I. KITSEE.

QUADRUPLEX PRINTING TELEGRAPHY.

APPLICATION FILED SEPT. 3, 1910.

987,631.

Patented Mar. 21, 1911.

2 SHEETS—SHEET 1.

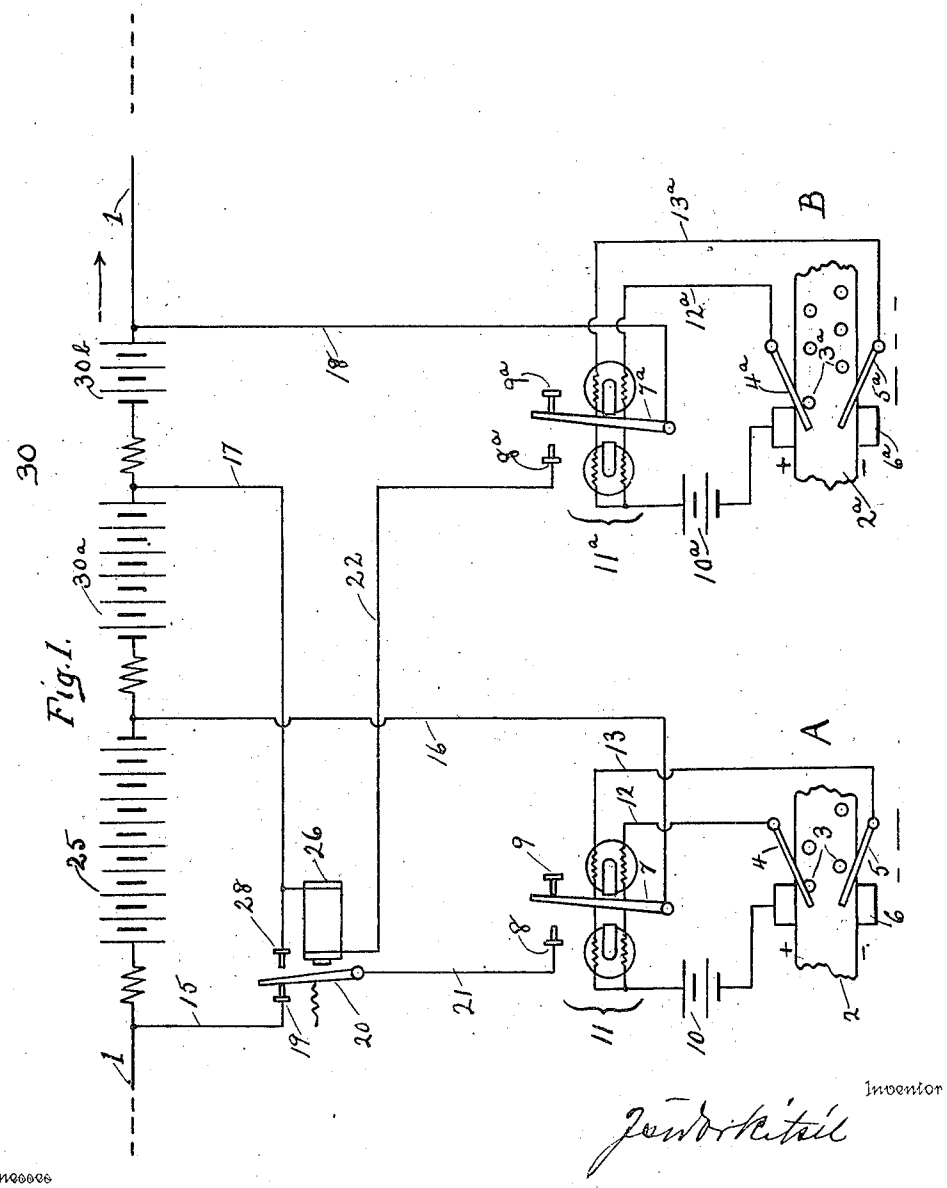

Fig. 1.

Inventor

Witnesses

Abrah Rittenhouse.

Mary E. Smith

I. KITSEE.

QUADRUPLEX PRINTING TELEGRAPHY.

APPLICATION FILED SEPT. 3, 1910.

987,631.

Patented Mar. 21, 1911.

2 SHEETS—SHEET 2.

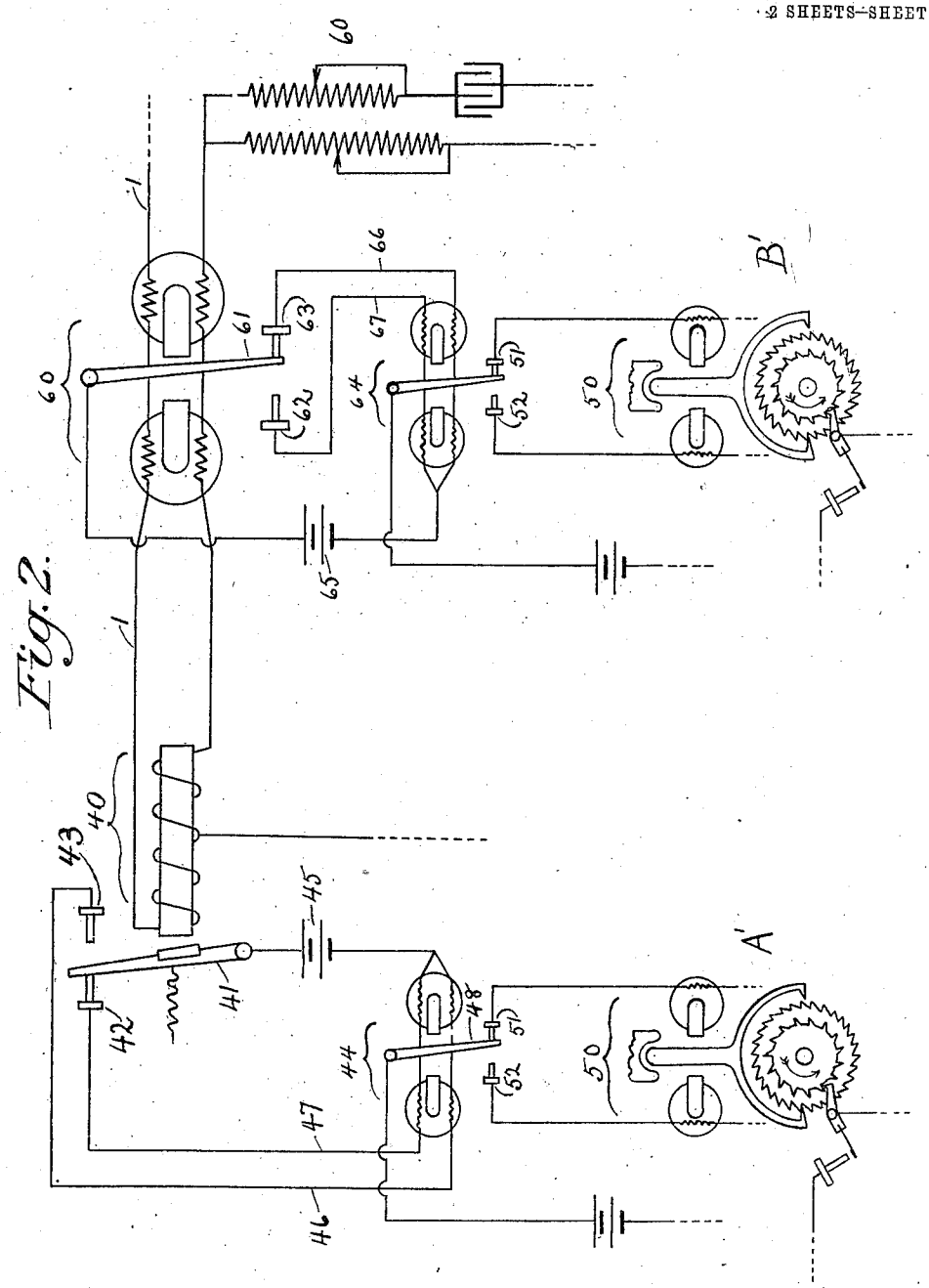

Fig. 2.

Witnesses
Abrah Rittenhouse
Mary E. Smith

Inventor
Isidor Kitsee

UNITED STATES PATENT OFFICE.

ISIDOR KITSEE, OF PHILADELPHIA, PENNSYLVANIA.

QUADRUPLEX PRINTING TELEGRAPHY.

987,631. Specification of Letters Patent. Patented Mar. 21, 1911.

Application filed September 3, 1910. Serial No. 580,413.

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 Quadruplex Printing Telegraphy, of which the following is a specification.

My invention relates to an improvement in quadruplex printing telegraphy. Its object is to produce a quadruplex printing system in a simple and efficient manner.

My invention is applicable to different systems of printing telegraphy, but its great value is most apparent in a system of printing telegraphy in which the groupings of the different characters of the Morse alphabet are made use of for the purpose of selecting locally the required type. Of such systems, the system now used by one of the largest telegraph companies and which is or was known as the "Barclay printer" is the one mostly in use to-day and I, therefore, will describe my invention as being applicable to such system, it being understood that this invention can be—as said above—applied to other systems.

In the practical working of a system of quadruplex printing telegraphy with the aid of one or the other of the existing types of printing telegraphy, it is of great importance that the transmitting means now used for such system should be employed in quadruplexing the same; so also should the printing organism not be illustrated at all as every alteration of either the transmitting or printing devices would retard from the value of the invention, as it is well known that the discarding of already standardized instruments and substituting for same new instruments is not favorably looked upon by the companies using these instruments. In my invention, therefore, I have taken care to make use of exactly the organism as is now used and have added thereto instruments which can be secured at a very small cost.

In the accompanying drawings Figure 1 is a diagram of the transmitting station and Fig. 2 is a diagram of the receiving station.

I will first describe the transmitting organism as illustrated in Fig. 1. In this figure, A is the transmitting organism of one operator and B the transmitting organism of the second operator. In the printing system above referred to, two impulses are transmitted for each character, one impulse—generally the positive—to mark the beginning of the character and one impulse—generally the negative—to mark the end of this character. In practice, a paper is made use of having for each character two perforations, one perforation adapted to allow contacting of a positive source of current with the line and the opposite perforation adapted to allow contacting of the negative source of current with the line. The lineal distance between these two perforations designates the character,—if the same should be a dot or dash. In actual practice, a device similar to the well known Wheatstone transmitter is employed as "contact maker".

I have not illustrated this device in its detail but have only illustrated the same in conventional sign and I have designated the different parts of this device as follows:—

2 is the paper; 3, 3, the perforations; 4 and 5 are the two contact makers, here shown as brushes and 6 the conductor with which the contact makers should connect.

In the system above referred to, the contact makers connect directly the necessary source of current to the wire, but in my invention, I have recourse to the following arrangement:—I connect the conductor 6 to a source of current 10; the other pole of this source I connect with a neutral wire of a differential polar relay 11. One of the brushes, here shown as the brush 4, is connected with the winding 12 of this polar relay and the brush 5 is connected here with the winding 13 of this polar relay. Therefore, when the brush 4 connects through a perforation with the conductor 6, a connection is made with the battery 10 through one winding of the differential polar relay 11, and through this connection, the relay is energized in a manner so as to move the armature 7 away from the stop 9 where it normally rests and toward and in contact with the stop 8. At this stop it will rest till the brush 5 makes contact with the conductor 6. The contacting of this brush with the conductor closes a circuit comprising the conductor 6, battery 10, winding 13 of relay 11 and brush 5; and as this winding is in opposite direction to the winding 12, it is obvious that through the closing of this circuit, the relay 11 will be magnetized in a manner, so that the armature 7 should be drawn away from the contact 8 and toward and in contact with 9.

In the line 1 is inserted the battery 25

and the batery 30. These two batteries are in opposition as to each other and should consist preferably of the same number of cells. The battery 30 comprises the sections 30^a and 30^b. To one terminal of the battery 25 is connected the wire 15 and to the other terminal of said battery is connected the wire 16. To the section 30^b of the battery 30 is connected at one terminal the wire 17 and at the other terminal the wire 18. To the wire 17 is connected the electro-magnet 26. The wire 15 of the battery 25 terminates in the stop 19 of the electro-magnet 26 and at this stop the armature 20 of said electro-magnet normally rests. This armature is connected through wire 21 to the stop 8 of the polar differential relay 11.

The transmitting means of the station B comprise the paper 2^a, contact makers 4^a and 5^a, conductor 6^a, source of current 10^a, differential polar relay 11^a, the windings 12^a and 13^a, stop 8^a, stop 9^a, and armature 7^a. The stop 8^a is connected through wire 22 with one terminal of the coil of electro-magnet 26. The junction of the other terminal of said coil with coil 17 is provided with the stop 28. The operation of this arrangement is as follows:—Normally, that is, when the line is at rest, both batteries oppose each other and no current will flow over the line. It is now supposed that A desires to telegraph. When A transmits impulses, the beginning of each impulse is marked through the contacting of brush 4 with the conductor 6. This makes a circuit—as said above—which throws the armature 7 of the relay 11 into connection with contact 8. Through this connection, a shunt is established around battery 25 comprising wire 16, armature 7, stop 8, wire 21, armature 20, stop 19 and wire 15. Through the shunting of the battery 25, the whole force of the battery 30 will be free and a current will flow in the direction of the unfeathered arrow over the line. As in most all quadruplex systems, the receiving organism comprises (besides other parts) a polar relay adapted to be worked by weak current of one polarity and a neutral relay adapted to be worked by a heavy current independent of polarity. Now, it is supposed that the whole force of the battery 30 which is available is sufficient to operate the neutral relay and, therefore, the impulses transmitted from the station A will operate this neutral relay in accordance with the perforations 3 of the paper 2. It is now supposed that the operator at B desires to telegraph. Here the contacting of the brush 4^a with the conductor 6^a will mark the beginning of an impulse and as the circuit made through this contact will energize the differential polar relay 11^a in a manner so that the armature 7^a will move toward and in connection with contact 8^a, the section 30^b of the battery 30 will be short circuited and this short circuit will comprise wire 18, armature 7^a, stop 8^a, wire 22, coil of electro-magnet 26 and wire 17. Through the short circuiting of this part of the battery 30, part of the battery 25 will be free and available and as the flow of the battery from 25 is of a direction adapted to operate the polar relay at the receiving station, but is not of sufficient strength to operate the netural relay, it is obvious that station B will be able to communicate through its polar relay at the receiving end. The armature 7^a will rest at the stop 8^a till the brush 5^a has made circuit with the conductor 6^a. Through the making of this circuit, the armature 7^a will be drawn away from the contact 8^a and in contact with 9^a thereby opening the shunt. From this description, it is clearly seen that the required current will flow at the required time independent of the length of contact of the different contacting brushes. It is only necessary that one brush should connect so as to throw the armature of its relay for the closing of a shunt and this shunt will remain closed no matter if the paper with its perforation has moved in a manner so as to break the contact between the brush and the conductor. This shunt will remain closed until the opposite brush has made contact with the conductor and the shunt will then remain open until the first brush again connects to one of its perforations. Dots and dashes, therefore, may be transmitted from either station A or station B and will be received as such at the receiving station.

When both stations A and B transmit messages and the brushes—say 4 and 4^a—connect respectively with their conductors 6 and 6^a, the following will result:—At station B the shunt around part of the battery 30 is established. Through the establishing of this shunt, the armature 20 of the electro-magnet 26 is drawn away from its stop 19 and in contact with its stop 28. When now at one and the same time, the brush 4 connects with the conductor 6, a shunt is established around the remaining part of the battery 30. The battery 30 is entirely short circuited and the whole force of the battery 25 is, therefore, available and as the flow of the current from this battery is of a direction to operate the polar relay at the receiving station and as the whole force of the battery is strong enough to operate the neutral relay, it is obvious that both relays will be operated at one and the same time.

I will now describe the receiving organism. A′ designates the receiving organism adapted to be operated by the transmitting organism A and the letter B′ designates the receiving organism adapted to be operated by the transmitting organism B. The receiving organism A′ comprises the neutral relay 40, its armature 41, forward stops 42

and 43. The armature normally rests on stop 42. The coil of the relay 40 is of the differential type. The relay 44 is of the differential polar type. The junction of the two windings is connected with the interposition of the battery 45 to the armature 41 of the relay 40. The winding 46 is connected to forward stop 43 and winding 47 is connected to forward stop 42. The relay 40 is of the neutral type and requires for its operation comparatively strong current independent of its polarity. 50 is part of the printing organism. I have not here illustrated the different parts of the whole arrangement as they do not form part of my invention and I have only shown a step-by-step movement which, in the printing system above referred to, is operated by the line relay of this system.

In quadruplexing, the chattering of the neutral relay is one of the greatest disadvantages and for the reason that this chattering should not normally affect the printing mechanism, I have here interposed between this relay 40 the polarized relay 44. When no current is flowing, the armature 41 impelled by its spring will rest on the stop 42 and the forming of the circuit including the battery 45 and the winding 47 will force the tongue 48 of the relay 44 toward and in contact with the stop 51 of the organism 50. When, now, through an incoming impulse, the tongue 41 of the relay 40 is forced toward and in contact with the stop 43, closing a circuit including the winding 46 of the polar relay 44, then the armature 48 of this relay 44 will be forced away from the stop 51 and toward and in contact with the stop 52, thereby making operative necessary devices in the printing organism. The tongue 48 will remain at the stop 52 as long as the tongue 41 of the relay 40 will remain at the stop 43, but should, through any unforeseen circumstances, the tongue 41 vibrate and make and break the contact with stop 43, this vibration and making and breaking of the contact will not affect the working of the relay 44 and the tongue of this relay will still remain at stop 52 until the tongue 41 of the relay 40 comes to rest at stop 42 and closes the circuit including the winding 47. When the tongue 41 comes to rest at 42, and through unforeseen circumstances, this tongue again vibrates and makes and breaks contact with stop 42, the tongue 48 of the relay 44, which is now resting at the stop 51, will remain in this position independent of the vibrations of the tongue 41 because these vibrations are not strong enough to force the tongue 41 to the stop 43. In reality, the localized relay 44 takes the place of the line relay of the printing system as is used today and the resultant effect of the operation of the relay 44 is the same as the resultant effect of the operation of the polar line relay of the printing system of to-day. The receiving organism of B′ comprises the differential polar relay 60 provided with the tongue 61 and the two forward stops 62 and 63. 64 is a localized differential polar relay; the junction of the two windings connected with the interposition of the battery 65 to the tongue 61. The winding 66 is connected to the stop 63 and the winding 67 is connected to the stop 62. The differential polar relay 60 is adapted to be operated through a line current of predetermined polarity but requires only a comparatively weak current. A relay, which is adapted to be operated by comparatively small currents, would take care of localized instruments which require for their operation a very heavy current, and for this reason and for the reason also that the chattering of the relay 60 should not injuriously affect the printing instrument, I have inserted between the line relay 60 and the printing organism 50 the relay 64. In all other respects, the operation of the relay 64, as to the printing organism, is the same as described with the organism A′.

The artificial lines are designated by the numeral 60.

I have described and illustrated the different line relays as being of the differential types, but it is obvious that this, my invention, is also applicable to such systems in which a bridge is substituted for the differential coil.

I have only illustrated and described two receiving and two transmitting stations, it being obvious that the remaining two transmitting and receiving stations are duplicates of the stations illustrated.

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

1. In telegraphy, a quadruplex printing system comprising a line of transmission, two transmitting and receiving stations for each terminal of said line, one transmitting station of each terminal comprising means to transmit positive impulses of short or long duration in accordance with the characters to be transmitted, the second transmitting station of each terminal comprising means to transmit negative impulses of short or long duration in accordance with the characters to be transmitted, one receiving station of each terminal comprising a neutral relay connected in the line, a polar relay operatively connected to the neutral relay and a step-by-step movement operatively connected to the polar relay, the second receiving station comprising a polar relay connected in the line, a second polar relay operatively connected to the first named polar relay and a step-by-step movement operatively connected to the second named polar relay.

2. In quadruplex printing telegraphy, a line of transmission, two stations for each terminal of said line, each station equipped with a transmitting and receiving organism, the transmitting organism comprising for each station a localized differential polar relay and localized means to actuate said relay in accordance with the characters desired to be transmitted and comprising for each terminal sources of current and means to shunt, with the aid of said polar relay, one or the other of said sources, whereby required impulses are impressed upon the line; and comprising for one station of each terminal a neutral line relay, a localized polar relay operatively related to said neutral relay and a printing organism operatively related to said polar relay; and comprising for the second station of each terminal a differential polar line relay, a polar relay operatively related to said line relay and a printing organism operatively related to said polar relay.

3. In quadruplex printing telegraphy, a line of transmission, four transmitting organisms, two for each terminal, each organism comprising a localized differential polar relay and means to actuate said relay in accordance with the characters desired to be transmitted and comprising for both stations of each terminal two sources of current in opposition as to each other and means to shunt, with the aid of the relay of one or the other of the stations, one or the other of said batteries.

4. In quadruplex printing telegraphy, a line of transmission, four receiving stations, two of each terminal of said line, one station of each terminal comprising a neutral line relay, a differential polar relay operatively related to said neutral relay and a printing organism operatively related to said differential polar relay and comprising for the second station of each terminal a differential polar line relay, a second differential polar relay operatively related to said first relay and a printing organism operatively related to said second polar relay.

5. In quadruplex printing telegraphy, a line of transmission, four transmitting organisms, two for each terminal, each of said organisms comprising a localized differential polar relay, means to actuate said relay in accordance with the characters to be transmitted and means to impress upon the line, through said operation, electric impulses necessary for said characters.

6. A telegraphic quadruplex printing system comprising the line of transmission, two stations for each terminal of said line, sources of current normally connected to the line for each terminal, means to shunt one or the other of said sources for each station of said terminals, one station of each terminal comprising a neutral relay, the second station of each terminal comprising a polar relay, means for each of said relays to make the same passive to home impulses, a localized circuit for each of said relays, a polar relay for each of said localized circuits, a second local circuit operatively related to the polar relay and means in said second circuit to operate therewith different printing organisms.

7. In a telegraphic quadruplex printing system, four receiving stations, two stations for each terminal of the line of transmission, a neutral relay inserted in the line for one station of each terminal and means for said relay to make the same inoperative to home impulses, a localized circuit, a polar relay and source of current in said circuit, said circuit adapted to be operated by said neutral relay, a second local circuit, a step-by-step movement in said second circuit, said second circuit adapted to be operated by the localized polar relay, said step-by-step movement adapted to operate different printing organisms; a polar relay for the second station of each terminal, means for said polar relay to make the same inoperative to home impulses; a localized circuit, a polar relay and source of current in said circuit, said circuit adapted to be operated by the polar line relay; a second local circuit, a step-by-step movement in said second circuit, said second circuit adapted to be operated by the localized polar relay, said step-by-step movement adapted to operate printing organisms.

8. In quadruplex printing telegraphy, the method of transmitting and receiving character symbols, which consists in locally developing at a transmitting station a short positive and a short negative impulse, producing thereby an impulse of predetermined polarity and of a length to accord with the length of the character symbol to be transmitted, transmitting such impulse to a receiving station, producing from such transmitted impulse two impulses, and translating such impulses into a character symbol one impulse indicating the beginning and one the ending of such symbol.

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

ISIDOR KITSEE.

Witnesses:
MARY C. SMITH,
ALVAH RITTENHOUSE.