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J. H. LEVIS, JR

MANUAL TELEPHONE SYSTEM

Filed Dec. 23, 1925

2 Sheets-Sheet 1

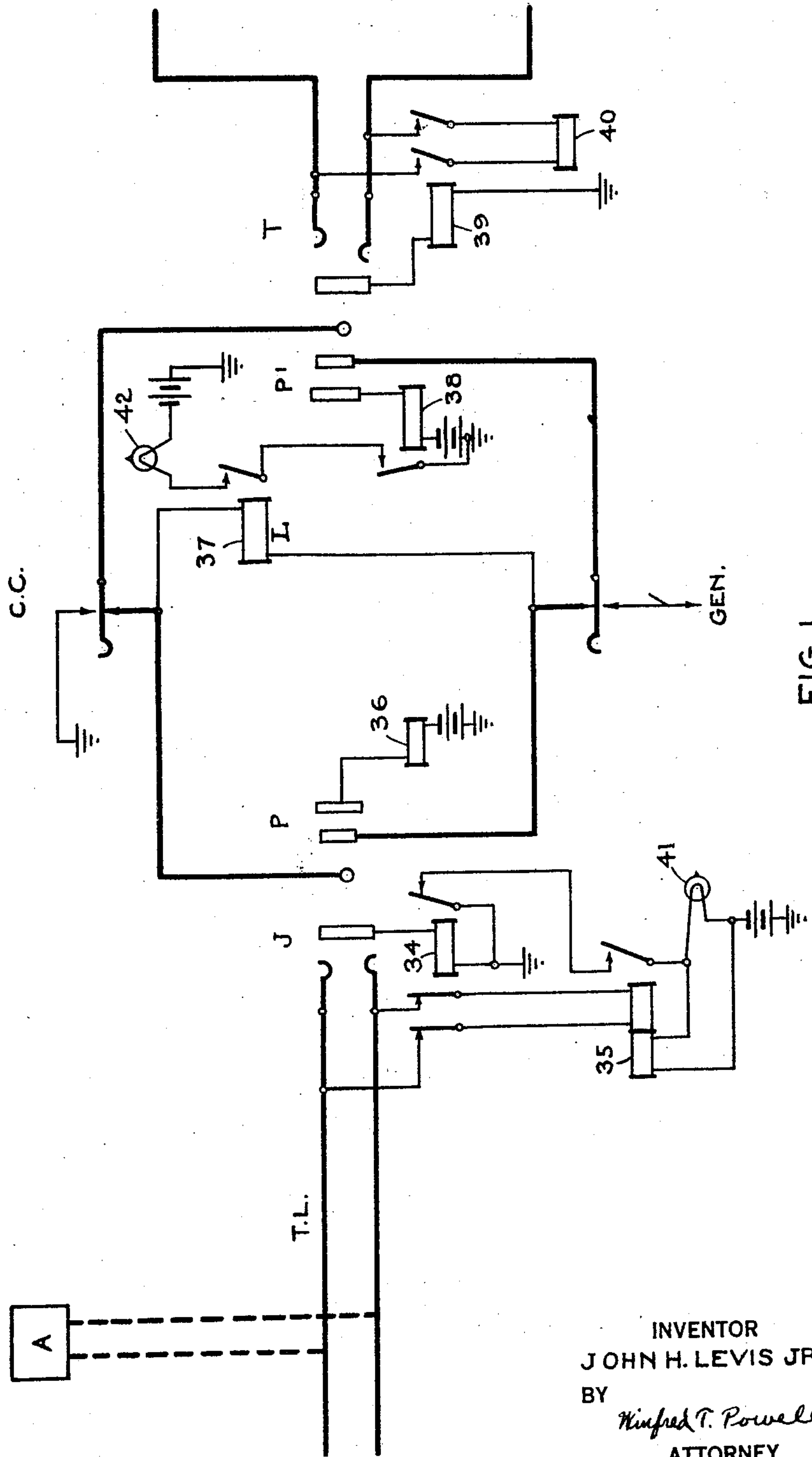


FIG. 1

INVENTOR
JOHN H. LEVIS JR.
BY
Hinfred T. Powell
ATTORNEY

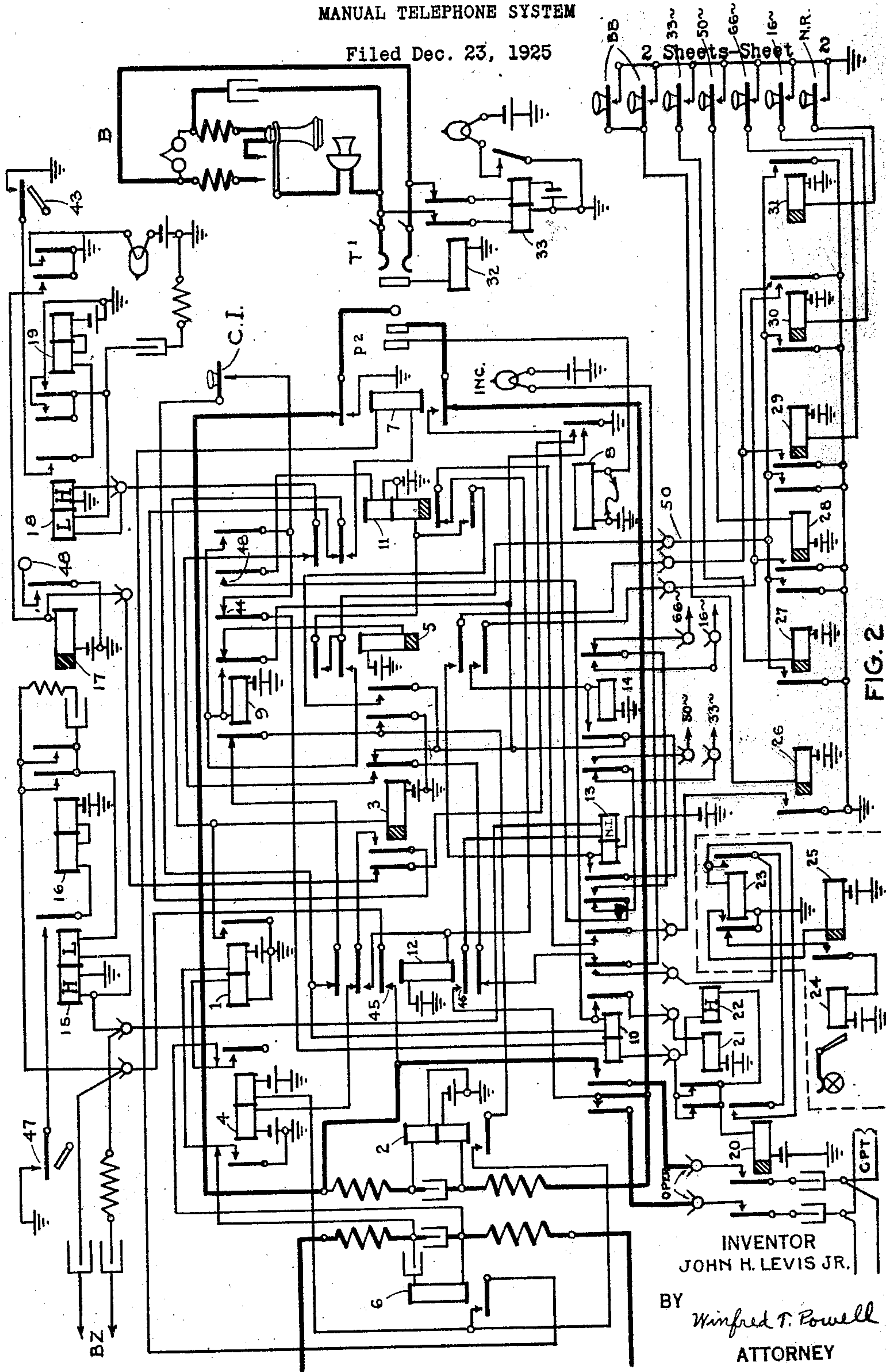
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INVENTOR
JOHN H. LEVIS JR.

BY *Winfred T. Powell*
ATTORNEY

UNITED STATES PATENT OFFICE.

JOHN H. LEVIS, JR., OF ROCHESTER, NEW YORK, ASSIGNOR TO THE STROMBERG-CARLSON TELEPHONE MANUFACTURING COMPANY, OF ROCHESTER, NEW YORK, A CORPORATION OF NEW YORK.

MANUAL TELEPHONE SYSTEM.

Application filed December 23, 1925. Serial No. 77,197.

This invention relates to manual telephone systems and more particularly to manual telephone systems in which toll switching trunks are used.

5 This invention is directed to the elimination of order wires in such a telephone system whereby the toll operator instead of being assigned a trunk by the terminating or "B" operator selects an idle trunk located
10 at the terminating or "B" position. Means are provided in the form of a signal to the toll operator to inform her when a terminating operator is ready to receive the designation of the wanted telephone line. This and
15 other features of the present invention are accomplished by a special application of the general method disclosed in my co-pending application, Serial No. 753,141, filed December 1, 1924.

20 One of the main features of the present invention is the novel method of associating a terminating operator's telephone set with a trunk circuit to which a toll line has been extended.

25 Another feature of this invention is the circuit arrangement by which a set of keys, comprising one key for each source of ringing current, is common to a group of trunk circuits and is arranged to co-operate with
30 the circuits by which an operator's telephone set is connected to a trunk circuit taken for use.

Another feature of this invention is the provision of means by which the proper frequency for signalling a wanted telephone
35 line is selected by the terminating or "B" operator, but is not applied to the wanted telephone line upon connection therewith, until the ringing key at the toll operator's
40 position is manually operated.

The drawings with Figs. 1 and 2 arranged in the order named, diagrammatically represent the circuits used in a toll switching system. In the upper left hand portion of
45 Fig. 1 there is represented a calling subscriber's substation, which is associated with the toll line. In order to simplify the drawings and since it is not believed necessary to show the toll line circuits located at the distant exchange, the calling subscriber's substation is shown connected to the toll line by dotted
50 lines.

The toll line terminates on a jack J at the toll operator's position. The toll operator's

cord circuit is represented by C. C. and the outgoing trunk is indicated by T. 55

Fig. 2 diagrammatically represents the circuits associated with a toll switching trunk extending from jack T. to the terminating or "B" position. These toll switching trunks may be mixed with other trunks located on regular "B" positions, but preferably they are segregated and located on special "B" positions, which are used for toll switching service only. 60 65

At the right of Fig. 2 is shown a common battery substation "B", connected to a multiple jack T¹. In the upper portion of Fig. 2 is shown a series of relays, which are common to a certain number of toll switching trunks, one particularly useful arrangement being the provision of one set of these common relays for twenty trunks. In the lower portion of Fig. 2 is shown a series of six slow acting relays, associated with seven non-locking buttons or keys. One set of these relays and buttons is used for each position. In the lower left hand portion of the drawing of Fig. 2 is shown two relays indicated 23 and 25 and a meter 24, which are common
70 75 80 85

It is believed that the invention will best be understood by describing the method of establishing a telephone connection from a
90 calling subscriber A, whose line terminates at an exchange in one office with a subscriber's line such as B, which terminates at a distant office, such connection being established over toll line T. L. For the purpose of this description it will be assumed that substation A is of the local battery type and that it is connected to the toll line in any well known manner; for example, by means of a cord circuit at a toll position in the distant
100 exchange. The toll operator at the distant exchange upon receiving a request for connection with a subscriber such as B, connects her cord circuit to toll line T. L. and rings on this line by operating a ringing
105 key associated with her cord circuit. Ringing current will be applied to the right hand winding of relay 35 associated with the in-

coming trunk, which is located on the toll board in the same exchange with which substation B is associated. Relay 35 will be operated by ringing current and will close a circuit from ground, right hand back contact of relay 34, make contact of relay 35 and left hand winding of relay 35 to grounded battery. This circuit functions to lock relay 35 in its operated position. Lamp 41 is connected in multiple with the left hand winding of relay 35 and it is therefore lighted to give an indication to the local toll operator that a connection is desired to this particular toll line. The toll operator inserts the answering plug P into the jack J thereby closing a circuit over the sleeve of the plug and jack for operating relay 34, which extinguishes the signal 41.

The local toll operator operates her listening key (not shown) and establishes a talking connection with the distant toll operator or subscriber A and determines the number of the wanted subscriber. The local toll operator now inserts plug P¹ into a toll switching trunk jack, for example T, thereby closing a circuit by way of the sleeve contacts of the plug and jack connection to operate relays 38 and 39 in the well known manner. The operation of relay 39 connects a high wound impedance coil 40 across the tip and ring conductors of the toll switching trunk for a purpose to be described later. Relay 38 prepares a circuit from ground for lighting supervisory lamp 42, as will be pointed out in the following description.

A circuit is now closed for operating relay 1 of the toll switching trunk of Fig. 2, extending from grounded battery, right hand winding of relay 1, left hand continuity spring and back contact of relay 4, upper winding of repeating coil, upper conductor of the total switching trunk, tip contacts of the jack and plug, back contact of the toll operator's ringing key, winding of relay 37, back contact of the ringing key, ring contacts of the plug and jack, lower conductor of the toll switching trunk, lower left hand winding of the repeating coil, right hand back contact and continuity spring of relay 4 and left hand winding of relay 1 to ground. Since relay 37 is of comparatively low resistance, relay 1 will be operated and in turn closes a circuit for operating relay 3, which circuit extends from grounded battery winding of relay 3 and make contact of relay 1 to ground.

The operation of relay 3 closes a circuit for operating relay 4, said circuit extending from grounded battery, left hand winding of relay 4, upper, middle back contact and armature of relay 12, inner left hand make contact of relay 3, inner, upper back contact of relay 11 and make contact of relay 1 to ground. The operation of relay 4 opens the original operating circuit of relay

1, and establishes a substitute circuit for holding relay 1, from ground, left hand make contact and continuity spring of relay 4, and right hand winding of relay 1 to grounded battery. It will thus be seen that when the toll operator plugs into jack T, relays 1, 3 and 4 are operated in rotation. The operation of relay 4 opens the original operating circuit of relay 1 and locks these three relays in their operated positions.

A circuit is now closed from grounded battery, incoming lamp INC., right hand middle back contact of relay 10, lower back contact of relay 12, right hand inner make contact of relay 3, upper back contact of relay 11 and right hand winding of relay 18 to ground. This circuit is effective to operate relay 18, which in turn closes a circuit from ground, flashing interrupter 43, make contact of relay 18, and both windings of relay 19 in series, to grounded battery. The constantly operating interrupter contact 43 causes the operation and release of relay 19 and this relay closes a circuit from ground, make contacts of relay 19, left hand winding of relay 18, to the circuit leading to lamp INC., previously traced. Since the right hand winding of relay 18 has a resistance comparatively high, for example two thousand ohms, it will be noted that lamp INC. will not receive sufficient current to be lighted, but relay 18 will receive sufficient current to be operated, as above described. The left hand winding of relay 18 is of comparatively low resistance, for example five ohms, so that the closure of the circuit to ground at make contacts of relay 19, establishes a low resistance shunt about the right hand winding of relay 18, which will allow sufficient current to flow for lighting lamp INC. It will thus be seen that relay 19 will be intermittently operated as long as there is any connection established in this group of trunks to which relay 19 is common and that during its intermittent operation relay 18 will be held energized and lamp INC. will be flashed, thus giving an indication to the terminating operator, that a connection is established with the trunk with which lamp INC. is associated.

When the terminating operator is ready to handle the connection associated with this trunk, she momentarily depresses the assignment or cut in key C. I., thereby closing a circuit from grounded battery, winding of relay 20, back contacts of relay 21, left hand winding of relay 10, back contact 44 of relay 9, contact of key C. I., upper back contact of relay 12, left hand back contact of relay 9 and right hand middle make contact of relay 3 to ground. Relays 20 and 10 are operated in the above described circuit, after which a circuit is established from grounded battery, winding of relay 21, inner right hand make contact and right hand

winding of relay 10, upper back contact of relay 12, left hand back contact of relay 9 and right hand middle make contact of relay 3 to ground. This circuit is effective to operate relay 21, which operation opens the original operating circuit of relays 20 and 10, but a substitute circuit for relay 10 is now established through its right hand winding. The operation of relay 20 as above described, connects the call-passing tone CPT to the operator's common telephone circuit OPER. The complete operator's talking circuit is not shown in this drawing, since it is of a well known type, for example as shown in the lower left hand portion of Fig. 3 of my co-pending application above mentioned. The application of this call-passing tone to the operator's talking circuit is for the purpose of notifying the originating toll operator that she is in telephonic connection with the terminating operator's telephone set. This call-passing tone is extended by way of the two left hand make contacts of relay 10 through the right hand windings of the repeating coil and the windings of relay 2 to ground and grounded battery. The tone is repeated into the left hand windings of the repeating coil and thence by way of the two-wire trunk to the originating operator's telephone set, which is connected to this trunk.

The operation of relay 21 as above described is for the purpose of including the high resistance winding of coil 22 in the common lead extending to all of the operator cut-in relays, similar to relay 10. This is for the purpose of preventing the operation of more than one relay, similar to relay 10 in case the operator should press another key similar to C. I. associated with another trunk in this group, thus preventing the connection of the call-passing tone and the operator's talking circuit to more than one trunk at a time.

Shortly after the operation of relay 21 as above pointed out relay 20 will release, since it does not get sufficient current through the winding of coil 22 to hold it in its energized condition. Relay 20, therefore, remains operated only for a short interval of time for the purpose of applying a short signal to the trunk for notifying the originating toll operator that the wanted number may be repeated, since the terminating operator is on the connection.

The incoming lamp INC is now dimly lighted, instead of being flashed as before, since relay 10 at its right hand middle contact opens the flashing circuit for this lamp and closes a circuit through the right hand make contact of relay 20 and the winding of relay 23 to ground. Relay 23 is of the proper resistance, for example two hundred ohms, to allow sufficient current to flow through the lamp circuit to cause it to be

only dimly lighted. Relay 23 is operated in series with the lamp and closes a circuit by way of its left hand make contact for operating relay 25.

After receiving the call-passing tone the toll operator repeats or passes the number of the wanted telephone line to the terminating or "B" operator. The "B" operator then makes the busy test of the wanted line and in this case where it is assumed that the jack T¹ is associated with the desired telephone line, she touches the tip of plug P² of the trunk to the sleeve of jack T¹. If this line is busy, the "B" operator will hear a distinctive click in her telephone head set, which is a signal that the call cannot be completed. The circuit for giving this click extends from battery, which will be found on the sleeve of the jack of a busy line, tip of plug P², upper back contact of relay 7, inner left hand make contact of relay 10 to one side of the operator's common telephone circuit and through circuits of the operator's telephone set in the well known manner for producing a distinctive click in her head set.

The operator upon hearing this busy indication depresses one of the busy-back keys BB to transmit a busy-back signal to the calling subscriber. It will be noted that two busy-back keys are shown by which it is intended to indicate that two of these keys are placed on each operator's position. One of the keys is placed at the right of the operator's position and the other key is placed at the left, so that one of them is easily accessible to either hand of the operator. The operation of the busy-back key closes a circuit from ground, make contact of the key, winding of the slow releasing relay 26 to grounded battery. Relay 26 operates and completes a circuit from ground at its make contact, outer right hand armature and front contact of relay 10, lower, inner back contact of relay 11 and winding of relay 12 to grounded battery. This operates relay 12 and it closes a locking circuit for itself extending from grounded battery, winding of relay 12, upper, middle make contact of relay 12, inner left hand make contact of relay 3, inner, upper back contact of relay 11 and make contact of relay 1 to ground. With relay 12 operated, a source of busy tone current BZ is connected to the right hand windings of the repeating coil by way of contacts 45 and 46 of relay 12. One side of this busy tone current is connected through a non-inductive winding placed on relay 13, in order to reduce the intensity of the tone, so that it will be pleasing to the ear. This tone is induced into the left hand winding of the repeating coil and from there leads back to the calling substation, which is connected to this trunk.

The operation of relay 12 opens at its extreme upper back contact, the circuit of relay 10 and this latter relay releases, thus disconnecting the operator's talking circuit from the trunk and also opening the circuits to the common relays 23 and 21. Relay 23 releases and opens the circuit of relay 25, but this latter relay being slow releasing maintains a circuit closed from ground, left hand back contact of relay 23, make contact of relay 25 and winding of meter 24 to grounded battery, which functions to operate the meter and after a short interval relay 25 releases and opens the circuit of meter 24. The operation of this meter indicates that the "B" operator has completed her work in connection with one call.

The deenergization of relay 10 opens at its right hand middle make contact the circuit of the lamp INC., thus extinguishing this signal. The operation of relay 12 opens at its upper middle back contact, the circuit of the left hand winding of relay 4, which allows this latter relay to release. At both back contacts and continuity springs of relay 4, the circuit of relay 1 is reestablished to the left hand windings of the repeating coil and relay 1 is maintained in its energized position, by means of the closed circuit across the toll switching trunk. The circuit to ground and grounded battery through the windings of relay 1 is effective to operate relay 37 in the toll cord circuit and the battery relay closes a circuit for lighting supervisory lamp 42.

The operation of relay 12 closes a circuit extending from grounded battery, lower winding of relay 2, lower, right hand winding of the repeating coil, contact 46 of relay 12, right hand winding of relay 13 and left hand winding of relay 15 to ground. The left hand winding of relay 15 is of very high resistance, for example five thousand ohms, this being of sufficient resistance to prevent the operation of relay 2 over this circuit, but relay 15 will be energized and will close a circuit from the common busy-back flashing interrupter 47 for operating relay 16. The operation of relay 16 connects the right hand winding of relay 15 by way of contacts 45 and 46 of relay 12 across the outside terminals of the right hand winding of the repeating coil and since the right hand winding of relay 15 is of comparatively low resistance, for example fifty ohms, this bridge across the right hand winding of the repeating coil will cause relay 2 to be operated. When interrupter 47 opens its contact, relay 16 is released and this low resistance shunt, consisting of the right hand winding of relay 15, is removed until contact 47 is again closed, this operation functioning to cause relay 2 to be intermittently operated. The intermittent closing and opening of the make contact on relay 2 closes a circuit from

ground, right hand middle contact of relay 3, make contact of relay 2 and right hand winding of relay 4 to grounded battery, which circuit functions to cause the intermittent operation of relay 4. Relay 4 thereby opens and closes the battery bridge of relay 1 to the toll switching trunk, leading back to the toll position and this opening and closing of the battery circuit on this trunk causes relay 37 to intermittently operate and flash the lamp 42. This is for the purpose of giving the toll operator a visual indication that the called line is busy at the same time that the busy-back tone is being applied to the calling line.

Let it be assumed that at the time the test of the wanted line is made, this line is found to be idle, whereupon the "B" operator inserts the plug P^2 into the jack T^1 of the wanted line and assuming that the wanted line is a party line, the operator depresses some one of the stations' keys located in the lower right hand portion of Fig. 2, to connect the proper source of ringing current to the toll switching trunk with which to ring the desired station on the wanted line. With the plug P^2 in engagement with jack T^1 , the cut-off relay 32 and the sleeve relay 8 are energized. The energization of relay 32 is for the well known purpose of removing the line relay 33 from across the called line circuit. The operation of relay 8 closes a circuit for operating relay 5 extending from grounded battery, winding of relay 5, inner, right hand back contact of relay 9 and make contact of relay 8 to ground. Lamp INC. now burns dimly as an indication to the "B" operator that the circuit has been established to the wanted line, but that the ringing frequency has not been selected. The circuit for dimly lighting lamp INC. has been previously described.

Assuming that the wanted station "B" has a ringer which responds to the source of fifty cycle ringing current, the operator depresses the ringing key marked fifty cycles, which results in the energization of the slow releasing relay 28. This relay thereupon attracts its armatures to complete an operating circuit for relay 14, extending from grounded battery, winding of relay 14, lower outer make contact of relay 5 and inner make contact of relay 28 to ground. Relay 14 as soon as it is operated, closes a locking circuit for itself from grounded battery, through its winding and inner left hand make contact and make contact of relay 8 to ground. Also at this time relay 9 is energized in a circuit extending from grounded battery winding of relay 9, inner, upper make contact of relay 5 and outer make contact of relay 28 to ground. Relay 9 closes a locking circuit for itself extending from grounded battery, its winding, inner, right hand make contact and make contact of re-

lay 8 to ground. A circuit is also closed for operating relay 11, extending from grounded battery, lower winding of this relay, upper make contact of relay 5 and left hand make contact of relay 28 to ground. Relay 11 closes a locking circuit for itself extending from grounded battery, lower winding of relay 11, lower make contact of relay 11 outer right hand make contact of relay 3 and make contact of relay 8 to ground. The operation of relay 9 opens the circuits of both windings of relay 10, this latter relay releases and by opening its right hand middle make contact extinguishes the lamp INC. The lamp INC. is connected by way of a back contact of relay 10 to a circuit including the right hand inner make contact of relay 3, but this circuit is interrupted at the upper, outer back contact of relay 11. The release of relay 10 as above described functions to release relays 23 and 25 and to operate meter 24 in a manner which was previously described in connection with a call for a busy line.

The operation of relay 9, as above described, opens at its inner, right hand back contact the circuit of relay 5 and this latter relay deenergizes, opening the previously established circuits for ringing selecting relays 13 and 14. The operation of relay 11, as above described, opens at its upper, inner back contact, the circuit of the left hand winding of relay 4 and this relay deenergizes, placing relay 1 across the trunk leading back to the toll cord circuit. The circuit to ground and grounded battery through relay 1, across this trunk functions to operate relay 37 of the toll cord circuit and this latter relay closes a circuit for lighting the supervisory lamp 42.

From the above description, it will be seen that the proper ringing frequency, in this case fifty cycles, has been selected by the terminating or "B" operator and this ringing frequency has been extended through the outer left hand make contact of relay 14 and the outer back contact of relay 13 to the lower make contact of relay 7. The ringing current is not applied to the called line in this system, until the toll operator rings over the toll switching trunk. When the toll operator is ready to establish the connection, she operates her ringing key, which is effective to apply generator and ground to the two sides of the toll switching trunk. It will be noted that the ringing key opens the circuit to relay 37 during the ringing interval and to prevent a premature release of relay 1, which controls the connection at this time, a bridge consisting of impedance coil 40 is maintained across the trunk, during the ringing period because the sleeve circuit of the toll calling cord is not interrupted. The ringing current, extends through the left hand windings of the

repeating coil of the switching trunk and the winding of relay 6, operating this latter relay, which closes a circuit from ground, make contact of relay 1, upper, inner make contact of relay 11, winding of relay 7, make contact of relay 6 and right hand winding of relay 4 to grounded battery. Relay 7 is operated over this circuit and fifty cycle generator is extended from the lower make contact of relay 7, ring contacts of the plug and jack, lower side of the called line, ringer of the substation, upper side of the called line, tip contacts of the plug and jack and the upper make contact of relay 7 to ground. This ringing current is only applied during the time that the toll operator actuates her ringing key, therefore, the called subscriber understands that this is a toll call, because the bell is not actuated by the automatic ringing equipment.

When the called party answers, a circuit is closed from grounded battery, lower winding of relay 2, lower, right hand winding of the repeating coil, lower back contact of relay 7, ring of the plug and jack over the called line circuit, tip of the plug and jack, upper back contact of relay 7, upper, right hand winding of the repeating coil and the upper winding of relay 2 to ground. Talking battery is supplied to the called line over the above traced circuit and relay 2 is energized, closing a circuit for operating relay 4 extending from grounded battery, right hand winding of relay 4, make contact of relay 2 and right hand middle make contact of relay 3 to ground. The operation of relay 4 removes the bridge to ground and grounded battery through relay 1, which functions to release relay 37 in the toll cord circuit, thus extinguishing lamp 42, this being an indication that the called party has answered. Talking battery for the calling substation is supplied from local batteries at this substation.

At the close of the conversation when the called party hangs up the receiver, relay 2 retracts its armature, which opens the circuit of the right hand winding of relay 4. This relay releases and again applies the battery bridge through the windings of relay 1 to the toll cord circuit by way of the toll switching trunk. Relay 37 is now energized closing a circuit for lighting supervisory lamp 42 as an indication to the toll operator that the called party has disconnected.

The toll operator now supervises the connection and stamps the toll ticket, after which she removes the plug P¹ from jack T. This removes the bridge consisting of relay 37 and relay 39 releases, removing the bridge consisting of coil 40 from the toll switching trunk. This functions to release relay 1 and this latter relay at its make contact opens the circuit of relay 3, releasing this latter relay. A circuit is now established for

lighting lamp INC., which at this time serves as a disconnect signal for the toll switching operator. This circuit extends from grounded battery, lamp, right hand middle back contact of relay 10, lower back contact of relay 12, right hand, inner back contact of relay 3 and make contact of relay 8 to ground. The "B" operator thereupon removes the plug P² from jack T¹, thus releasing relays 32 and 8. The release of relay 8 opens the locking circuits of relays 9 and 14 and the release of relay 3, as above described, opens the locking circuit of relay 11.

If, during the time of extremely light traffic through the exchange, for instance late at night, the "B" operator is not at the position when the toll operator disconnects from the switching trunk, as above described, when relay 3 is released a circuit is established from ground, make contact of relay 8, outer, left hand back contact of relay 3 and winding of common relay 17 to grounded battery. This latter relay is energized and closes a circuit for actuating an alarm signal indicated at 48. When the "B" operator removes the plug from jack T¹ and relay 8 is released, the circuit for actuating this night alarm is interrupted.

The apparatus is now in its normal condition, in readiness for use in a succeeding call.

It sometimes happens that the "B" operator desires to connect a toll switching trunk with another circuit without the necessity of selecting a ringing frequency. Such a mentioned connection may arise when it is necessary to extend a connection from the trunk circuit to an intercepting operator. In such a case it is necessary for the "B" operator to cause the circuit to function to apply ground to the two make contacts of relay 5 by way of conductor 50. Of course, it would only be necessary to operate someone of the frequency selecting buttons, thereby energizing one of the relays 27, 28, 29 or 30, but in order to make the operation uniform, so that a "B" operator from some other position in the exchange can handle the toll switching position without any change in the method of operation, the non-ring key NR has been provided. The operation of key NR energizes relay 31 and it in turn connects ground through the make contacts of relay 5 for energizing and locking relays 11 and 9. This places the circuit in the same condition as in the previously described connection just after the operator depressed the 50 cycle button.

It sometimes happens that the toll operator momentarily opens the circuit of the switching trunk at the plug P¹. In such a case, relays 1 and 11 would be released and lamp INC. would begin to flash. The "B" operator now presses the cut-in key C. I. to re-establish connection with this circuit,

thereby closing a circuit from grounded battery, upper winding of relay 11, make contact 48 of relay 9, right hand winding of relay 10, contacts of key C. I., right hand outer make contact of relay 9, right hand, inner make contact of relay 9 to ground at a make contact of relay 8. Relay 11 is operated over this circuit and relay 10 is energized by way of its right hand winding for connecting in the common equipment including the operator's talking circuit. In this case, however, since relay 10 is operated by way of its right hand winding, relay 20 will not be energized with the result that the call-passing tone will not be applied to the trunk and since relay 23 will not be operated, the meter will not record another completed call for a connection of this kind.

What I claim is:

1. In a telephone system, a calling line and a called line, means including a cord circuit and trunk circuit for interconnecting said lines, an operator's telephone set, means responsive to the extension of said calling line to said trunk circuit for connecting said operator's telephone set to said trunk circuit to the exclusion of other trunk circuits, means for extending said trunk circuit to said called line, a plurality of sources of ringing current for signalling stations on said called line, means including a single ringing key for each source of ringing current common to a plurality of said trunk circuits, means responsive to the depression of one of said ringing keys for selecting the proper source of signalling current to signal the wanted station on said called line, and means controlled from said cord circuit for applying said proper source of signalling current to said called line.

2. In a telephone system, a calling line and a called line, means including a cord circuit at a first position and a trunk circuit at a second position for interconnecting said lines, an operator's telephone set, means responsive to the extension of said calling line to said trunk circuit for connecting said operator's telephone set to said trunk circuit to the exclusion of other trunk circuits, means for extending said trunk circuit to said called line, a plurality of sources of ringing current for signalling stations on said called line, means including a single ringing key for each source of ringing current common to a plurality of said trunk circuits, means responsive to the depression of one of said ringing keys for selecting the proper source of signalling current to signal the wanted station on said called line, and means controlled at the will of the operator at said first position for applying said proper source of signalling current to said called line.

3. In a telephone system, a calling line and a called line, means including a cord circuit

at a first position and a trunk circuit at a second position for interconnecting said lines, an operator's telephone set, means responsive to the extension of said calling line to said trunk circuit for connecting said operator's telephone set to said trunk circuit to the exclusion of other trunk circuits, means for extending said trunk circuit to said called line, a plurality of sources of ringing current for signalling stations on said called line, means including a single ringing key for each source of ringing current common to a plurality of said trunk circuits, means responsive to the depression of one of said ringing keys for selecting the proper source of signalling current to signal the wanted station on said called line, and means manually controlled at said cord circuit for applying said proper source of signalling current to said called line.

4. In a telephone system, a toll position and a local position, telephone lines terminating at each of said positions, certain of said telephone lines being party lines having a plurality of stations, trunks for interconnecting said positions, means at the toll position for extending a calling telephone line terminating thereat to a trunk, a signal lamp individual to said trunk, a circuit for lighting said lamp when said trunk is extending to a calling telephone line, an operator's telephone set, means controlled in part by the extension of said calling telephone line to said trunk for connecting said operator's telephone set to said trunk to the exclusion of other trunks, means including a portion of said first mentioned circuit for dimly lighting said lamp while said operator's telephone set is connected to said trunk, means for extending said trunk to a wanted telephone line, a plurality of sources of ringing current for signalling the stations on said party lines, means including a single ringing key for each source of ringing current common to said trunk circuits for selecting the proper source of signalling current to signal the wanted station on said wanted telephone line, and means controlled from said toll position for applying said proper source of signalling current to said wanted telephone line.

5. In a telephone system, a toll position and a local position, telephone lines terminating at each of said positions, certain of said telephone lines being party lines having a plurality of stations, trunks for interconnecting said positions, means at the toll position for extending a calling telephone line terminating thereat to a trunk, a signal lamp individual to said trunk, a circuit for lighting said lamp when said trunk is extended to a calling telephone line, an operator's telephone set, means controlled in part by the extension of said calling telephone line to said trunk for connecting said operator's tel-

ephone set to said trunk to the exclusion of other trunks, means including a portion of said first mentioned circuit for lighting said lamp in a distinctive manner while said operator's telephone set is connected to said trunk, means for extending said trunk to a wanted telephone line, a plurality of sources of ringing current for signalling the stations on said party lines, means including a single ringing key for each source of ringing current common to said trunk circuits for selecting the proper source of signalling current to signal the wanted station on said wanted telephone line, and means controlled from said toll position for applying said proper source of signalling current to said wanted telephone line.

6. In a telephone system, a toll position and a local position, telephone lines terminating at each of said positions, means at the toll position for extending a calling telephone line terminating thereat to a trunk, an operator's telephone set at the local position, automatic means responsive to the extension of said calling telephone line to said trunk for connecting said operator's telephone circuit to said trunk to the exclusion of other trunks, means for signalling the operator at the toll position that such connection has been made, a plurality of sources of ringing current for signalling stations terminating at said local position, means including a single ringing key for each source of ringing current common to said trunk circuits for selecting the proper source of signalling current to signal the wanted station, and means manually controlled at the will of the operator at said toll position for applying said proper source of signalling current to said wanted line.

7. In a telephone system; an originating position, a terminating position, telephone lines terminating at each of said positions, means at the originating position for extending a calling telephone line terminating thereat to a trunk, an operator's telephone set at the terminating position, a source of signalling current, a relay individual to each trunk for connecting said operator's telephone set to said trunk and for connecting said signalling current to said trunk, automatic means responsive to the extension of said calling telephone line to said trunk for actuating said relay, a plurality of sources of ringing current for signalling stations on said wanted telephone line, means common to a plurality of said trunks for selecting a source of ringing current, and means controlled at the originating position for applying said source of signalling current to said wanted telephone line.

8. In a telephone system, an originating position and a terminating position, telephone lines terminating at each of said positions, trunks each having conductors extend-

ing between said positions, means for extending telephone lines to each end of a trunk, a plurality of sources of ringing current for signalling stations on telephone lines terminating at said terminating position, means including a single ringing key for each source of ringing current, said keys being common to a plurality of said trunks for selecting the proper source of ringing current for signalling the wanted station, a relay in said trunk circuit for connecting said selected ringing current to said wanted line for signalling the wanted station thereon, and means controlled at said originating position for energizing said relay.

9. In a telephone system, an originating position and a terminating position, telephone lines terminating at each of said positions, certain of said telephone lines being party lines having a plurality of stations, trunks for interconnecting said positions, means at the originating position for extending a calling telephone line terminating thereat to a trunk, a plurality of sources of ringing current for signalling the stations on said party lines, means including a single key for each source of ringing current, said keys being common to said terminating position for selecting the proper source of ringing current for signalling a wanted station on one of said party lines, a relay in said

trunk circuit controlled by ringing current from said originating position for applying said selected ringing current to one of said party lines for signalling said wanted station.

10. In a telephone system, an originating position and a terminating position, telephone lines terminating at each of said positions, trunk circuits extending between said positions, means for extending telephone lines to each end of said trunk circuits, sources of signalling current for signalling stations on telephone lines connected to said terminating position, a single key common to said trunk circuits for each source of signaling current at said terminating position, a source of ringing current at said originating position, a battery bridge across said trunk at said terminating position, means for removing said battery bridge from across said trunk when said ringing current is connected to said trunk at said originating position, and means controlled by said ringing current for applying to a wanted station on one of said telephone lines signaling current selected by the operation of one of said common keys.

In witness whereof, I hereunto subscribe my name this 21st day of December A. D. 1925.

JOHN H. LEVIS, JR.