April 30, 1929. W. T. POWELL 1,710,803

MULTIOFFICE TELEPHONE SYSTEM

Filed April 15, 1927 4 Sheets-Sheet

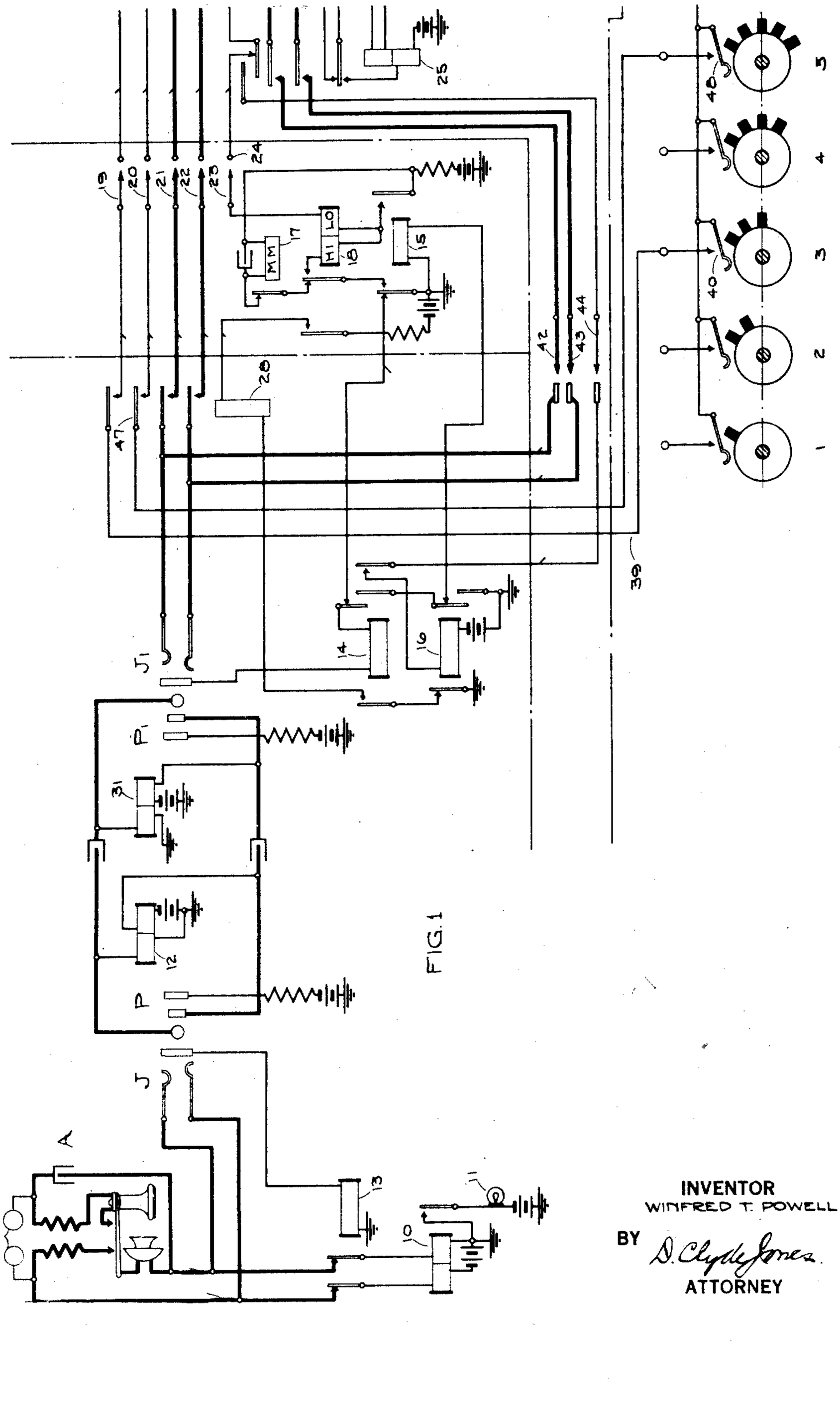

FIG.1

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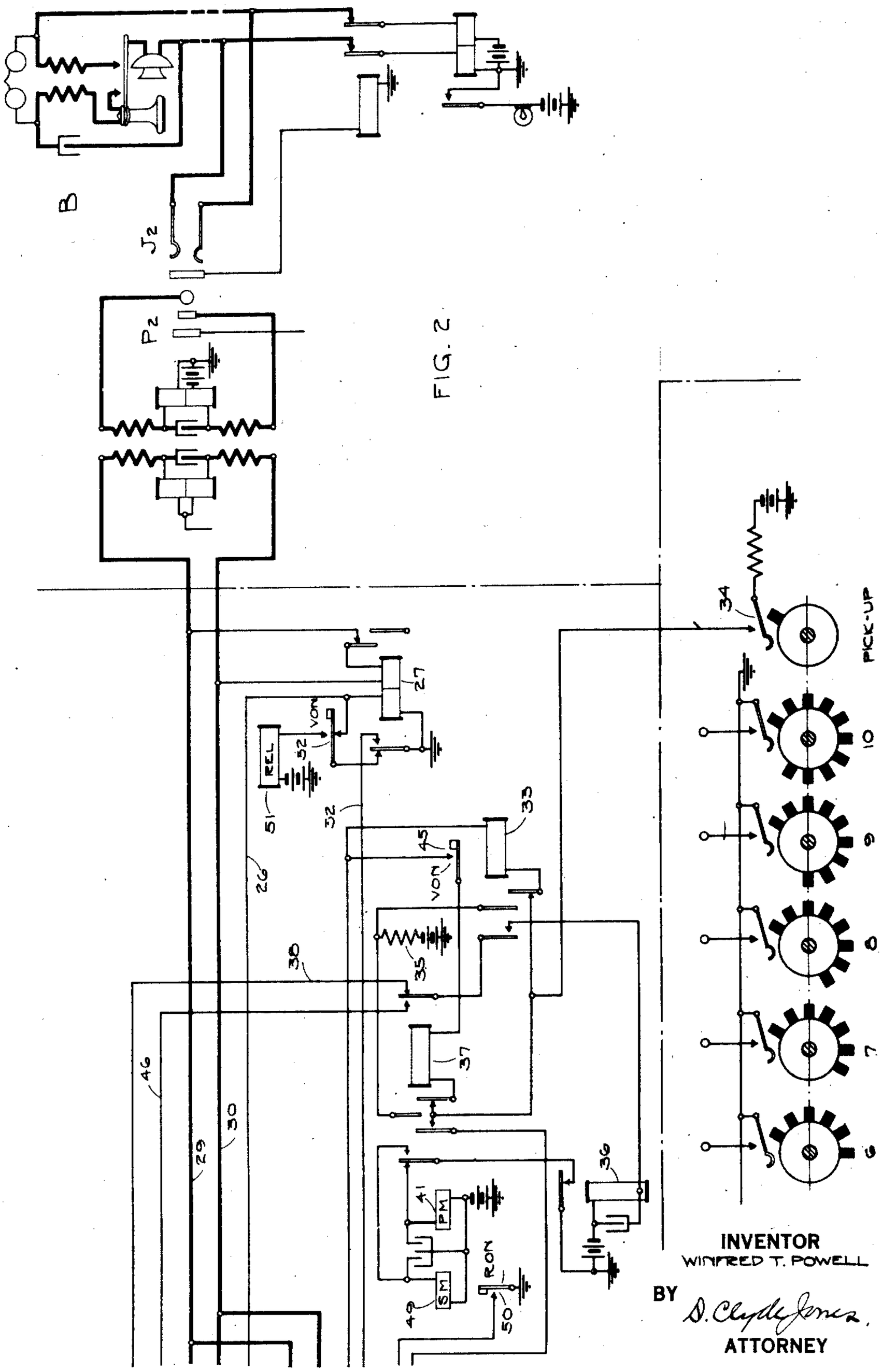

FIG. 2

April 30, 1929. W. T. POWELL 1,710,803

MULTIOFFICE TELEPHONE SYSTEM

Filed April 15, 1927 4 Sheets-Sheet 3

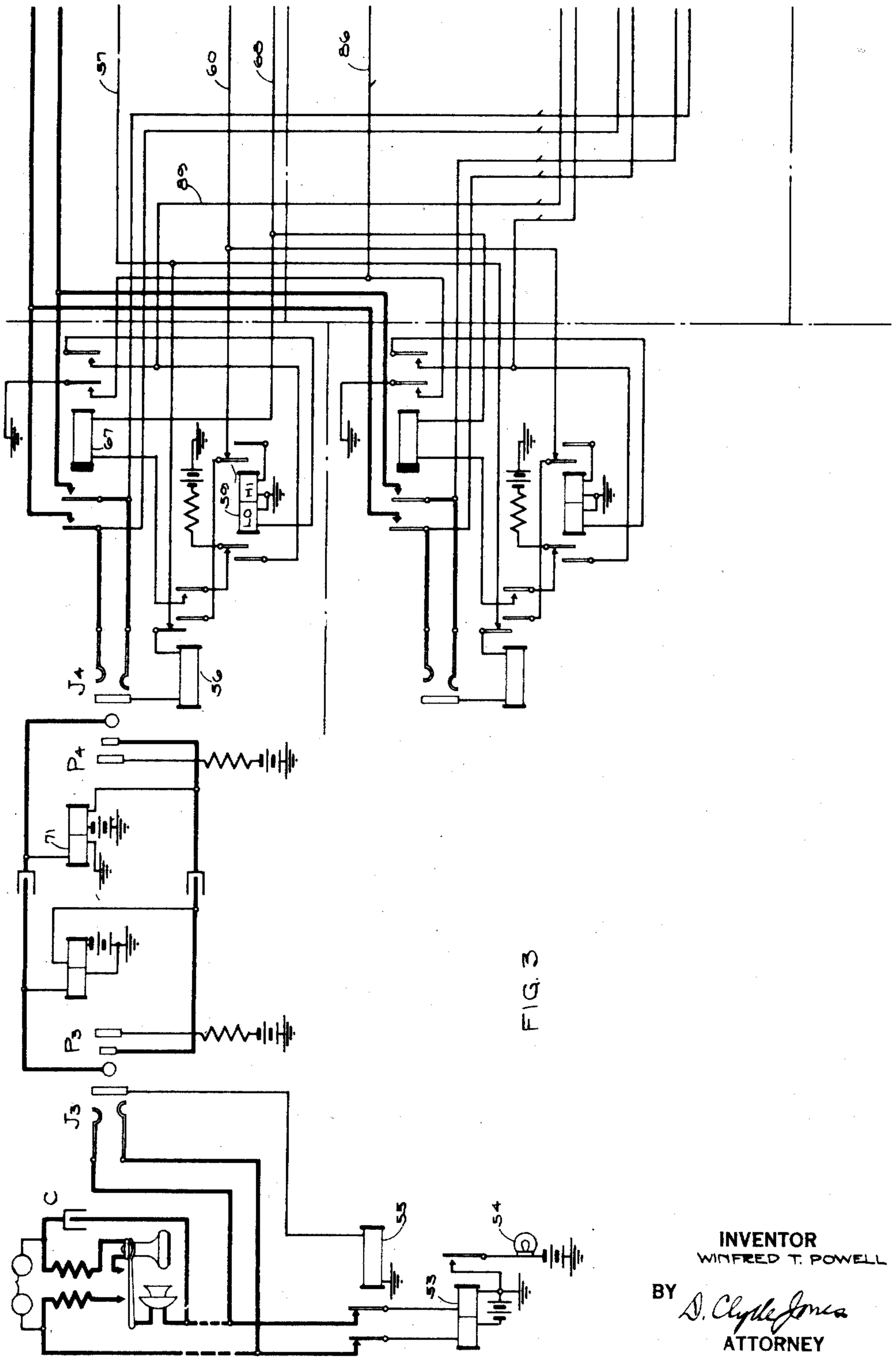

FIG 3

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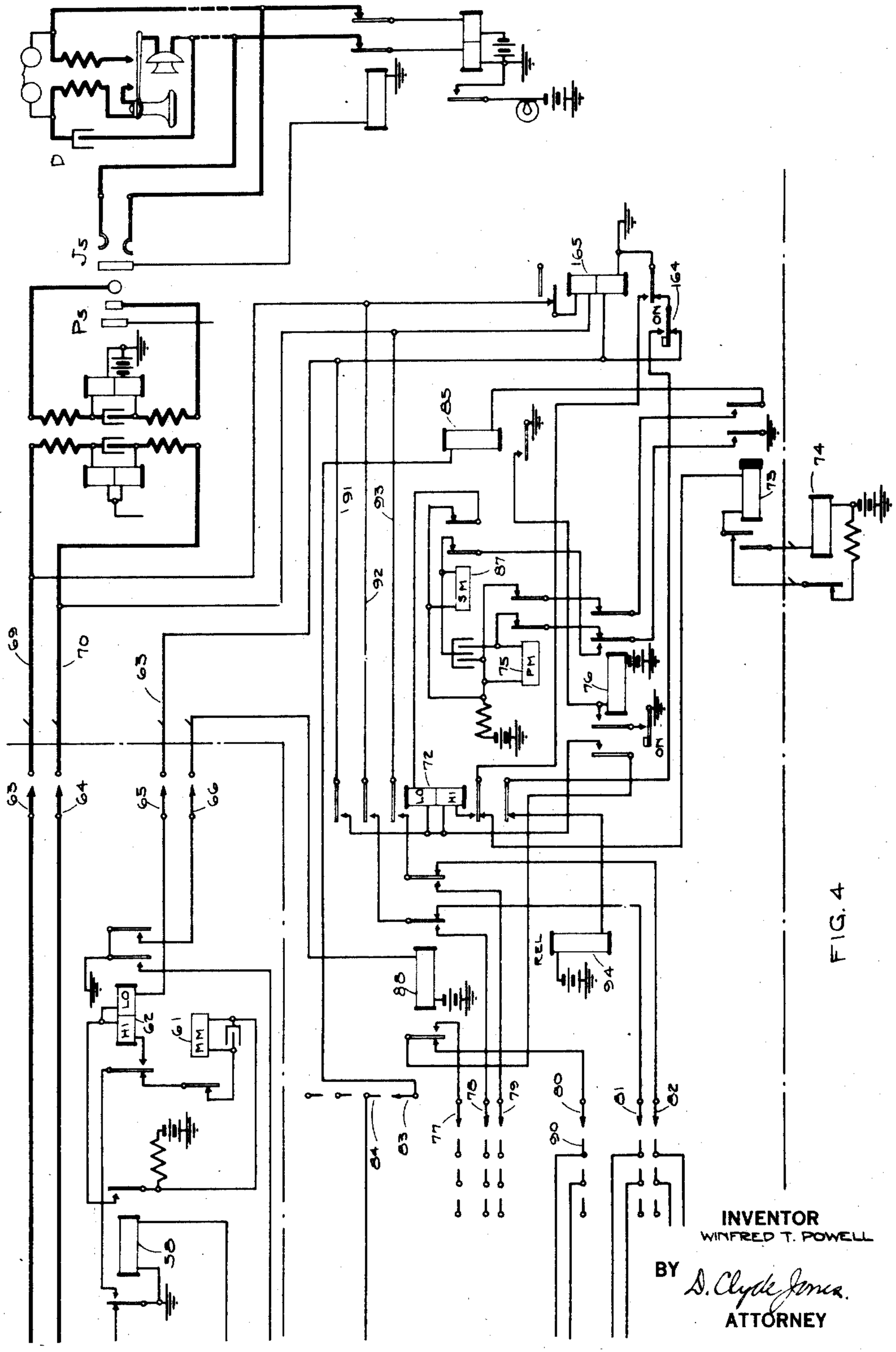

FIG. 4

Patented Apr. 30, 1929. 1,710,803

UNITED STATES PATENT OFFICE.

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MULTI OFFICE TELEPHONE SYSTEM.

Application filed April 15, 1927. Serial No. 184,030.

In manual telephone systems and also in automatic telephone systems it is frequently desirable to employ back-selecting or finder switches in interconnecting incoming lines with certain outgoing lines or trunks. Such finder switches, while they permit the use of a minimum amount of equipment, have the disadvantage that a call is delayed during the time that the switch is hunting for the calling incoming line. This delay may be further increased due to the fact that each finder switch, as now employed, seizes the first calling line which it reaches irrespective of the fact that other lines may have originated calls earlier. Thereafter it is necessary to start a second finder switch in operation to seize the first calling incoming line from which it will be seen that it is possible under certain conditions for a long period of delay to intervene before the call is extended.

In accordance with the present invention, it is proposed to provide what is known as a by-path arrangement by which a temporary connection is extended from a calling incoming line to a trunk during the period that a finder switch is operating to extend its trunk to the calling incoming line and when this last mentioned connection is established the temporary or by-path connection is disestablished.

Another feature resides in the provision of means whereby calling incoming lines are extended to trunks in the sequence in which they originate calls.

A further feature of the present invention is the provision in such a by-path arrangement of means common to a plurality of switches for directively operating any allotted switch to seize a predetermined calling incoming line even though its brushes pass over terminals of another incoming line.

An additional feature of the invention includes the incorporation of such a finder switching arrangement for trunking between the various offices of a manual telephone system.

Referring to the drawings, Figs. 1 and 2 when placed in the order named, diagrammatically represent a portion of a telephone system including a so-called A office and a so-called B office. Fig. 1 and the portion of Fig. 2 shown at the left of the broken line represent a calling subscriber's line and an operator's position at an originating or A office. It will be understood, of course, that there are a plurality of subscribers' lines terminating at this office and a plurality of A operators' positions, only one of which is indicated, and associated with this position there is provided an outgoing trunk accessible to a finder switch, the operating circuits of which are represented in the right-hand portion of Fig. 1 and the left-hand portion of Fig. 2. In the broken line rectangle of Fig. 1 there are indicated the circuits of an allotter switch which functions to allot idle finders of a group for use and also to establish a temporary or by-path connection during the time that an allotted finder switch is performing its hunting operation. At the right-hand portion of Fig. 2 there is indicated the B operator's position in which one of a plurality of called lines is shown as terminating. Figs. 3 and 4 represent a modified form of the invention including A and B offices with telephone lines terminating at each office and finder switches for performing the trunking operations between these offices. The modification represented in these last two figures differs mainly from the modification first described in that it employs a different circuit arrangement for directively operating the finder switches.

The finder switch employed in this system may be similar to those disclosed on page 46 of Automatic Telephony by Smith and Campbell (first edition), while the allotter switches may be similar to those disclosed in the patent to Clement #1,107,153 granted August 11, 1914.

With this brief outline of the invention, it is believed that the modification of Figs. 1 and 2 will best be understood by describing the method of establishing a telephone connection from a telephone line indicated at A to a telephone line indicated at B. When the subscriber removes his receiver from its switch-hook the line relay 10 is energized over the two sides of the calling lines in series and attracts its armature to light the line lamp 11. The A operator upon noting that this lamp is lighted, inserts the plug P of an idle cord circuit at her position into an answering jack J of the calling telephone

line. This operation completes a circuit through both windings of the answering supervisory relay 12 and the two sides of the answering cord and the calling telephone line also in the series. The insertion of the plug P into the jack J also completes a circuit from grounded battery, the resistor, sleeve contacts of the plug and jack, winding of the cut-off relay 13 to ground. The cut-off relay is thus energized and at its armatures and contacts opens the energizing circuit of the line relay 10 which thereupon deenergizes to extinguish the line lamp 11.

At this time the A operator's telephone set (not shown) is connected either manually or automatically through the cord circuit taken for use to the calling telephone line so that the operator can inquire the designation of the wanted telephone line. Upon obtaining this information she then inserts the plug P^1 of the cord circuit taken for use into the jack J^1, which is one of a group of jacks allotted to the wanted office. Each of these jacks is provided with an outgoing trunk which terminates in the terminals of a group and unit-selecting finder switch, which, for purposes of this description, is assumed to be of the type known as the up-and-around switch. As soon as the plug P^1 is inserted into the jack J^1, a circuit is closed from grounded battery, through the resistance, sleeve contacts of the plug P^1 and jack J^1, winding of the cut-off relay 14, its continuity spring and back contact, back contact and armature of the relay 15, to ground. This last described circuit is controlled at the armature and back contact of the relay 15 associated with the allotter switch for the purpose of preventing any interference between contemporaneous calls in case the operator extended a connection to a second jack similar to J^1, before the finder switch had completed its first connection. Relay 14 when operated in this circuit closes a locking circuit for itself through the sleeve contacts of plug and jack and through its continuity spring and armature, continuity spring and back contact of relay 16, winding of relay 15, to ground. Relay 15 is operated in this circuit and functions to start the allotter switch in operation while it disconnects the ground connection from all other relays of this group of outgoing trunks similar to relay 14. When the relay 15 is energized an operating circuit is closed for the motor magnet 17 of the allotter from grounded battery, the resistor, winding, back contact and armature of this magnet, inner back contact and armature of relay 18, front contact and armature of relay 15, to ground. Motor magnet 17 is thus operated by intermittently interrupting this circuit and advances its brushes 19, 20, 21, 22 and 23 until its test brush 23 encounters an idle trunk whose test terminal is characterized by the presence of ground potential. At this time the test relay 18 is operated in a circuit from grounded battery, the resistor, armature and front contact of relay 15, through the low resistance winding of the relay 18, test brush 23, test terminal 24 of the idle trunk, back contact, and continuity spring of relay 25, conductor 26, vertical off-normal contacts VON, back contact and armature of relay 27, to ground. Relay 18 is energized in this circuit and is locked operated from grounded battery, resistance, armature and front contact of relay 15, high resistance winding of relay 18, its front contact and armature, front contact and armature of relay 15, to ground. With the relay 18 actuated, the switching relay 28 is operated from grounded battery, resistor, outer armature and front contact of relay 18, winding of relay 28, front contact of the sleeve relay 14, back contact and armature of relay 16 to ground. When the relay 28 is operated, the calling subscriber's line is extended through the A operator's cord circuit and the outgoing trunk connected to the jack J^1 to the conductors 29 and 30 of the selected plug-ended trunk terminating at the B operator's position equipment at the distant office which may be similar to that disclosed in the application of John H. Levis, Jr., S. N. 77,197, Dec. 23, 1925, Patent No. 1,678,068 of July 24, 1928.

The A operator may then instruct the B operator as to the number of the wanted line and the B operator may proceed to connect the plug P^2 of this trunk into the jack J^2 of the called telephone line and thereafter actuate ringing equipment (not shown) to signal this telephone line. It will be noted that the make-busy relay 27 has its right-hand winding bridged across the tip and ring conductors 29 and 30 of the selected primary trunk which receives its source of battery through the windings of the calling supervisory relay 31 of Fig. 1. Relay 27 operates and at its right-hand continuity spring and armature opens its original energizing circuit but substitutes a holding circuit for itself from ground through its left-hand winding, conductor 26, upper continuity spring and back contact of relay 25, terminal 24 and allotter brush 23, right-hand winding of relay 18, right-hand front contact and armature of relay 15, the resistor, to grounded battery. The operation of relay 27 removes the direct ground from conductor 26 at its left-hand back contact and armature so that this trunk cannot be seized by another allotter switch.

As soon as the relay 27 is operated it starts the operation of the allotted finder switch by closing a circuit from ground, left-hand armature and front contact of relay 27, conductor 32, inner armature and back contact of relay 25, winding of relay

33, its continuity spring and back contact, through the contacts 34, known as the pick-up contacts of a common impulse machine, and thence through the resistor to grounded battery. It will be understood that the pick-up contacts 34 are provided so that the common impulse machine will be ineffective to control the finder switch until the impulse machine is at the beginning of a cycle or series of impulses. When the contacts 34 are closed, the relay 33 is operated and closes a holding circuit for itself independently of of the pick-up contacts, which circuit is similar to that previously described except that it now extends through the continuity spring and armature of the relay 33, and resistor 35 to grounded battery. As soon as the pick-up relay 33 is operated it closes a circuit for impulse relay 36 from grounded battery, winding of this relay, left-hand front contact and armature of pick-up relay 33, armature and back contact of change-over relay 37, conductor 38, allotter brush 19, uppermost front contact and armature of relay 38, conductor 38, allotter brush 19, uppermost front contact and armature of relay 28, conductor 39 contacts 40 of the #3 interrupter, since it is assumed that the calling outgoing trunk is in the third group and thence from the contacts of this interrupter to ground. Under the control of this circuit the impulse relay 36 of Fig. 2 receives three group impulses as a result of which an operating circuit is closed for the primary motor magnet 41 from grounded battery, winding of this magnet, back contact and armature of change-over relay 37, front contact and armature of impulse relay 36 to ground. The primary motor magnet is thus operated to advance the brushes 42, 43 and 44, three steps in their primary or group-selecting movement.

The common interrupter continues to rotate and when the pick-up contacts 34 are again closed, at the conclusion of the sending of the series of group impulses, the change-over relay 37 is operated in a circuit now extending from grounded battery, the resistor, interrupter contacts 34, back contact and continuity spring of the relay 37, its winding, off-normal contacts 45 which are closed as soon as the switch begins its group-selecting movement, back contact and armature of relay 25, conductor 32, front contact and armature of relay 27 to ground. The change-over relay on operation closes a locking circuit for itself from grounded battery, the resistor 35, its armature, continuity spring and winding, and thence to ground over the remainder of the circuit previously described as extending through the vertical off-normal contacts 45. The finder switch is now in readiness to receive the units-selecting impulses and since it is assumed that the designation of the outgoing trunk is No. 35, the common impulse machine is connected in such a manner that the finder switch receives five directive impulses from the impulse relay 36. These impulses are generated in a circuit now traceable from grounded battery, winding of impulse relay 36, front contact and armature of relay 33, right-hand armature and front contact of the change-over relay 37, conductor 46, allotter brush 20, front contact and armature 47 of relay 28, impulse contacts 48 of the common impulse machine, to ground. Under the control of this circuit the impulse relay 36 generates five impulses and in response to each of these impulses the secondary motor magnet 49 is operated from grounded battery, its winding, outer left-hand front contact and armature of relay 37, front contact and armature of relay 36, to ground. In response to each of these impulses the brushes 42, 43 and 44 of the finder switch are advanced five steps in the selected group which movement positions these brushes in engagement with the terminals of the outgoing trunk terminating in the jack J^1.

When the pick-up contacts 34 are again closed at the conclusion of the units series of impulses, the switching relay 25 is operated in a circuit traceable from grounded battery, the resistor, pick-up contacts 34, outer left-hand contact and armature of relay 37, upper winding of relay 25, rotary off-normal contacts 50, closed on the first rotary movement of the switch, to ground. The operation of the switching relay 25 extends the outgoing trunk through the brushes 42 and 43 of the finder switch to the conductors 29 and 30 of the trunk terminating at the selected B operator's position. As soon as the relay 25 is energized it also closes a locking circuit for itself from grounded battery, its lower winding, its innermost front contact and armature, left-hand front contact and armature of relay 27 to ground. At the continuity spring and contact of the switching relay 25 the circuit, which has been guarding the test conductor of the allotter from interference by other allotters testing this trunk, is opened but this trunk is still retained for use in a guarding circuit now extending from ground, left-hand winding of the make-busy relay 27, conductor 26, continuity spring and armature of the relay 25, test brush 44 of the finder, outer armature and front contact of sleeve relay 14, and winding of relay 16 to grounded battery. The make-busy relay 27 is thus held operated and the relay 16 is energized for a purpose to be described. At the innermost back contact and armature of the switching relay 25 the holding circuit of the change-over relay 37 and the pick-up relay 33 is opened to cause these relays to de-energize. With the switching relay thus

operated, the application of grounded battery to these relay windings through the pick-up contacts 34 is ineffective until another connection is being established.

When the relay 16 of Fig. 1 associated with the outgoing jack J^1 is operated as above described it opens the locking circuit of the switching relay 28 which deenergizes to disconnect the allotter for use in establishing another connection. On the operation of the relay 16, the cut-off relay 14 is locked operated directly to ground through its continuity spring and armature and through the continuity spring and armature of relay 16 instead of to ground through the winding of the relay 15. It will now be noted that the make-busy relay 27 is controlled by the sleeve relay 14 which in turn is controlled at the sleeve contacts of the plug P^1 and jack J^1 and that the switching relay 25 is maintained energized from a make contact of the make-busy relay.

At the conclusion of the conversation, supervisory equipment (not shown) signals the B operator who thereupon removes the plug P^2 from the jack J^2 of the called line. Other supervisory equipment at the A operator's position also gives a disconnect signal to this operator who thereupon removes the plug P from the jack J and also removes plug P^1 from the jack J^1. When the plug P^1 is disconnected from the jack J^1, the cut-off relay 14 deenergizes, which relay at its outer armature and contact opens the holding circuit of the relay 16 causing it to deenergize. This holding circuit of the relay 16, it will be remembered, included the left-hand winding of the make-busy relay 27 of Fig. 2 also deenergizes and thereby completes a circuit for the release magnet 51 from grounded battery, winding of this magnet, vertical off-normal contacts 52, back contact and armature of relay 27 to ground. The release magnet on operation restores the finder switch to its normal position in the well-known manner and thereby opens the off-normal contacts 52. At this time also ground potential is connected to the test conductor of this last-used trunk through the left-hand armature and back contact of make-busy relay 27 and the vertical off-normal contacts so that this trunk is again in condition for use.

The modification, shown in Figs. 3 and 4, shows a different arrangement for directively operating the finder switches. The present modification, however, shows an arrangement by which a conventional up-and-around switch, normally having access to one hundred outlets, may be arranged to have access to a greater number of trunks. In Figs. 3 and 4 two offices are indicated but it will be understood that this is merely for purposes of description since the system may have many more offices. In this arrangement when a calling subscriber at C initiates a call, his line relay is energized to light the line lamp and the A operator inserts the plug P^3 into the jack J^3. This operation completes an energizing circuit for the cut-off relay 55, which causes the line relay to deenergize in turn extinguishing the line lamp 54. The A operator's telephone set (not shown) is then connected to the cord circuit taken for use and she inquires the number of the wanted line which it is assumed is the line D terminating at the B office shown at the right of Fig. 4. The operator then inserts the calling plug P^4 into the jack J^4 which is effective to energize the cut-off relay 56 from grounded battery, the resistor, sleeve contacts of this plug and jack, winding of the relay 56, its continuity spring and back contact, conductor 57, back contact and armature of the relay 58, to ground. If no other allotter associated with this group of outgoing trunks is in use the relay 58 will be in its normal position and this last described circuit is effective to operate the sleeve relay of the cord and the cut-off relay 56 of the trunk. Relay 56 when operated closes a locking circuit for itself through its continuity spring and armature, continuity spring and back contact of the relay 59, conductor 60, winding of the relay 58, to ground. The cut-off relay is thus held operated and the relay 58 is energized to remove the ground potential from all other cut-off relays such as 56 of this group at the operator's section so that if any other operator at this section connects one of her cord circuits to an outlet jack similar to J^4 of this group, the outgoing trunk connected thereto will not seize the allotter until the connection first initiated has been completed to the selected trunk through its associated finder switch.

The energization of the relay 58 closes an operating circuit for the motor magnet 61 of the allotter from grounded battery, the resistor, winding, back contact and armature of this magnet, back contact and armature of relay 62, front contact and armature of relay 58, to ground. Under the control of this circuit which is self-interrupted, the motor magnet advances the brushes 63, 64, 65 and 66 of the allotter until the test brush 65 encounters the test terminal of an idle trunk which is characterized by the presence of direct ground potential. The energization of the relay 58 also completes a portion of the test circuit for the allotter which is traceable from grounded battery, resistor, right-hand armature and front contact of relay 58, right-hand low resistance winding of the switching relay 62 and thence to the test brush 65. The motor magnet advances the brushes of the allotter until its test brush encounters a test terminal characterized by the presence of direct ground potential there-

on, at which time the mentioned testing circuit including the right-hand winding of the switching relay 62 is completed over conductor 63 of the idle trunk, off-normal contacts 164, inner back contact and armature of the make-busy relay 65, to ground. The switching relay 62 is energized in this circuit and at its left-hand armature and back contact opens the operating circuit for the motor magnet 61 to stop the allotter switch while at the left-hand front contact and armature of relay 58 there is closed a locking circuit from ground through the left-hand armature and front contact of the relay 62, its high resistance winding, right-hand contact and armature of relay 58, resistor to grounded battery. The operation of the relay 62 closes an energizing circuit for the switching relay 67 of Fig. 3 from grounded battery, the resistor, continuity spring and back contact of relay 59, outer armature and front contact of relay 56, winding of the slow releasing switching relay 67, conductor 68, inner front contact and armature of relay 62 to ground. The switching relay 67 when thus energized connects the outgoing trunk jack J^4 through the brushes 63 and 64 of the allotter to the tip and ring conductors 69 and 70 of the trunk terminating at a B operator's position in the wanted office. With the outgoing trunk extended in this manner, a circuit is completed from ground and grounded battery through the windings of the supervisory relay 71 of Fig. 3 and thence through the tip and ring conductors 69 and 70, upper winding of the relay 165, its continuity spring and back contact. Relay 165 is actuated in this manner and is held operated from ground through its lower winding, conductor 63, allotter brush 65, through the low resistance winding of the relay 62, front contact and armature of the relay 58, and the resistor, to grounded battery. The operation of the make-busy relay 165 renders the trunk selected by the allotter unselectable because it removes the direct ground potential normally connected to the test terminal thereof.

The A operator may then transmit the designation of the wanted telephone line over this temporary connection to the trunk including conductors 69 and 70 with which there is associated at the B operator's position a B operator's telephone set as well as signaling and supervisory equipment, (not shown).

The B operator upon receiving designation of the wanted line inserts the plug P^5 into the jack J^5 thereof and signals the subscriber in the well-known manner. In the event that no other finder switch of this group is being operated to locate an outgoing trunk then the operation of the make-busy relay 165 is effective to start the operation of the finder switch of Fig. 4. This operation is initiated by the closure of a circuit from ground, inner armature and front contact of relay 165, inner armature and back contact of the relay 72, winding of the slow releasing relay 73, its continuity spring and back contact, armature and back contact of relay 74, resistor to grounded battery. The relay 73 is energized in this circuit and closes a locking circuit for itself from grounded battery, winding of the relay 74, armature and continuity spring of relay 73, and thence to ground, over the remainder of the circuit previously described. The relay 74 is common to all of the trunks of this group and when it attracts its armatures it disables the starting circuits of all the other finder switches of the trunks to which it is common. It will readily be understood that if the other finder switches of this group were not disabled and some other finder switch were permitted to start operation, it would be possible for the first call to be delayed since the finder switch first started might seize a later call.

With the relay 73 operated as just described, a driving circuit for the primary motor magnet 75 is closed from grounded battery, through the resistor, winding of this magnet, its inner back contact and armature, inner back contact and armature of relay 76, front contact and armature of the relay 73, to ground. Under the control of this circuit the primary motor magnet advances the brushes 77 to 82 inclusive and the group brush 83 of the switch until the group or level brush 83 encounters the group or level corresponding to contact 84 in which the outgoing trunk terminals are located. When this group terminal 84 is found the switching relay 85 is actuated in a circuit traceable from grounded battery, through the resistor, outer back contact and armature of the primary magnet 75, outer back contact and armature of the relay 76, outer front contact and armature of relay 73, winding of the switching relay 85, group brush 83, group terminal 84, conductor 86, inner front contact and armature of the relay 67 to ground. As soon as the switching relay 85 is thus operated it closes an energizing circuit for the change-over relay 76 completed from grounded battery, winding of the relay 76, front contact and armature of relay 85, to ground. The change-over relay 76 upon attracting its armatures closes a locking circuit for itself through its inner left-hand front contact and armature, off-normal contacts ON, to ground, and also completes a driving circuit for the secondary motor magnet 87 from grounded battery, through the resistor, winding of this magnet, its back contact and inner armature, right-hand front contact and armature of relay 76, inner front contact and armature of the relay 73, to ground. This driving

circuit causes the secondary motor magnet to advance the brushes 77 to 82 inclusive of the finder switch in its secondary movement over the terminals of the selected group. Since it is assumed at this time that the relay 88 is not energized, only the brushes 80 to 82 inclusive of the finder switch are effective. When the test brush 80 of the finder engages the test terminal of the outgoing trunk terminating in the jack J^4, the stopping magnet 59 of Fig. 3 is actuated in a circuit completed from ground through the low resistance winding of this relay, outer armature and front contact of the relay 67, conductor 89, test terminal 90, test brush 80, left-hand back contact and armature of the relay 88, armature and front contact of the relay 76, upper winding of the relay 72, outer back contact and armature of the magnet 87, resistor, to grounded battery. This circuit is effective to stop the finder switch by shunting the secondary motor magnet 87 and at the same time to operate the switching relay 72. This last described circuit in addition to operating the switching relay 72 energizes the stopping relay 59 of Fig. 3 through its low resistance winding and the operation of stopping relay 59 extends a circuit from grounded battery, through the resistor, continuity spring and armature of the relay 59, conductor 89, terminal 90, test brush 80, back contact and armature of the relay 88, outer armature and front contact of the relay 76, high resistance winding of the relay 72, its lower front contact and armature, inner front contact and armature of the relay 165 to ground. The relay 72, since it is controlled by the stopping relay 59 which is governed by the connection of the play P^4 with jack J^4, thus places the holding circuit of the switching relay 72 under the control of this plug and jack. As soon as the switching relay 72 is operated the make-busy relay 165 is held attracted in a circuit completed from ground through its lower winding, conductor 91, uppermost armature and front contact of relay 72, and thence over the remainder of the circuit previously described as including the test brush 80, terminal 90, conductor 89, and completed to grounded battery through the continuity spring and armature of the relay 59. The energization of the switching relay 72 also extends the tip and ring terminals of the outgoing trunk connected to the jack J^4 to the tip and ring conductors 92 and 93 which are directly connected to the conductors 69 and 70 of the selected primary trunk teminating at the B operator's position. It should be pointed out that this connection to the conductors 92 and 93 is completed before the relay 67 of Fig. 3 deenergizes to break-down the temporary connection to the conductors 69 and 70. In this way there exists an overlapping connection to the selected primary trunk to prevent disconnection between the outgoing trunk and the primary trunk.

If the primary trunk has not already been connected to the wanted telephone line D the B operator now proceeds to establish this connection by inserting the plug P^5 into the jack J^5 and then signals the wanted subscriber in the well-known manner.

The allotter switch and the temporary connection which it has established are now released since the stopping relay 59 of Fig. 3 is energized and at its right hand back contact and armature open the circuit including the conductor 60 which has maintained the relay 58 energized, thereby holding the allotter in operated condition. The release of the relay 58 causes the release of the relay 62 and since the allotter switch is of the type that remains in the position last used the allotter is now in readiness for use on a succeeding call.

On the termination of the connection, when the calling and called subscribers replace their receivers on their associated switchhooks supervisory equipment (not shown) is operated at the A and B operators' positions to signal for disconnection. The A operator then removes the plug P^3 from the jack J^3 and the plug P^4 from the jack J^4 while the B operator removes the plug P^5 from the jack J^5. The removal of the plug P^4 from the jack J^4 causes the deenergization of the relays 56 and 59 and the release of this last-named relay removes grounded battery from the conductor 89 which has been holding the relays 72 and 165 in operated condition. The release of these last two relays operates the release magnet 94 of the finder in a circuit closed from grounded battery, winding of this magnet, lowermost back contact and armature of the relay 72, off-normal contacts ON, inner back contact and armature of the relay 165 to ground. The allotter switch and the finder switch are now in condition for use on a succeeding call and the release of the relay 165 applies direct ground potential to the test conductor of the primary trunk last used to indicate that it is in idle condition.

What I claim, is:

1. In a telephone system, a plurality of incoming lines, a plurality of outgoing lines, a finder switch for each outgoing line for connecting it to any calling incoming line, an allotter for assigning finder switches for use, means including said allotter for establishing a temporary by-path connection between a calling incoming line and said assigned outgoing line, and means including an impulsing device common to said switches for directively operating said assigned finder switch.

2. In a telephone system, a plurality of

incoming lines, a plurality of outgoing lines, a finder switch for each outgoing line for connecting it to any calling incoming line, an allotter for assigning finder switches for use, means including said allotter for establishing a temporary by-path connection between a calling incoming line and an assigned outgoing line, and means including an impulse device common to said switches for transmitting to said assigned finder switch a series of code impulses individual to the calling incoming line whereby said finder switch is directively operated to find said calling incoming line to the exclusion of other calling incoming lines.

3. In a telephone system, a plurality of incoming lines, a plurality of outgoing lines, an automatic finder switch for each outgoing line for seizing a calling incoming line, means including an allotter for assigning a finder switch for use and for establishing a temporary connection from said calling incoming line to the trunk of said assigned finder switch, said finder switch operating by group and unit-selecting movements to complete its operation, and means including an impulse device common to a plurality of said switches for transmitting group and unit-selecting code impulses to directively operate said assigned finder to select the calling incoming line to the exclusion of other calling incoming lines.

4. In a telephone system, a plurality of incoming lines, a plurality of outgoing lines, an automatic finder switch for each outgoing line for seizing a calling incoming line, means including an allotter for assigning a finder switch for use and for establishing a temporary connection from said calling incoming line to the trunk of said assigned finder switch, said finder switch operating by group and unit selecting movements to complete its operation, means including an impulse device common to a plurality of said switches comprising a plurality of impulse circuit interrupting mechanisms for transmitting group and unit selecting code impulses to directively operate said assigned finder switch to select the calling incoming line to the exclusion of other calling incoming lines.

5. In a telephone system, an A operator's position, a plurality of incoming lines terminating thereat, telephone lines terminating at said A operator's position, means for interconnecting a calling telephone line and an incoming line, a B operator's position, trunks terminating at said B operator's position, means including an automatic finder switch for each trunk for connecting said trunk to a calling incoming line, and operating means for said automatic switch functioning to cause said automatic switch to seize said calling incoming line to the exclusion of other incoming lines calling at the same time.

6. In a telephone system, an A operator's position, incoming lines extending therefrom, a B operator's position, trunks terminating thereat, an automatic switch for each trunk for extending said trunk to a calling incoming line, means responsive to the initiation of a call on one of said incoming lines for establishing a temporary connection therefrom to an idle trunk, and means for operating the automatic switch of said trunk to seize said calling incoming line to the exclusion of other calling incoming lines to replace said temporary connection.

7. In a telephone system, an A operator's position, incoming lines extending therefrom, a B operator's position, trunks terminating in said last-mentioned position, an automatic switch for each trunk to connect it to a calling incoming line, an allotter for assigning idle automatic switches and associated trunks for use, means responsive to the initiation of a call on one of said lines for extending said line through the brushes of said allotter to the assigned trunk, and common impulse mechanism for directively advancing the automatic switch of said trunk to seize the calling incoming line.

8. In a telephone system, an A operator's position, incoming lines from said position, a B operator's position, trunks terminating at said last mentioned position, an automatic switch for each trunk operating to connect a calling incoming line to an idle trunk, an allotter for assigning an automatic switch and its associated trunk for use in extending a connection, means responsive to the initiation of a call on any one of said incoming lines for extending said line temporarily through the brushes of said allotter to the allotted trunk, means including circuits extending through brushes of said allotter for directively operating the allotted automatic switch to seize the calling incoming line, and means for releasing said temporary connection.

In witness whereof, I hereunto subscribe my name this 5th day of April A. D. 1927.

WINFRED T. POWELL.