I. KITSEE.

DUPLEX TELEGRAPHY.

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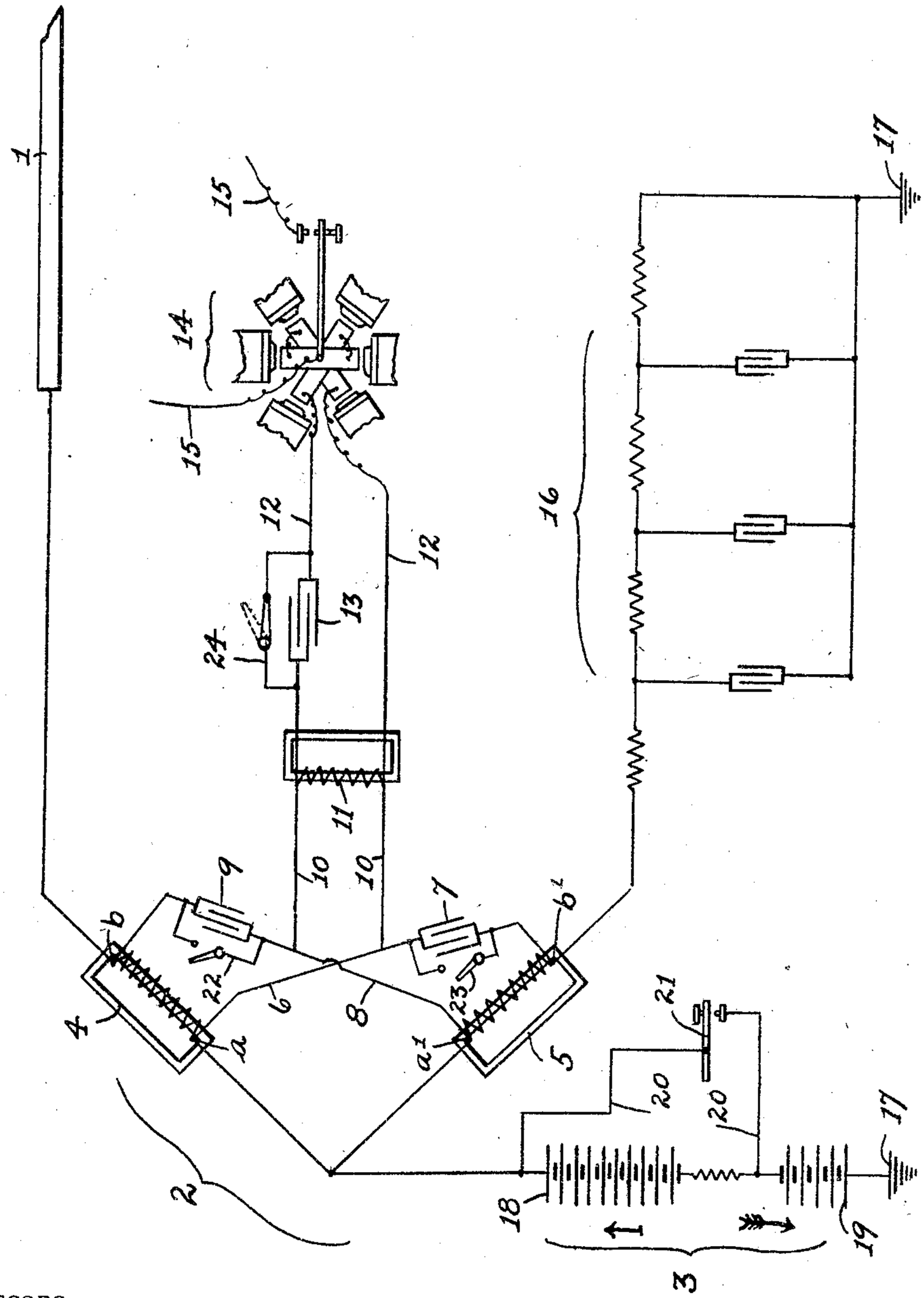
1,094,578. Patented Apr. 28, 1914.



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DUPLEX TELEGRAPHY.

1,094,578. Specification of Letters Patent. **Patented Apr. 28, 1914.**

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To all whom it may concern:

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

My invention relates to an improvement in duplex telegraphy. Its object is to produce an efficient arrangement for duplexing on lines with great capacity, such as submarine cables, and has more special reference to duplex telegraphy in which the incoming impulses are to be received by devices adapted to actuate a local circuit.

My experiences have brought out the fact that if relays are employed as receiving instruments in cable telegraphy, the incoming current has to be "curbed" for the purpose of eliminating the effect of the "moving zero", due to the capacity of the cable. This "curbing" reduces the available energy to a great extent and, in practical working on submarine cables where the impressed voltage is limited, further reduction results in a loss of speed. In working simplex, no further loss is entailed, but most of the cables are worked today with the "duplexing-bridge" and in this system, a greater part of the arrived current is lost. The two sides of the bridge have to be provided with resistances, so as to force part of the incoming current through the receiving device. To make a large percentage of the incoming energy available, it is best that these resistances should be of a high value as compared with the receiving device in the cross wire of the bridge, but as the bridges at both terminals have to be electrically alike, the great disadvantage arises that through such high resistances, the transmitting current is cut down at the transmitting station; and if, on the other hand, the resistances in the bridge sides are made low as compared with the resistance of the receiving device in the cross wire, then the incoming current passes to the greatest extent to earth without affecting the operation of the receiving relay.

In my experiments, I have found that in simplex working (without employing the bridge) it is best to have two impedances, the first one inserted between the cable and ground and the second in shunt to the first impedance; and I have found that the first impedance may have a very low resistance value even if the resistance of the receiving device is comparatively high. In working over lines with about two million K. R., I had good results with an impedance placed between the cable and ground of only thirty ohms resistance when the receiving device had a resistance of one thousand ohms. It has to be stated that the second impedance had a higher value than the first and was connected to the first with the interposition of a capacity. In my experiments, this capacity had a value of twenty microfarads.

For the purpose of adopting the arrangement substantially as outlined and making available a greater part of the energy in duplexing, as is now possible, I have recourse to arrangements substantially as illustrated in the accompanying drawing and described in the specification.

The drawing represents in diagrammatic view one terminal of a duplex system connected to the cable including transmitting and receiving organism. I have here illustrated the transmitting organism as to comprise means for keeping normally a current on the cable and to enable the operator to transmit two impulses of opposite polarity for each manipulation of the key, as I prefer in my system, to telegraph over the cable with Morse characters and transmit for each character a positive and negative impulse, but it is obvious that the transmitting arrangement may be changed to suit requirements.

In this drawing; 1 is the cable; 2 the bridge arrangement as an entirety; 3 the transmitting arrangement as an entirety. Of the bridge arrangement 2, 4 is an impedance inserted in one side of the bridge and 5 the impedance inserted in the second side of the bridge.

a and *b* are the terminals of impedance 4; and *a'* and *b'* the terminals of impedance 5. Terminal *a* of impedance 4 is connected through wire 6 with the interposition of the condenser 7 to terminal *b'* of impedance 5; and terminal *b* of impedance 4 is connected through wire 8 with the interposition of condenser 9 to the terminal *a'* of impedance 5. The impedance 11 is connected in shunt to the wires 6 and 8 through circuit wires 10.

14 is a relay connected in shunt through

circuit wires 12, here shown with the interposition of condenser 13 to the impedance 11. The condenser 9 is provided with means 22, condenser 7 with means 23 and condenser 13 with means 24 to short circuit the same.

In my experiments, I have found that condenser 13 is not necessary for the purpose of receiving good results and I have, therefore, shown the same in the drawings as being short circuited through the switch. But I have found that condensers 9 and 7 greatly facilitate the operation of the arrangement and I have, therefore, shown the shunts of these condensers as being open.

The transmitting arrangement 3 comprises here the two batteries 18 and 19; the battery 18 being of double the electromotive force of the battery 19. It is obvious that the required amount of individual cells may constitute the batteries 18 or 19, provided, however, that the battery 18 is double the electromotive force of the battery 19.

20 is a shunt around battery 18 and 21 the key operating said shunt. When the key is open, a current flows from battery 18 over the cable in the direction of the unfeathered arrow and, when the key is closed, a current flows over the cable in the direction of the feathered arrow. The home impulses are neutralized in the bridge and do not affect the inner part of the bridge arrangement at all, but when an impulse from the far station arrives, the same has to travel through impedance 4 and will, therefore, be felt in the shunt circuit including the impedance 11 and the relay 14.

I have found that this arrangement is far superior to the arrangement where the receiving device is simply inserted in a cross wire of the bridge as is practised today.

16 represents the artificial line and 17 the ground.

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

1. Means to duplex lines with great capacity, said means comprising a bridge circuit, a resistance for each side of said bridge circuit, cross circuits connecting the two terminals of the resistance of one bridge side to the two terminals of the resistance of the second bridge side, an inductive resistance connected with one terminal to one of the cross circuits and with the second terminal to the second of the cross circuits, a shunt for said inductive resistance, a relay, said relay connected in said shunt circuit.

2. In a bridge for duplexing lines with great capacity, an inductive resistance for each side of said bridge, a condenser connecting one terminal of the resistance of one bridge side with the opposite terminal of the resistance of the second bridge side, a second condenser connecting the other terminal of the resistance of one bridge side with the opposite terminal of the resistance of the second bridge side.

3. In a duplexing bridge, an inductive resistance for each side of said bridge, two cross circuits, one cross circuit connecting the near terminal of the resistance of one bridge side to the far terminal of the resistance of the second bridge side and the second cross circuit connecting the near terminal of the resistance of the second bridge side to the far terminal of the resistance of the first bridge side.

4. In duplex telegraphy, a bridge circuit, an inductive resistance in each side of said bridge circuit, two cross wires connecting crosswise the inductive resistances of both bridge sides, a shunt from said cross wires, the shunt connected with one terminal to one of said cross wires and with the other terminal to the second of said wires, an inductive resistance for said shunt, a second shunt, a condenser in said second shunt and a receiving device closing said shunt.

5. In duplex telegraphy, means to reduce the loss of the incoming impulses due to the bridge circuit, said means comprising inductive resistances inserted in the sides of the bridge circuits, two cross circuits connecting the two terminals of one inductive resistance to the two terminals of the other inductive resistance, a condenser in each of said cross circuits, a relay, a circuit for said relay, one terminal of said circuit connected to one of said cross circuits, the second terminal connected to the second of said cross circuits.

6. In duplex telegraphy, a bridge circuit, an inductive resistance for each side of said bridge circuit, a condenser connected with one terminal to one terminal of the inductive resistance of one bridge side and with the other terminal to the opposite terminal of the inductive resistance of the second bridge side, a second condenser, said second condenser connected with one terminal to the second terminal of the inductive resistance of the first bridge side and with the other terminal to the opposite terminal of the inductive resistance of the second bridge side, an inductive resistance connected in shunt to said two condensers and a relay connected in shunt to the last named inductive resistance.

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

ISIDOR KITSEE.

Witnesses:
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