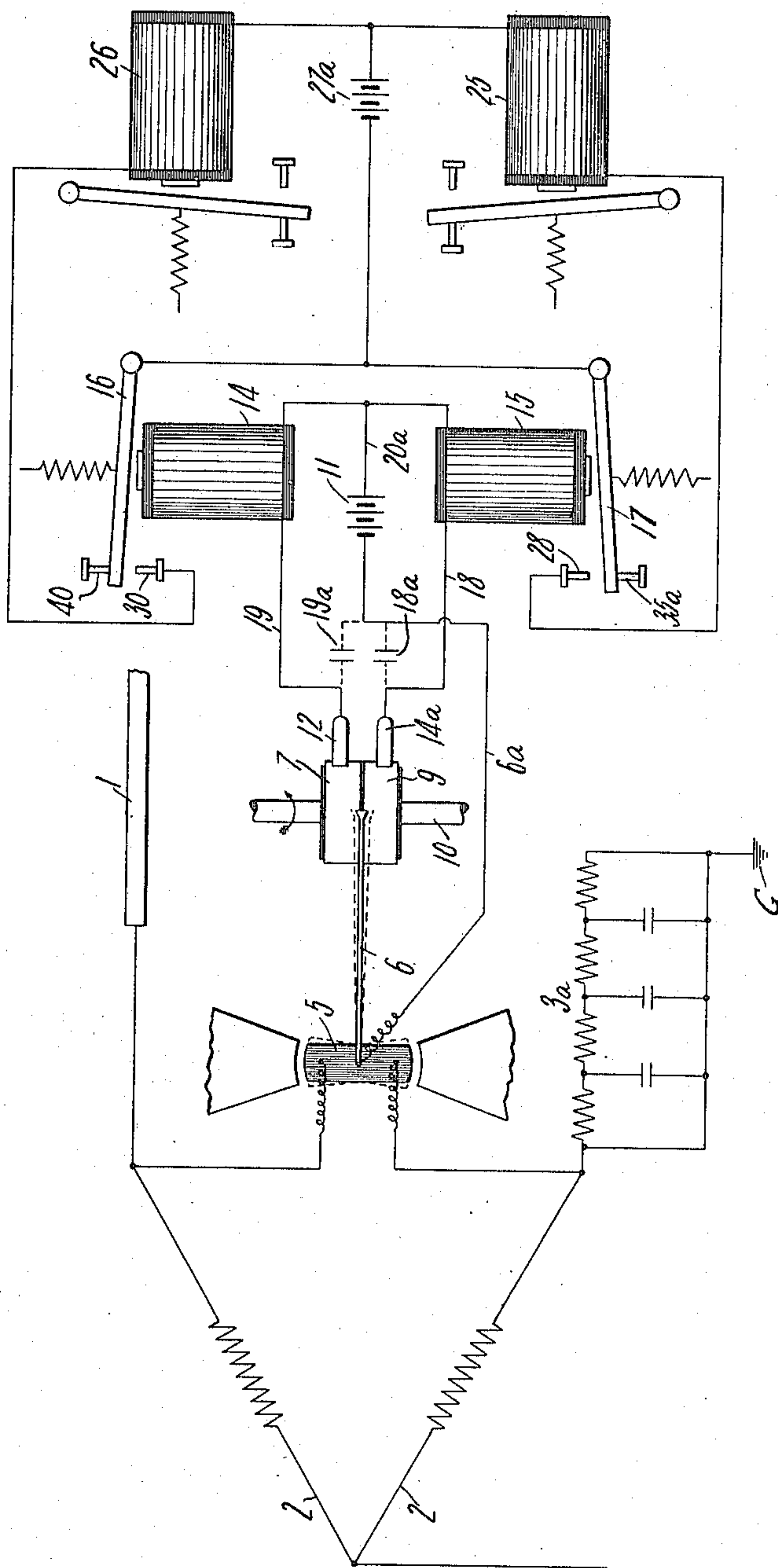


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TELEGRAPHY.

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1,221,547.

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WITNESSES

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To all whom it may concern:

Be it known, that I, ISIDOR KITSEE, a resident of Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented a new and useful Improvement in Telegraphy, of which the following is a specification.

This invention relates to an improvement in telegraphy, and has special reference to a system in which two messages may be simultaneously transmitted from one terminal of the line of transmission and simultaneously received at the other terminal, and in which by the use of a bridge at each terminal, two messages may be simultaneously transmitted from each terminal and simultaneously received at each terminal.

The improvements will be described in connection with a diplexing or quadruplexing system in which normally (that is, when no messages are being sent) pulses of opposite polarity and of a fairly high frequency are impressed upon the line, and in which when one of the sending keys is closed only pulses of one polarity are impressed on the line and when the other sending key is depressed only pulses of the opposite polarity are impressed on the line, and when both sending keys are closed no current is impressed on the line.

In an application filed by me May 7, 1913, Serial No. 766,085, I have described and illustrated a system of quadruplexing telegraphy of the general character above described and which is applicable to lines with great distributed capacity, such as submarine cables, and also to lines where the capacity is a negligible factor, such as aerial or land lines, and in which system a sensitive receiving device operating on the principle of a siphon recorder is illustrated and described, this receiving device being a polarized line relay whose armature operates in conjunction with three local circuit terminals or contacts, the whole being so arranged that in the normal condition (that is, with pulses of opposite polarities on the line) the armature of the line relay vibrates continuously over the three contacts with such rapidity that the translating devices in the local circuits connected to said contacts do not respond,—but upon the suppression of the pulses of one polarity said

armature remains in contact with one of said circuit terminals or contacts for a sufficient period of time to enable the translating instruments in said circuit to respond, and upon the suppression of pulses of the opposite polarity said armature remains in contact with another one of said contacts for a sufficient length of time to enable the translating instruments in that circuit to respond, and when all pulses are suppressed said armature comes to rest upon the intermediate contact, which is connected in circuit with both of the translating instruments, to enable both to respond.

The present invention relates to the same character of quadruplexing system and receiving instrumentalities, but embodies a much simpler receiving system, and particularly in dispensing with the intermediate circuit contact of the former system, while at the same time retaining the function of the line relay whereby in its zero position it effects the energization of both receiving instruments. The system is also adapted for diplexing lines of transmission.

The accompanying drawing is a diagrammatic view illustrating the receiving arrangement of the system only.

The sending arrangement may be of the character illustrated in my application above specified, or any other arrangement whereby in normal condition pulses of opposite polarity and considerable frequency are impressed upon the line, and whereby when one sending key is closed the pulses of one polarity are depressed sufficiently to enable the pulses of opposite polarity to hold the line relay at rest in one position, when the other key is depressed pulses of the opposite polarity are sufficiently depressed to enable the other polarities to hold the line relay at rest in its opposite position, and when both keys are depressed pulses of both polarities are sufficiently depressed to enable the line relay to remain at rest in zero or neutral position.

In the drawings 1 indicates the line of transmission; 2, 2 indicates the bridge; and 3^a indicates an artificial line grounded at G, all as is well understood in quadruplexing telegraphy.

The receiving organism illustrated consists of the line relay 5 inserted in the cross

circuit of the bridge, and provided with the conducting tongue or armature 6. This line relay operates upon the principle of a siphon recorder, the tongue or armature 6 replacing the ordinary needle or pen of the siphon recorder, said relay vibrating back and forth under the opposite pulses in the same manner that a siphon recorder operates, and which will be clearly understood without further description. In the drawing this relay is shown merely diagrammatically.

7 and 9 are two circuit terminals or contacts, shown as two conducting bands mounted on a drum and insulated from each other and being revoluble with the aid of the shaft 10. The tongue or armature 6 is shown in full lines in its zero position and in dotted lines deflected to the right or left, as the case may be, and having its end of sufficient breadth that when in zero position it bridges the insulation between contacts 7 and 9, and connects with both of said contacts. 11 indicates a suitable source of current, here shown as a battery whose negative pole is connected by wire 6^a to the tongue or armature 6. 12 and 14^a are two brushes contacting respectively with the conducting bands 7 and 9. 14 and 15 are two localized relays provided respectively with the armatures 16 and 17. The coil of relay 15 has one of its terminals connected by wire 18 with brush 14^a, and the coil of relay 14 has one of its terminals connected by wire 19 with the brush 12,—and the junction of the other terminal of both of said coils is connected by wire 20^a with the free pole of the source of current 11. The arrangement of these circuits is such that the one source of current 11 serves as the necessary source of energy for both relays 14 and 15. Condensers 18^a and 19^a may, if desired, be connected across between wire 6^a and wires 18 and 19 respectively, thus shunting the battery 11 and coils 15 and 14 respectively.

When the tongue or armature 6 is at rest on the conducting band 7 (such, for instance, as when the positive pulses on the line are the dominating pulses) a circuit is established as follows: positive pole of source 11, wire 20^a, coil of relay 14, wire 19, brush 12, conducting band 7, tongue or armature 6, wire 6^a, and negative pole of source 11.

When the tongue or armature 6 is at rest on the conducting band 9 (such, for instance, as when the negative pulses on the line are the dominating pulses) a circuit is established as follows: positive pole of source 11, wire 20^a, coil of relay 15, wire 18, brush 14^a, conducting band 9, armature or tongue 6, wire 6^a, and negative pole of source 11.

When the tongue or armature 6 is at rest

in neutral or zero position with its broad end contacting with both conducting bands 7 and 9 (as when no pulses are on the line) a circuit is established as follows: positive pole of source 11, wire 20^a, and whence the current divides, one branch going by way of coil of relay 14, wire 19, brush 12, conducting band 7, tongue or armature 6, wire 6^a and negative pole of the source 11, and the other branch going through coil of relay 15, wire 18, brush 14^a, conducting band 9, tongue or armature 6, wire 6^a and the negative pole of the source 11.

25 and 26 indicate two translating devices, being shown as the coils of sounders, but obviously any other indicating or recording device may be substituted therefor. The coil 25 has one of its terminals connected through the source of current 27^a to the armature 17 of relay 15, and has its other terminal connected to a stop 28 related to said armature 17. The coil of translating device 26 has one of its terminals connected through the source of current 27^a to the armature 16 of relay 14, and has its other terminal connected to stop 30 related to said armature. Also related to the armature 17 of relay 15 is a stop 35^a against which said armature 17 is normally held by a spring; and related to armature 16 of relay 14 is a stop 40 against which said armature 16 is normally held by a spring.

The various coils are so wound, and the several circuits have such resistance, that when the tongue or armature 6 of the line relay 5 normally vibrates and connects the two conducting rings 7 and 9 in quick succession, no translation of such slight contacts will be made. Also, when one operator at the distant transmitting station breaks in on the other operator, the tongue or armature 6 of the line relay 5 moves and comes to rest at zero or middle position.

At the transmitting station, the line 1 is connected to a suitable source of alternation so that normally pulses alternating in polarity are impressed upon the line. The sending apparatus illustrated in my application Serial No. 766,085, filed May 7, 1913, is a good example of suitable sending apparatus. The number of cycles which can be impressed upon the line should be as high as compatible with the good work of the receiving device, but since in the case of submarine cables the voltage of the pulses must be limited, only a certain predetermined number of such pulses can be sent over the line and this number will be in inverse proportion to the length or capacity of the cable. The office of these pulses is not to produce signals at the receiving station, but only to vibrate the tongue or armature 6 of the receiving device, and such vibration must be in such quick succession that the contacting with one or the other of

the conducting rings 7 and 9 of the local circuits is too short to permit the devices connected to such circuits to respond.

Normally, therefore, we have at the receiving station a vibratory movement of the tongue or armature 6 of the line relay. Let us now suppose that one of the operators at the sending end desires to transmit a message. He operates his key in the usual manner,—a short depression of the key for a dot and a longer depression for a dash. Through the depression of this key he depresses or entirely suppresses one of the polarities of the pulsating current, so as to leave on the line only one polarity, or, at least, a dominating polarity, say positive polarity; or in other words, the pulses of alternate polarity are replaced by a flow of direct current, we will say in a positive direction. As soon, however, as he releases the key the normal conditions of the arrangement prevail and pulses of alternate polarity are again impressed upon the line. The depression of the key even for a dot must be of longer duration than the duration of an impulse from the alternating source, and of a time unit long enough so that at the receiving station the deflection of the tongue or armature 6 to the right or left will be for a period of time sufficient to actuate the translating device related to the particular contact on which said tongue or armature comes to rest. If the sending key results in leaving on the line the positive pulses, or a direct current flowing in a positive direction, then the armature will come to rest, say, upon contact ring 7, which will result in a response by the receiving instruments associated with that circuit. If the other key at the sending station is depressed exactly the same effect is produced, except that the negative pulses, or a direct current flowing in a negative direction, remain on the line, and in this case the armature 6 will come to rest, say, upon the contact ring 9, and remain at rest a sufficient length of time to enable the instruments associated with that circuit to respond. The period of time that the armature remains at rest depends, of course, upon the length of the time of depression of the sending key, and consequently the receiving instruments will record dots or dashes as transmitted. In case both keys at the sending station are depressed all pulses on the line cease, and consequently the armature 6 comes to rest in its neutral position, whereupon the receiving instruments in both local circuits will respond.

Normally, therefore, at the receiving station both of the translating devices are at rest, but when positive signal impulses arrive the tongue or armature 6 is deflected, say, to contact with the conducting band 7 for a time period sufficiently long to energize the electromagnet 14, and this has the

result that the translating device 26 is operated and translates into readable characters the positive impulses received. On the other hand, when negative signal impulses arrive the tongue or armature 6 is deflected to contact with the conducting band 9 for a time period sufficiently long to energize electromagnet 15, with a result that the translating device 25 is operated and translates into readable characters the negative impulses received. Again, when no impulses whatsoever are received the tongue or armature 6 remains in its neutral position for a time period sufficiently long to cause the energization of both electromagnets 14 and 15, with the result that both the translating devices 25 and 26 are operated and indicate or record a character commensurate with the period of time that no pulses are on the line, or, in other words, record the length of time that both sending keys are simultaneously closed. The moment one of said keys is opened the tongue or armature 6 is deflected either to the right or left and will remain at rest upon the particular conducting band corresponding to the key which remains closed, so that the translating device corresponding to that particular key will continue to respond. The moment that both keys are opened the armature 6 again begins its vibration in unison with the normal pulses on the line.

What I claim is:

1. In telegraphy, the combination of a pair of local circuits, means in one of said circuits to translate positive pulses into readable characters, means in the other of said circuits to translate negative pulses into readable characters, a line relay, and an armature therefor arranged in response to positive pulses to close one of said circuits, and in response to negative pulses to close the other circuit, and when in zero position to close both circuits.

2. In telegraphy, the combination with a line of transmission, a line relay, a circuit operatively related to said line relay to translate pulses of one polarity received by said line relay, and a second circuit operatively related to said line relay adapted to translate pulses of opposite polarity received by said line relay, said line relay being arranged in its zero position to energize both of said circuits.

3. In telegraphy, a pair of receiving circuits, a translating device in each circuit, and a line relay responsive to pulses on the line and arranged upon receipt of impulses of one polarity to energize one of said circuits, upon receipt of pulses of the opposite polarity to energize the other circuit, upon receipt of pulses of both polarities to energize neither circuit, and in the absence of receipt of impulses of either polarity to energize both circuits.

4. In telegraphy, a pair of receiving circuits, signal translating devices in each circuit, a line relay responsive to pulses on the line, a vibrating armature therefor, and a pair of circuit terminals, one for each of said local circuits and so related to said vibrating armature that upon the receipt of pulses of opposite polarity said armature vibrates over both of said terminals, upon receipt of pulses of one polarity said armature pauses upon one of said terminals, upon receipts of pulses of the opposite polarity said armature pauses upon the other of said terminals, and in the absence of pulses said armature pauses in contact with both of said terminals.

5. The method of diplexing lines of transmission, which consists in causing the armature of a line relay to connect alternately with alternate parts of two conductors in quick succession to denote that no signal is received, causing said armature to connect for a comparatively long period of time with one of said conductors to denote that one signal is received, and causing said armature to remain stationary, thereby connecting with both of said conductors, to denote that two signals are received simultaneously.

6. A device for diplexing telegraphic messages comprising a receiver inserted in the line of transmission, an armature for said

receiver, two conductors in operative relation to said armature, means to vibrate said armature normally from one to the other of said conductors, and means for said armature to make contact with both of said conductors when no current is sent over the line.

7. The method of diplexing a line of transmission, which consists in causing, when no signal is transmitted, the movable part of a line relay to alternately and in quick succession connect with one or the other of two conductors, and causing said movable part to connect with both of said conductors when two signals are simultaneously transmitted.

8. Means to receive and translate into readable characters simultaneously two messages, said means comprising one line relay, an armature therefor, two localized circuits, a translating device for each circuit, and means for said armature to vibrate in quick succession to indicate that no signal has arrived, and when at rest at its zero position to make operative both of said translating devices.

In testimony whereof, I have hereunto set my hand.

ISIDOR KITSEE.

Witnesses:

EDITH R. STILLEY,
MARY C. SMITH.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."