

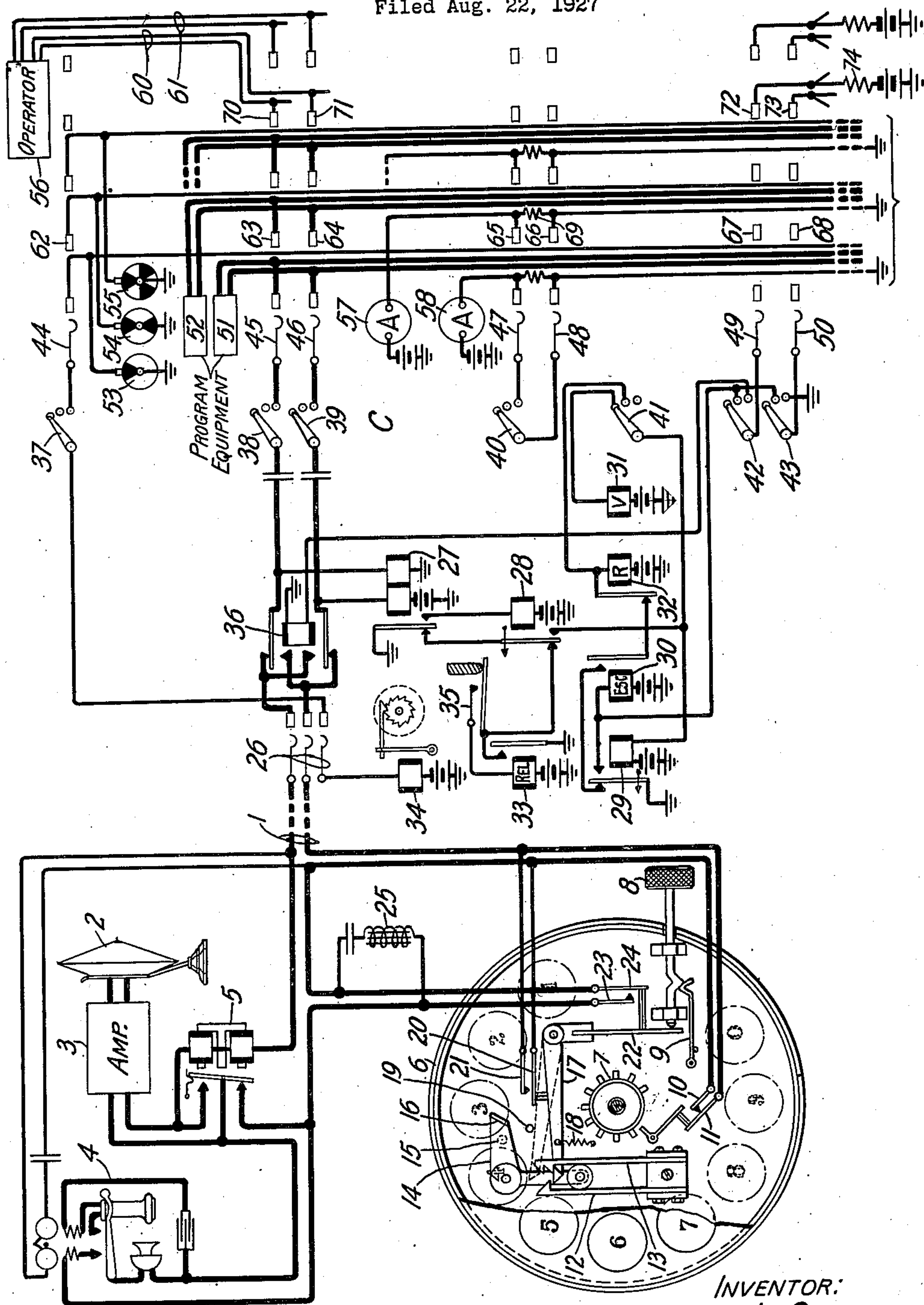
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TRANSMISSION SYSTEM

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TRANSMISSION SYSTEM

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This invention relates to transmission systems and particularly to systems combining both telephone and program distribution service.

5 Its object is to simplify the operation from the subscriber's viewpoint and to otherwise improve the service rendered him.

10 A feature of the invention is a system in which a subscriber's dial controls automatic switches at the central office to select a desired program, which is received at his substation on a program receiving set, or to select an operator's position, in which case means at the substation becomes effective to 15 disconnect the program receiving set and to render the telephone set effective for conversation.

20 Another feature is a switch controlling transmitter at the substation arranged to send the necessary number of impulses for making a selection and then to prevent the sending of further impulses.

25 Another feature is an arrangement for indicating the number of subscribers listening to a program, including an indicating instrument and means effective to shunt a portion of the resistance in circuit therewith each time a subscriber listens in on the program.

30 The drawing discloses a combined telephone and program distribution system, showing a subscriber's line and a portion of the central office equipment.

35 The subscriber's line 1 is equipped with the usual substation set 4 and also with a program receiving set including a loud speaking receiver 2 and an amplifier 3 which may be of any suitable design. The substation is also provided with an impulse transmitter.

40 The line 1 at the central office terminates in a line switch 26, which may be of any suitable type. The line switch 26 has access to trunks reaching connectors such as the connector C shown in detail. If desirable, intermediate selector switches may be inserted 45 between the line switch and the connector.

50 The connector switch C has a plurality of brushes 44 to 50 inclusive which engage corresponding rows of terminals in the terminal bank. These brushes are stepped vertically to select a desired level of terminals and then

rotate horizontally to choose any particular set of terminals in the level. The brushes 45 and 46 have access to successive program equipments 51, 52, etc., which may be of any suitable type. The equipment 51, for example, serves to transmit a given program. 55 The equipment 52 serves to transmit another program. Likewise, as many equipments may be provided as there are programs to be sent at any given time. The brushes 45 and 46 also 60 have access through other terminals in the same or in different levels through circuits 60 and 61 to an operator's board 56.

The brush 44 engages contacts connected to the interrupters 53, 54, 55, etc. While the switch is in connection with a given program equipment a corresponding interrupter is included in the circuit of brush 44 to cause 65 the operation of the subscriber's meter 34. The rate at which the meter is operated is determined by the class of program being received. 70

The brushes 47 and 48 engage contacts associated with the measuring instruments 57, 58, etc. These instruments are for indicating the number of subscribers listening to a given program at any particular time. 75

If the subscriber wishes to receive any particular program, he manipulates his impulse transmitter, thus causing the connector switch 80 C to select the equipment for transmitting that program. While a program is being received, the polarized relay 5 is in the position shown, disconnecting the telephone set 4 and including the receiving set in circuit with the 85 line. If, however, the subscriber wishes to converse with another subscriber or with the operator, to secure information, for instance, regarding the programs, he may do so by dialing a number which sets the connector switch C on a trunk leading to the operator's position. In response to seizing the operator's position, the current is reversed over the line, operating the relay 5 to disconnect the 90 program receiving set and connect the telephone set 4 to the line. 95

A detailed description will now be given of the manner in which the system operates. Assume that the subscriber wishes to receive the program being sent from the equipment 100

52. To initiate the call he presses the key 8 inward. The movement of the key 8 bends the spring 22 which is attached to one arm of the escapement lever 17. The bending of the spring 22 stores energy therein to rotate the escapement lever 17 upward. The lever 17, however, is held in the position shown by its engagement with the lower notch in the escapement spring 13. The curvature on the key 8 passes beyond the spring 9 holding the key in its inward position, maintaining the spring 22 in its deflected position. The spring 22 also closes the contacts 23 and 24.

The closure of springs 23 and 24 completes a bridge across the tip and ring conductors of the line 1. This bridge may be traced from the tip conductor of line 1, thence through the windings of relay 5, through the amplifier 3, bottom contact of relay 5, contacts 23 and 24, thence through the impulse contacts 10 and 11 to the ring side of the line 1. The closure of the line initiates the operation of the line switch 26 in the usual manner and the switch 26 operates to seize a trunk leading to an idle connector switch C. As soon as the connector is seized, a circuit is closed from battery through the left winding of relay 27, lower contact of relay 36, thence over the ring side of the line and returning over the tip side of the line through the upper contact of relay 36, right winding of relay 27 to ground. Relay 27 operates and closes an obvious circuit for the slow release relay 28.

The subscriber now manipulates his dial to transmit the first series of impulses to operate the connector C in a vertical direction to select the desired level of terminals. As the dial rotates to its forward position, the pin 15, which is secured thereto, engages the cam surface 16 of the lever 14. This tilts the lower arm of the lever 14 to the left deflecting the spring 12. This has no effect, however, upon the escapement lever 17. During the return motion of the dial 6, the impulse springs 10 and 11 are repeatedly opened and closed by the impulse wheel 7. Each opening and closing of the impulse springs causes the release and reenergization of the impulse relay 27. When the dial returns to its normal position, the pin 15 engages the other side of the cam surface 16 tilting the lever 14 in the opposite direction. This deflects the escapement spring 13 so that the lever 17 escapes from the lower notch of said spring and is caught and held by the notch on the escapement spring 12.

Relay 27 on releasing completes a circuit from ground through its back contact, front contact of relay 28, and thence in parallel through the winding of slow release relay 29 and side switch arm 41 in its first position and the winding of vertical stepping magnet 31 to battery. Relay 29 operates and remains energized during the series of impulses. For each impulse the magnet 31 operates and steps the brushes of the connector C up one step. At

the end of the series, relay 27 remains energized for an interval permitting the slow relay 29 to release. At the time relay 29 operated, it completed an obvious circuit for escapement magnet 30. When relay 29 releases the circuit of magnet 30 is opened and the magnet releases the side switch brushes 37 to 43 inclusive into the second position.

The subscriber manipulates the dial to send the second and last series of impulses. On the first forward movement of the dial the pin 15 again engages the lever 14 deflecting the spring 12 and allowing the lever 17 to escape. The lever 17 is caught by the upper notch on the escapement spring 13. On the return movement of the dial the impulse springs are opened to cause the repeated operation of the impulse relay 27. As the dial approaches its normal position the pin 15 tilts the lever 14 in the opposite direction deflecting the spring 13 and allowing the lever 17 to fully escape until it is stopped by the stop pin 19. In this position the lever 17 closes the springs 20 and 21 for a purpose which will presently be explained.

During the second series of impulses, relay 27 completes a circuit from ground through its back contact, front contact of relay 28 and thence in parallel through the winding of relay 29 and the side switch lever 41 in its second position and the winding of the rotary stepping magnet 32 to battery. The magnet 32 rotates the brushes of the connector C from position to position. At the end of the series of impulses the brushes come to rest on the terminals 62 to 68 inclusive. After an interval slow release relay 29 releases opening the circuit of magnet 30, permitting the side switch to move into its third position. In position 3 of the side switch the tip and ring conductors of the subscriber's line are extended through arms 38 and 39, brushes 45 and 46 and terminals 63 and 64 to the program distributing equipment 52.

While the subscriber is listening to the program, a circuit is completed from ground through the interrupter 54, terminal 62, brush 44, wiper 37, through the line switch 26, and the winding of the register 34 to battery. At each closure of the interrupter 54 a count is made on the register 34.

With the wiper 40 in position 3 a circuit is completed from terminal 65, brush 47, wiper 40, brush 48 to the terminal 66. This circuit shunts the resistance 69 which is in series with the instrument 57. The removal of the resistance 69 allows an additional amount of current to flow through the instrument. This indicates that another subscriber is listening to the program. It will be understood that the same program set may be seized through other connectors, each of which is provided with a resistance 69 in series with the instrument 57.

It was noted hereinbefore that the springs

20 and 21 are closed on the completion of dialing. The purpose for this is to insure that the subscriber can not disturb the circuits by further operation of the dial. This safeguard is accomplished by shunting the impulse springs 10 and 11, the shunt circuit extending through the springs 20 and 21.

When the subscriber has finished listening to the program he may release the equipment by withdrawing the key 8. This removes the tension from spring 22 allowing the spring 18 to draw the escapement lever 17 down to its normal position, as shown. The key 8 also opens the contacts 23 and 24 opening the circuit of the relay 27. The bridge 25 comprising a condenser and an impedance coil serves to sustain the current in the line to prevent disagreeable noise due to the operation of the key 8.

Relay 27 in releasing causes the release of relay 28. Relay 28 completes a circuit from battery through the winding of magnet 33, closed vertical off-normal contact 35, back contacts of relays 28 and 27 to ground. Magnet 33 operates and locks to ground through its own front contact. Magnet 33 causes the release of connector switch C. When the switch is released, the contact 35 opens permitting the magnet to release. The side switch is also restored in a manner well known in the art.

Assume next that the subscriber wishes to call the operator at the central office. He actuates the key 8 to initiate the call and manipulates the dial 6 in accordance with the number for calling an operator. The connector C is operated as above described to select the proper level and is rotated to position the brushes on a set of terminals 70, 71, 72, and 73, representing the first operator's circuit 60. If the operator's circuit 60 is idle, no ground potential exists on the terminal 73 and the escape magnet 30 releases the side switch into position 3. In this position a circuit is closed from ground through the side switch arm 43, brush 50, to the multiple terminal 73, to render the trunk 60 busy to other connectors.

Another circuit is completed from battery through the resistance 74, terminal 72, brush 49, wiper 42, winding of relay 36 to ground. Relay 36 reverses the direction of flow of current over the line 1 causing the polarized relay 5 to operate. Relay 5 disconnects the program receiving set and renders the telephone 4 effective. The circuit for talking current may be traced over the tip side of the line through the windings of relay 5, contact of said relay, thence through the telephone set 4 and returning over the lower side of the line. The subscriber may now converse with the operator.

If the first operator's trunk 60 is busy, when the rotary movement is completed, a holding circuit is closed from battery through

the magnet 30, wiper 43, in position 2, brush 50, to the grounded terminal 73. Magnet 30 remains energized and as soon as relay 29 releases, a circuit is closed from battery through the winding of magnet 32, contact of said magnet, contact of magnet 30 to ground on the back contact of relay 29. The rotary magnet 32 interrupts its own circuit and steps the connector from one set of terminals to another until an idle operator's trunk is reached. When an idle trunk is found, the magnet 30 releases opening the circuit of magnet 32 and moving the side switch into position 3.

The subscriber may converse with the operator or he may request that his line be connected with another subscriber's line.

While the transmitter 6 is designed for sending two series of impulses to release the lever 17 it may be altered to send any number of series by changing the notches on the escapement springs 12 and 13.

What is claimed is:

1. In combination, a central office, a subscriber's line terminating therein, means at the central office for sending programs over said line, a program receiving set and a telephone set at the substation, an operator's position, automatic switches, means controlled by the subscriber for setting said switches to select any one of said programs or the operator's position, and means responsive to the selection of the operator's position for rendering said program receiving set ineffective and for rendering effective said telephone set.

2. In combination, a central office, a subscriber's line terminating therein, means at the central office for sending programs over said line, a program receiving set at the substation normally connected to the line, a telephone set at the substation, an operator's position, automatic switches, an impulse sender at the substation controlled by the subscriber for setting said switches to select one of said programs or to select the operator's position, and means at the substation responsive to the selection of the operator's position for rendering the program receiving set ineffective and for rendering effective said telephone set.

3. In combination, a central office having subscriber's lines terminating therein, means at the central office for sending programs over said lines, a program receiving set and a telephone set at each substation, an operator's position and automatic switches at the central office, means controlled by a subscriber for setting said automatic switches to select any one of the programs and to select the operator's position, means controlled by one of the switches responsive to the selection of the operator's position for sending a signal back to the substation, and means controlled by said signal for rendering the program re-

ceiving set ineffective and the telephone set effective.

4. In combination, a central office having a subscriber's line terminating therein, means at the central office for sending programs over said line, a program receiving set and a telephone set at the substation, an operator's position and automatic switches at the central office, means controlled by the subscriber for setting said switches to select either a program or the operator's position, means responsive to the selection of the operator for reversing the polarity of current flowing in said line, and a polarized relay at the substation responsive to such reversal for rendering the program receiving set ineffective and the telephone set effective.

5. In combination, a central office having automatic switches therein, a subscriber's line leading to the central office, a transmitter at the substation having interrupting contacts for sending impulses to operate said switches, a set of contacts for shunting the interrupting contacts, a progressively movable device, a switch for closing the line circuit and for rendering said device operative, and means for advancing said device responsive to a definite number of manipulations of the transmitter to close said shunting contacts.

6. In combination, a central office having automatic switches, a subscriber's line leading to the central office, a transmitter at the substation having a dial and a set of interrupting springs for sending impulses to operate said switches, a set of contacts for shunting said springs to prevent the sending of further impulses, a progressively movable device, a switch for closing the line circuit and for storing energy to operate said device, and means for advancing said device responsive to a definite number of manipulations of said dial to close said shunt contacts.

7. In combination, a central office having automatic switches therein, a subscriber's line leading to the central office, a transmitter at the substation having interrupting springs for sending impulses to operate said switches, a number of program transmitting mechanisms selectable by said switches, a set of contacts for shunting the interrupting springs to prevent the sending of further impulses after a program has been selected, an escapement device operable at each manipulation of the transmitter, a switch for closing the line circuit and for storing energy for operating said escapement, means for causing the advance of said escapement to close said shunt contacts in response to a definite number of manipulations of said transmitter, and means for preventing reaction disturbances on said line when said last mentioned switch is operated.

8. In combination, a central office having a plurality of program distributing equipments, a subscriber's line, a selective switch

for connecting the line to one of said equipments, an indicating instrument having a resistance in circuit therewith, and means for shunting said resistance to indicate that the subscriber is listening to the program.

9. In combination, a central office having a program sending equipment, subscribers' lines, selective switches for connecting said lines to said equipment, an indicating instrument for said equipment, having a resistance normally in circuit therewith, and means controlled by each subscriber on selecting the program equipment for altering said resistance.

10. In combination, a central office having program distributing equipments, subscribers' lines, selective switches controlled by the subscribers for extending their lines to said equipments, indicating instruments, one for each equipment, resistances in circuit with said instruments, and means controlled by each of said switches on selecting an equipment for shunting a portion of the resistance in series with the corresponding instrument.

In witness whereof, I hereunto subscribe my name this 19th day of August A. D., 1927.

CHARLES L. GOODRUM.