

Oct. 25, 1932.

J. J. CATOGGE

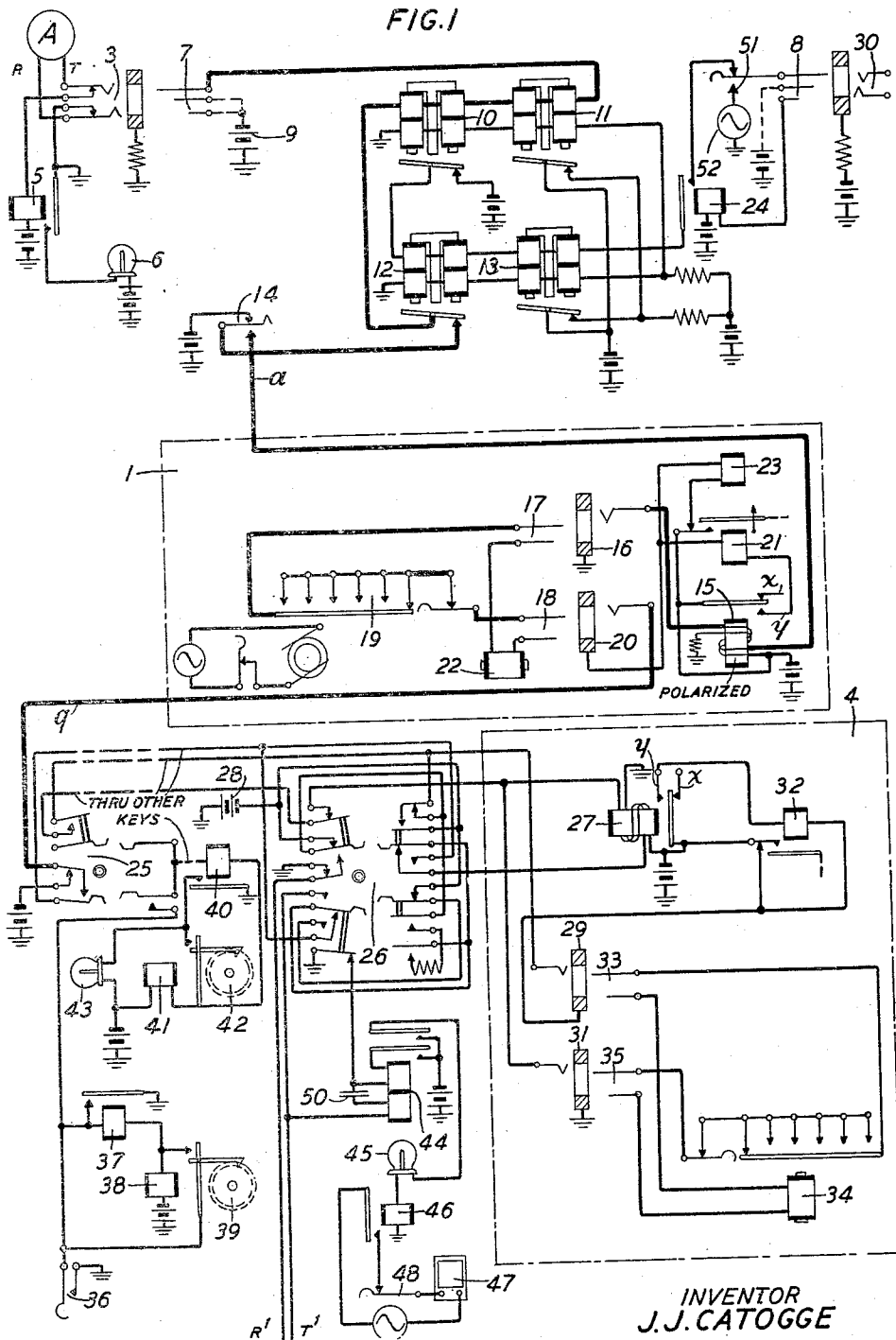
1,884,567

TELEGRAPH EXCHANGE SYSTEM

Filed June 18, 1931

2 Sheets-Sheet 1

FIG. 1



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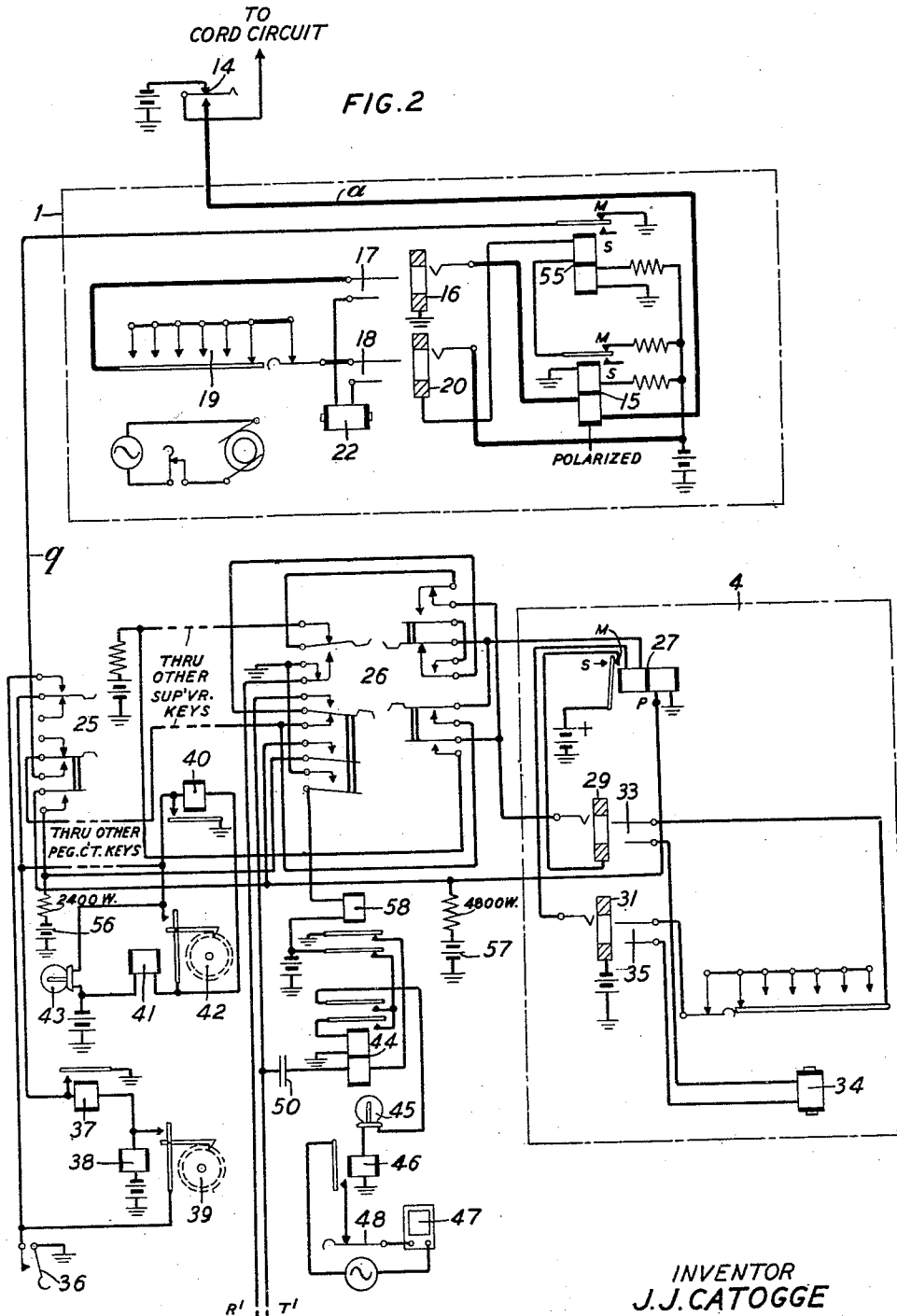
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2 Sheets-Sheet 2



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TELEGRAPH EXCHANGE SYSTEM

Application filed June 18, 1931. Serial No. 545,213.

This invention relates to printing telegraph exchange systems and more particularly to those systems wherein an operator's printer circuit is employed at a central office switchboard for communicating either with a subscriber's station or with another operator connected to the system. A telegraph system of this type is described in the specification of Locke-Kinkead application Serial No. 459,684, filed June 7, 1930, the description of which specification is hereby made part of the present specification as if fully included herein.

An object of this invention is to enable convenient and efficient supervision of an operator's printer circuit at a central office switchboard.

A particular embodiment of this invention comprises a supervisor's printer circuit for monitoring on an operator's printer set at the central office of a telegraph exchange system. Keys are provided for the circuit, individual to each operator's position, for connecting the supervisor's circuit with any of a plurality of operators' sets at the switchboard. Peg count registers indicate the number of incoming calls answered by the switchboard operators. Key switching means associated with the supervisor's printer enable the supervisor to initiate an outgoing call over a trunk circuit to the switchboard or to answer a call incoming to the circuit. An indicating lamp in the circuit is utilized to attract the attention of the supervisor whenever an incoming call is connected to the supervisor's trunk circuit. The apparatus comprising the supervisor's circuit may be located, if desired, at a desk immediately removed from the switchboard.

A feature of this invention is the peg count register indicator arrangement in the supervisor's circuit for registering the number of calls answered by an operator at a position of the switchboard.

Another feature lies in the key switching means for initiating a call from the supervisor's desk and for connecting the printer set therewith with an operator's circuit for monitoring purposes.

A further feature is a circuit scheme for

indicating to the supervisor that a call is being routed to the supervisor's desk.

Other objects and features will appear in the subsequent detailed disclosure.

Referring to the drawings,

Fig. 1 illustrates schematically a supervisor's printer circuit with associated peg count register and trunk circuit equipment. This supervisor's circuit is shown in connection with an operator's printer circuit and a cord circuit, and

Fig. 2 illustrates a further modification of the supervisor's printer circuit wherein the supervisor's printer operates in multiple with the operator's circuit instead of being serially connected thereto as shown in Fig. 1.

Referring to Fig. 1, there is shown at the central office an operator's printer circuit 1 comprising a printer set and associated relay equipment. This printer circuit is used for communicating over cord circuit 2 with any subscriber's printer station A connected to the exchange system and terminating at the central office in jack 3 which is the terminal point of lines T and R extending from subscriber's station A to the central office. Cord circuit 2 includes a known type of repeater circuit which comprises four polar relays for repeating signal impulses received from one line section to another line section with which it is associated. Such a repeater circuit is more fully described in the patent to J. M. Fell, No. 1,479,430, issued January 1, 1924 to which reference is made for a more complete understanding. A supervisor's printer circuit 4 with associated peg count register equipment is provided for monitoring and supervisory purposes.

It is to be understood, of course, that cord circuit 2 and the line equipment associated with jack 3 are only illustrative of any apparatus which may be used to accomplish the objects of this invention. In actual practice, other cord circuits similar to 2 and other line jack circuits similar to the one shown are employed. A plurality of operator's printer circuits may also be used, each circuit being individual to an operator's position. The subscriber's station circuit at A may be of the type described in the Locke-Kinkead applica-

tion Serial No. 459,684, mentioned hereinbefore.

The manner in which a connection is established will now be described.

Assuming that subscriber A desires to initiate a call, a start key at the subscriber's printer station (which forms no part of the present invention) will be pressed causing the operation of mechanism which will serially connect lines T and R through the subscriber's equipment and cause the operation of relay 5 in the line jack circuit, in turn, lighting lamp 6. This circuit is traced from battery through the winding of relay 5, contact of jack 3, T of the line, through the equipment at subscriber's station A, back over R of the line to ground through the lower contact of jack 3. The operation of relay 5 will light lamp 6 on a circuit traced from ground on its armature and contact to battery through the lamp.

The operator at the central office, observing the lighted lamp, will answer the call by inserting answering plug 7 of cord circuit 2 into jack 3 of the subscriber's line. This action extinguishes the lamp 6 by opening the contacts of jack 3 and releasing relay 5. The insertion of plug 7 will complete a circuit from positive battery 9 on the ring of cord 7 through jack 3 and ring side R of the line, back over tip side T of the line and tip of cord 7 through the line windings of polar relays 11 and 10, contact of polar relay 12 to negative battery on the contact of operator's key 14. The position of the relays will now be as shown in the drawings.

The operator connects her telegraph printer set to the cord circuit by operating key 14 which transfers the line circuit from negative battery on key 14 to negative battery in the supervisor's circuit. This circuit may be traced over the lead *a* through the winding of polarized relay 15 in the operator's circuit, tip of operator's jack 16, tip of operator's plug 17, sending contacts 19, tip of operator's plug 18, tip of jack 20 to negative battery over lead *q* on the contact of key 25 in the supervisor's circuit. The operation of key 14 connects the operator's printer in series with the answering side of the cord circuit repeater. Consequently, communication may now take place between the operator and the subscriber through the cord circuit and over the line to which the cord is connected. Relay 15, in operating, causes the operation of relay 21 from battery through the operated contact of relay 15, winding of relay 21, sleeve of jack 20, plug 18, winding of printer magnet 22, plug 17, sleeve of jack 16 to ground.

Under normal conditions, when the operator's set 1 is not connected to the cord circuit, the circuit through the *a* lead is opened. The armature of relay 15 is then held against its *x* contacts by a local biasing current and relay 23 is kept operated from battery through the normal break contact of relay 21, winding of

relay 23, sleeve of jack 20, plug 18, winding of printer relay 22, plug 17 to ground on sleeve 16 holding up printer magnet 22. It is understood, of course, that the printer motor is started by actuating a switch at the operator's position which connects current to the motor. When the printer is not in use, magnet 22 is therefore held locked up, thus preventing a free whirling of the printing telegraph set. Printer magnet 22 is also held operated when the operator's printer set is in use and current is flowing in lead *a*. This current will overcome the biasing current of relay 15 and operate 15. This operation will move the armature of relay 21 from its *x* contact to its *y* contact operating relay 21, as previously described, and releasing relay 23. The printer will now be under control of relay 15. Relay 21 is designed to be a slow-release relay so that it will remain operated while relay 15 is following the printer signals either received from the line or sent to the line from the printer keyboard. Relay 23 may also serve to indicate to an operator that a line signal has already been answered by another operator or that the line to which the operator is connected is open. This forms no part of this invention and is described in detail in the Locke-Kinkead application Serial No. 459,684 hereinbefore mentioned.

The operator being now connected with the subscriber's printer may send the word "Operator" or "Opr." which is typed on the receiver unit of the subscriber's printer A. The subscriber may answer by transmitting to the operator's printer set information regarding the called subscriber's line. The operator having obtained the information (let us suppose) that the call is to a local subscriber to whom she has direct access, then connects plug 8 into jack 30 in the called subscriber's line. The insertion of plug 8 into jack 30 of the called subscriber's line causes the operation of relay 24 in the cord circuit, in turn, connecting the tip of cord 8 through the line windings of relays 13 and 12 in the repeater cord circuit to battery on the contact of relay 10. The operator may now ring the subscriber by operating ringing key 51 which will connect alternating current from source of supply 52 to the tip of plug 8 associated with the tip side of the called subscriber's line circuit. When the subscriber answers the incoming call signal, the transmission circuit will be in condition for communication between both subscribers with the operator "monitoring" or listening in. If desired, the operator may restore key 14 to normal, thus permitting the operator's printer set 1 to be used for answering calls incoming from other subscribers' stations over other cord circuits and associated key equipment.

The operation of the supervisor's printer and peg count monitoring circuit will now be described. Returning to the circuit connec-

tion under consideration when the operator's printer set at the switchboard has answered the subscriber, it will be recalled that negative battery for the operator's printer set was obtained over the *g* lead through key 25. Assuming that the supervisor desires to monitor on the switchboard operator's printer, the supervisor will operate key 25 associated with the particular position upon which she wishes to monitor. This action will transfer the *g* lead from the negative battery on the contact of relay 25 to the lower make contact of key 25 through the other keys (designated 25) associated with other positions, lower left break contact of key 26, then to upper right break contact of the same key to one winding of relay 27, back over the upper left break contact of key 26, upper left make contact of key 25, upper right break contact of key 26, left make contact of key 26 to negative battery 28, operating relay 27 in the supervisor's printer circuit. It will be noted that the supervisor's set may only receive signals over this circuit since the sending contacts of the printer are now short-circuited. This path is traced from the tip of jack 29 in the printer circuit, upper make contact of key 25 to the tip of jack 31. The circuit for the supervisor's set is similar to the circuit for the operator's printer set 1, previously described. Relay 27 is normally held to its *x* contact by the biasing battery flowing through one of its windings. A closed circuit may be traced from battery of relay 27 through the break contacts of relay 32, sleeve of jack 29, sleeve of operator's cord 33, winding of printer magnet 34, sleeve of plug 35 to ground on the sleeve of jack 31, thus normally holding the printer magnet 34 operated. The operation of relay 27 when connected in a circuit operates relay 32 on a path traced from battery on the armature and make contact *y* of relay 27, winding of relay 32, sleeve of jack 29, sleeve of plug 33, winding of magnet 34 to ground on sleeve of jack 31 and plug 35. Relay 32 is designed as a slow-release relay. Therefore, it will remain operated while relay 27 is following either the received or sent line signal impulses.

When the printer is not in use magnet 34 is held locked, thus preventing a free whirling of the printer set. When the printer is in use and relay 32 is operated, the printer magnet is under control of relay 27. The motor for the printer will run continuously when the printer switch is on.

An advantage of this arrangement is that the operator's printer circuit and the supervisor's printer circuit are serially connected together. The reception of signals on the supervisor's printer, when monitoring on an operator's position, is an indication that the circuit is properly connected through the operator's printer circuit to the cord circuit.

To provide means for checking the peg

count, key 25 is so arranged that by one operation of the key all springs on the left and right side of the key, as shown in the figure, make contact. This will connect the peg count set of the supervisor in multiple with the peg count set of the operator. Each operator's position has an individual key 36 located at the position. Associated with key 26 are relays 37 and 38 and a register 39. At the supervisor's desk is a duplicate set of relays 40 and 41 and a register 42, also lamp 43. When the operator has received or answered a call, she presses key 36 which completes a circuit from ground on key 36, through winding of relay 37, message register relay 38 to battery, operating relays 37 and 38. Relay 37 in operating places ground on its own winding to short-circuit itself. This ground also serves the additional purpose of insuring the operation of relay 38. The latter relay in operating actuates register 39 which records all calls. Relay 37 in short-circuiting itself falls back and releases relay 38 and register 39. Relays 40 and 41 and register 42 function in the same manner since the ground from key 36 traces a path through the operated contacts of key 25 to operate relays 40 and 41. Indicating lamp 43 is adapted to light up upon the operation of relay 40 on a circuit traced from battery through lamp 43 to ground on the contact and armature of relay 40. This lamp is a visible indication to the supervisor that the operator has pressed her peg count key. Registers 39 and 42 will operate and lamp 60 will light up simultaneously. It is to be understood, of course, that key 25 is located at the supervisor's desk and is individual to each position, although relays 40 and 41, register 42 and lamp 43 may be common to a plurality of keys 26, if desired.

The supervisor's desk is also provided with several trunk circuits for receiving calls and making outgoing calls over the switchboard in the same manner as an ordinary subscriber would do these things. Each trunk circuit has associated with it a three-position key 26, an alternating current relay 44, a lamp 45 and connections *T'* and *R'* leading to a line jack circuit similar to that shown at the switchboard in connection with subscriber's station A.

When an incoming call is received over the *T'* and *R'* leads, relay 44 will operate on a circuit traced from the ringing current at the sending end of the line over *T'* of the line, through the secondary winding of A. C. relay 44, through the condenser 50 to ground on the lower break contact of key 26. In operating, relay 44 will lock up over its primary winding and back contact through key 26 to ground. From the other set of contacts of relay 44, lamp 45 will light and auxiliary signal relay 46 will operate to ground, in turn, operating bell 47 through key 48.

When key 26 associated with the indicated

trunk is thrown to the left or print position, ground will be removed from the circuit and relay 44 will release, extinguishing lamp 45 and releasing the auxiliary signal bell 47. The printer of the supervisor's circuit will then be bridged across the tip lead T' and ring lead R' of the trunk line on a path from R', left upper inner make contact of key 26, right upper break contact of key 26, tip of jack 29, tip of supervisor's plug 33, sending contacts of printer, tip of plug 35, tip of jack 31, winding of printer relay 27, right upper inner break contacts of key 26, left lower inner make contact of key 26 to tip lead T' of the trunk line. Communication between the supervisor and the calling party may now take place.

Key 26 is a special three-position key. If thrown to the right or hold position, all contacts shown on the entire key will be actuated. Assuming that the supervisor wishes to hold the trunk line over which a call has just come in while she desires to answer a call incoming over another trunk circuit, she will then throw key 26 to the hold position, thus actuating all contacts on the key and disconnecting the supervisor's printer relay from the first trunk line and replacing the printer set by resistance 49. If desired, resistance 49 may be omitted altogether and a short circuit connection used instead to replace the printer set when key 26 is thrown to the hold position. The circuit is traced from lead R' of the line, left inner upper make contact of key 26, right lower make contact of the same key, resistance 49, right lower outer make contact of key 26, left lower inner make contact of key 26 to tip T' of the line. The supervisor is then free to receive calls or initiate calls on another trunk.

When the supervisor restores key 26 to its normal position from either the print or hold position on the completion of a call, the ring side R' of the line is grounded on the left upper inner break contact. This ground may, in turn, be used to light a lamp in the cord circuit at the switchboard to act as a disconnect signal to the calling operator, if desired. This feature, however, forms no part of this invention. It is described in detail in the Locke-Kinthead application supra. The tip lead T' of the line is again connected through relay 44 and the condenser 50 to ground on key 26.

If it is desired to make an outgoing call, key 26 is operated to the left or print position, in which case, the printer line relay 27 is bridged across the tip of lead T' and ring lead R' of the trunk thereby operating the line jack lamp at the switchboard. This circuit through the key is the same as that traced when the supervisor had operated key 26 to the print position to answer an incoming call.

Fig. 2 illustrates a modification of the supervisor's circuit wherein the supervisor's

printer may be arranged to operate in multiple with the operator's circuit over the q lead. This is effected by connecting the q lead to a contact on an auxiliary relay.

One advantage of this modified arrangement is that the insertion of the supervisor's circuit for monitoring purposes cannot affect the operator's communication circuit to the subscriber, and thus cause a momentary opening of the signaling path. Such momentary opening of the line may inform the operator of the presence of the supervisor on the circuit and thus defeat the purpose which the monitoring feature is intended to accomplish.

The operator connects her telegraph printer set to the cord circuit by operating key 14 which transfers the line leading to the cord circuit from negative battery on key 14 to negative battery in the operator's printer circuit. This circuit is traced through one winding of polarized relay 15, tip of operator's jack 16, tip of operator's plug 17, sending contacts 19 of the printer, tip of plug 18, tip of jack 20 to negative battery. Current flowing through the a lead will operate relay 15 and cause it to follow all printer signals, operating, in turn, polarized relay 55.

When operator's key 14 is not actuated the a lead will be open and the armature of relay 15 will be held against its marking contact by the biasing current through its upper winding. This normal position of relay 15 will energize one winding of relay 55 in such manner as to hold the armature of relay 55 against its marking contact, which has ground connected thereto. This last circuit is traced from battery through the marking contact and armature of relay 15, one winding of relay 55, sleeve of jack 20, sleeve of plug 18, winding of printer magnet 22, sleeve of plug 17 to ground on the sleeve of jack 16. Thus the printer magnet 22 is held locked up, preventing a free whirling of the telegraph set.

The operation of relay 15, in accordance with the signals transmitted over lead a to the cord circuit, will operate relay 55 which, in turn, will send signals to the supervisor's circuit over the q lead by opening or closing the circuit on the armature of the relay.

The operation of the supervisor's printer circuit will now be described. When the printer set is not connected for communication, printer magnet 34 will be held up on a circuit traced from positive battery on the armature and marking contact of relay 27, sleeve of jack 29, sleeve of cord 33, winding of relay 34, sleeve of cord 35 to negative battery on the sleeve of jack 31, thus preventing a free whirling of the printer set. Relay 27, when not connected in a communication circuit, is energized by a biasing current through one of its windings in a direction to hold its armature against its marking contact, as indicated in the drawings. This circuit is traced from positive battery 57

through a 4800 ohm resistance to ground through the winding of relay 27. It is to be noted that the potential of point P is now positive with respect to the winding and the current is in such direction as to hold the armature on its marking contact. The operation of peg count key 25 in the supervisor's circuit will connect the supervisor's printer to the operator's circuit over the *g* lead. This circuit is traced from lead *g*, lower inner make contact of key 25, through the other peg count and trunk circuit keys to the left inner break contact of key 26, right inner break contact of the same key, the line winding of relay 27, tip of jack 31, tip of plug 35, sending contacts of printer, tip of plug 33, tip of jack 29, right and left upper break contacts of key 26, to positive battery. Relay 27 will follow the printer signals, in turn, operating printer magnet 34. The operation of key 25 also connects negative battery 56 through a 2400 ohm resistance, through the lower make contacts of key 25 to the biasing winding of relay 27. This action changes the potential of point P of relay 27 from positive through a 4800 ohm resistance to negative, thus tending to move the armature of the relay to its open or spacing contact. However, the current through the line winding is more than sufficient to keep relay 27 in its normal marking position. The transmission of a space signal over lead *g* will open the circuit through the line winding of relay 27 and cause the armature to move to its spacing contact.

An incoming call to the supervisor's desk is received over the T' and R' leads of the trunk circuit. In such case, relay 44 will operate on a circuit traced from ringing current at the sending end of the line over lead T' through condenser 50, one winding of relay 44 to ground on the break contact and armature of relay 56. In operating, relay 44 will lock up on a circuit traced from ground through its upper winding and make contact, to battery on the break contact of relay 58. The operation of relay 44 will light lamp 45 and operate auxiliary signal relay 46, in a manner similar to that hereinbefore described in connection with Fig. 1. The supervisor, observing the lighted lamp, will actuate key 26 associated with the lighted trunk circuit to the left or calling position. This action will connect the printer set for communication with the incoming subscriber. The actuation of key 26 will apply ground to operate relay 56 from the lower make contact of key 26. The operation of relay 56 will open the locking up circuit for relay 44, which will release, in turn, extinguishing lamp 45 and releasing relay 46.

The supervisor's printer will be bridged across the T' and R' leads on a circuit traced from R', the upper left make contact of key 26, upper right break contact of the same key,

tip of jack 29, tip of plug 33, sending contacts of printer, tip of plug 35, tip of jack 31, line winding of relay 27, right inner break contacts of key 26, left inner make contacts of key 26, to T' of the trunk circuit.

It is to be noted that the actuation of key 26 also changes the potential of point P of relay 27 from positive to negative, in the same manner as hereinbefore described in connection with the actuation of key 25. Negative battery 56 is connected through a 2400 ohm resistance to point P through the left lower inner make contact of key 26, when the key is thrown.

If the supervisor wishes to hold the call, key 26 will be thrown to the hold position. In this position, all contacts of the right and left sides of the key will be made. The supervisor's line relay 27 will be disconnected from the line and will be replaced by a short circuit bridged across the T' and R' leads of the trunk circuit. This circuit is traced from T' left inner make contacts of jack 26, right inner make contacts of the same key, left upper inner make contacts, to lead R' of the trunk circuit. It is to be understood that, if desired, a resistance may be inserted in the short-circuiting path bridged across the trunk.

To initiate a call over the trunk circuit to the switchboard, key 26 will be actuated to the left or calling position. This action will bridge the supervisor's printer set across T' and R' in the same manner as described in connection with answering a call incoming over the trunk circuit.

When key 26 is thrown to its normal or disconnected position, the ring R' of the trunk circuit is grounded at the key to cause the lamp in the cord circuit associated with the trunk to light.

It is apparent that various modifications may be made in this invention to suit different circuit arrangements without departing from the scope of this invention.

What is claimed is:

1. In a telegraph exchange system having operators' telegraph printer circuits, a supervisor's printer circuit comprising a telegraph printer set, a switching device for associating said supervisor's telegraph circuit with an operator's telegraph circuit for monitoring purposes, a trunk line, and an additional switching device in said supervisor's circuit for signaling an operator over said trunk line for making a call over the telegraph system.

2. In a telegraph exchange system, in combination, a printer set, a group of keys, each key being individual to an operator's position, and circuit means for operatively connecting said printer set with an operator's printer circuit upon the operation of a corresponding one of said keys.

3. In a telegraph exchange system, a su-

pervisor's printer circuit comprising a printer set, circuit means associated with said set and switching means for operatively connecting said circuit means with an operator's position for supervisory purposes, said supervisor's printer set being responsive to signal impulses received over said circuit means and being disabled to transmit signal impulses over said circuit means when so connected.

4. A telegraph exchange system of the type which employs a plurality of operators' telegraph printer sets at the switchboard for answering signals characterized in this that there is provided for supervisory purposes a supervisor's printer circuit comprising a telegraph printer and circuit means not under the control or observation of said operators for connecting said supervisor's printer with any of said operator's printer sets.

5. A peg count circuit for a group of operators' telegraph positions comprising a group of keys, each key of said group being individual to and located at an operator's position, a plurality of registers, each register being individual to an operator's position and adapted to respond to the operation of the particular key of said group which is associated with the same position, an additional register, and means to connect said additional register in said circuit for operation upon the actuation of one of said keys.

6. A peg count circuit for an operator's telegraph position comprising a key, two indicators responsive to the operation of said key and means for disconnecting one of said indicators without affecting the operation of said other indicator.

7. A peg count register circuit comprising a plurality of indicators and a plurality of keys, each of said indicators being responsive to the operation of a different one of said keys, an additional indicator and means for associating said additional indicator with any one of said plurality of indicators for simultaneous operation therewith.

8. A peg count circuit for a group of operators' telegraph positions comprising a set of keys arranged together, each key being individual to an operator's position, a second set of keys, each key of said second set being individual to and located at an operator's position, a register and a lamp indicator common to said first set of keys and located with said first set of keys, circuit means associated with said register and lamp indicator for operating the register and lighting the lamp, said circuit means being responsive to the successive operations of a key in said first set and a key in said second set associated with the same position.

9. In combination, in a telegraph exchange system, subscriber lines, an operator's printer circuit for answering calls incoming to a cen-

tral office switchboard over said subscriber lines, a supervisor's printer circuit and switching means for serially connecting said supervisor's printer with said operator's printer, said switching means being operatively independent of the connection of said operator's printer to said subscriber lines.

10. In a telegraph exchange, a cord circuit, an operator printer connectable at will to said cord circuit, an extension circuit through said operator printer to a source of potential, and a key for cutting a supervisor operator printer into said extension between said source and said operator printer.

11. In a telegraph exchange system, a link circuit, an operator printer connectable to said link circuit to be operated thereover, and a supervisor printer connectable at will to said link circuit to be operated thereover when said operator printer is connected thereto, in combination with devices whereby said supervisor printer may be connected to or disconnected from said link circuit, said devices including contacts whereby the operability of said operator circuit over said link circuit is maintained.

12. A telegraphic exchange comprising a plurality of operator link circuits for connection to subscriber lines, a plurality of operator printer circuits, a supplemental relay in each printer circuit controlling a path extending to a supervisor operator position, and devices in said path for connecting a supervisor operator printer into said path.

13. In a telegraph exchange system, an operator circuit including a telegraph printer set for answering subscribers' calls, a key for connecting said printer set into a subscriber circuit, said operator circuit including an extension through a supervisor operator position whereat is located a supervisor operator telegraph printer set, and a device at said position for cutting said supervisor operator printer set into said operator circuit at will.

14. A printing telegraph system comprising a switching position including an operator printing telegraph set, a plurality of incoming circuits terminating at said position, a connecting device for connecting a selected incoming circuit across said operator printing telegraph set, a holding path other than a path through said operator's printing telegraph set, and means for holding said incoming circuit closed across said holding path whereby after answering a call upon the incoming circuit said circuit may be held closed while the operator is performing other operations.

15. In a telegraph exchange system, an incoming line terminating in a jack, and a supervisor operator printing telegraph set in combination with two channels of distinctive operating characteristics over which said set may be operatively connected to said line.

16. A system in accordance with the immediately foregoing claim in which one of said channels includes means whereby said operator set is connected for transmission and reception and the other includes means whereby said set is connected for reception only.

17. In combination, in a printing telegraph exchange, an interconnecting link circuit for connecting subscriber lines, an operator circuit including a telegraph sending and receiving set having sending contacts, plug and jack instrumentalities for connecting said set into operative relation to said link circuit, and devices connected to said plug and jack instrumentalities to render the sending contacts of said set inoperative when the plug and jack instrumentalities are conditioned to connect said set into operative relation with said link circuit.

In witness whereof I hereunto subscribe my name this 16th day of June, 1931.

JOSEPH J. CATOGGE.