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E. F. WATSON

ALTERNATING CURRENT PRINTING TELEGRAPH SYSTEM

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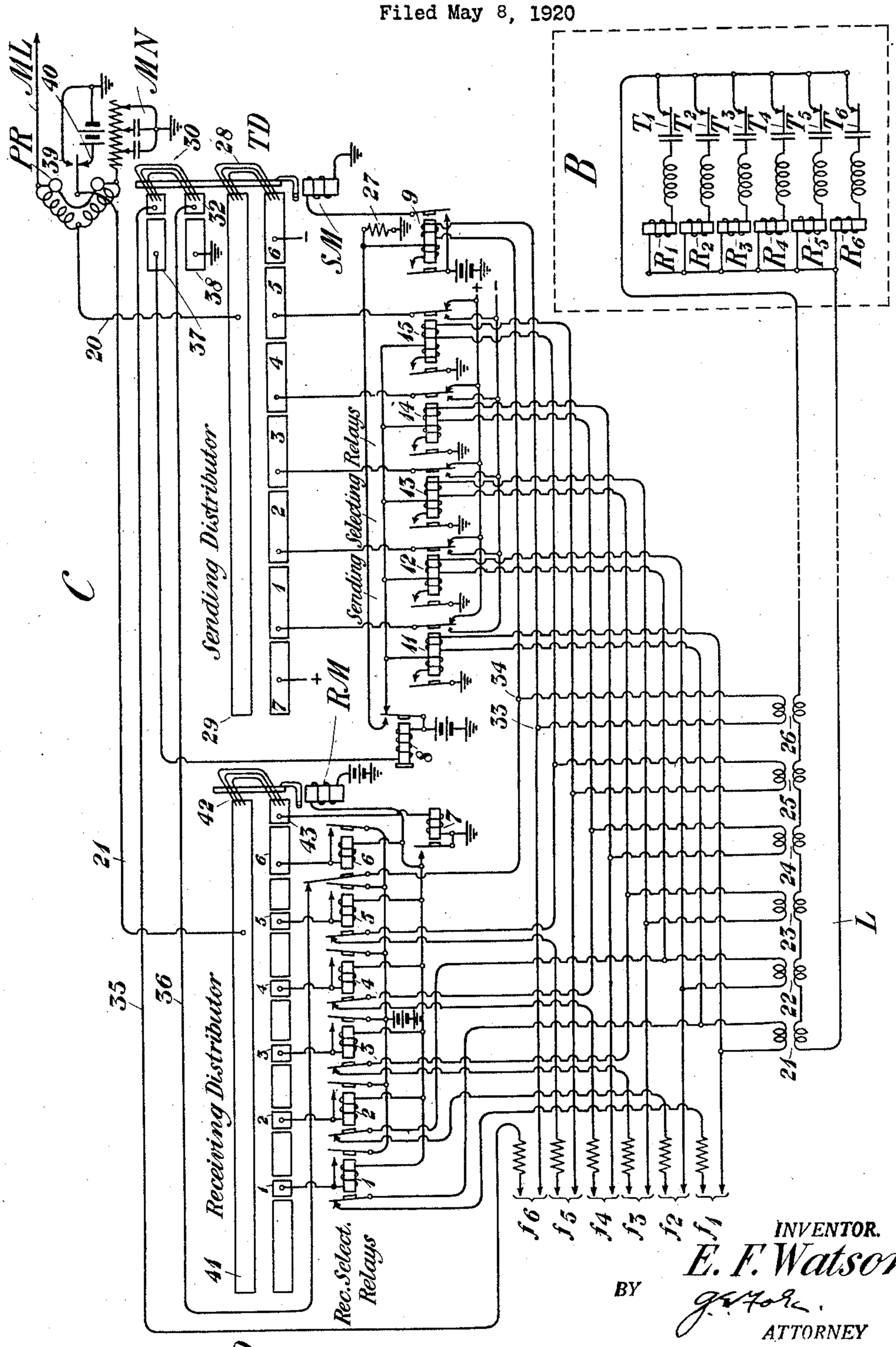

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ALTERNATING-CURRENT PRINTING-TELEGRAPH SYSTEM.

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To all whom it may concern:

Be it known that I, EDWARD F. WATSON, residing at Yonkers, in the county of Westchester and State of New York, have invented certain Improvements in Alternating-Current Printing-Telegraph Systems, of which the following is a specification.

This invention relates to printing telegraph systems, and more particularly to printing telegraph systems in which alternating currents, or so-called carrier currents, are employed for transmission purposes.

One of the objects of the invention is to provide means whereby printing telegraph signals transmitted over a main line by means of direct current impulses may be transmitted over a local loop by means of alternating or carrier currents.

Another object of the invention is to provide a means for translating a five unit code into alternating or carrier currents.

Another object of the invention is to provide an arrangement for transmitting printing telegraph signals from a main line over a local loop to a subscriber's station, the apparatus being so arranged that the distributor or tuning apparatus may be associated with the main line at a central office instead of at the local subscriber's station.

A still further object of the invention is to provide a printing telegraph system in which the signals may be transmitted from the main line over a local loop to a subscriber's station by means of apparatus which is relatively easy to maintain and keep in adjustment.

Other and further objects of the invention will be clear from the following description when read in connection with the accompanying drawing, the figure of which illustrates a circuit diagram of one embodiment of the invention.

Referring to the diagram, ML designates a main transmission line, and L a local subscriber's loop leading from the central office C to subscriber's station B. The main line ML terminates at the central office in the usual balanced duplex arrangement comprising an artificial line or network MN for balancing the main line, a polarized receiving relay PR bridged across neutral points of the main line and artificial line with respect to the transmitting circuit 20. A transmitting distributor TD is connected with the circuit 20, while a receiving distributor RD is associated with the polarized receiving relay PR through a circuit 21; each of these distributors is of the well known start-stop type, and includes segments for controlling the transmission and reception of individual elements of a printing telegraph code.

Means are provided for impressing six different frequencies f_1 to f_6 inclusive upon the local loop L under the control of selecting relays numbers 1 to 6 inclusive associated with the receiving distributor RD. The first five of these selecting relays determine the character selecting impulses of the code combination and the sixth relay controls the initiation of the printing operation. Five relays, numbers 11 to 15 inclusive, are similarly associated with the transmitting distributor TD_4 controlling the transmission of five unit code impulses to the main line ML as determined by the transmitting apparatus at the subscriber's station B. These relays are responsive to alternating current of frequencies f_1 to f_5 inclusive. A sixth relay 9, which is responsive to the frequency f_6 is controlled from the subscriber's station B to release the transmitting distributor TD.

Further details of the apparatus will be understood from a description of the operation, which is as follows:

Normally, the left hand back contacts of the relays 1 to 6 inclusive are closed, and the frequencies f_1 to f_6 inclusive are transmitted over circuits including these back contacts, and through the transformers 21, 22, 23, 24, 25 and 26 to the loop L. At the sub-station B there are six selective circuits, each tuned to one of the frequencies, and each containing a relay such as R_1, R_2 etc. The selective circuits also includes contacts T_1 to T_6 inclusive of a transmitting device. Contacts T_1 to T_5 may be selectively operated to transmit signals, as will be presently described. Contact T_6 will always be operated when any of the contacts T_1 to T_5 inclusive are operated. The relays R_1 to R_5 are alternating current relays, and are normally energized by the individual frequencies selectively transmitted therethrough by the selective circuits, and these relays may be selectively released to close circuits for selecting a character of

a printing telegraph instrument of any well known type. As this instrument forms no part of the present invention, it is not illustrated. The relay R_6 is also normally energized, but is released when the contact T_6 is operated in transmitting a code combination. The relay R_6 operates in a well known manner to set the printer in operation to print the selected character.

The several frequencies just described as being supplied to the loop L individually find paths of low resistance through the several tuned circuits at the sub-station B. It will be noted that connections are provided from the frequency sources to the right hand windings of relays 11 to 15 inclusive, as well as the relay 9, these connections being in parallel with the connections to the transformers 21 to 26 inclusive, so that the several tuned circuits at the subscriber's stations are in effect low impedance shunts across the windings of the relays 11 to 15, and the relay 9. Consequently, the amount of energy normally supplied from the six frequency sources is insufficient to operate any of these relays. If, however, the operator at station B depresses a key, thereby selectively operating certain of the contacts T_1 to T_5 inclusive, for example, the contacts T_1, T_3 and T_5, it will be seen that the first, third, fifth and sixth of these tuned circuits will be opened, it being remembered that the contact T_6 will be opened whenever any of the other contacts are operated. This results in the de-energization of the relays R_1, R_3, R_5 and R_6 to cause the printing of the corresponding character upon the local printer. The opening of these tuned circuits increases the impedances of the loop L to frequencies f_1, f_3, f_5 and f_6, so that the energy of the currents of these frequencies supplied to the relays 9 and 11 to 15 inclusive, is sufficient to energize the right hand windings of relays 11, 13, 15 and 9. Relays 11, 13 and 15 are locked up through their left hand windings and over the back contact of a sluggish relay 8. Relay 9 is locked up over its left hand front contact through its left hand winding through a resistance 27 to ground.

Normally, positive battery is connected to the first, second, third, fourth and fifth segments of the lower ring of the distributor TD over the right hand back contacts of the relays 11 to 15 inclusive. The operation of the relays 11, 13 and 15, however, results in connecting negative battery to the first, third and fifth segments. Negative battery is connected to the sixth or stop segment of the transmitter, and flows over the brush 28 and ring 29 of the distributor and thence over the conductor 20 to the line ML, thereby transmitting the so-called stop impulse.

As soon as the relay 9 is energized, as above described, a circuit is completed over its right hand front contact for the sending start magnet SM which releases the brush arm of the distributor so that it begins to rotate over the face of the distributor. As the brush 28 passes from the sixth segment, the negative stop impulse ceases, and as the brush passes on to the seventh or starting segment, positive battery is connected over the seventh segment, the brush arm 28 and ring 29 of the distributor, and thence over conductor 20 to the main line ML to transmit the starting impulse. The brush 30 at the same time passes off of segments 31 and 32. It will be noted that the frequency f_6 is normally supplied to the terminals 33 and 34 over a circuit including the conductor 35, segment 31, brush 30 and segment 32 of the distributor, over conductor 36 and the left hand back contact of the relay 6. The brushes 6 in passing from segments 31 and 32 opens this circuit so that the frequency f_6 is no longer supplied either to the loop L or the right hand winding of the relay 9. The relay 9, therefore depends entirely upon its locking circuit.

As the brush 28 passes over segments 1 to 5 inclusive of the distributor, the five character-determining impulses are transmitted as determined by the condition of the relays 11 to 15 inclusive. The brush arm 28 then passes on to the sixth segment and comes to rest in engagement with the catch controlled by the sending magnet SM, a negative stop impulse being transmitted when the brush is on the sixth segment. The starting magnet SM is released to permit the catch to engage the brush arm by reason of the fact that just before the brush arm comes to rest, the brush 30 passes on to segments 37 and 38, thereby completing a circuit for the slow release relay 8 which, at its right hand back contact, opens the locking circuits of the relays 11 to 15 inclusive, restoring them to normal, and at its right hand front contact short-circuits the left hand winding of the relay 9, restoring it to normal. The release of the relay 9 causes the de-energization of the starting magnet SM in time to engage the brush arm.

When receiving from the main line ML, the received code combination consists of a positive starting impulse, a combination of five character-forming impulses, followed by a negative stop impulse. It will be assumed that in the case of the receiving operation about to be described that the first, third and fifth character-determining impulses will be negative, and the other two positive, as in the case of the code combination just described for the transmitting operation.

Normally, the negative stop impulse is be-

ing transmitted over the main line ML so that the polarized relay PR maintains its armature against its lower contact 40, thereby completing a circuit 40 from battery over contact 41, conductor 21, ring 41, brush 42 and segment 43 of the receiving distributor RD and through the winding of the start relay 7 to ground. The relay 7 is maintained energized by this circuit. As soon as the positive starting impulse is received from the main line ML, however, the armature of the polarized relay PR is shifted to grounded contact 39, thereby releasing the starting relay 7. Starting relay 7, upon being released, connects ground over its back contact to relays 1 to 6 inclusive, and also completes a circuit for the receiving start magnet RM which releases the brush arm so that the brush 42 begins to pass over the segments of the distributor. By the time the brush 42 has passed over the idle segment at the left of the lower ring of the distributor RD and passes on to the first segment, the first negative impulse of the five character-determining impulses is being received from the main line ML. The armature of the polarized relay PR is, therefore, shifted to contact 40, and battery is connected over conductor 21, ring 41, brush 42 and the first segment of the distributor RD through the winding of relay 1 to ground over back contact of relay 7. Relay 1 is energized, and locks itself up over its right hand front contact. At its left hand contact it opens a circuit whereby the frequency f_1 is supplied to the transformer 21, so that this frequency is no longer supplied to the loop L, and consequently the receiving relay R_1 is released. As the brush passes over the second segment of the distributor, the second impulse of the character-forming combination is received, but as this impulse is a positive or spacing impulse, ground is connected to the ring 41 of the distributor over the conductor 21 and relay 2 is not operated. As the brush passes on over the remaining segments, relays 3 and 5 are operated, while relay 4 is not energized. Relays 3 and 5 open the circuits whereby frequencies f_3 and f_5 are supplied to the loop L, so that relay R_3 R_5 are successively released. As the brush passes over the sixth segment of the lower ring of the distributor RD, the negative stop impulse is being received, so that battery is connected over the conductor 21 to the ring 41, and the relay 6 is operated and locked up. This relay disconnects frequency f_6 from the loop L so that the relay R_6 at station B is released and sets the printer in operation to print the character selected by the relays R_1, R_3 and R_5.

The brush arm 42 now passes on to the segment 43 so that as a result of the negative stop impulse which is at this moment being received, battery is connected to the ring 41 and the relay 7 is energized to release relays 1 to 6 inclusive, and deenergize the receiving start magnet RM, so that the brush arm engages the catch controlled by this magnet, and comes to rest. This completes the cycle of operations when receiving.

It will be obvious that the general principles herein disclosed may be embodied in many other organizations widely different from those illustrated, without departing from the spirit of the invention as defined in the following claims.

What is claimed is:

1. In a printing telegraph system, a main transmission line over which printing telegraph signals are transmitted by means of direct current impulses, a local line extending to a subscriber's station, and over which printing telegraph signals may be transmitted by means of simultaneously transmitted alternating carrier currents of different frequencies, and means associated with said local line and said main line for individually translating each direct current impulse successively transmitted over the main line into a corresponding carrier frequency alternating current for simultaneous transmission over said local line.

2. In a printing telegraph system, a main transmission line over which printing telegraph signals are transmitted by means of direct current impulses, a local line extending to a subscriber's station, and over which printing telegraph signals may be transmitted by means of simultaneously transmitted alternating carrier currents of different frequencies, and means associated with said local line and said main line for individually translating each carrier frequency alternating current simultaneously transmitted over said local line into a corresponding direct current impulse for successive transmission over the main line.

3. In a printing telegraph system, a main transmission line over which printing telegraph signals are transmitted by means of direct current impulses, a local line extending to a subscriber's station, and over which printing telegraph signals may be transmitted by means of simultaneously transmitted alternating carrier currents of different frequencies, and means associated with said local line and said main line for individually translating each direct current impulse successively transmitted over said main line into a corresponding carrier frequency alternating current for simultaneous transmission over said local line and vice versa, so that two-way transmission may take place between said lines.

4. In a printing telegraph system a main line over which printing telegraph signals may be transmitted by means of a five unit code, a local line extending to a subscriber's

station and over which printing telegraph signals may be transmitted by means of simultaneously transmitted alternating carrier currents of different frequencies, a distributor for associating said main line with said local line, and means associated with said distributor for individually translating the component carrier frequencies of alternating carrier current combinations simultaneously set up at the subscriber's station into direct current impulses of five unit code combinations for successive transmission over the main line.

5. In a printing telegraph system, a main line over which printing telegraph signals may be transmitted by means of a five unit code, a local line extending to a subscriber's station, and over which printing telegraph signals may be transmitted by means of simultaneously transmitted carrier currents of different frequencies, a distributor at the junction point of said lines, and means associated with said distributor whereby the direct current impulses of five unit code combinations successively received from the main line may be individually translated into component carrier frequencies of alternating carrier current combinations for simultaneous transmission over the local line to operate a receiving printer at the subscriber's station.

6. In a printing telegraph system, a main transmission line over which printing telegraph signals may be transmitted by means of a five unit code, a local line extending to a subscriber's station, and over which printing telegraph signals may be transmitted by means of simultaneously transmitted carrier currents of different frequencies, transmitting and receiving distributors at the junction point of said lines, means associated with said transmitting distributor for individually translating the component carrier frequencies of alternating carrier current combinations simultaneously set up at the subscriber's station into direct current impulses of five unit code combinations for successive transmission over the main line, and means associated with said receiving distributor for individually translating the direct current impulses of five unit code combinations successively received over the main line into component carrier frequencies of alternating carrier current combinations for simultaneous transmission over the local line to actuate a receiving mechanism at the subscriber's station.

7. In a printing telegraph system, a main line over which printing telegraph signals may be transmitted by means of a five unit code, a local line extending to a subscriber's station, and over which printing telegraph signals may be transmitted by means of simultaneously transmitted carrier current combinations of different frequencies, and means at the junction point of said lines for individually translating the component carrier frequencies of alternating carrier current combinations simultaneously set up at the subscriber's station into direct current impulses of five unit code combinations for successive transmission over the main line.

8. In a printing telegraph system, a main line over which printing telegraph signals may be transmitted by means of five unit code, a local line extending to a subscriber's station, and over which printing telegraph signals may be transmitted by means of simultaneously transmitted carrier current combinations of different frequencies, and means at the junction point of said lines for individually translating the component carrier frequencies of alternating carrier current combinations simultaneously set up at the subscriber's station into direct current impulses of five unit code combinations for successive transmission over the main line, and means at the junction point of said lines for individually translating the direct current impulses of five unit code combinations successively received from the main line into component carrier frequencies of alternating carrier current combinations for simultaneous transmission over the local line to operate a subscriber's printer thereat.

9. In a printing telegraph system, a main line over which printing telegraph signals may be transmitted by a five unit code, a local line extending to a subscriber's station and over which printing telegraph signals may be transmitted by means of simultaneously transmitted carrier current combinations of different frequencies, and means at the junction point of said lines for individually translating the direct current impulses of five unit code combinations successively received over the main line into component carrier frequencies of alternating carrier current combinations for simultaneous transmission over the local line to actuate a receiving printer at the subscriber's station.

In testimony whereof, I have signed my name to this specification this 7th day of May, 1920.

EDWARD F. WATSON.