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I. KITSEE.

TELEGRAPHY.

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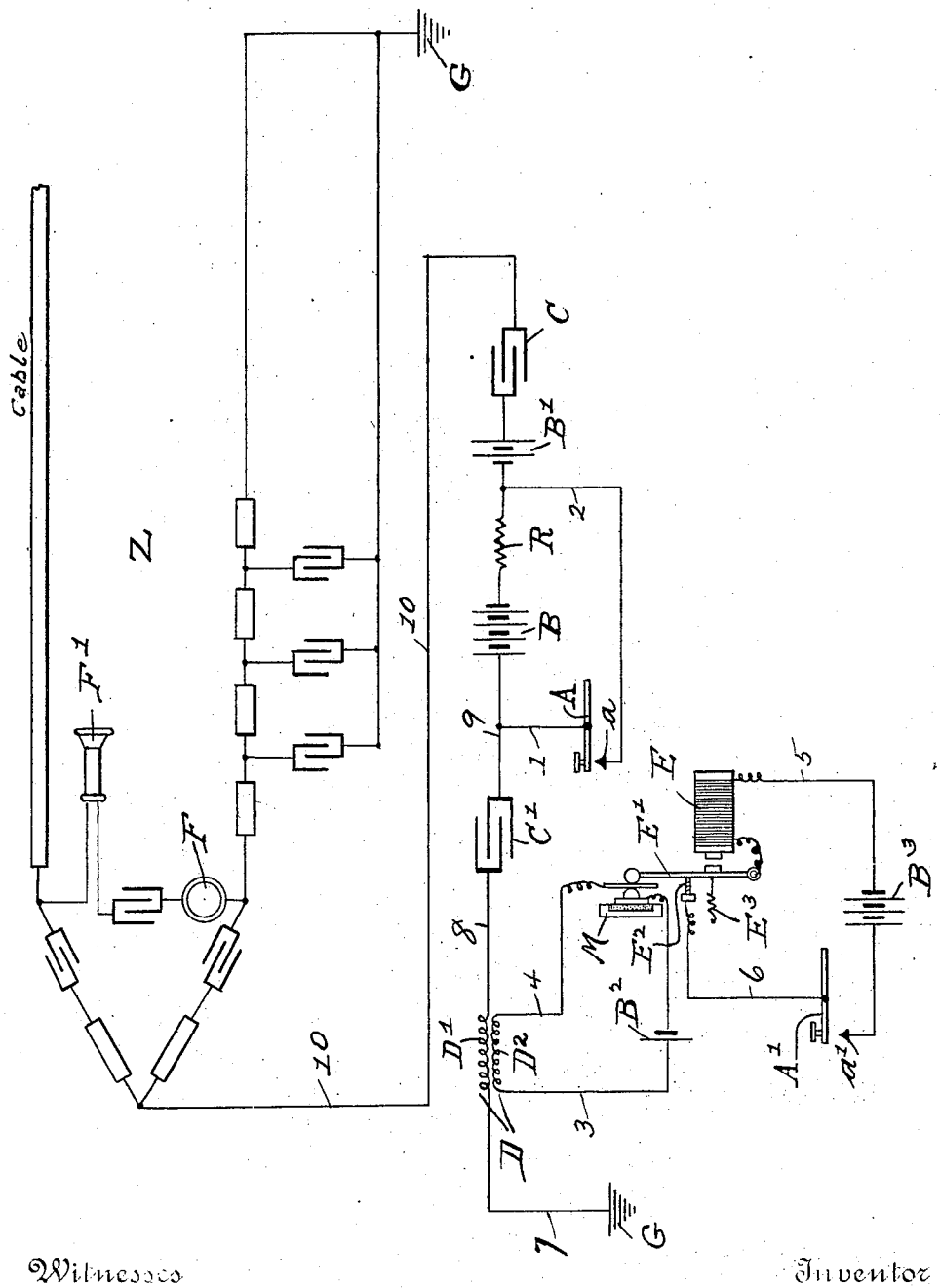

Witnesses

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TELEGRAPHY.

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To all whom it may concern:

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

My invention relates to an improvement in telegraphy. Its object is to increase the efficiency of such lines where the capacity necessitates arrangements differing from overhead land-lines—such, for instance, as submarine cables.

On land-lines the transmitting of messages is accomplished with the aid of a source of current connected with one polarity to the transmitting-key, and as the line permits the use of currents of different strengths the quadruplexing of such lines was made possible.

In cable telegraphy the situation is far different. The peculiar condition of the cable requires that the different characters of the alphabet should be symbolized by currents of opposite polarity. Whereas, therefore, on a land-line the longer or shorter closing period of the key symbolizes a dot or dash, in cable telegraphy a dash is symbolized by the transmission of a positive impulse and a dot by a negative impulse.

The one great feature in quadruplexing land-lines—namely, the using of one polarity for one message and the opposite polarity for the second message—cannot be taken advantage of on cable-lines, and as to the different strengths of the current it has to be stated that all attempts to actuate one kind of instrument on the cable by one strength of current and the other instrument by a greater or lesser strength of current have so far failed.

The peculiar condition of the cable and the preservation of its insulating-covering made the employment of receiving instruments not designed to actuate a local circuit a necessity, and the siphon-recorder, now universally adopted, is the most approved of such devices.

It is, as stated above, the aim of my invention to increase the efficiency of the cable, and I accomplish this object by quadruplexing such cable.

In attempting to transmit two messages simultaneously from one station it is first of all necessary that each operator shall find an uninterrupted path from his transmitting instrument to the line. On land-lines this path is generally provided for the keys by shunting the same with the aid of a condenser, a device impervious to the flow of a straight current; but on cables such arrangement would only decrease the impulses flowing over the line, for the reason that the line itself may be likened to a long-drawn-out condenser and for the further reason that condensers, if not actually placed in series with the line, are usually placed in series with the receiving instrument. Other means have therefore to be provided. A third reason is that an appreciable increase of the force now used is out of the question. In an arrangement, therefore, for simultaneously transmitting impulses in one direction the second receiving instrument must be able to answer to differentiate between the two transmitted impulses in another direction, and for this reason my invention consists of the arrangements and devices, as will hereinafter be more fully described, illustrated in the drawing, and more clearly pointed out in the claims following the specification.

The accompanying drawing illustrates my invention in diagrammatic form.

In the drawing, Z represents one part of the cable with its artificial line for the purpose of duplexing the same with the usual arrangement.

F is a receiver, here shown only as a conventional sign, but in reality consisting of an electromagnetic device—such, for instance, as a siphon-recorder or any other polarized receiving or relaying instrument sensitive enough for the purpose.

F′ is an additional receiver, here shown as the usual telephonic ear-phone.

In the usual cable telegraphy the double key is made use of a device connecting the line when the station is not in use directly to the ground, and it is necessary to state that in the drawing the usual arrangement for telegraphing on submarine cables is replaced by an arrangement in which true reversals are sent over the line. I prefer in the quadruplexing of the cable this same arrangement and have therefore illustrated the same in connection with this my invention; but it is obvious that instead of this arrangement the usual double key with the usual code may be employed.

Broadly speaking, the arrangement substituted for the double key consists of two batteries, one of an electromotive force about double the electromotive force of the second, both batteries opposing each other and both batteries in series as to each other and the line, preferably with the interposition of condensers, a shunt around the battery of higher electromotive force, and the transmitting-key adapted to open and close said shunt. The operation of this part of the arrangement consists, broadly speaking, therein that when the shunt is open one-half of the force of the battery of the higher electromotive force charges the condenser with one polarity and when the key is closed, shunting this higher electromotive-force battery, the opposing battery charges the condenser in the opposite direction, and through this charge the receiving device F is actuated.

In the drawing this part of the arrangement embraces the battery B, consisting, as illustrated, of four cells; the battery B′, consisting, as illustrated, of two cells and connected, as shown in the drawing, in opposition; the condensers C and C′, the shunt consisting of the wires 1 and 2 and including the key consisting of the lever A and the stationary point *a*. In this shunt is included the resistance R, so that the battery should not be entirely short-circuited.

The condenser C is, as is illustrated, connected, through wire 10, with the line or cable Z, and the condenser C′ is connected with the positive pole of the battery B through wire 9.

The arrangement constituting this present invention is illustrated in the drawing as embracing a local circuit comprising a source of current, here designated as B^3; a transmitting-key consisting of the lever A′ and the stationary point *a′*; a make-and-break device provided with a clapper, this device consisting of the electromagnet E; the vibrating clapper E′, acting as the armature proper; the contact E^2, and the spring E^3. The contact E^2 is connected, through wire 6, with the movable lever A′ of the key and one terminal of the electromagnet E connected, through wire 5, with one pole of the battery B^3, the other pole of which is connected to the contact *a′*.

It is self-evident that in such an arrangement the clapper E′ would vibrate as soon as the lever A′ presses on the point *a′*.

In proximity to the clapper E′ is the variable resistance M. This variable resistance may consist of an ordinary microphonic transmitter, and, in fact, through the difference of pressure on the ordinary telephonic or microphonic transmitter I have sent impulses over a line embracing over one hundred thousand ohms resistance and of a capacity of twelve microfarads, using an arrangement such as is illustrated to vary the pressure. The variable resistance M is connected with one terminal to one pole of a source of current, here shown as the battery B^2, the other pole of which is connected to the primary D^2 of the inductorium D. The other terminal of this primary is connected, through wire 4, with the other terminal of the variable resistance M. In the line is inserted the secondary D′ of this inductorium. The wire 8 connects the condenser C′ to said secondary, and the wire 7 connects the other terminal of said secondary to the ground G.

It is supposed that the operator selected to transmit impulses which should be received at the opposite end by the receiver F is desirous of transmitting a message. He operates the lever A of his key in the same manner as is usual with the common Morse system. The impulses transmitted thereby over the line will effect the device F on the opposite end. They will also be heard by the operator at the ear-phone F′; but this operator will know that these slow impulses are not meant for him.

When the operator selected to transmit messages to be received by the device F′ desires to send a message, he also operates his key in the usual Morse method; but each closing of the key will result in a series of quick vibrations of the clapper E′. These quick vibrations will result in the greater or lesser compression of the variable resistance M, thereby varying the flow of the current in the primary D^2, inducing thereby impulses in the secondary D′. These impulses will not affect the device F on the opposite end, but will be heard by the operator of the device F′ as a buzzing or vibratory sound, the unit of time this sound lasts determining the character transmitted.

During my experiments I had occasion to transmit in accordance with the device embracing the batteries B and B′, in conjunction with the device embracing the variable resistance M, messages over a line containing over one hundred thousand ohms resistance, having over forty henries and possessing a capacity of over thirteen microfarads. At the other terminal of the line a polarized relay of the Siemens type (but changed in some parts for the occasion) and a telephonic transmitter were connected in the line substantially in the same manner as is illustrated in the drawing. The polarized relay was not affected at all by the quick vibrations originating in the induction-coil D, and the slow clicks heard in the phone did not to any injurious degree interfere with the receiving of the messages originated by the manipulation of the key-lever A. Two operators were receiving messages sent simultaneously by two transmitting operators, each one being able to read his own message distinctly.

I will state here that I have substituted in one of the experiments for the variable resistance M a common make-and-break device; but I have found that induced currents due

to the breaking easily penetrate the insulation and leak to a considerable extent when the outer conducting-envelop is immersed in water and the ends of the line are connected to this grounded water.

As it is of great importance to preserve the insulation of long-distance lines—such, for instance, as submarine cables—I believe it is best not to employ such currents, and I have therefore substituted a mechanism substantially as is illustrated as M, whereby through the pressure of an automatic device the current-flow in the primary of an inductorium can be varied according to requirements.

Having now described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. Means to transmit over a cable of comparatively great capacity simultaneously two messages in one direction, said means embracing means adapted to transmit characters of one message, each character comprising one impulse of one polarity followed by a space impulse of opposite polarity, the difference in time between the two impulses symbolizing the character, and means adapted to transmit characters of a second message, a variable resistance for said means each character comprising a series of impulses induced in the line through the variation of said variable resistance, the number of said impulses symbolizing the character.

2. In combination with a transmitting-line, two transmitting devices, one of said transmitting devices embracing a transmitting-key, and source of current, a variable resistance, a source of current, and an inductorium for the second of said transmitting devices; the primary connected to the source of current, the secondary connected to the line, and means to change the value of said variable resistance in accordance with the impulses to be transmitted.

3. Means to transmit simultaneously two messages over a line, said means embracing two transmitters; a key adapted to be manually operated and source of current for one transmitter; a variable resistance, means to automatically vary said resistance, a manually-operated key, and a source of current for the second transmitter; both transmitters in operative relation to the line of transmission.

4. Means to transmit simultaneously two messages over a cable and receive the same at a second station, said means embracing at the transmitting-station a key adapted to be manually operated and to transmit over the line impulses of comparatively slow succession, a variable resistance, a second key adapted to be manually operated and to vary through said operation the value of a variable resistance, and adapted to transmit impulses in quick succession over the line, and embracing at the receiving-station a device such as a polarized relay for the first-named impulses, and a second device such as a telephone-receiver for the second-named impulses.

5. In combination with a transmitting-line means to transmit two messages simultaneously over said line said means embracing two sets of batteries inserted in the line in opposition as to each other, a shunt around one of said sets and a transmitting-key adapted to open and close said shunt in accordance with the characters to be transmitted, for one message; and embracing a secondary of an inductorium inserted in the line and localized means to induce impulses in said secondary in accordance with the characters to be transmitted for, the second message.

In testimony whereof I affix my signature in presence of two witnesses.

ISIDOR KITSEE.

Witnesses:
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