

Feb. 10, 1931.

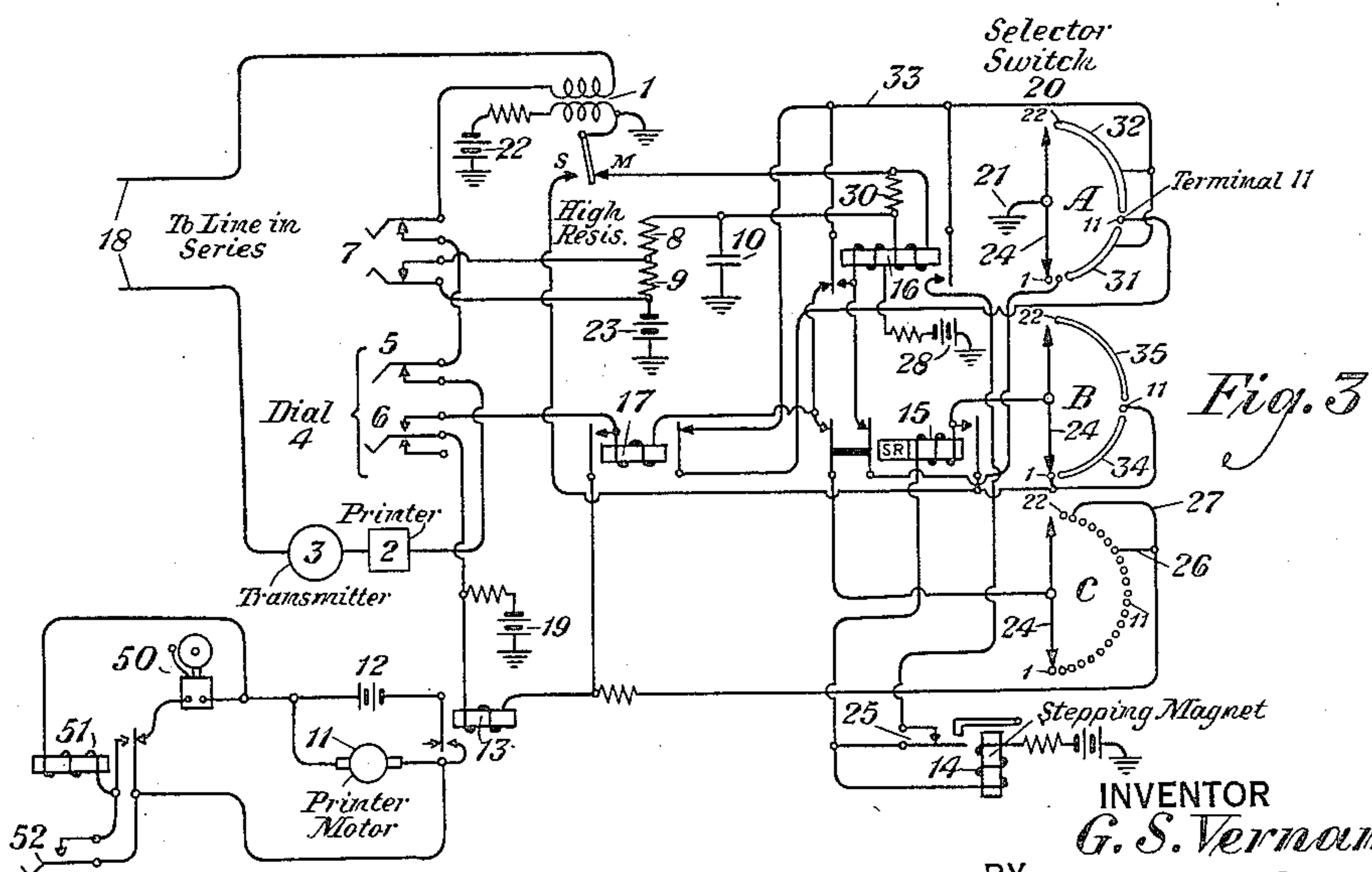
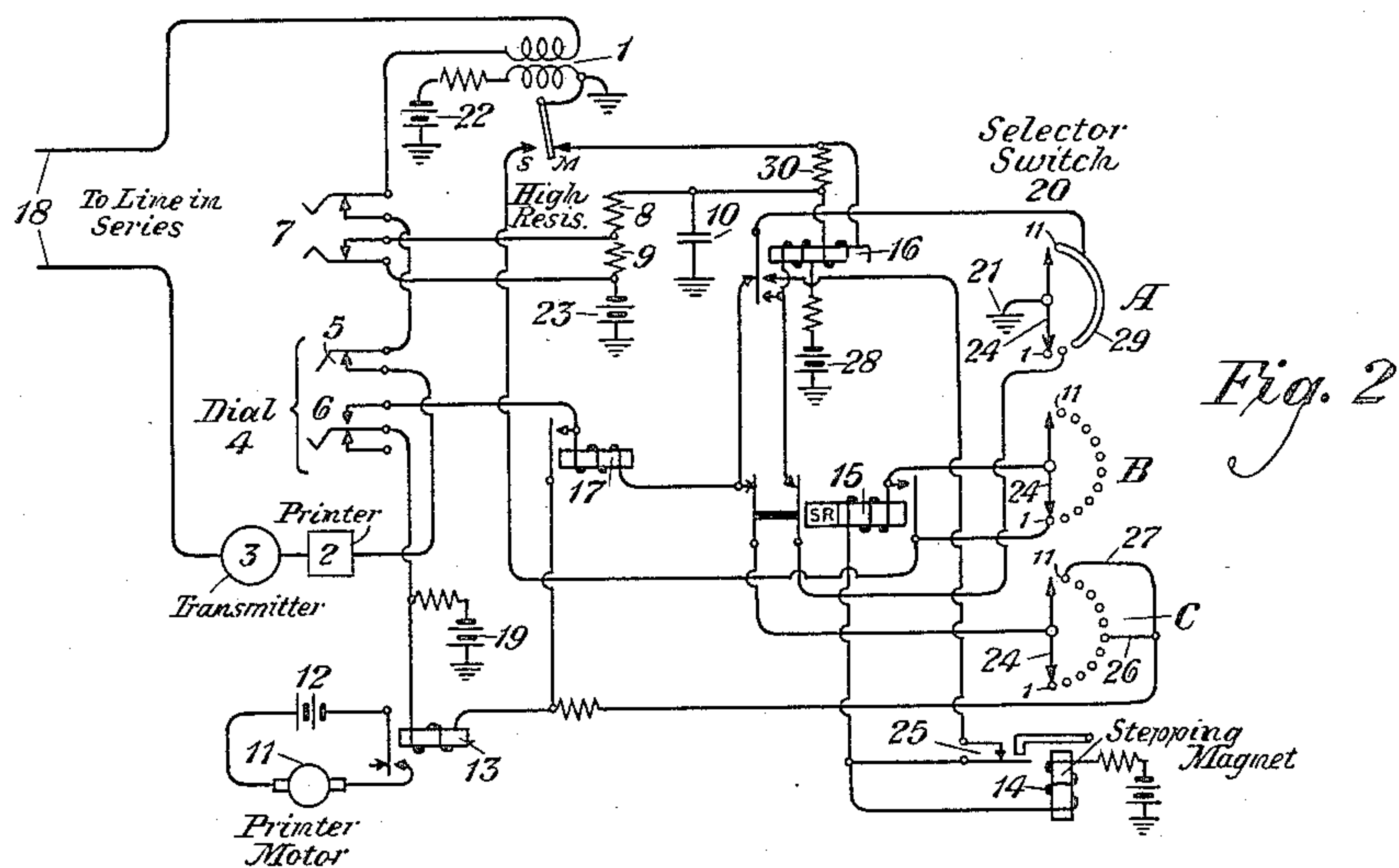
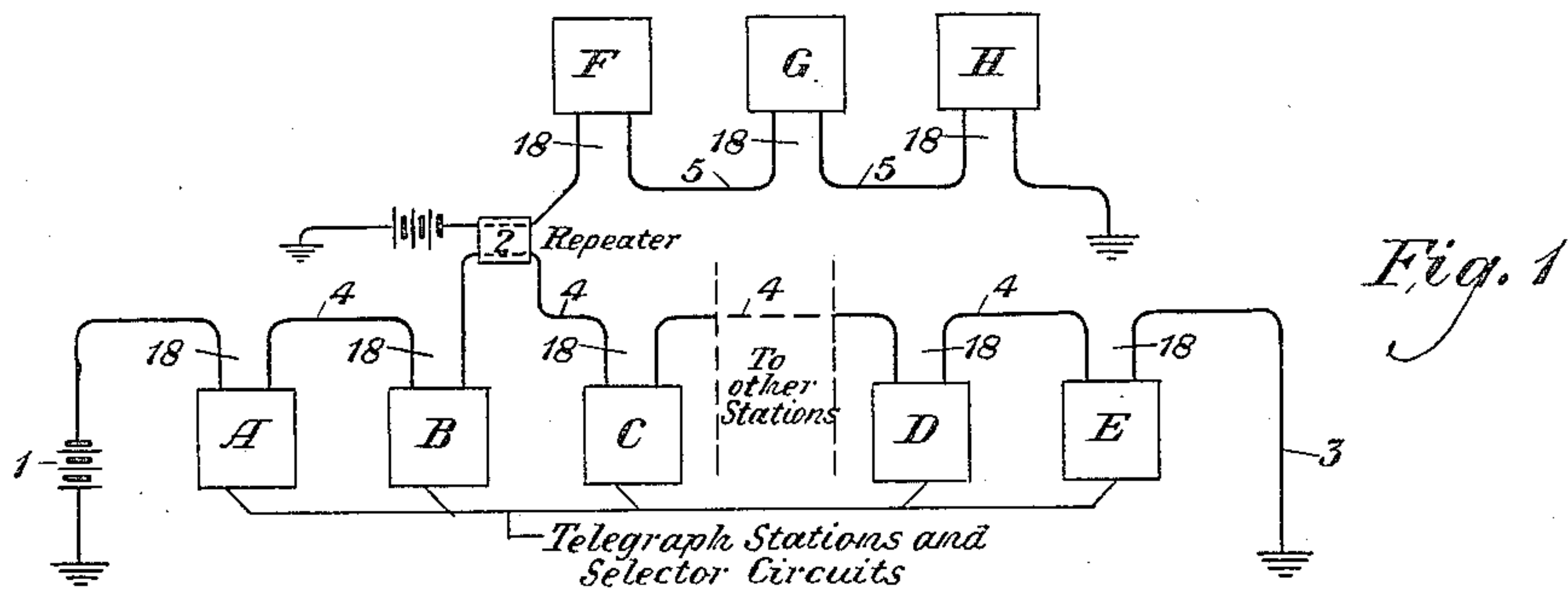
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1,791,587

PRINTING TELEGRAPH SYSTEM

Filed Dec. 1, 1928

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

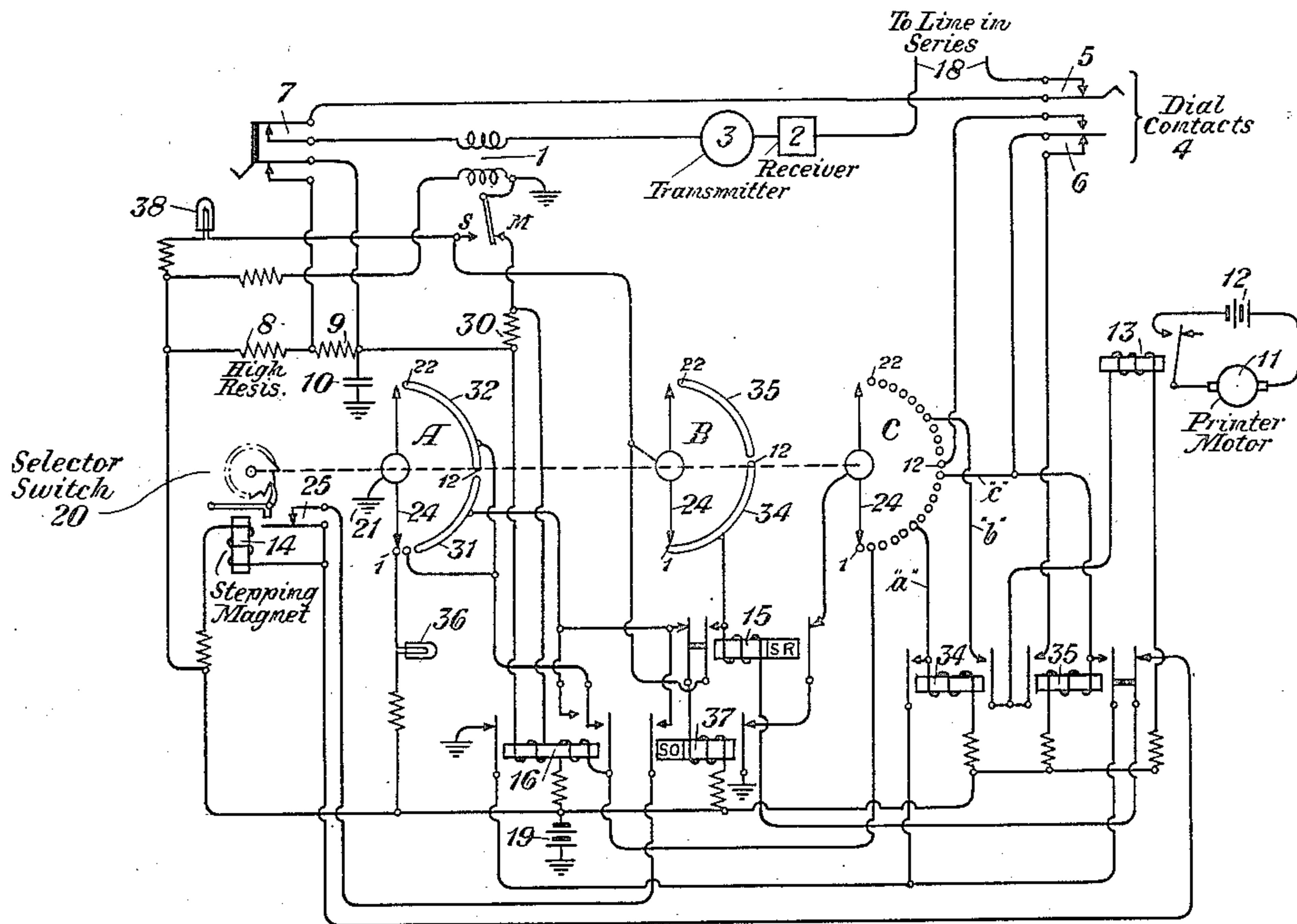


Fig. 4

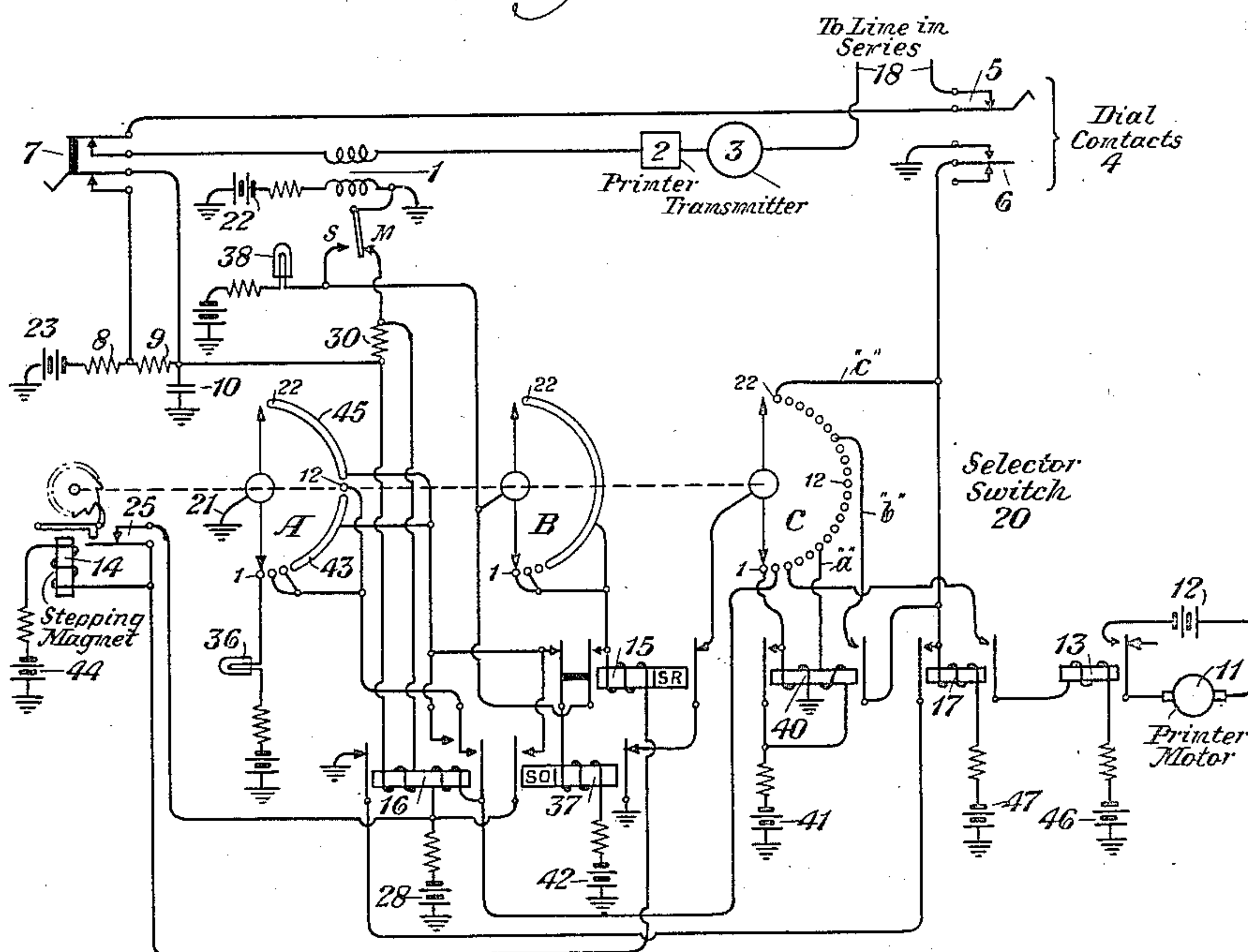


Fig. 5

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PRINTING-TELEGRAPH SYSTEM

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This invention relates to the art of telegraph communication and discloses novel selective control circuits applicable principally to printing telegraph systems, whereby one or more telegraph stations associated with a given transmission circuit may be called by another such station for communication purposes.

Selective means individual to each of the stations are operated in accordance with dial pulses transmitted from the calling station. At the station or stations thus selected an alarm is operated or, in the case of printing telegraph, the printer set motors are started after which printer signals may be sent immediately, or the usual printer bell signal may be operated, if desired, to attract the operator's attention. Means are also provided whereby any station may restore the selective means at all the stations, and in the case of printing telegraph, may stop the printer set motors thereat.

The selective control arrangements disclosed may be used in conjunction with any type of key operated or printing telegraph set, and on any of the well-known types of telegraph transmission circuits including radio circuits. The pulses of the calling code may be transmitted from a standard type of telephone dial pulsing device. In the specific arrangements disclosed, as many as 80 different code combinations are available, although no inventive skill would be required in extending the available combinations considerably beyond this figure.

The selective circuits will be described with reference to the drawings, of which Figure 1 shows in schematic form a typical telegraph transmission circuit connecting a plurality of printing telegraph stations. Figs. 2 to 5, inclusive, disclose four selective control circuits for accomplishing the purposes set forth above. All of the circuits disclosed are based on the same fundamental principle of selection but differ from one another in certain details in order to include specific desirable features.

Referring to Fig. 1, the rectangles A to H, inclusive, designate a plurality of printing telegraph stations together with the necessary

selective equipment for intercommunication, said stations being associated with the same line circuit. Stations A to E, inclusive, are connected in series between battery 1 and ground 3 by means of the line 4. Stations F to H, inclusive, are in series in a branch line 5 which is connected to the main line 4 through telegraph repeater 2. By means of the selective control circuits to be disclosed, any station may be connected to any other station or to a number or all of the other stations for intercommunication purposes. The leads 18 entering each rectangle are the same leads 18 that are indicated on Figs. 2 to 5, inclusive.

Referring now to Fig. 2, which shows the selective control circuit at one station for interconnecting a maximum of eight printing telegraph stations, the line circuit incoming over the lower of leads 18 extends in series through the transmitter 3 and the printer 2 of a printing telegraph unit, through the contacts 5 of telephone dial 4 for transmitting pulses, through a non-locking stop key 7 and through the line winding of a line relay 1 and out to the line over the upper of leads 18. The line relay 1 controls the selecting arrangement. In its idle condition, line relay 1 is held against its marking contact M by means of current through the line winding supplied from battery 1 of Fig. 1. The current flowing through the auxiliary winding from battery 22 tends to move the armature of the relay against the spacing contact but the strength of the auxiliary current is so adjusted that the armature of relay 1 will be operated against the spacing contact only while the current in the line winding is interrupted. With the armature of relay 1 against the marking contact, the current flows from the battery 23 through the lower non-operated contacts of key 7, shunting resistance 9, through high resistance 8 and through the parallel circuit comprising resistance 30 and one winding of relay 16, through marking contact and armature of relay 1 to ground. This circuit, as will be explained below, serves the purpose of restoring the selector equipment at the various stations to normal at the end of a call through the medium of the

charge on condenser 10. For the present it will be sufficient to state that the charge on condenser 10, with the circuit as shown, is practically negligible due to the low resistance of the parallel circuit comprising resistance 30 and the right winding of relay 16. The high resistance 8 limits the current through the right winding of relay 16 to such value that it does not operate at this time.

The circuit is so arranged that a single false pulse, such as that due to a lightning surge, will not cause the selector switch to improperly connect stations for communication purposes. The manner in which the effect of a false pulse is cared for will be explained before the normal dialing for station connections is considered.

The reception of a false pulse, such as that due to a momentary opening on the line, for example, will cause relay 1 momentarily to move against its spacing contact S. A circuit is thus established from ground through the armature and spacing contact S of relay 1, through terminal 1 and brush arm 24 of arc B of the selector switch 20, through the winding of the slow release relay 15 and through the winding of the stepping magnet 14 of the selector switch 20 to grounded battery. The stepping magnet 14 and the slow release relay 15 are operated over this circuit, relay 15, upon operating, short-circuiting, through its right armature and front contact, the circuit previously traced through terminal 1 and the brush arm of arc B of the selector switch. When the false pulse is ended, the line relay 1 will again move against its marking contact, causing the release of the stepping magnet 14 which will advance the brushes 24 of the selector switch 20 one step. If no more pulses are received at this time, the slow release relay 15 releases after a brief interval. This establishes a circuit from ground 21 through brush arm 24 of arc A of the selector switch and contact 2, through the left inner armature and back contact of relay 15, through the left winding of relay 16 to grounded battery 28.

Relay 16 operates over this circuit and connects ground through the self-interrupting contacts 25 to operate the stepping magnet 14. The circuit is traced from grounded battery through the winding of relay 14, through the self-interrupting contacts 25, through the front contacts and armature of relay 16, through left inner back contact and armature of relay 15 to ground through terminal 2 and brush arm 24 of arc A on the selector switch. The stepping magnet operates and immediately releases on this circuit due to its self-interrupting contacts 25 and thus advances the selector switch brushes 24 one step. This brings the brush arm 24 of arc A into contact with conductive segment 29, and thus establishes a holding circuit for relay 16 from battery, through the left winding,

front contact and armature of relay 16 to ground 21, through segment 29 and brush arm 24 of arc A. Relay 16 thus remains operated while the brush arm of arc A is on segment 29 and thus maintains an operating circuit for the stepping magnet 14 through its self-interrupting contacts until the stepping magnet steps the brush arms around to normal. The operating circuit for stepping magnet 14 is the same as that previously traced with the exception that ground is now maintained through segment 29 of arc A instead of terminal 2 thereof, as previously traced. It will be seen that with this arrangement, ground remains connected to the stepping magnet 14 until the brush arms 24 are restored to their normal positions as shown on the drawing.

Suppose, now, that the dial 4 is operated at one of the stations on the line. These pulses consisting of current interruptions in the line, flowing through the line winding of relay 1 at any station, will cause the relay to be operated in accordance therewith. When the first pulse is received at a given station, the operation of the armature of relay 1 against its spacing contact will complete the circuit described through the winding of the stepping magnet 14 and the slow release relay 15 to ground at relay 1. Relay 15, upon operating, will short circuit its operating path through terminal 1 and brush arm 24 of arc B by means of the path through its right armature and front contact. Stepping magnet 14 will operate and release in accordance with the pulses received due to the alternate connection and removal of ground from the spacing contact of relay 1, and will thus cause the brush arms 24 to be stepped around to the terminal corresponding to the digit dialed. Relay 15, being of the slow-release type, remains operated between pulses and in this way maintains the circuit for connecting ground at relay 1 to the stepping magnet 14. As the brush arms pass over terminal 2 in this case, no circuit is completed to operate relay 16 as was the case with the false pulse described above, due to the fact that now the operating circuit for the left winding of relay 16 will be open at the contacts of relay 15 which remains operated during the pulsing, as explained. After all the pulses are received, the armature of relay 1 comes to rest against its marking contact and thus opens the circuit of relay 15 which, in a short time, releases.

At each station, one of the terminals 3 to 10, inclusive, of arc C of the selector switch is connected by means of a lead 26 to relay 13. For the station shown on Fig. 2, the terminal thus connected is terminal 6. At each of the other stations, of course, a different terminal would thus be connected to relay 13 so that any one of a maximum of eight stations could be selected by dialing. Assume in connection

with Fig. 2 that the digit 5 was dialed, thus bringing the brushes to rest on the sixth terminal of the selector arcs. Upon the release of relay 15, as explained, a circuit would be established from grounded battery 19, through the winding of relay 13 over lead 26 and through brush arm 24 now resting on terminal 6 of arc C of the selector switch, through the left outer armature and back contact of relay 15, through the back contact and armature of relay 16, through segment 29 and brush 24 of arc A to ground 21. Relay 13 operates over this circuit and thus completes a circuit through its armature and front contact to connect a source of power 12 to the printer motor 11 which starts the printer motor running at the station in question, and thus prepares the printer unit thereat for two-way communication. Relay 1 will thereafter follow the printer signals but this will not complete an operating circuit for the stepping magnet 14, owing to the fact that the brush arm 24 of arc B will now be at rest on some terminal other than terminal 1.

At some stations, the selector brushes, in stepping ahead in accordance with the code dialed, have passed over the terminal to which relay 13 is connected. No operating circuit is established for the relay 13 at such stations, however, when the brush passes over the terminal, due to the fact that the slow release relay 15 is operated during pulsing at such station and thus opens the operating circuit for relay 13 at the left outer contacts of relay 15.

Relay 13 at all stations is connected to the eleventh terminal of arc C of the selector switch by means of lead 27, as shown. The result is that when any station dials zero, the brushes at all stations will be stepped around to the eleventh terminal and thus at each station a circuit will be completed to operate relay 13, as described. The motors at all the stations will thus be started, permitting any station to simultaneously transmit a message to all of the other stations.

The printer motor 11 at the calling station is started, as well as that at the called station, whenever the dial at the calling station is operated. While the dial is operated, the off-normal contacts 6 of the dial are closed and remain closed until the dial returns to normal. The local selector switch 20 steps ahead in accordance with the code dialed and as soon as the brush arm 24 of arc A reaches the segment 29, a circuit is completed to operate relay 17. This circuit is traced from grounded battery 19 through off-normal contacts 6, through the winding of relay 17, back contact and armature of relay 16 to ground 21 through segment 29 and brush arm 24 of arc A. Relay 17 operates over this circuit and connects ground 21 to relay 13 through the medium of the armature and front contact of relay 17. Re-

lay 13, however, does not operate until dial 4 has returned to normal due to the short-circuiting path connected across the winding of relay 13 which is traced from the battery 19 through the off-normal contacts 6 of dial 4 to the front contact of relay 17. When the dial returns to normal, however, the off-normal contacts 6 open and thus remove the short-circuiting path from across the winding of relay 13. Relay 13 thereupon operates on the circuit from battery 19, through the winding of relay 13, armature and front contact and winding of relay 17 to ground 21 at arc A of the selector switch. The operation of relay 13 connects source of power 12 to the printer set motor 11 at the calling station and thus starts the motor thereat running. Delaying the starting of the motors at the calling station until the dial has returned to normal prevents the printer at the calling station from operating in response to dial pulses and thus recording false characters.

The printer set motors at any or all stations which are operating at a given time may be stopped from any station by the operation of the stop key 7 at the station in question and holding the key thus operated for several seconds. While the stop key 7 at a given station is thus operated, relay 1 at each station is operated against its spacing contact and thus removes the low impedance shunt to ground through the marking contact and armature of relay 1 from across the capacity 10. While the key 7 is thus held open, the capacity 10 at all of the other stations is slowly charged up to the potential of battery 23. The charging circuit is traced from battery 23 through the lower non-operated contacts of key 7, through the high resistance 8 and through capacity 10 to ground. When, now, the stop key 7 at the station in question is restored, the armature of relay 1 at each station moves to its marking contact and thus reconnects the ground to the high potential side of capacity 10. Capacity 10, being now fully charged, discharges through the right winding of relay 16 and resistance 30 in parallel to ground through the marking contact of armature of relay 1. This surge of discharged current operates relay 16 which immediately locks up on a circuit from battery 28, through the left winding, left front contact and armature of relay 16 to ground 21, through segment 29 and brush arm 24 of arc A. In this connection it should be recalled, of course, that while the motors at a given station are running, the brush arm 24 of arc A will be on segment 29. The operation of relay 16 puts ground on the stepping magnet 14 through its self-interrupting contacts 25, causing the selector switch to be stepped around to normal. This circuit was traced from battery through the winding and self-interrupting contacts of stepping magnet 14,

through the front contact and armature of relay 16 to ground 21 at arc A. When the selector switch is restored to normal, the ground is removed from the winding of relay 16, causing it to release.

The operation of relay 16, in addition to causing the selector switch to be stepped around to normal, also causes the release of relays 13 and 17 by disconnecting ground 21 from the windings of these relays at the back contact of relay 16. The release of relay 13 in turn disconnects the source of power 12 from the printer motor 11, causing it to cease running.

At the station from which the stop signal is sent, the operation of the stop key 7 connects an additional resistance 9 in series with the high resistance 8 so that the condenser 10 at this station is charged at a slower rate than the condensers at the other stations. If the local set stops when the key is released, showing that the local condenser was charged sufficiently to operate relay 16, this will insure that the condensers 10 at the other stations will also have been sufficiently charged to operate their respective relays 16. This feature serves as an operating precaution to insure that the key 7 will be operated long enough to stop the motors at all stations.

One inherent disadvantage of the circuit arrangement of Fig. 2 lies in the fact that it is not possible to be connected to several stations at one time by dialing their code calls in succession. This is due to the fact that the selectors at all stations are disconnected from the line after the first series of calling impulses in order that further impulses will not step the selector at the called station ahead and thus stop the motors at that station. However, the printer set motors of any one of eight distant stations or the motors at all eight stations may be started and stopped from one station by means of this arrangement. If it were desired to call a certain group of stations from time to time, this could be accomplished by connecting relay 13 at such stations to a common terminal of arc C on the selector switch, in addition to the connections mentioned above for this relay. By dialing this common terminal, the motors would be started at the desired group of stations. This procedure would, of course, cut down the maximum number of stations that could be individually called.

Referring now to Fig. 3, the circuit arrangement of this drawing is somewhat similar to that of Fig. 2 described above, with the difference, however, that the circuit of Fig. 3 will accommodate a maximum of seventeen stations instead of eight, as was the case with the circuit of Fig. 2. With the selector circuit of Fig. 3, any one of eight stations may be called up by dialing a single digit, in which case the circuit would operate in exactly the same manner as the circuit

of Fig. 2. Also, as regards the circuit operation for false signal pulses and the starting and stopping of the printer set motors, the circuit operation is the same as for Fig. 2.

If it is desired to call one of the first eight stations, the dial 4 is operated once to dial the proper station and the selector switch is stepped around to the proper station after the manner described in connection with Fig. 2. If, on the other hand, it is desired to call a station connected to one of the nine terminals 12 to 20, inclusive, the dial must be operated twice. In this case the first digit of the code to be dialed is zero. This steps the selector switch ahead 10 steps to terminal 11 and after a short time the slow release relay 15 releases. When the line relay 1 moves against its spacing contact in response to the first impulse at the second digit dial, a circuit will be closed from battery through the winding of the stepping magnet 14, winding of the slow release relay 15, brush arm 24, and eleventh terminal of arc B of the selector switch to ground through the spacing contact and armature of relay 1. Relay 15, upon re-operating, short-circuits its connection through the contacts of arc B of the switch by means of its right front contact and armature. Relay 15 thus remains operated while the selector switch is stepped around in accordance with the code dialed to the predetermined one of terminals 12 to 20, inclusive. When the armature of relay 1 moves against its marking contact at the end of the dial pulses for the second digit, relay 15 will release and the brush arms of the selector switch will remain connected to the terminals corresponding to the station dialed. The line relay 1 will thereafter follow the printer signals, but relay 15 cannot re-operate in response thereto since the operating circuit therefor will be open at the terminals of arc B of the selector switch.

Assume that in the circuit arrangement of Fig. 3 the code dialed corresponds to terminal 16 of the selector switch, and that lead 26 is connected to this terminal as shown. When the brush arms of the selector switch come to rest on terminal 16 at the called station, a circuit will be closed from battery 19 through relay 13 over lead 26 to terminal 16 and through the brush arms 24 of arc C of the selector switch, through the left outer back armature and back contact of relay 15, left back contact and armature of relay 16, to ground through the contact segment and brush arms 24 of arc A of the selector switch. The consequent operation of relay 13 connects the source of power 12 to the printer motor 11 at the called station and thus starts the motor operating. The circuit comprising alarm 50, relay 51 and key 52 is an alarm circuit, the operation of which will be explained below.

The printer motors at the calling station

will not be connected for operation until the dial contacts return to normal at the end of the second digit dialed in the case of a two digit call. As soon as the first digit is dialed, relay 17 will operate over the circuit from battery 19 through the off-normal contacts 6 of the dial 4, through the winding of relay 17, left back contact and armature of relay 16, to ground through segment 31 and brush arms 24 of arc A. The operation of relay 17 connects the ground at arc A to the winding of relay 13 through the left front contact and armature of relay 17, but relay 13 does not operate while the dial is off-normal, due to the fact that its winding is short-circuited by the path from battery 19 through the off-normal contact 6 to the front contact of relay 17.

The selector switch will be stepped around to terminal 11 in response to the first digit dialed, which is zero. As the selector brushes in thus rotating pass off of terminal 10 onto terminal 11, the ground 21 will be disconnected from the winding of relay 17 causing its release. With the brush arms on terminal 10, ground 21 is connected through the brush arm and segment 31 of arc A and through the left armature and back contact of relay 16 to the winding of relay 17. With the brush arms on terminal 11, however, the ground 21 is connected through the brush arm and terminal 11 of arc A through the armature and back contact of relay 17, the left armature and back contact of relay 16 to the winding of relay 17. As the brush arms pass onto terminal 11, however, relay 17 is operated so that the latter circuit traced is open at the contact of relay 17. Relay 17 will thus release, and once released, it cannot re-operate at this time even through the ground 21 is now connected to its winding owing to the disconnection of battery 19 therefrom, the dial 4 being now in its normal position.

With relay 17, released, the ground at 21 will be connected through the right back contact of relay 17 to lead 33. This is necessary since it may be desirable to send a stop signal with the brushes on terminal 11, in which case a ground would be required on a lead 33 to operate the stepping magnet 14, as will be explained below.

Returning now to the dialing operations, the first pulse of the second digit re-operates relays 15 and 14 by means of the ground supplied through the armature and spacing contact of relay 1, terminal 11 and brush arm of arc B to the winding of relay 15. The brush arms are thus rotated in accordance with the code dialed.

When the brush arm of arc A passes onto segment 32, relay 17 will re-operate from battery 19 through the off-normal contact 6 to ground 21. When the dial returns to normal, relay 13 will operate from battery 19 through the winding of relay 13, left front

contact and winding of relay 17 to ground 21. Relay 17, of course, remains operated over this circuit. The operation of relay 13 starts the printer motor 11 at the calling station. The brush arms will remain connected to the terminal of the station dialed due to the fact that the operating circuit of stepping magnet 14 and relay 15 in series is open at segments 34 and 35 of arc B. The operation of relay 1 in response to printer signals will thus have no further effect on the selector switch operation.

In order to stop the printer set motors at stations where they are running, the stop key 7 at any station is operated for several seconds to charge completely condenser 10. The subsequent discharge of condenser 10 consequent upon restoration of the stop key 7 will operate relay 16 as explained. Relay 16, upon operating, will lock up through its left front contact and armature to ground 21 through segment 31 or 32 of arc A dependent upon whether or not the brush arms are connected to the terminal of a one or two digit station. Relay 16, upon operating, disconnects at its left back contact the ground 21 from the windings of relays 13 and 17, thus causing the release of these relays. The release of relay 13 in turn stops the printer motor by disconnecting the source of power therefrom.

Relay 16, upon operating, also connects ground 21 through its right front contact to the self-interrupting contacts 25 of the stepping magnet. If the selector switch is connected to a two digit terminal, this ground will be obtained through segment 32 of arc A. The selector switch will thus be rotated to its normal position in which position stepping magnet 14 and relay 16 will release, restoring the circuit to normal. If the selector switch is initially connected to a one digit terminal, ground for the stepping magnet is obtained through segment 31 of arc A. The selector switch is thus rotated to terminal 11. With the brush arms connected to terminal 11, ground 21, to maintain relays 14 and 16 operative, is supplied through the brush arm and terminal 11 of arc A, through the right armature and back contact of relay 17, now released, to lead 33 connected to the windings of stepping magnet 14 and relay 16 through operated contacts of relay 16. The selector switch is thus rotated to terminal 12 by means of the self-interrupting contact 21. With the selector switch on terminal 12, ground 21 is furnished to stepping magnet 14 and relay 16 through segment 32 of arc A. The selector switch is thus rotated to its normal position when stepping magnet 14 and relay 16 release, restoring the selector circuit to normal.

If it is desired to start the motors running at all of the stations, the code 00 is dialed, which will cause the selector switch at each station to be rotated to terminal 21. When relay 15 releases after the pulsing, a circuit

will be traced from battery 19 through the winding of relay 13, over lead 27, through terminal 21 and brush of arc C, through the left back contacts of relays 15 and 16 to ground 21, through arc A. This operation of relay 13 will start the printer motor running at each station, so that any station may thereafter transmit to all of the other stations.

The circuit arrangement of Fig. 4 is similar in mode of operation to the circuits of Figs. 2 and 3, with the necessary modifications to enable the circuit to accommodate a maximum of eighty stations. In this arrangement, each of the stations is called by dialing a two digit code except in the case of a common call for all the stations, which consists of but one digit. When the line is idle, an idle signal is lighted at all stations as an indication that a call may be placed. If the line goes open while it is in the idle condition, the line relay 1 moves to its spacing contact and the busy lamp 38 lights continuously over the circuit from battery 19 through lamp 38 to ground through the spacing contact and armature of relay 1. This is an indication of an open line as the busy lamp flickers when the line is opened and closed rapidly in ordinary operation during the transmission of printer signals. In the open condition a circuit is established from ground at relay 1 through the armature and spacing contact of relay 1, through the brush arm and segment 34 of arc B, through the winding of the slow release relay 15, right outer back contact of relay 35, through the winding of the stepping magnet 14 to battery 19. The slow release relay 15 operates, short-circuiting through its left inner armature and front contact its operating circuit through arc B of the selector switch. The circuit remains in this condition as long as the line is open, with both the idle and busy signals lighted. The idle signal 36, of course, is lighted on the circuit from battery 19 through lamp 36, terminal 1 and brush arm 24 of arc A to ground 21.

If the open circuit is momentary, such as might be caused by lightning surge impinging on the line, the line relay 1 will move back to its marking contact after a short interval, at which time the busy signal 38 will be extinguished, and the selector switch will be stepped ahead one step, extinguishing the idle signal 36 by disconnecting ground therefrom. After a brief interval relay 15 releases and a circuit is established from ground through the right armature and back contact of relay 37, the right armature and back contact of relay 15, brush arm and terminal 2 of arc C through the right winding of relay 16 to battery 19. Relay 16 thereupon operates and locks to ground through its right armature and front contacts and through terminal 2 and brush arm of arc A to ground 21. The

operation of relay 16 furnishes ground to operate relay 37. The circuit is traced from battery 19 through the winding of relay 37, left outer armature and back contact of relay 15, right front contacts of relay 16 to ground through terminal 2 and brush arm of arc A. The operation of relay 37 connects ground 21 at arc A to the self-interrupting contacts of the stepping magnet 14, which thus causes the selector switch to be stepped around to its normal position. The circuit in this case is traced from battery 19 through the winding of relay 14, self-interrupting contacts 25, left armature and front contact of relay 37, through the right front contacts of relay 16 to ground 21 through the terminal and brush arms of arc A. It will be seen from the circuit connections that ground 21 is thus connected to the self-interrupting contacts of the stepping magnet for every position of the selector switch until it is restored to normal.

If the open circuit on the line is of longer duration, say for several seconds, condenser 10 will be charged completely over the circuit from battery 19 through resistance 8, non-operated contacts of stop key 7, through the condenser to ground, due to the removal of the shunt path to ground through the marking contact and armature of line relay 1. When the line is closed again, condenser 10 will discharge through the left winding of relay 16 and resistance 30 in parallel to ground through the marking contact and armature of relay 1. This discharge causes the operation of relay 16 which immediately locks to ground through the right armature and front contacts and through terminal 2 and the brush arms of arc A. As soon as this occurs, relay 37 operates, preparing the circuit to step the selector switch around to its normal position, as described above.

When it is desired to call a station, the condition of the busy and idle lamps is observed. If the line is idle, the idle lamp 36 is lighted and the busy lamp 38 is extinguished, the former due to the fact that ground 21 is connected to lamp 36 through terminal 1 of arc A, the latter due to the fact that the ground at relay 1 is disconnected from its spacing contact. If the line is busy, the idle lamp is extinguished and the busy lamp is flickering if signals are being transmitted at that instant, due to the intermittent ground connected to lamp 31 through the spacing contact and armature of relay 1. If signals are not being transmitted, the busy lamp will also be extinguished. If both lamps remain extinguished for a time it indicates that the motors of some sets are running but that the sets are not in use. The motors of these sets may be stopped by operation of the stop key. After the motors are stopped and the selector switches all returned to normal, the idle lamp 36 will be lighted and the code combination of

the desired station may be sent by means of the dial.

When the first series of pulses of the code combination is sent over the line, the line relays at all stations respond. The first pulse of the code dialed establishes a circuit from ground to the armature and spacing contact of relay 1, through the brush and segment 34 of arc B, through the winding of relay 15, back contact of relay 35, and through the winding of the stepping magnet 14 to battery. Relay 15 operates, short-circuiting through its left inner armature and front contact the operating circuit therefor through the brush arm and segment 34 of arc B. The stepping magnet 14 is operated in accordance with the pulse dialed, causing the selector switch to be stepped ahead to the dialed terminal. As soon as the brush arms pass off terminal 1, the idle lamp 36 is extinguished. No operating circuit for relay 16 is established in this case as the brush arm of arc C passes over terminal 2, due to the fact that the slow release relay 15 holds up between pulses and thus prevents the ground at the right armature of relay 37 from being connected to the right winding of relay 16.

After all the pulses of the first digit have been received, the armature of relay 1 comes to rest against its marking contact and thus opens the circuit of relay 15 which releases. With the connection as shown in Fig. 4, if "5" is dialed, the brush arms of the selector switch will come to rest on terminal 6, thus setting up a circuit through arc C to operate relay 34. The circuit is traced from ground on the armature of relay 37 through the armature and back contact of that relay, armature and back contact of relay 15, brush arm and terminal 6 of arc C through the winding of relay 34 to battery 19. Relay 34 operates over this circuit and immediately locks up through its left front contact and armature to ground at the left back contact of relay 16. It should be noted that the terminal to which lead "a" is connected at each station determines the first or tens digit of the code call for that station.

A circuit is also completed at this time to operate relay 37. This circuit is traced from battery 19 through the winding of relay 37, left outer armature and back contact of relay 15, segment 31 and brush arms of arc A to ground 21. Relay 37 is slow to operate so that it will not open the operating circuit for relay 34, traced above, until the latter relay has operated and locked itself up as described. The operation of relay 37 completes a circuit through the self-interrupting contacts of the stepping magnet 14 to step the selector switch brush arms around to terminal 12. This operating circuit is traced from battery 19 through the winding of stepping magnet 14, self-interrupting contacts 25, left outer armature and front contact of relay 37, through

segment 31 and brush arms of arc A to ground 21. As will be seen from an inspection of arc A, this ground is maintained connected to the self-interrupting contacts at the stepping magnet until the selector switch brush arms pass on to terminal 12, at which time the ground 21 is removed from segment 31 which stops the operation of the stepping magnet 14 and also causes the release of relay 37.

The brush arms of arc C, in stepping around in response to the pulses of the first digit dialed, may have passed over the terminal to which lead "a" is connected at some stations, but relay 34 at such stations will not operate due to the fact that relay 15 thereat would be operated at the time and would thus maintain open the operating circuit for relay 34 at such stations. The brush arms at stations other than the dialed may also have passed over the terminal to which lead "a" is connected while being stepped ahead to terminal 12 by the self-interrupting contacts of the stepping magnet 14 in the manner just described, but relay 34 at such stations will not operate as its operating circuit is maintained open at the contacts of the corresponding relay 37 which is operated at the time. Hence, relay 34 will be operated only at those stations where the "C" brush stopped on the terminal to which lead "a" was connected, i. e., with the circuit arrangement of Fig. 4 at those stations having "5" for the first or tens digit of their code calls.

When the second series of pulses of the code combination corresponding to the units digit is sent over the line, relay 15 re-operates over the circuit traced above from ground through the armature and spacing contact of relay 1, arc B of the selector switch, winding of relay 15 and through the winding of the stepping magnet 14 to battery 19. Relay 15 operates, shunting out the "B" brush and arc of the selector switch, and the selector switch is stepped ahead in accordance with the incoming pulses. At the station called, the selector switch stops on the terminal to which the "b" lead is connected. The "b" lead may also be connected to the corresponding terminal at some other stations, but in such cases relay 34 will not have been operated by the first series of pulses, so that a further selecting circuit will not be completed through the medium of the "b" lead at such stations. At the called station, however, a circuit will be established after relay 15 releases, from ground through the right armature and back contact of relay 37, right armature and back contact of relay 15, brush arm and terminal of arc C over lead "b", through the right front contact and armature of relay 34, and winding of relay 13 to battery 19. Relay 13 operates over this circuit and connects the source of power 12 to the printer set motor

11 at the called station, thus setting the motor thereat in operation. The selector switch brush arms at all stations will remain on the terminal to which the "b" lead at the called station is connected, until a stop signal is sent to restore them to normal, as the operating circuit for the stepping magnet 14 and for the slow release relay 15 is now open at arc B of the selector switch, the brushes of which now rest on segment 35. Thus, subsequent operations of the armature of relay 1 against the spacing contact due to the printer signals will not operate the stepping magnet, the only result of such relay operation thereafter being to cause a flickering of the busy lamp 38 due to the intermittent ground connected thereto. Furthermore, relay 37 will not operate at this time to connect ground to the self-interrupting contacts of the stepping magnet 14, due to the fact that the winding of relay 37 is connected only to segment 31 of arc A and not to segment 32 upon which the brushes of that arc now rest.

Whenever a station is called, the motors of the set at the calling station are also started. The brush arms of the selector switch at the calling station will be stepped ahead to the terminal corresponding to the first digit of the code dialed and will thereafter be stepped ahead by the self-interrupting contacts of the stepping magnet to terminal 12 in the manner described above for the called station. When the second digit is sent, the closing of the off-normal contacts 6 of dial 4 at the called station, before the pulses are sent, completes a circuit to operate relay 35 at the calling station. This circuit is traced from battery 19, through the winding of relay 35, through the upper or off-normal contacts 6, through terminal 12 and the brush arm of arc C, right back contact and armature of relay 15 and the right back contact and armature of relay 37 to ground. Relay 35 operates and immediately locks up through its right inner front contact and armature to ground at the left back contact of relay 16. The transmission of the pulses corresponding to the second digit dialed will not operate the slow release relay 15 or the stepping magnet 14 at the calling station in this case, due to the fact that the operating circuit therefor will be opened at the right outer armature and back contact of relay 35 which is now operated as described above. As a consequence of this fact, the stepping magnet at the calling station will not be operated in accordance with the pulses transmitted.

After the pulses corresponding to the second digit dialed are sent out, the lower or back contacts of the off-normal contacts 6 close and complete a circuit from battery 19 through the winding of control relay 13, through the left armature and front contact of relay 35, the lower contacts of the off-normal contacts 6, the right inner front contact

and armature of relay 35 to ground on the left back contact of relay 16. Relay 13 at the calling station operates over this circuit and connects the source of power 12 to the printer motor 11, starting the motor in operation. The printer motor at the calling station is not started in this manner, however, until all the pulses corresponding to the second digit have been transmitted, due to the fact that the lower contacts 6 of dial 4 do not close until the dial has returned to normal. This avoids the recording of false characters on the printer at the calling station as would be the case if the motor started before these dial pulses had been transmitted.

The circuit of Fig. 4 contains provision whereby any station may simultaneously start the printer set motors at all the stations in operation, so that any station may thereafter simultaneously transmit messages to all of the other stations. When it is desired to start the motors at all of the stations in the circuit, the common called code combination, which is of one digit, preferably "zero", is transmitted. The dialing of the digit zero will step the brush arms of the selector switches at all stations around to terminal 11 in the manner described above. It will be noted that the "c" lead from the winding of relay 35 is connected to terminal 11 of arc C at all stations. Thus, when the brush arms come to rest on step 11 as a result of the dialing of the zero digit, the circuit will be completed to operate relay 35. This circuit being traced from battery 19 through the winding of relay 35 over lead "c" through terminal 11 and the brush arms of arc C, right back contacts of relay 15 upon the release thereof, and right back contacts of relay 37 to ground. The operation of relay 35 completes the above described circuit to operate relay 13 and thus start the printer set motors at all the stations. This operating circuit for relay 13 is, of course, traced from battery 19 through the winding of relay 13, the left operated contacts of relay 35, lower or non-operated contacts 6 of dial 4, right operated contacts of relay 35 to ground at the back contact of relay 16. The operation of relay 13 in this manner at each branch station connects the source of power 12 to the printer motor 11 thereat and thus starts the motor operating.

The release of relay 15, after the pulses corresponding to the zero digit dialed are received, will complete the above described circuit to operate relay 37 through segment 31 of arc A of the selector switch. The selector switch will thus be stepped ahead through the self-interrupting contacts of the stepping magnet 14 to terminal 12 in the manner described above. Subsequent to this, however, the further operation of the line relay 1 in response to printer signals will not operate the selector switches thereafter,

due to the fact that the operating circuit for relay 15 will be open at the right outer contacts of relay 35 which has now operated.

When it is desired to stop the motors of any sets which may be running, the stop key 7 at any station may be operated for several seconds. The stop circuit operates exactly as described above in connection with Figs. 2 and 3, i. e., the accumulated charge on condenser 10 in discharging operates relay 16. As soon as relay 16 operates, it locks up through its right armature and front contacts to ground 21 through segment 32 and the brush arms of arc A. The operation of relay 16 in turn completes a circuit to operate relay 37 traced from battery 19, through the winding of relay 37, back contacts of relay 15, front contacts of relay 16 to ground 21 through segment 32 and the brush arms of arc A. The operation of relay 37 in turn completes a circuit through the self-interrupting contacts of the stepping magnet to step the selector switch around to normal. The latter circuit is traced from battery 19 through the winding of stepping magnet 14, self-interrupting contacts 25, left front contacts of relay 37, right front contacts of relay 16 to ground 21 through segment 32 and the brush arms of arc A. It will be noted that the three circuits traced are maintained until the selector switch brush arms are returned to normal, at which time the ground 21 is removed from the circuits causing the release of relays 16 and 37 and magnet 14. In this way, the selector switch circuit at each station is restored to normal. It will be noted that upon the operation of relay 16 in response to a stop signal, ground will be connected to the right front contacts of the relay for every position of the selector switch brush arms from terminals 2 to 22, inclusive, so that regardless of the initial position of the brush arms, the selector switch will be stepped around to normal upon the operation of relay 37 consequent upon the operation and locking up of relay 16. The operation of relay 16 releases relay 35 if the latter is operated at the time, and the release of the latter relay in turn releases relay 13 to stop the printer motor.

It will be noted in connection with all of the circuit arrangements thus far described that it is not possible to dial an arbitrary group of stations. Certain preselected groups may, however, be dialed by wiring the corresponding relay 13 to common selector switch terminals as mentioned above. Fig. 5, now to be described, on the other hand, discloses a selective circuit arrangement whereby the calling station may be connected with any desired group of stations merely by dialing in succession the codes corresponding to the desired stations. The No. 2 digit in the circuit arrangement of Fig. 5 is reserved as a start signal for starting the printer set motors

at the stations dialed. Each station has a two digit code signal for calling, the first digit in all cases being "3" or higher. Any number of stations may be selected by sending their two digit codes in succession, but the motors at these stations will not start until extra digit "2" is transmitted, at which time the motors at all selected stations will start as well as that at the calling station.

The circuit of Fig. 5 is similar to that of Fig. 4 as regards its operation in case of an open line or a false signal pulse, and as regards the method of stopping the printer set motors and restoring the selector switches to their normal position by sending in a long open pulse upon operation of the stop key 7. The method of operating relay 13 to start the printer set motors is somewhat different, however.

When the first digit of a code combination is transmitted over the line, the line relays 1 at all stations will respond and operate the corresponding slow release relay 15 and the stepping magnet 14, as in the circuits previously described. The stepping magnet 14 will step the brushes ahead until all the pulses of the first digit have been received, after which relay 15 will release due to the restoration of the armature of relay 1 against its marking contact. Assuming that at the called station the lead "a" is connected to the sixth terminal of arc C and that "5" is dialed, a circuit will be completed to operate relay 40. This circuit is traced from battery 41 through the right winding of relay 40, terminal 6 and brush arm of arc C, right back contacts of relay 15 and right back contacts of relay 37 to ground. Relay 40, upon operating, immediately locks up from battery 41 through the left armature and front contact and left winding of relay 40 to ground. A circuit is also completed upon the release of relay 15 to operate relay 37, this latter circuit being traced from battery 42 through the winding of relay 37, left back contacts of relay 15, segment 43 and brush arms of arc A to ground 21. Relay 37, being slow to operate, of course, does not operate over this circuit until relay 40 has had time to operate and lock up. The operation of relay 37 completes a circuit through the self-interrupting contacts of the stepping magnet to step the selector switch around to terminal 12. This circuit is traced from battery 44 through the winding of stepping magnet 14, self-interrupting contacts 25, left armature and front contact of relay 37, segment 43 and brush arms of arc A to ground 21. This circuit is maintained until the selector switch brush arms pass on to terminal 12, at which time the circuit is opened to release stepping magnet 14 and relay 37. As several stations may have the same tens digit in their code calls, relay 40 at several stations may operate at this time, but at such stations the second or

units digit of the code called, which is determined by the connection of lead "b" on the drawing, will, of course, be different so that the operation of relay 40 at such stations will not prepare a circuit for the subsequent operation of other selective mechanism, except at the station called.

Assuming that the second digit dialed is "4" and that the lead "b" is connected to the fourth terminal of the second quadrant of arc C, as shown in Fig. 5, a circuit will be completed to operate relay 17 when the selector switch comes to rest after the second digit is dialed. The operation of the slow release relay 15 and the stepping magnet 14 is, of course, the same for the dialing of the second digit as that for the dialing of the first digit. When the selector switch comes to rest after dialing the second digit, the operating circuit for relay 17 will be traced from battery 47 through the winding of relay 17, right armature and front contact of relay 40, over lead "b", through the terminal and brush arm of arc C, right back contacts of relays 15 and 37, respectively, to ground. Relay 17, upon operating, immediately locks up through its left front contact and armature to ground at the left back contacts of relay 16. Relay 17, upon operating and locking up in this manner, is, of course, not affected thereafter by the operation of the selector switch as a result of the subsequent dialing of other stations.

As soon as the selector switch has come to rest at the end of the second digit dialed, the circuit is also completed through arc A to re-operate relay 37. Relay 37, however, being slow operating, does not operate until relay 17 has operated and locked up over the circuit described. The operating circuit for relay 37 in the present case is traced from battery 42 through the winding of the relay, segment 45 and brush arms of arc A to ground 21. The operation of relay 37 completes the circuit described above to operate the stepping magnet 14 through its self-interrupting contacts 25 to ground through segment 45 and brush arms of arc A. The selector switch is thus stepped around to its normal position, in which position the ground 21 is removed from segment 45, thus releasing stepping magnet 14 and relay 37. When the selector switch is thus restored to normal, the left or holding winding of relay 40 is short-circuited and the relay releases. This short-circuiting path is traced from the left front contact of the relay 40 through terminal 1 and brush arm of arc C to ground through the right contacts of relays 15 and 37, respectively. It is evident from the circuit operation described above that any number of two digit codes may be transmitted in succession, each such code energizing relay 17 at one particular station.

After all the desired stations have been selected in the manner described, digit "2" is

dialed. This advances the selector switches at all stations to terminal 3, and when the slow release relay 15 releases after this final digit, a circuit is completed through arc C of the stations dialed to operate relay 13 thereat. This circuit is traced from battery 46 through the winding of relay 13, right armature and front contact of relays 17, terminal 3 and the brush arm of arc C to ground through the right back contacts of relays 15 and 37, respectively. The operation of relay 13 connects the source of power 12 to the printer motor 11 and thus starts the printer motor at the station in question. It will be noted that relay 13 will operate only at the stations which have been dialed, since only at these stations will relay 17 be operated.

As the third terminal of arc B is open, the subsequent operation of the line relay 1 in response to printer signals will not operate relays 15 and 14 to cause further operation of the selector switch. The selector switches will thus remain on terminal 3 until the call is complete and the stop signal transmitted. Furthermore, relay 37 does not operate at this time to connect the stepping magnet to ground through its self-interrupting contacts, since the winding of relay 37 is not connected to terminal 3 of arc A.

At the end of the call, the selector switches may be restored to normal by operating the stop key 7 at any station for several seconds. The operation of the stop key 7 will, of course, charge condenser 10 which in turn, on discharging, upon restoration of the key, will operate relay 16. Relay 16, when operating, immediately locks to ground through its right winding and right front contacts and through the terminals and brush arms of arc A to ground 21 regardless of the position at that time of the brush arms of arc A. As soon as relay 16 operates, the circuit will be complete to operate relay 37. This circuit is traced from battery 42 through the winding of relay 37, left back contacts of relay 15, right front contacts of relay 16 to ground 21 through arc A. Relay 16, upon operating, releases relay 17 in turn releasing relay 13 and completes the circuit through the self-interrupting contacts of the stepping magnet 14 through the left armature and front contact of relay 37 as explained above, to ground 21 through arc A regardless of the position of the brush arms. The selector switch is thus stepped around to its normal position, in which position relays 16 and 37 release.

The off-normal contacts 6 of dial 4 at the calling station are so connected as to energize the selecting relay 17 on the first operation of the dial due to the ground obtained through contacts 6 in the off-normal position. Relay 17 at the calling station, upon operating, locks to ground through its left front contact and armature at relay 16. The printer motors at the calling station, as at the

called stations, are not started in operation, however, until the digit "2" is dialed, since the operating circuit for relay 13 is not completed until the selector switch brush arms come to rest on terminal 3.

Relay 17 may also be multiplied to a particular terminal such as the highest or zero terminal of the second quadrant of the "C" arc, as indicated by lead "c". By dialing a number such as "302", the second digit of which is zero, the selecting relays 17 at all stations, and subsequently the control relays 13, will be operated simultaneously and the motors at all stations thus started. Dialing the number "3", of course, steps the brush arms around to terminal 4, after which they are stepped around automatically to terminal 12 as described. Dialing the digit zero thereafter steps the brush arms around to terminal 22 to which lead "c" is connected, thus operating all the relays 17. When "2" is now subsequently dialed, the brush arms will come to rest on the terminal 3 as described above, thus completing the circuit to operate the relay 13 at each station.

The description of the alarm circuit comprising elements 50, 51 and 52 of Fig. 3 has been reserved until now since this alarm circuit may be used equally well in conjunction with any of the circuit arrangements shown in Figs. 2 to 5, inclusive. The alarm circuit is shown in connection with Fig. 3 merely as a matter of convenience.

Referring to Fig. 3, when relay 13 operates after selection of a station in the manner described above, source of power 12 is connected to printer motor 11 to start the same. In addition to starting the motor, relay 13, upon operating, connects battery 12 to the alarm 50 to operate the same. The circuit is traced from battery 12 through alarm 50, back contact and armature of relay 51, front contact and armature of relay 13 and back to the battery. The operator, upon being attracted by operation of the alarm 50, operates the non-locking key 52 momentarily to complete an operating circuit for relay 51. The circuit is traced from battery 12, through the winding of relay 51, operated contacts of key 52, and through the operated contacts of relay 13 back to battery. As soon as relay 51 operates it completes a locking circuit for itself through its front contact and armature, so that it remains operated upon the subsequent release of key 52. The operation of relay 51 opens at its back contacts, the operating circuit of alarm 50, which is thus silenced. The circuit remains in this condition until relay 13 is released upon transmission of a stop signal as explained above. The release of relay 13 disconnects battery 12 from the winding of relay 51, which releases thus restoring the circuit to its initial condition. The use of the alarm circuit is, of course, optional. Furthermore, any suitable

alarm circuit may be used where desired. That shown in Fig. 3 is merely by way of illustration.

What is claimed is:

1. In a telegraph system in combination, a signal transmission circuit, a plurality of stations associated therewith, means at one or more stations for transmitting pulses to other stations, selective means at such other stations responsive to said pulses whereby one or more such stations may be called, means for rendering said selective means unresponsive to telegraph signals, means individual to any or all stations whereby any such station may restore the selective means at the plurality of stations.

2. In a telegraph system in combination, a signal transmission circuit, a plurality of stations associated therewith, means individual to one or more stations for transmitting pulses over said circuit to other stations, selective means individual to such other stations responsive to said pulses whereby one or more such stations may be called, means for rendering said selective means unresponsive to telegraph signals transmitted over said circuit, means individual to any or all stations whereby any such station may restore the selective means at the plurality of stations.

3. In a telegraph system in combination, a signal transmission circuit, a plurality of stations associated therewith, means at each station for transmitting pulses to all stations, selective means at each station responsive to said pulses whereby one or more stations may be called, means for rendering said selective means unresponsive to telegraph signals, means at each station whereby any station may restore to normal the selective means at all stations.

4. In a telegraph system in combination, a signal transmission circuit, a plurality of stations associated therewith each equipped with a printing telegraph set, means at one or more stations for transmitting pulses to other stations, selective means at such other stations responsive to said pulses whereby one or more such stations may be called and the printer set motors started thereat subsequent to said pulsing, means for rendering said selective means unresponsive to telegraph signals after the desired stations are called, means individual to any or all stations whereby any station may restore to normal the selective means at all stations.

5. In a telegraph system in combination, a signal transmission circuit, a plurality of stations associated therewith, means at one or more stations for transmitting pulses over said circuit, line relays individual to a plurality of stations responsive to said pulses, selective means at said stations under control of said line relays during pulsing whereby one or more stations may be called, means

for rendering said selective means unresponsive to said line relays thereafter, means individual to one or more stations whereby any such station may restore to normal said selective means at the plurality of stations.

5 6. In a telegraph system in combination, a signal transmission circuit, a plurality of stations associated therewith, a printing telegraph set at each station, means at one or more stations for transmitting pulses over
10 said circuit, line relays individual to said stations responsive to said pulses, selective means thereat controlled by said line relays during pulsing whereby one or more stations may be called and the printer set motors
15 started thereat, means for rendering said selective means unresponsive to the line relays thereafter, means individual to one or more stations whereby any such station may restore to normal the selective means at all
20 of said stations.

7. In a telegraph system in combination, a signal transmission circuit, a plurality of
25 stations associated therewith, means at one or more stations for transmitting pulses over said transmission circuit, line relays individual to said stations responsive to said pulses, selective means and a slow release relay at each station, said slow release relays operating to place the selective means under control of the line relays during pulsing whereby one or more stations may be called and releasing thereafter to prevent further operation of said selective means in response to
30 line signals, means whereby any of a plurality of stations may restore said selective means at all stations.

8. In a telegraph system in combination, a signal transmission circuit, a plurality of
40 stations associated therewith, means at one or more stations for transmitting pulses over said circuit, line relays individual to said stations responsive to said pulses, selective means and slow release relays individual to
45 said stations, said slow release relays operatively associating said line relays and selective means during pulsing whereby one or more stations may be called, said slow release relays releasing thereafter to prevent further operation of said selective means in response to line signals, means whereby any of a plurality of stations may restore said selective means at all stations, means for preventing selection of an undesired station while said
50 selective means are being actively advanced or restored.

9. In a telegraph system in combination, a signal transmission circuit, a plurality of stations associated therewith, means at one or
60 more stations for sending pulses over said circuit, selective means individual to said stations and responsive to said pulses whereby one or more stations may be called, signal storing means so associated with each said
65 selective means as to require a different pulse

code to select each station, means whereby all stations may be selected simultaneously in response to a single code, means to simultaneously operate translating means at all the selected stations in response to a final code,
70 means for rendering said selective means unresponsive to telegraph signals thereafter, means whereby any station may restore the selective means at all stations, supervisory means associated with each selective means
75 to indicate the operated condition thereof, means whereby a false initial pulse is ineffective as to said selecting means.

10. In a telegraph system in combination, a signal transmission circuit, a plurality of
80 stations associated therewith each equipped with a printing telegraph set, means at one or more stations for sending pulses over said circuit, selective means at each station responsive to said pulses whereby one or more
85 stations may be called, signal storing means so associated with each said selective means as to require a different pulse code to select each station, means whereby all stations may be selected simultaneously in response to a
90 single code, means responsive to a final code to call all of the selected stations and start the printer set motors thereat, means to render said selective means unresponsive to telegraph signals thereafter, means whereby any
95 station may restore the selective means and stop the printer set motors at all stations, supervisory means associated with each selective means to indicate the operated condition thereof, means whereby a false initial pulse
100 is ineffective as to said selective means, and means whereby said pulsing means starts the printer motors at the calling station subsequent to said pulsing.

11. In a telegraph system in combination,
105 a signal transmission circuit, a plurality of stations associated therewith, a printing telegraph set at each station, means at one or more stations for sending pulses over said circuit, selective means at each station responsive
110 to said pulses whereby one or more stations may be called, means operable at each station thus selected to start the printer set motors thereat and to signal the operator, a non-locking key and a locking relay controlled thereby for extinguishing said signal,
115 means whereby any station may restore the selective means at all stations to stop the printer set motors and release said locking relay thereat.

12. In a telegraph system in combination, a signal transmission circuit, a plurality of
120 stations associated therewith, means at one or more stations for sending pulses over said circuit, selective means at each station responsive to said pulses whereby one or more stations may be called, means at one or more stations for sending a sustained pulse over
125 said circuit, slow acting means at each station responsive to said sustained pulse for re- 130

storing said selective means thereat, means to insure transmission of said sustained pulse sufficiently long to operate each said slow acting means.

13. In a telegraph system in combination, a transmission circuit, a plurality of stations associated therewith, means at one or more stations for sending pulses over said circuit, selecting means at each station comprising, 5 a selector switch, selecting relays associated with a plurality of terminals thereof, a different combination of terminals for each station, means responsive to said pulses for advancing said selector switch brush arms to a 10 desired combination of terminals in succession whereby a given station is permanently selected, means thereafter for automatically restoring said brush arms whereby in response to other pulses, a second or any number of other stations may be similarly selected 15 in succession, said brush arms being thereafter advanced in response to a final code to a certain terminal of said selector switches whereby translating means are operated at 20 all the selected stations, additional means associated with a certain other terminal of said selector switches, whereby responsive to a single code, all stations may be selected simultaneously, means for rendering said selecting means unresponsive to telegraph signals after operation of said translating 25 means, means whereby any station may restore the selective means at all stations.

14. In a telegraph system in combination, 35 a signal transmission circuit, a plurality of stations associated therewith, means at one or more stations for sending pulses over said circuit, selecting means at each station comprising a line relay responsive to said pulses, 40 a selector switch, selecting relays associated with a plurality of terminals of said switch, a different combination of terminals for each station, a slow release relay operatively associating during pulsing only, said line relay 45 with said selector switch for advancing the brush arms thereof to desired terminals in sequence whereby a desired station is permanently selected, a slow operate relay activated thereafter to automatically restore 50 said brush arms whereby in a similar manner a second or a plurality of other stations may be selected in sequence, said slow release and slow operate relays further cooperating to prevent the selection of an undesired station 55 during the actual advance or restoration of said brush arms, means thereafter for advancing said brush arms to a certain terminal responsive to a final code whereby translating means are activated at each of the selected stations, means whereby any station 60 may restore the selecting means at all stations.

15. In a telegraph system in combination, 65 a signal transmission circuit, a plurality of stations associated therewith, means at one

or more stations for sending pulses over said circuit, a printing telegraph set at each station, selecting means individual to said stations comprising a selector switch, selecting 70 relays associated with a plurality of terminals thereof, a different combination of terminals for each station, means associated with said transmission circuit and responsive to said pulses for advancing said selector switch brush arms to a desired combination 75 of terminals in sequence whereby a desired station is permanently selected, means thereafter for automatically restoring said brush arms at all stations whereby in like manner a second or a plurality of other stations may 80 be selected in sequence, said brush arms being then advanced to a certain terminal responsive to a final pulse code whereby all the selected stations are called and the printer set motors started thereat, means whereby 85 said selective means are rendered unresponsive to telegraph signals thereafter, means whereby any station may restore the selective means at all stations.

16. In a telegraph system in combination, 90 a signal transmission circuit, a plurality of stations associated therewith, a printing telegraph set at each station, means at one or more stations for sending pulses over said circuit, selecting means at each station comprising a line relay responsive to said pulses, 95 a selector switch, selecting relays associated with a plurality of terminals thereof, a different combination of terminals for each station, a slow release relay operatively associating during pulsing only, said line relay 100 with said selector switch for advancing the brush arms thereof to desired terminals in sequence whereby a desired station is permanently selected, a slow operate relay operated thereafter to automatically restore said 105 selector switch whereby in a similar manner, a second or a plurality of other stations may be selected in sequence, said slow release and slow operate relays co-operating to prevent 110 selection of an undesired station while said brush arms are in motion, said brush arms finally advancing to a certain terminal responsive to a final code whereby means are activated at all of the selected stations to call 115 said stations and start the printer set motors thereat, means whereby any station may restore the selective means at all stations and stop the printer set motors, and means associated with said selector switches whereby, 120 responsive to a single code, all stations may be selected simultaneously.

17. In a telegraph system in combination, 125 a signal transmission circuit, a plurality of stations associated therewith, means at one or more stations for sending pulses over said circuit, selective means at each station responsive to said pulses whereby one or more stations may be called, means at one or more stations for sending a sustained pulse over 130

said circuit, a condenser and a relay at each station, means thereat responsive to said sustained pulse to slowly charge said condenser and to discharge the same thereafter to operate said relay, means controlled by said relays to restore the selective means at said stations.

18. In a telegraph system in combination, a signal transmission circuit, a plurality of stations associated therewith, means at one or more stations for sending pulses over said circuit, selecting means at each station comprising a line relay responsive to said pulses, a selector switch, translating means associated with a terminal or terminals or said selector switch, a different terminal or terminal combination for each station, a slow release relay operatively associating during pulsing only, said line relay and selector switch for advancing said selector switch brush arms to a desired terminal or terminals in sequence whereby a desired station may be called, and the translating means operated thereat, means associated with a certain terminal of said selector switch, the same terminal at each station, whereby all stations may be called simultaneously, means including said slow release relay to prevent selection of an undesired station during actual motion of said brush arms, means controlled by said pulsing means to operate the translating means at the calling station subsequent to pulsing, means whereby any station may restore the selecting means at all stations.

19. In a telegraph system in combination, a signal transmission circuit, a plurality of stations associated therewith, a printing telegraph set at each station, means at one or more stations for sending pulses over said circuit, selector means at each station responsive to said pulses whereby one or more stations may be called and the printer set motors started thereat, means at one or more stations for sending a sustained pulse over said circuit, a condenser and a relay at each station, means thereat responsive to said sustained pulse to slowly charge said condenser and to discharge the same to operate said relay, means controlled by said relay at each station to restore to normal the selective means and stop the printer set motors thereat.

In testimony whereof, I have signed my name to this specification this 28th day of November, 1928.

GILBERT S. VERNAM.