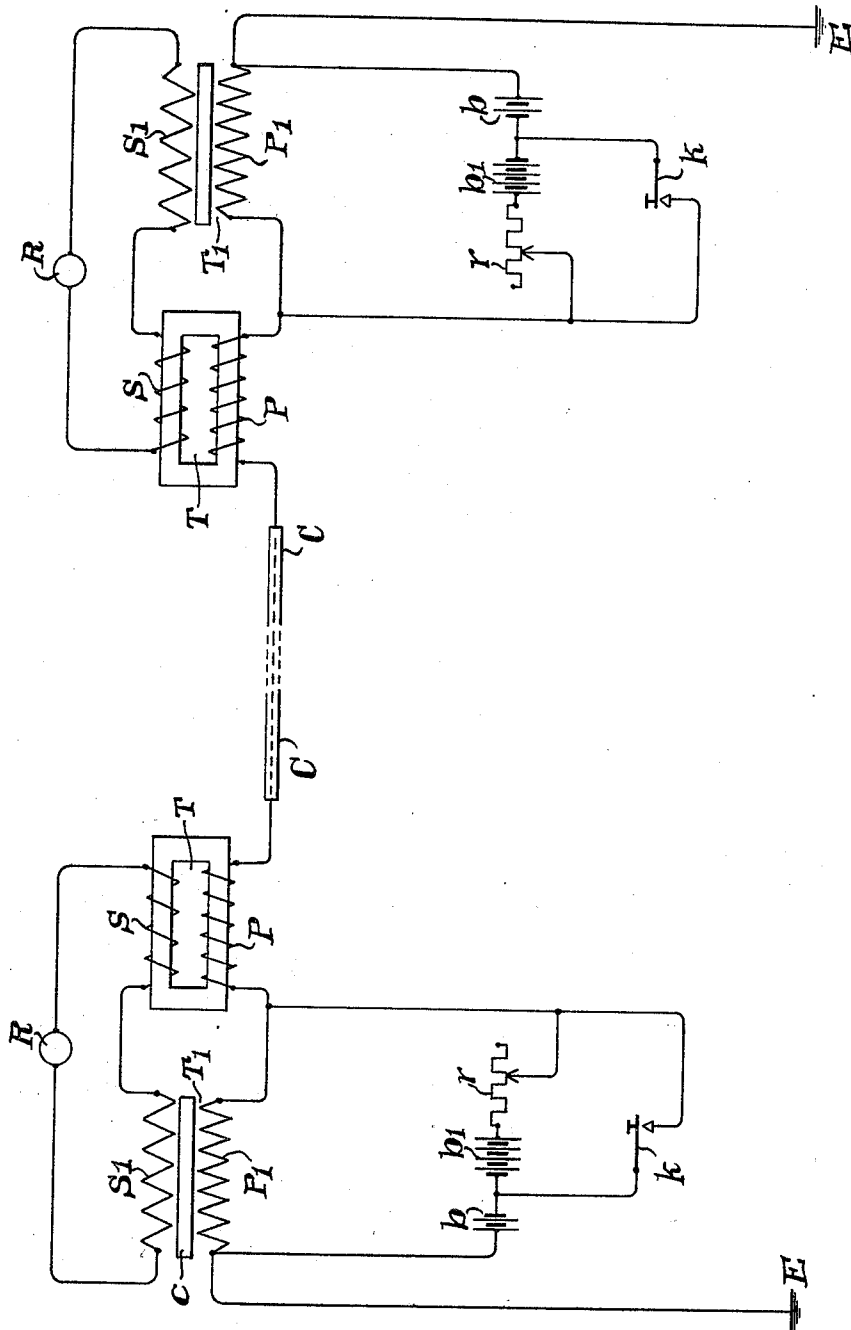


I. KITSEE.
CABLE DUPLEX SYSTEM.

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1,005,714.

Patented Oct. 10, 1911.



WITNESSES

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CABLE DUPLEX SYSTEM.

1,005,714.

Specification of Letters Patent.

Patented Oct. 10, 1911.

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To all whom it may concern:

Be it known that I, ISIDOR KITSEE, a citizen of the United States, residing in the city of Philadelphia, county of Philadelphia, and State of Pennsylvania, have invented a new and useful Cable Duplex System, of which the following is a specification.

My invention relates to telegraphy, and more particularly to telegraphy over lines or circuits in which there is great capacity causing well known disturbing effects.

More particularly my invention relates to duplex telegraphy wherein two messages may be simultaneously transmitted over a line or cable in opposite directions without interference. To this end, I provide the apparatus, arrangement and system hereinafter described.

For an illustration of one of the forms my invention may take, reference is to be had to the accompanying drawing, which is a diagrammatic view of the receiving and transmitting apparatus at two electrically connected but widely separated stations.

C is the line or cable which extends between the two stations, and associated with the same are the two primary windings P and P¹ of the two transformers or converters T and T¹ respectively, the primaries P and P¹ being connected between the cable or line C and the earth E. The transformer T is preferably of closed magnetic circuit type as shown, while the transformer T¹ is preferably such as will permit an adjustment or change or variation in the mutual induction between the primary and secondary, so as to adjust, change or vary the inductive effect of the primary P¹ upon its secondary S¹. To this end, the primary P¹ and the core c, or either of them, may adjustably slide into and out of the secondary S¹ to vary the effect of the primary P¹ upon the secondary S¹. The secondary S¹ of transformer T¹ is serially connected with the secondary S of the transformer T, the secondary being in a circuit including the instrument R which may be a siphon recorder, relay, or any other translating or receiving device. The primary and secondary windings are so connected that, under the influence of current of a given direction in the primaries, the secondaries S and S¹ deliver

currents in opposition to each other which, therefore, neutralize each other and have no effect upon the instrument R. This neutralizing effect is secured by the adjustment in transformer T¹, previously mentioned, whereby the effect of the secondary S¹ may be made exactly equal and opposite to the effect of secondary S. The primary P has preferably more convolutions and resistance than its secondary S; and the primary P¹ preferably has more convolutions and resistance than its secondary S¹.

In a circuit in shunt to the winding P¹ are connected the opposed sources of energy *b* and *b*¹, and an adjustable resistance *r* is provided. The sources *b* and *b*¹ are of different powers, *b*¹ being here shown, by way of example, and preferably, as of twice the power of *b*. The operator's key *k* controls a circuit in shunt to the source *b*¹.

By way of example merely, and without limiting my invention to the proportions and values given, it may be stated that in connection with an Atlantic cable, I have used apparatus as shown, the primary P having a resistance of about 4,000 ohms, the secondary S a resistance of about 1,000 ohms, the primary P¹ a resistance of about 158 ohms, and the secondary S¹ a resistance of about six tenths of an ohm; the source *b* consisting of 10 cells and the source *b*¹ of 20 cells.

In general, the operation is as follows: To transmit messages over the line or cable, the operator at each station manipulates his key *k*. With the keys open at both stations, there is no current in the line, the sources at one station being opposed to the sources at the other, but at each station a current is flowing through each primary P¹. So it is that if at both stations the operators open their keys at the same moments no current is transmitted to line but the local current through the primary P¹ at each station affects the home receiver R to produce a signal as if coming from the distant station. With the key open at one station, the closure of the key at the other station opposes the source *b* at one station to the opposed sources *b* and *b*¹ at the other station with a resultant current in the line equivalent to the power of the source *b* and in a given direction. This current traversing the line or

cable passes through the primary P at the distant station and induces a current in the secondary circuit to affect the receiver R, the effect of the received impulse in the transformer T¹ being insignificant. If the keys are closed at both stations, there is no current on the line since the source *b* at one station will oppose and balance the source *b* at the other station, but the local current in the primary P¹ will induce a substantial impulse in the secondary circuit to affect the receiver R, as if an impulse came from the distant station. The impulses or currents flowing to line produce equal and opposite impulses in the secondary circuit at the home station, so that the receiver is not affected by impulses or currents transmitted from the same station.

From the foregoing description, it is apparent, therefore, without an artificial line or cable, I have provided a duplex system of cable telegraphy in which the home instrument is not affected by impulses transmitted to line or cable from the same station, and wherein under certain circumstances no current flows over the line or cable, but the receiving instrument is affected just as if a current were transmitted from the distant station.

What I claim is:

1. In telegraphy, the combination with a line or cable, of means for transmitting and receiving current impulses, said means comprising two transformers, a source of current and a receiving device, one winding of each transformer connected in the line or cable, the second winding of each transformer connected to the receiving device, said source of current connected in shunt to one of said transformer windings, said source being provided with means for transmitting over said line or cable impulses alternating in polarity.

2. In telegraphy, the combination with a line or cable, of means for simultaneously transmitting and receiving messages between two stations, said means comprising for each station two transformers, a source of current and a receiving device, and means associated with one transformer for neutralizing the home impulses on the home receiver, said source of current connected in shunt to one winding of a transformer and provided with means for transmitting impulses over said line or cable.

3. The combination with a line, of two transformers, the primary of one transformer being shunted by a circuit including opposed sources of energy, a key in a circuit in shunt to one of said sources, and a signal translating instrument.

4. The combination with a line, of two transformers, the primary of one transformer being shunted by a circuit including opposed sources of energy of different

powers, a key connected in a circuit in shunt to the source of greater power, and a signal translating instrument.

5. The combination with a line, of two transformers, the primary of one transformer being shunted by a circuit including opposed sources of energy, and a key in a circuit in shunt to one of said sources, a receiving instrument, the transformer secondaries included in circuit with said receiving instrument, said secondaries producing equal and opposite effects under the influence of transmitted current.

6. The combination with a line, of two transformers, the primary of one transformer being shunted by a circuit including opposed sources of energy of different powers, and a key connected in a circuit in shunt to the source of greater power, a receiving instrument, the transformer secondaries included in circuit with said receiving instrument, said secondaries producing equal and opposite effects under the influence of transmitted current.

7. The combination with a line, of two transformers of different ratios of transformation, a signal translating instrument, a local circuit including the primary of the transformer of greater ratio of transformation, opposed sources of energy in said local circuit, and a key controlling said sources.

8. The combination with a line, of two transformers of different ratios of transformation, a local circuit including the primary of the transformer of greater ratio of transformation, opposed sources of energy in said local circuit, and a key controlling said sources, a receiving instrument, the transformer secondaries included in circuit with said receiving instrument, said secondaries producing equal and opposite effects under the influence of transmitted current.

9. The combination with a line, of two transformers, a receiving instrument, the transformer secondaries included in circuit with said receiving instrument, opposed sources of energy of different powers, the primary of one transformer included in a local circuit with said opposed sources of energy of different powers, a key controlling said sources, and means for varying the mutual induction between said primary winding and its associated secondary.

10. The combination with a line, of two transformers, a receiving instrument, the transformer secondaries being included in circuit with said receiving instrument, opposed sources of energy of different powers, the primary of one transformer included in a local circuit with said opposed sources of energy of different powers, and a key for controlling said sources, the secondary associated with said primary winding having relatively low resistance.

11. The combination with a line or cable,

of a winding associated therewith, a local
circuit including said winding and opposed
sources of energy, and a key connected in a
circuit in shunt to one of said sources, and
5 similar apparatus at a distant station, the
sources at the two stations opposing and bal-
ancing each other.

In testimony whereof I have hereunto
affixed my signature in the presence of the
two subscribing witnesses.

ISIDOR KITSEE.

Witnesses:

DANIEL WEBSTER, Jr.,
A. E. STEINBOCK.

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