

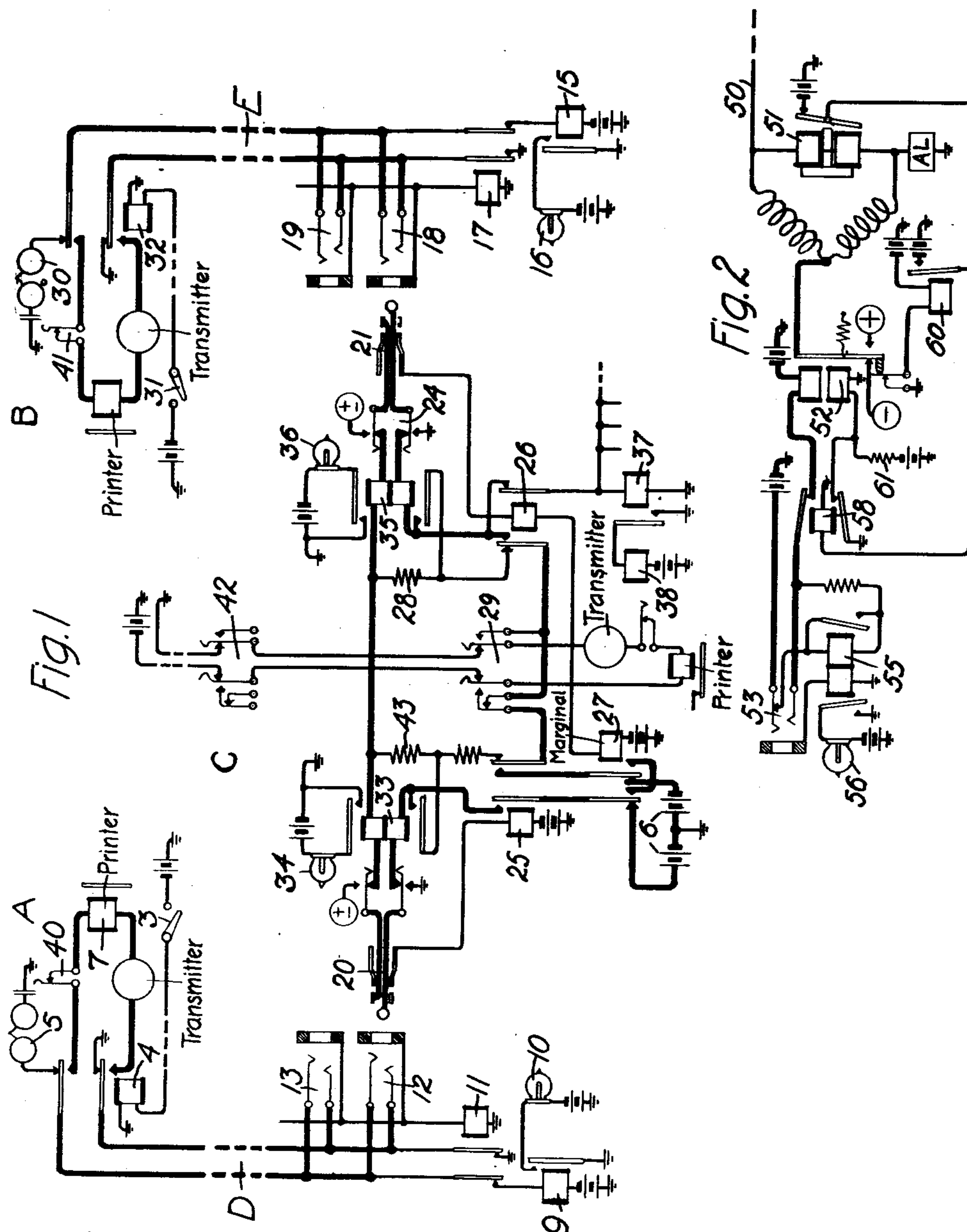
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R. D. PARKER ET AL

PRINTING TELEGRAPH EXCHANGE SYSTEM

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RALZEMOND D. PARKER AND GILBERT S. VERNAM, OF BROOKLYN, NEW YORK, ASSIGNORS TO AMERICAN TELEPHONE AND TELEGRAPH COMPANY, A CORPORATION OF NEW YORK.

PRINTING-TELEGRAPH EXCHANGE SYSTEM.

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To all whom it may concern:

Be it known that we, RALZEMOND D. PARKER and GILBERT S. VERNAM, residing at Brooklyn, in the county of Kings and State of New York, have invented certain Improvements in Printing-Telegraph Exchange Systems, of which the following is a specification.

This invention relates to telegraph systems.

An object of the invention is to provide a printing telegraph system which is flexible and one wherein a plurality of lines terminate at a central point, where means are located for establishing connections between said lines.

In the preferred form of the invention there is provided a printing telegraph system in which a plurality of printing telegraph subscribers' lines terminate at a central office where link circuits are located for establishing connections between the lines as desired. Each of the link circuits is arranged with supervisory means for giving an indication to the operator when the telegraphic communication has ceased.

A better understanding of the invention may be had from the following description, taken in conjunction with the accompanying drawing which illustrates the invention. In Figure 1 one embodiment of the invention is shown diagrammatically. Fig. 2 illustrates a modification of the invention.

Referring for the moment to Fig. 1, there are shown two telegraph lines D and E extending from printing telegraph subscribers' stations A and B, respectively, which terminate at a central office at which is located a link circuit C for interconnecting the telegraph lines. It will be understood, of course, that many lines similar to D and E may, terminate at the same central office, and that a plurality of link circuits similar to C may be employed. For the sake of convenience, however, only two such telegraph lines have been shown.

Each of the stations A and B is provided with printing telegraph equipment consisting of a transmitter and a receiving printer, which, for the sake of clearness, have been shown diagrammatically. It is understood, of course, that such printing telegraph equipment comprises the usual sending dis-

tributor and its associated transmitter, which may be either of the manually operated type or the tape transmitter, while the receiving mechanism comprises a receiving distributor with a receiving printer for recording the effects of the impulses transmitted.

Associated with the line D is a line relay 9, which controls the actuation of line lamp 10. A cut-off relay 11 is also provided for severing the energizing circuit of the line relay 9. Likewise associated with the line E is a line relay 15, which through its contacts controls a line lamp 16. As in the previous case, the energizing circuit of the line relay 15 is severed upon the energization of a cut-off relay 17.

The link circuit C, which serves to extend one line to another, is provided with a pair of plugs 20 and 21, which are designated respectively as the answering and calling plugs, and which for the sake of clearness will be referred to as such hereinafter. There is also arranged in the link circuit C suitable means for supervising a connection after it has once been established.

Assume that subscriber A desires to be placed into telegraphic communication with subscriber B, whose line E terminates at the central station in a pair of multiple jacks 18 and 19. The subscriber A in desiring to be connected with the subscriber B actuates key 3, whereupon the circuit for relay 4 is completed over a circuit extending from battery, through the contacts of key 3 and the winding of relay 4, to ground. The key 3, in addition to closing the energizing circuit of relay 4, may also be used for closing the power circuit of the distributors and printer in any well known manner. Relay 4, in closing its contacts, completes an energizing circuit for line relay 9 and disconnects the call bell 5 from the tip conductor of the telegraph line D. Line relay 9, in energizing, completes an operating circuit for line lamp 10, which indicates to the operator at the central office that A desires to be connected with another station. The operator thereupon inserts the answering plug 20 into either of the jacks 12 or 13, whereupon an energizing circuit is completed for cut-off relay 11. The energizing circuit of cut-off relay 11 may be traced from ground-

ed battery, through the winding of relay 25, sleeve contact of plug 20, sleeve contact of jack 12, and the winding of cut-off relay 11, to ground. Cut-off relay 11, in energizing, severs the circuit of the line relay 9, which becomes deenergized for causing the lamp 10 to be extinguished. Relay 25 is also energized over the circuit just traced, and connects the batteries 6 serially with the tip and ring conductors of the link circuit C.

The operator may now actuate key 29, which connects the printing telegraph equipment associated therewith in series with the tip and ring conductors of the link circuit C. With the calling plug 21 in its seat, that is, not inserted in a jack, sleeve relay 26 is accordingly deenergized for connecting resistance 28 in bridge of the tip and ring conductors of the link circuit C, whereupon an operating circuit for the printing telegraph equipment associated with the link circuit C and that at the subscriber's station is completed. As shown in Fig. 1, the printing telegraph equipment, which may be associated with the link circuit C, is common to a plurality of link circuits and may be connected with the other link circuits by the actuation of a key, such as 42. It is understood, of course, that each of the link circuits is provided with a corresponding key.

The subscriber A now operates his transmitter to transmit over the line D to the central station a characteristic group of impulses representing the number of the subscriber's line desired. In the particular case chosen for illustration, the character transmitted would be representative of the line E, which extends from the central station to the subscriber's station B. The transmitted character or characters will accordingly be received on the printer mechanism at the central office, which was connected with the line D upon the actuation of the key 29.

The operator, having ascertained the number of the called for line, connects the tip of the plug 21 with the sleeve of either of the jacks 18 or 19 for the purpose of testing the line to determine whether the line is busy. Should the line be busy, a circuit is completed for relay 37 extending from battery, which is connected with the sleeve contact of the connected plug of some other cord circuit through the windings of corresponding relays 26 and 27, sleeve contact of the tested jack, tip contact of plug 20, lower contact of ringing key 24, lower winding of relay 35, right hand contact and armature of relay 26 and the winding of test relay 37 to ground. Relay 37, in energizing, closes at its contact the operating circuit of a sounder 38, which indicates to the operator that the line is busy and that a connection

should not be established. The operator, however, upon finding the line idle, may insert the plug 21 into either of the multiple jacks 18 or 19 and restore key 29 to normal. The key 29 being restored to normal, the printing equipment is disconnected from the link circuit, and the tip conductor of the link circuit is again complete. The plug 21 having been inserted in the jack 18, completes an energizing circuit for sleeve relay 26 and cut-off relay 17 extending from battery, through the winding of marginal relay 27, winding of sleeve relay 26, sleeve conductor of plugs 20, 21, and sleeve contact of jack 18 and the winding of cut-off relay 17, to ground. Cut-off relay 17, in energizing, severs the energizing circuit of line relay 15, whereupon this relay is prevented from energizing for causing the operation of line lamp 16 upon the operation of relay 32. Sleeve relay 26, in energizing, opens at its right hand contact the energizing circuit of busy test relay 37, whereupon this relay is prevented from energizing for causing the operation of busy sounder 38. It is, of course, to be understood that the sounder 38 may be substituted by any other well-known type of indicating means, such as a bell or lamp. The sleeve relay 26, in addition to the severing of the energizing circuit of busy test relay 37, opens at its left hand back contact the circuit of resistance 28, and closes at its front contact the tip conductor extending between the plugs 20 and 21. On account of the resistance of the cut-off relay 17, relay 27 is not energized when the link circuit is connected with line of the type shown as E. Plug 21 being inserted in the jack of the called for line, supervisory relay 35 is also energized over a circuit extending from the negative pole of battery 6, right hand contact and armature of relay 27, right hand contact and armature of relay 25, contacts of key 29 if this key is in normal position, left hand armature and front contact of relay 26, lower winding of relay 35, contacts of ringing key 21, tip contacts of plug 21 and jack 18, and the armature and contact of relay 32 to ground. Relay 35 is accordingly energized for causing the illumination of supervisory lamp 36. The operator now actuates ringing key 24, which impresses on the line E ringing current. This ringing current traverses the line 2, passing through the call bell 30 at the subscriber's station B. The call bell 30 responds to such current for producing an audible signal to indicate to the subscriber B that the party desires to communicate with him telegraphically. The subscriber B thereupon actuates key 31, which completes an energizing circuit for line relay 32. Relay 32, in energizing, opens at its contacts the operating circuit of call bells 30, and connects the printing telegraph

equipment associated therewith with the line E, which is now in a position to receive messages from the subscriber A. Relay 32 also in attracting its lower armature closes a circuit including the upper winding of differential supervisory relay 35 whereby the effect of current in the lower winding is neutralized and the relay accordingly deenergized for extinguishing lamp 36. The operator by the extinguishment of lamp 36 is advised that subscriber B has responded to the call and the printing telegraph equipment thereat is operatively connected with the line.

In order to advise the subscriber A that the connection has been established and that subscriber B is in a position to receive, the subscriber B operates his transmitter to send a series of impulses over the line E through the link circuit C to the line D, where such impulses pass through the line relay 7 controlling the operation of the receiving printer mechanism (not shown). The subscriber A, upon receiving an indication from the subscriber B that the system is now in a condition for the transmission of messages between the two stations, operates the transmitter at his station for transmitting the desired message to the station B.

If the communication has been completed between the two subscribers A and B and it is desired to signal the operator that the link circuit C may now be taken down, the subscribers open their respective keys 3 and 31 for causing the deenergization of the associated relays 4 and 32. Relay 4, in releasing, opens the circuit through the upper winding of differential relay 33, allowing current to flow only through the lower winding, and thus energizing differential relay 33, which in closing its upper contact causes the lighting of supervisory lamp 34, which indicates to the operator that the plug 20 can now be removed from its associated jack. This relay 33, in closing its lower contact, bridges a resistance 43 between the ring and tip conductors of the link circuit C. Likewise, if the subscriber B opens key 31, thereby causing the deenergization of relay 32, differential supervisory relay 35 will be operated for causing the lamp 36 to be lighted. This, as in the previous case, serves as an indication to the operator that the connection may be taken down. Relay 35 also bridges the resistance 28 between the tip and ring conductors of the link circuit C. The bridging of the resistances 43 and 28 upon the energization of supervisory relays 33 and 35, respectively, between the tip and ring conductors of the cord circuit, makes it possible for either subscriber to communicate with the operator upon the actuation of key 29 for connecting the printing telegraph equipment thereat in circuit with the tip conductor. Should subscriber A desire to signal the

operator before the connection is broken, key 3 would be opened and closed to cause the deenergization and energization of supervisory relay 33. Relay 33 responding to the actuation of key 3 causes the flashing of lamp 34. The operator, observing the flashing of this lamp, operates key 29 for connecting the printing equipment in the link circuit. The subscriber A may now communicate with the operator for any purpose desired, irrespective whether station B has disconnected or not. Like operation is brought about should subscriber B actuate key 31 in a similar manner.

Assume that during the time subscriber A is transmitting a message to subscriber B the latter subscriber desires to interrupt the sending of subscriber A in which case it is only necessary for subscriber A to actuate break key 41. The operation of break key 41 opens the line extending to the central office and from which the open condition is received at the subscriber station A to indicate to such subscriber that B desires to reverse the direction of sending. Likewise, at station A there is shown a break key 40 for accomplishing the same purpose as that described in connection with break key 41.

In Fig. 2 there is shown a conductor 50, which extends to a distant telegraph station where a cord circuit similar to C may be located, and which may be utilized for connecting the conductor 50 with the local subscriber in the district in which the conductor 50 terminates. As shown in Fig. 2, the conductor 50 terminates in a pair of ratio arms and an artificial line AL for the purpose of providing half duplex service. Associated with the ratio arms is a receiving relay 51 and a pole changer relay 52. The pole changer relay 52 has one of its windings connected with the ring conductor of jack 53, into which there may be inserted a plug 21 similar to that shown in Fig. 1. The jack 53 has associated therewith a relay 55, which controls through its left hand contact the operation of a lamp 56, while through its right hand contact the winding of relay 55 is short circuited. When the plug 21 is inserted in the jack 53, the energizing circuit of the relay 55, which extends from battery, through the tip contact of jack 53, right hand winding of relay 55, resistance 57, upper armature and contact of relay 58, and the winding of pole changer relay 52, to the negative terminal of the battery is severed. However, when the plug 21 is inserted in the jack, a circuit is established over the sleeve contacts, which prevents relay 55 from becoming deenergized, and thereby prevents the lighting of lamp 56. In the type of circuit shown in Fig. 2, owing to the lower resistance of the winding of relay 55 to which the sleeve of the cord circuit is connected, marginal relay 27 for this type of line is en-

energized. Relay 27, in opening its contacts, disconnects the battery 6 from the tip conductor of the link circuit and establishes upon the closure of its contacts the closure of the link circuit, excluding battery 6. When the link circuit is connected with the line 50, which terminates in the ratio arms and accordingly in the jack 53, and the transmitter at the station A is operated, pole changer relay 52 responds to the operation of the transmitter thereat for applying to the apex of the ratio arms impulses in accordance with those transmitted, due to the operation of the transmitter at the station A. Accordingly, such impulses will be transmitted over the conductor 50 to the distant station, where such impulses pass through a receiving relay corresponding to relay 51, which causes the deenergization and energization of relay 58 in accordance with the received signals. Accordingly, impulses will be repeated to the subscriber B through the associated link circuit in accordance with those transmitted from the station A. There is also shown in Fig. 2 associated with the pole changer relay 52, a repeating sounder 60, which responds to the operation of the pole changer relay 52.

Should it be desired to signal to the operator at the central station, where the jack 53 is located, an impulse would be transmitted over conductor 50 to operate receiving relay 51. Relay 51, responding to such impulse, causes the deenergization of relay 58, and accordingly the opening of the energizing circuit of relay 55. Relay 55 thereupon releases its armatures to light lamp 56 and short circuit its own winding. The short circuiting of its winding prevents the reenergization of relay 55 upon the operation of relay 58, whereby lamp 56 remains lighted until the answering plug is inserted in jack 53. Relay 58 in opening its lower contact removes the short circuit from the lower winding of relay 52 whereupon the armature of this relay remains in the position shown in the drawing until the direction of sending is reversed.

It is apparent from the previous description that the present invention provides an arrangement of apparatus whereby it is possible to have a plurality of printing telegraph subscribers connected by suitable conductors to a central station, where link circuits are located for connecting the lines one with another. It is obvious that such an arrangement facilitates materially the telegraphic communication, and lessens the cost of such installations in that it does not require the installation of a separate line between the several subscribers. Also, it permits of a subscriber being connected with another subscriber whose line terminates at a central station where link circuits are located.

What is claimed is:

1. In a printing telegraph exchange system, a plurality of subscribers' stations, printing telegraph equipment located at each of said stations, a central office, signaling conductors connecting said stations with said central office, signaling means at said central station individual to each of said signaling conductors operative upon the association of said printing telegraph equipment with said signaling conductor to apprise the operator at the central station that connection is desired with another line, a link circuit at said central office, a receiving printer, and means operative for connecting said printer with said link circuit, and said printer being thereby rendered responsive to the operation of the printing telegraph equipment at the calling subscriber's station when said link circuit is connected with the line thereof to record the number of the party desired.

2. A printing telegraph exchange system comprising a plurality of stations where printing telegraph equipment is located, a telegraph line extending from each of said stations and terminating at a central station, a link circuit at said central station for establishing a connection between said lines, a telegraph mechanism at said central stations, means for associating said mechanism with said link circuit, a source of current for said telegraph mechanism, and means operative upon the connection of said link circuit with a calling line for connecting said source of current with said link circuit and said telegraph mechanism.

3. A printing telegraph exchange system comprising a plurality of stations where printing telegraph equipment is located, a telegraph line extending from each of said stations and terminating at a central station, a link circuit at said central station for establishing a connection between said lines, a telegraph mechanism at said central stations, means for associating said mechanism with said link circuit, a source of current for said telegraph mechanism, means operative upon the connection of said link circuit with a calling line for connecting said source of current with said link circuit and said telegraph mechanism, and means responsive to the connection of said link circuit with the called for line to establish the continuity of said link circuit.

4. In a printing telegraph exchange system, a plurality of subscribers' stations, printing telegraph equipment at each of said stations, a central office, signaling conductors connecting said subscribers' stations with said central office, link circuits at said central office for extending said signaling conductors, a differential relay in each end of said link circuits responsive to the disconnection of said printing telegraph equipment from

the connected signaling conductors, and a signaling device operated by said relay for indicating to the operator that the communication between the connected parties

5 has been completed.

5. A printing telegraph exchange system comprising a plurality of stations where printing telegraph equipment is located, a telegraph line extending from each of said

10 stations and terminating at a central office, a link circuit at said central office for extending said lines, a signaling device at each of said stations, means in said link circuit for impressing on the connected line current to operate said signaling device, and

15 means responsive to the connection of said printing telegraph equipment with the line for disconnecting said signaling device.

6. A printing telegraph exchange system

20 comprising a plurality of stations where printing telegraph equipment is located, a telegraph line extending from each of said stations and terminating at a central office, a link circuit at said central office for es-

25 tablishing a connection between said lines and arranged to permit the transmission of direct current telegraph signals between the connected stations, supervisory means in said link circuit, and means at each of said

30 stations for causing the intermittent operation of said supervisory means for recalling the operator after a communication has been completed.

7. A printing telegraph exchange system

35 comprising a plurality of stations, printing telegraph equipment located at each of said stations, telegraph lines connecting said stations with a central office, a link circuit at said central office for establishing a connection between said lines, printing telegraph

40 equipment associated with said link circuit, a key for connecting said printing telegraph equipment in series with the tip and ring conductors of said link circuit, and

45 means effective upon the operation of said key for permitting the operation of said printer equipment at the central office upon the operation of said printing telegraph equipment located at the subscriber's sta-

50 tion.

8. A printing telegraph system comprising a plurality of stations where printing telegraph equipment is located, a telegraph

55 line extending from each of said stations to a central station, normally open link circuits at said central stations for interconnecting said line telegraph mechanism associated with said link circuits, and means responsive to the connection of said link circuit

60 with a calling line for completing the cir-

cuit of said link circuit with said telegraph mechanism.

9. A printing telegraph exchange system comprising a plurality of stations where printing telegraph mechanism is located, a

65 telegraph line extending from each of said stations to a central station, normally open link circuits at said central stations for establishing connections between said lines, a source of signaling current at said central

70 station, and means operated upon the connection of said link circuit with a calling and a called for line for completing the continuity of said link circuit and connect-

75 ing said source of current with said link circuit.

10. In a printing telegraph exchange system, a plurality of subscribers' stations, printing telegraph equipment located at each of the stations, signaling conductors

80 connecting said stations with a central station, a telegraph line equipped for duplex operation, also terminating at said central station and extending to another central

85 station, and means at each of said central stations for establishing circuits between said telegraph line and said signaling conductors.

11. In a printing telegraph exchange system, a plurality of subscribers' stations,

90 printing telegraph equipment located at each of the stations, signaling conductors connecting said stations with a central station, a telegraph line extending from said central station to another station, inter-

95 changeable means for connecting said signaling conductors with said telegraph line, a source of signaling current associated with said means, and means responsive to the connection of said means with said tele-

100 graph line for disconnecting said source of current.

12. A printing telegraph exchange system comprising a plurality of stations where

105 printing telegraph equipment operative on direct current signals is located, telegraph lines connecting said stations with a central station, means at said central station for connecting any one of the telegraph lines

110 with any other telegraph line and for permitting the passage of direct current signals between the connected lines, and means associated with said link circuit for per-

115 mitting the supervision of any connections which may be established.

In testimony whereof, we have signed our names to this specification this 22nd day of December, 1922.

RALZEMOND D. PARKER.
GILBERT S. VERNAM.