes the switches 26 and 28, and the battery 27. By operating either or both of the switches 26 and 28 at stations A and B the control circuit 10 may cause the ratchet mechanism to operate and the calibrated dials to shift from their initial positions with respect to the indicating instruments. When the calibrated dials are thus shifted, it is pointed out that the current over line 9 produced by a change in the resistance of one of the resistance arms, which caused the needle to point to the letter A, would no longer cause the needle to point to such letter, but the resistance of the arm would have to be varied to a different degree and a different current produced to cause the needle to point to letter A. Accordingly by manipulating the switches 26 and 28 the relationship between the values of the currents transmitted between stations and the signals may be constantly varied, thereby affording protection against the interception of messages by unauthorized persons who might have access to line 9. Since the ratchet mechanisms in both of the indicating instruments are in series in circuit 10 the calibrated dials 13' and 14' would both be shifted in synchronism and in a corresponding manner. The communication system described has the advantages of being direct reading, of great accuracy in operation, and is not affected by changes in the potential of the battery 7. Furthermore as the current flow over line 9 is continuous but varying in amount, it would be difficult to pick up the changes in current value by induction on adjacent wires. There is also an

additional advantage from the standpoint of secrecy in having the circuit free from grounds.

In Figure 2 is illustrated a two-wire series circuit in which the arrangements of the invention might be embodied. The indicating instruments 13 and 14 are connected in series in the circuit including conductors 8 and 11 and the signals are produced by varying the resistances 24 and 25 at the stations A and B respectively. In order to provide for secrecy the calibrated dials 13' and 14', on which are marked the letters or characters, may be shifted by means of the control circuit 10 in the manner already described. As the operation of the arrangement would be substantially similar to that described with respect to Fig. 1 no further description thereof will be given.

In Figure 3 is illustrated an arrangement whereby the indicating instruments 13 and 14 are connected in series with the variable resistances 24 and 25, and the battery 7, over a grounded circuit 8. As the operation of the arrangement would be substantially similar to that already described, no further description thereof will be given. In Figure 4 is shown the details of the ratchet mechanism and switches in the control circuit 10. The circuit 10 includes the winding of a relay, the switch 26 and the battery 27. The relay controls the ratchet mechanism as shown for varying the calibration of the dials. By operating the switch 26 the relay may be actuated in an obvious manner to control the ratchet mechanism 13'.

While the invention has been disclosed as embodied in certain specific arrangements which have been deemed desirable, it is understood that it is capable of embodiment in many and widely varied forms without departing from the spirit of the invention as defined in the appended claims.

What is claimed is:

1. A circuit including a source of current and interconnecting two stations, said circuit having included serially therein at each of said stations a manually operable variable resistance and an indicating instrument responsive to the amount of current flowing over said circuit, said indicating instruments being provided with dials calibrated with message characters, and a control circuit serially connecting said indicating instruments for shifting the positions of said dials with respect to said indicating instruments.
2. A circuit including a source of current and interconnecting two stations, said circuit having included serially therein at each of said stations a manually operable variable resistance and an indicating instrument responsive to the amount of current flowing over said circuit, said indicating instruments being provided with dials gradu-



ated with message characters and so positioned with respect to said instruments that currents of certain values transmitted over said circuit will cause said instruments to  
5 register with certain of the characters of said dials, and means at each of said stations for simultaneously shifting the positions of

said dials whereby the previously existing relationship between current values and message characters may be changed. 10

In testimony whereof I have signed my name to this specification this 29th day of March, 1920.

ALFRED U. HARPER.