

Aug. 16, 1927.

H. B. JOHNSON ET AL

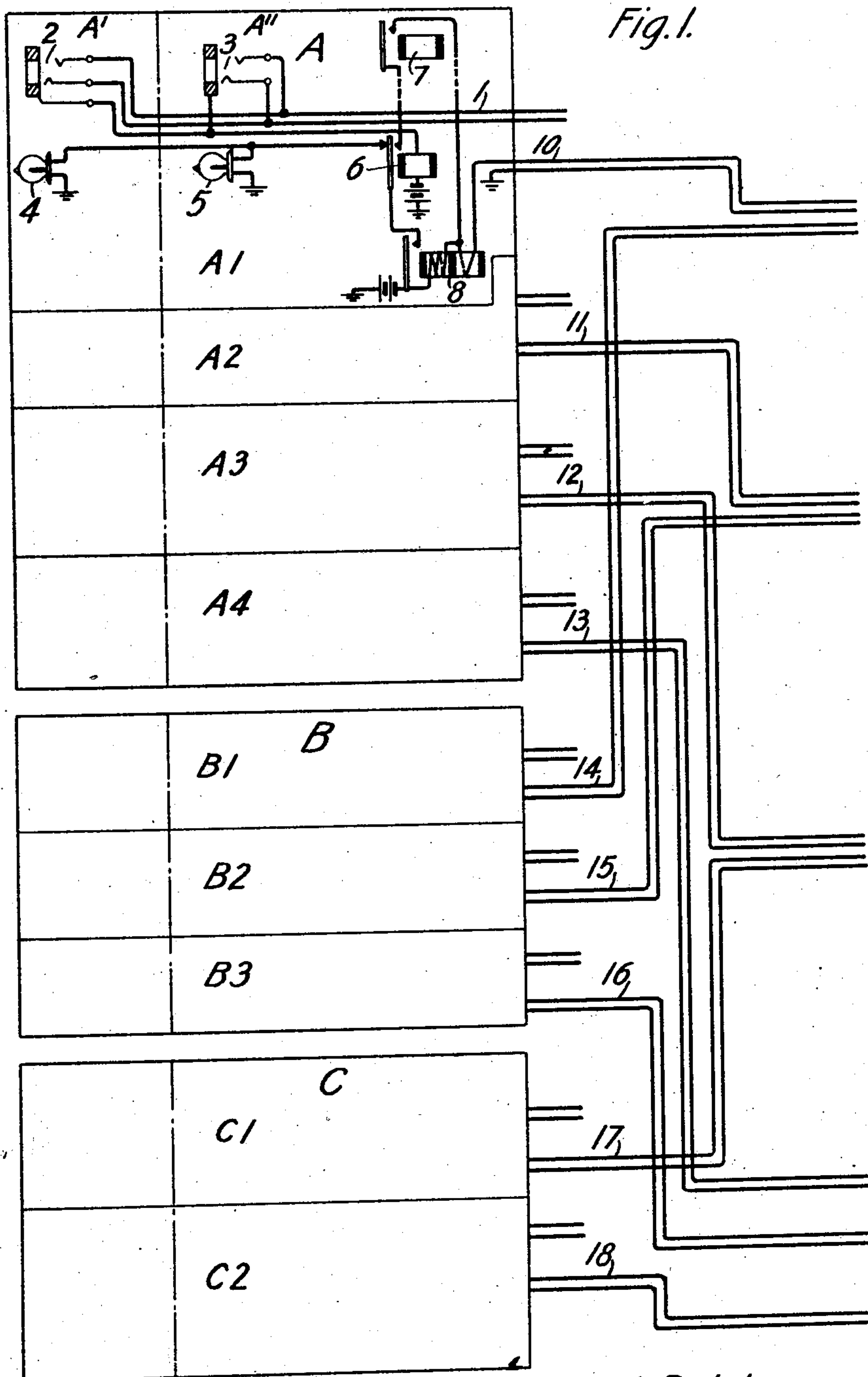
1,639,135

TELEPHONE SYSTEM

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4 Sheets-Sheet 1

Fig. 1.



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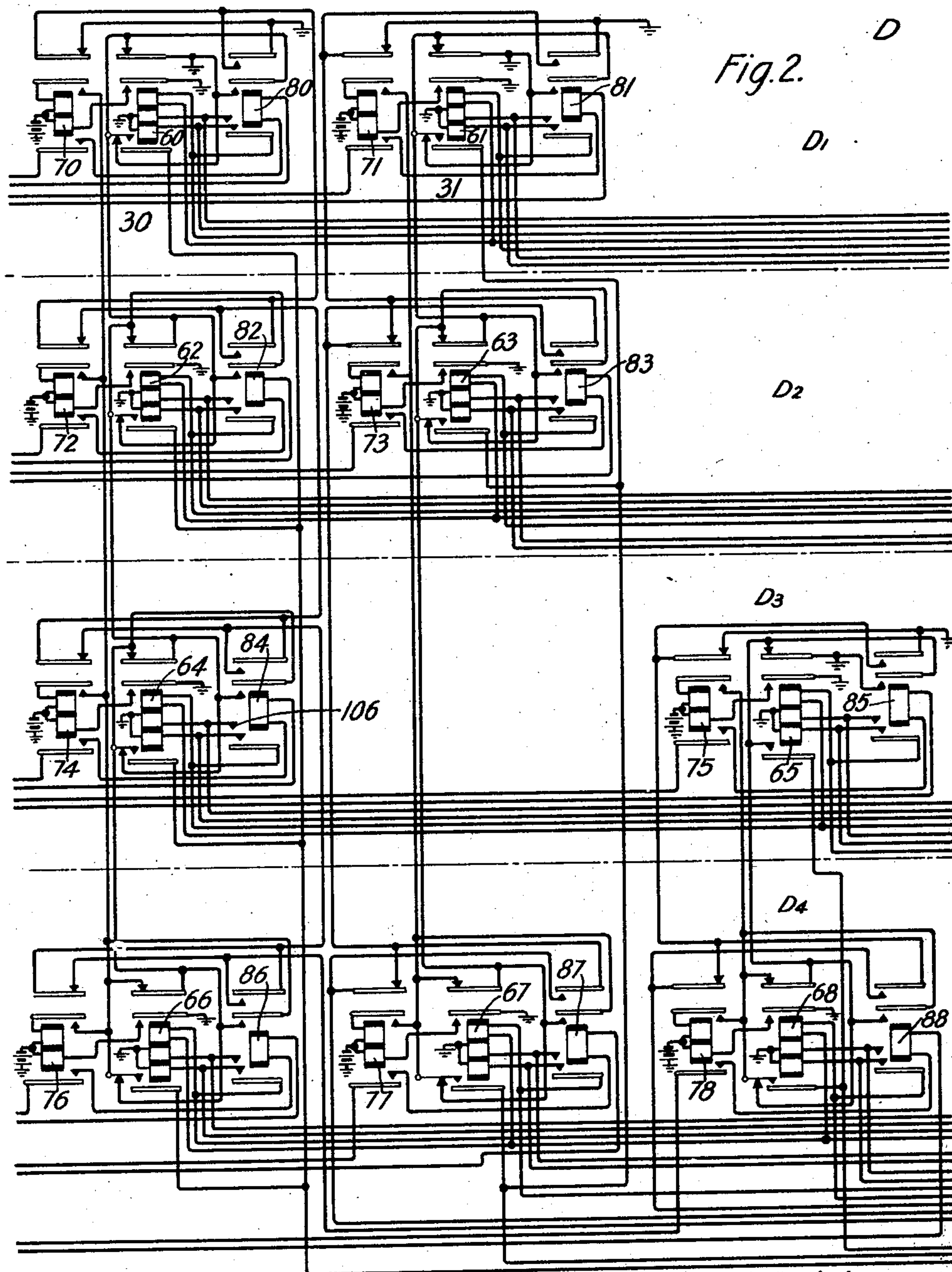
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4 Sheets-Sheet 2



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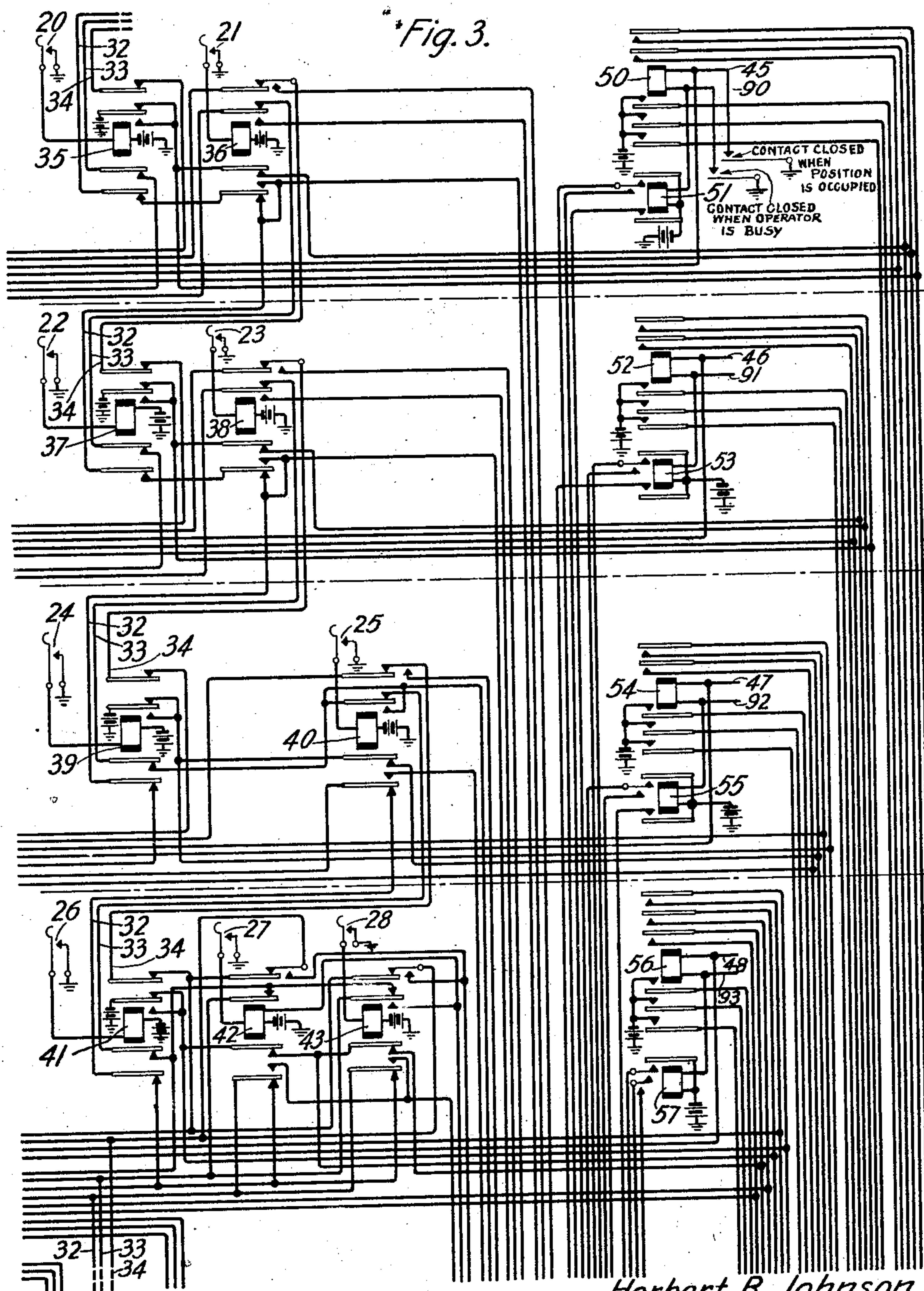
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4 Sheets-Sheet 3



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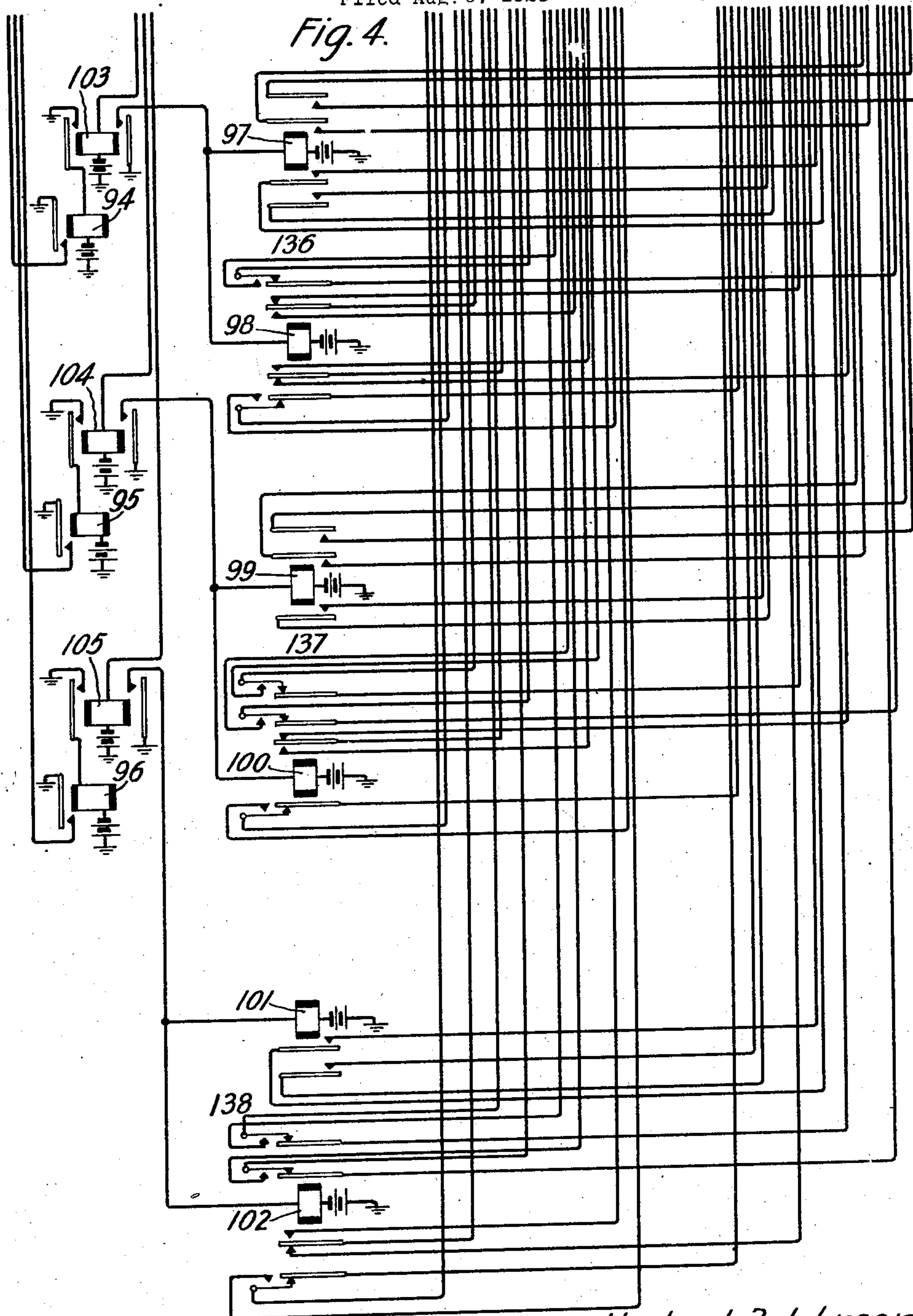
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TELEPHONE SYSTEM

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4 Sheets-Sheet 4



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UNITED STATES PATENT OFFICE.

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TELEPHONE SYSTEM.

Application filed August 9, 1926. Serial No. 128,170.

This invention relates to telephone systems and particularly to trunk indicating devices for straightforward trunking systems.

5 The principal object of this invention is to further improve indicating systems and particularly systems wherein A operators may be directed to choose trunks terminating at certain B operators' positions in preference to trunks terminating in other B operators' positions for the extension of calls. Thus incoming calls may be more conveniently handled during slack periods by a reduced number of B operators.

15 According to the present invention a system is provided wherein the trunks leading to any one of a plurality of B operators' positions from an A position may be rendered non-available together with means whereby a group of trunks thus made non-available may be automatically rendered available when all trunks leading to some other B position become busy.

25 Moreover the system is so arranged that any B operator may bring to her attention calls incoming over a variable number of groups of trunks.

30 According to a further feature the trunks are made available to A operator in such an order that as successive groups of trunks become busy the next group to be employed will be the group which appears nearest to the position of the attending B operator.

35 In present straightforward trunking systems the A operators of one office may extend a connection over a trunk to a B operator's position at a distant office by the simple expedient of seizing a trunk leading to said distant office. Generally there is provided some means for indicating to the A operator which one out of a number or group of trunks leading to the distant office should be next selected by her. A system disclosing such an arrangement is covered in Patent No. 1,632,826, issued to L. L. Eagon June 21, 1927. Other indicating systems may be provided, for example, systems having means whereby the A operator is apprized of the idle or busy condition of the B operator. A system disclosing an arrangement of this

kind is covered in the copending application of Bailey and Broe, Serial No. 738,488, filed September 18, 1924.

The B operators in attendance may choose any positions as their home positions and any number of adjacent unattended positions may be arranged to be attended to by an operator at a home position. The indicating for the A operators at the various distant offices progresses from group to group beginning of course with the group terminating at the home positions. Keys located at the various B operators' positions may be manipulated for splitting the positions in any desired manner into groups to be attended to by the reduced number of B operators. This number of B operators depends of course on the traffic requirements during different periods.

40 This invention has been applied to a straightforward trunking system in which the straightforward trunks outgoing from each of a plurality of offices and presided over by A operators, are divided into groups, all of these groups terminating in a common distant office with the groups from each office terminating at different B operators' positions and with a plurality of groups of trunks from different offices terminating in each B operator's position. In general, there is provided means whereby indications may be given at A operators' positions to choose and extend connections over idle trunks terminating at or near certain B operators' positions in preference to idle trunks terminating at other B operators' positions at which the operators are not in attendance. Calls are directed over such trunks in accordance with a preferential scheme depending on the most advantageous terminating points of these trunks in regard to their relative distance from the positions occupied by the B operators in attendance during slack periods.

45 The invention is illustrated in the accompanying drawing in connection with an indicating system for trunks from three different offices that terminate in four positions at a common office. In Fig. 1 the indicating circuit arrangements at three trunk originat-

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ing offices have been shown with only a small portion of the circuits at one office represented in detail, and the remainder merely represented by enclosures. Figs. 2 and 3 show the circuits of the indicating system at four positions at the common office, while Fig. 4 shows the circuit equipment of the indicating system that is common to said four positions in the common office.

Referring now to the drawings, the particular arrangement chosen for the illustration of the invention consists in general of the following major portions. In Fig. 1 has been shown, by means of three enclosures, offices A, B and C containing trunks divided into groups. In office A, four groups, A¹, A², A³ and A⁴, have been shown, in office B, three groups, B¹, B² and B³, and in office C, two groups, C¹ and C². All of these groups have merely been indicated by separate compartments in the enclosures for the various offices, except group A¹ of office A, in which one trunk 1 with associated jacks 2 and 3 and corresponding indicating lamps 4 and 5 at two different positions A' and A'' have been shown. It should be understood that all other trunks in this group as well as in all of the other groups of the offices of A, B and C are similarly arranged. The indicating lamps 4 and 5, as well as the corresponding lamps of the other trunks in this group, are connected to relays such as 6, and these relays, the last of which is marked 7, are connected in a circuit in series relation as shown to a relay 8 that is common to all trunks in this group. Outgoing from this group to a common office D is a pair of conductors 10, and it should be noted that corresponding pairs of conductors 11 to 18 are shown outgoing from the various other groups of offices A, B and C to office D. The trunks from these various groups to the office D are not shown as they do not form part of this invention except to the extent that they may be chosen for extending connections to these offices in accordance with the indicating system that forms the subject matter of this invention. However, these trunk groups are arranged to terminate in the various positions in office D in the same manner as the corresponding pairs of conductors 10 to 18. In office D four positions, D¹, D², D³ and D⁴ have been shown, and the conductors 10 to 18 and the corresponding trunk groups from the offices A, B and C, terminate in these positions as follows: Conductors 10 and the trunks of group A¹ office A, conductors 14 and the trunks of group B¹ office B, terminate in position D¹ office D, conductors 11 and trunks of group A² office A, conductors 15 and trunks of group B² office B terminate in position D² office D, conductors 12 and trunks of group A³ office A, and conductors 17 and trunks of group C¹ office C, termi-

nate in position D³ office D, while conductors 13 and trunks of group A⁴ office A, conductors 16 and trunks of group B³ office B, and conductors 18 and trunks of group C² office C, terminate in position D⁴ office D. Therefore, when trunks are chosen for establishing connections from the various offices A, B and C, they will be attended to by the operators at the positions at which these trunks terminate in office D, except when they are to be attended by operators at other positions in a manner as hereinafter described. Splitting keys such as 20 to 27 located at the various positions D¹ to D⁴ are used to split the indicating arrangement in various combinations for directing the choice of trunks from these in the groups that the A operators are normally directed to choose from to trunks in other groups. It should be noted that the conductors 11 to 18 terminate at the respective positions at certain groups of relays that are more or less individual to these conductors, for example, conductors 10 terminate in the group 30, while conductors 14 terminate in group 31 at the position D¹ office D, etc. Groups of relays such as 136, 137 and 138 may be considered more or less common to the four positions D¹ to D⁴ and individual to the offices A, B and C respectively. These explanations of the coordination of the various groups of the relays is merely given as a general guide in reading the drawings.

To make clear the functioning of the indicating system, as applied to the above described arrangement of trunks, detailed descriptions will now be made of various examples of splitting the trunk indicating for the attention of differently arranged operators at the four positions in office D.

The first case to be considered will be that in which all four positions are attended by these respective operators. In this case the splitting keys 20, 22, 24 and 26 are operated and also a splitting key corresponding to key 20 in the position beyond position D⁴. The operation of these keys confines the indicating system to the four positions individually in a manner as will be hereinafter described. That is, the conductors 32, 33 and 34 are disconnected at the contacts of relays 35, 37, 39 and 41 when these relays operate on the action of keys 20, 22, 24 and 26, and in the same manner these leads are cut off at the operation of a corresponding relay in the position adjacent to position D⁴.

Normally, therefore, the operators at the offices A, B and C when desiring to select trunks outgoing to the office D may seize a trunk from any one of the groups of trunks terminating at their boards. The trunk to seize in each group is indicated by a lighted lamp. For example, in office A, the operators at positions A' and

A'' have four groups of trunks terminating at their positions, and each of the operators therefore has normally the choice of four trunks, one in each of the groups A¹, A², A³ and A⁴. There is, however, usually some predetermined arrangement among the operators to the effect that each operator will ordinarily confine her attentions to certain groups. For example, the operator's first choice at position A' might be from group A¹ and second choice from group A², while the operator's first choice at position A'' would normally be from group A³ and second choice from group A⁴. The first trunk in group A¹ has been shown and normally the lamps 4 and 5 of this trunk are lighted to indicate that this is the trunk to be used first. If this trunk is taken for use, relay 6 will operate over the sleeve circuit of jack 2, if the operator at position A' has engaged the corresponding trunk 1, and the lamps 4 and 5 will, therefore, be extinguished while the lamps of the next trunk corresponding to lamps 4 and 5 will be lighted. In the same manner one trunk after another in group A¹, will be identified by lighted lamps so that the operator need not test for an idle trunk, but under normal conditions merely connect with the trunk having its lamps lighted. If all of the trunks from group A¹ become busy all lamps in this group will naturally become extinguished.

It should be understood that relay 8 under normal conditions is operated to supply battery for the lamps of the succeeding trunks through the chain circuit shown. This circuit extends from battery through the armature and front contact of relay 8 and the armatures and contacts of relay 6 and other similar relays to the last of these relays marked "7", where it extends through a low resistance winding of relay 8 to conductors 10 for purposes, as will hereinafter be described. For example, if the operator at position D¹, where the trunks from group A¹ terminate, becomes busy, the lamps of the next idle trunk at group A¹ will be extinguished and the operator at position A' will thereafter select a trunk in group A². If the operator at position D², where the trunks from group A² terminate, becomes busy there will, of course, be no objection to having the operator at positions A' choose trunks from groups A³ and A⁴.

To maintain this relay 8 and all other corresponding relays in other groups normally operated, reference should now be made to Figs. 2, 3 and 4. It should be understood that when operators are in attendance at all of the positions D¹ to D⁴, they will, as is well known in the art, connect their telephone sets, through switch contacts provided for this purpose, at the positions and through various well known circuit ar-

rangements, with the trunks terminating at their respective positions. When the operators' sets are so connected, there will be provided a connection to ground for the leads 45 to 48 at the four positions. It is evident that these ground connections may be made in any well known manner and as the cooperative arrangement between the trunks and the operator's telephone sets forms no part of this invention, no further descriptions will be made relative to these ground connections. It is evident that the ground on these leads causes the operation of relays 50 and 51 in position D¹, relays 52 and 53 in position D², relays 54 and 55 in position D³ and relays 56 and 57 at position D⁴. The operation of relay 50 causes the operation of relays 60 and 61 in position D¹. The operation of relay 52 causes the operation of relays 62 and 63 in position D². The operation of relay 55 causes the operation of relays 64 and 65 in position D³ while the operation of relay 56 causes the operation of relays 66, 67 and 68 in position D⁴. It is perhaps only necessary to trace the circuit for the operation of relays 60 and 61 as the circuits for the other relays are similar to this circuit, which is as follows: From battery, upper inner armature and front contact of relay 35, upper outer armature and front contact of relay 50, upper winding of relay 60 to ground at lead 45, for the operation of relay 60. From battery, upper inner armature and front contact of relay 35, lower inner armature and back contact of relay 36, inner upper armature and front contact of relay 50, upper winding of relay 61 to ground at lead 45, for the operation of relay 61. The operation of relays 60 to 68 causes the operation of relays 70 to 78, respectively, over obvious circuits. These latter relays in operating close at their lower armatures and front contacts circuits for the operation of relay 8 at group A¹ and all other relays corresponding thereto at the other groups A² to C². The circuit for relay 8 is as follows: battery, high and low resistance windings of relay 8 in series, upper conductor of the pair 10, lower armature and front contact of relay 70, winding of relay 80, lower conductor of the pair 10 to ground. It is obvious that the circuits for the other relays in the remaining groups follow similar paths through the relays 81 to 88 and the pair of conductors 11 to 18, respectively. The relays 80 to 88 do not operate in these circuits, due to the high resistance windings of relay 8 and the corresponding relays in the other groups. The operation of relay 8 and the corresponding relays in the other group therefore supply battery for the indicating lamps of the trunks in these various groups.

As stated, if all the trunks in a group are engaged, all the lamps in this group are ex-

tinguished. If an operator at office D is busy, some indication thereof must be given to the operator at the distant end for the trunks terminating at her position. It will now be explained how the lamps of the groups of trunks terminating at this position are extinguished. That is, relays such as 8 are released for such groups of trunks so that battery is removed from the circuits for the lamps. For example, if the operator at position D¹ is busy relay 8 and the corresponding relay for group B¹ in office B will be released. First a connection is closed to ground for the leads 90 to 93 when the corresponding positions D¹ to D⁴ become busy. No means for applying these ground connections have been illustrated as it is well known in the art how this may be accomplished. If now, for example, the operator at position D¹ is busy the ground connection established to lead 90 causes the release of relay 50. The release of relay 50 opens the energizing circuits for relays 60 and 61, which in turn causes the release of relays 70 and 71, respectively. Relay 8 and the corresponding relay for group B¹ of office B, are, therefore, released to remove the battery from the indicating lamp circuits in these groups. The fact that the operator at position D¹ is busy will consequently be indicated by the extinguishing of the trunk lamps of groups A¹ and B¹, and the operators in offices A and B attending to the corresponding trunks in these groups will naturally not attempt to make any connection therewith but choose trunks from other groups as long as this condition prevails.

Attention will now be directed towards the arrangement of the indicating when some operators are absent from their positions and the remaining operators have to attend to incoming calls, not only over the trunks terminating in their home positions but also over to calls incoming over trunks terminating in absent operators' positions. It should be noted that the splitting keys 20 to 23 are not only employed to establish divisions between the positions but also between the groups in positions in any desired manner so that the groups in the positions may also be divided if desired for the grouping of positions and parts thereof for the attention of the remaining operators.

A case will now be described that requires even less splitting than that already described, that is, only the operation of key 20 to separate the position D¹ from the adjacent position above and the operation of the first key in the position below position D⁴ to separate positions D¹ to D⁴ from adjacent positions. In this case it might be assumed therefore that all four positions D¹ to D⁴ are to be attended to by one operator only and that this operator will sit be-

tween positions D² and D³, making position D³ her home position. In other words, this operator will connect her telephone set to the switchboard contact provided for this purpose at position D³. In this case, therefore, a ground will be connected to the lead 47, as hereinbefore described, to cause the operation of relays 64 and 65, and 74 and 75. The operation of relay 74 causes the operation of the relay corresponding to relay 8 in group A³ of office A and the lamps of the first idle trunk in this group to be lighted, while the operation of relay 75 causes the relay corresponding to relay 8 of group C¹ in office C to be operated and the lamps of the first idle trunk in this group to be lighted. In other words, the operator in office A will be permitted to choose for the next connection to be extended, a trunk from group A³ and the operator in office C will be permitted to choose an idle trunk from group C¹ for the extension of the next connection. It will be noted that the trunks terminating in position D³ extend from offices A and C, and that these trunks are within easy reach of the operator. On the other hand, as no trunks terminate in this position from the office B, the lamps indicating the first idle trunks of groups terminating in the positions on either side of position D³, namely, positions D² and D⁴ will be lighted so that the operators of office B may choose for the next connection to be extended an idle trunk from either group B² or B³.

It will now be explained how the lamps indicating idle trunks in these groups B² or B³ are lighted under these circumstances. Normally relays 103, 104 and 105 are maintained operated, that is, if none of the relays 70 to 78 are operated, but as relays 74 and 75 are operated relays 103 and 104 are released. Relay 103 is released as the connection to ground at the upper outer armature and back contact of relay 70 is disconnected from the circuit for this relay at the upper armature and back contact of relay 74, and relay 105 is released as the connection to ground at the upper outer armature and back contact of relay 75 is disconnected from the circuit for this relay, due to the operation of relay 75. On the other hand, relay 104 is maintained actuated over a circuit as follows: from battery through the winding of relay 104, upper outer armature and back contact of relays 77, 73 and 71 to ground. Relay 104 in operating causes the operation of relays 95, 99 and 100 over obvious circuits. Relay 100 now completes a circuit for the operation of relays 67 and 63. The circuit for relay 67 is as follows: battery, middle lower armature and front contact of relay 54, upper outer armature and back contact of relay 100, upper inner armature and back contact of relay 40, lower

inner armature and back contact of relay 41, middle winding of relay 67 to ground, while the circuit for the operation of relay 63 is as follows: from battery at the same point and through the same armatures and contacts of relays 54, 100 and 40 to the inner lower armature and back contact of relay 39, inner upper armature and back contact of relay 38, lower winding of relay 63 to ground. Relays 67 and 63 in operating cause the operation of relays 77 and 73, respectively and the relays in groups B² and B³ corresponding to relay 8. As the ground for relay 104 is removed on the operation of relays 72 and 73, relays 95, 99, 100 and 104 will now be released and thereby also cause the release of relays 67 and 63. A temporary ground will be supplied for the locking of relays 77 and 73 at the lower make-before-break contacts of relays 67 and 63 until these relays are fully released should they release before relay 95. On the release of these relays the ground is supplied through the upper outer armature and back contacts of these relays and the corresponding upper outer armature and back contact of relay 61. Consequently, the lamps for the first idle trunks in the groups B² and B³ in office B will be lighted to indicate to the operators of office B that an operator is in attendance at office D. Trunks incoming from these groups may now therefore be attended to by the operator at position D³ and as the trunks from these groups terminate in positions on either side of position D³, namely, in positions D² and D⁴, the operator sitting at position D³ can easily attend to calls incoming to these positions.

If it is now assumed that for example, all the trunks in group A³ become busy the trunks from office A terminating in the position on either side of position D³ will be indicated, that is, the operators in office A will be directed to choose trunks from groups A² and A⁴ when the trunks in group A³ are busy and the operator at position D³ will consequently have to answer calls incoming over these trunks from office A in positions D² and D³. The switching operations taking place under these circumstances are as follows: As previously explained when a group of trunks become busy, the chain circuit from battery through the sleeve relays is extended through the low resistance winding of the corresponding common relay. The high resistance winding of this relay is thereby short circuited and the corresponding relay at the office D associated with the common conductors thus becomes energized. Ordinarily, that is when all operators at office D are in attendance, this has one effect on the circuit, but in this case when relay 84 becomes energized it operates to close circuits for the operation of relays

in positions D² and D⁴ as follows: Referring to the relays in position D² the first to become operated is relay 62 over a circuit as follows: battery, upper inner armature and back contact of relay 39, upper outer armature and front contact of relay 54, contact 106 of relay 84, upper outer armature and back contact of relay 39, upper outer armature and back contact of relay 38, lower winding of relay 62 to ground. The operation of relay 62 causes the operation of relay 72 which in turn operates the corresponding relay in group A² to light the lamps of the next idle trunk in this group. Referring now to the relays in position D⁴, the first to be operated is relay 66 over a circuit as follows: battery, upper inner armature of back contact of relay 39, upper outer armature and front contact of relay 54, lower armature and inner front contact of relay 84, upper outer armature and back contact of relay 40, upper outer armature and back contact of relay 41, middle winding of relay 66 to ground. The operation of relay 66 causes the operation of relay 76 and the corresponding relay in group A⁴ is operated to cause the lighting of the lamps of the next idle trunk in this group. Thus as stated, the operator at D³ will now attend to calls in position D² from group A² and calls in position D⁴ from group A⁴ as long as all of the trunks in group A³ are busy.

It is evident that if the trunks in these two groups also become busy the indication will switch to positions further away from the home position. In this case the only switching that can be done is from group A² to group A¹. This shifting is initiated by the operation of relay 82 and the lamps in group A¹ are lighted in the same manner as were the lamps in the preceding groups. Similarly if the trunks in groups C¹ become busy the operation of relay 85 will switch the indicating to group C² and if the trunks in group B² become busy the operation of relay 83 will cause the lighting of the lamps of the next idle trunk in group B¹. In other words as the trunks in the groups terminating at the home position and, as in this case, where no trunks from office B terminate in the home position but in the adjacent positions on either side thereof become busy, the trunks of the groups terminating in the positions nearest the home position in each case will be indicated, and conversely the indicating will recede towards the home position as the trunks in the succeeding groups become idle. By this arrangement the operators at the offices A, B and C will be directed to choose trunks from groups terminating at the nearest point to the position of the attending operator and as group after group becomes busy the indicating will change so that these operators

will choose trunks from groups terminating further and further away from the home position.

As previously stated, when an operator at a position in office D becomes busy the indicating for the trunks terminated at her position will cease, i. e., the common relay for the group at the distant office will be released and the lamps of the next idle trunks will be extinguished. Thus the operators for one group after another may become busy and consequently the lamps in one group after another of a particular office may become extinguished. This scheme of indicating functions in this manner as long as at least one operator at office D remains idle to attend to calls incoming over the remaining corresponding group of trunks for a particular office. However, if this last operator at office D becomes busy, the lamps indicating idle trunks in all the groups of this particular office will again be lighted. The operators at this office may therefore continue to choose idle trunks from any of the groups even though all of the operators attending to such groups at the exchange D are momentarily engaged. The purpose of this arrangement is obvious, it enables the operators A, B or C to prepare the desired connections the moment they are required and not wait for an operator at the office D to become idle. It follows from the foregoing that the moment an operator at office D becomes idle all of the lighted indicating lamps will be extinguished except, of course, the lamps of the next idle trunk in the group terminating at this idle operator's position at office D.

In the last case under consideration, namely, when one operator at position D³ attends to calls incoming from all four positions, the conditions will be such that when the operator becomes busy the lamps of the various groups that at the moment happen to contain idle trunks, remain lighted. This lighting of the lamps at the office A, B or C when all operators attending to the groups of trunks outgoing therefrom become busy, is accomplished in the following manner: The conditions are the same regardless of the number of operators in attendance at office D. For example, if only the operator at position D³ is in attendance and there are still idle trunks in groups A³, C¹ and B² and B³ and if this operator becomes busy, the lamps in these groups will remain lighted, even though relay 54 is released due to the busy condition of the operator which, under normal conditions would cause the lamps to be extinguished. It will be noted that on the release of relay 54 relays 64, 65, 63 and 67 will be momentarily released and also relays 74 and 75 and 73 and 77. When these latter relays are released circuits are completed for the op-

eration of relays 103, 104 and 105 as follows: The circuit for relay 103 may be traced as follows: from battery, winding of relay 103, upper outer armatures and back contacts of relays 76, 74, 72 and 70 to ground. The circuit for relay 104 may be traced as follows: from battery, winding of relay 104, upper outer armatures and back contacts of relays 77, 73 and 71 to ground. The circuit for relay 105 may be traced as follows: from battery, winding of relay 105, upper outer armatures and back contacts of relay 78 and 75 to ground. When these relays become actuated they cause relays 94, 97, 98 and 95, 99 and 100 and 96, 101 and 102 to become actuated. On the operation of these latter relays circuits are closed for relays 64, 65, 63 and 67. The circuit for relay 64 may be traced as follows: from battery, upper inner armature and back contact of relay 39, inner lower armature and front contact of relay 97, upper winding of relay 64, ground at 47. The circuit for relay 65 may be traced as follows: battery and upper inner armature and back contact of relay 39, lower inner armature and back contact of relay 40, inner lower armature and front contact of relay 101, upper winding of relay 65 to ground at 47. The circuit for relay 63 may be traced as follows: battery, upper armature and innermost contact of relay 55, upper outer make-before-break contacts of relay 100, inner lower armature and back contact of relay 39, inner upper armature and back contact of relay 38, lower winding of relay 63 to ground. The circuit for the operation of relay 67 may be traced as follows: battery, upper armature and inner contact of relay 55, upper outer and make-before-break contacts of relay 100, upper inner armature and back contact of relay 40, inner lower armature and back contact of relay 41, middle winding of relay 64 to ground. The operation of relays 64, 65, 63 and 67 causes the reoperation of relays 74, 75, 73 and 77 respectively and the operation of these latter relays cause the operation of the common relays for groups A³ and C¹ and B² and B³ and the lighting of the corresponding lamps of the idle trunks in their group. It will be observed that the original energizing circuits for relays 103, 104 and 105 are opened by the operation of relays 74, 73, 77 and 75 and therefore release causing release of relays 94, 97, 98, 95, 99, 100, 96, 101 and 102. The release of these latter relays cause the release of relays 64, 65, 63, 67, but relays 74, 75, 73 and 77 are now held operated over locking circuits through their upper windings and the upper outer armatures and back contacts. Relay 74, for example, is locked by a circuit from battery upper winding of relay 74, upper inner armature and front contact of this relay through

the upper outer armatures and back contacts of relays 66, 64, 62 and 60 to ground. The locking circuit for relays 73, and 77 may be traced from battery through their upper windings and upper inner armatures and front contacts through the upper outer armatures and back contacts of relays 67, 63 and 61 to ground, while the locking circuit for relay 75 may be traced from battery through the upper winding and upper inner armature and front contact of relay 75, upper outer armature and back contacts of relays 68 and 65 to ground. In a similar manner, if all the trunks in these groups are busy lamps in the adjacent groups are lighted in the same manner as hereinbefore described.

It seems unnecessary to describe any further examples of splitting in detail and it may be sufficient to merely mention the various places where splitting may take place. For example, two operators may be assigned to attend the four positions, one for positions D¹ and D² and the other for positions D³ and D⁴. In this case the key 24 is operated in addition to the keys already mentioned. This separates the leads 32, 33 and 34 between positions D² and D³ by the operation of relay 39. Each operator may choose either of the two positions assigned to her as a home position. Another arrangement may be to split the groups in a position, for example, one operator may be assigned to attend position D¹ and group A² of position D², another may be assigned to group D² in position D² and the whole of position D³, while a third operator may be assigned to attend group D⁴. In this case, key 23 is operated in position D² and key 26 in position D⁴ to separate the leads 32, 33 and 34 by the operation of relays 38 and 41. By means of this arrangement of keys the indicating system may be controlled to direct the operators at the offices A, B and C to choose trunks in accordance with the conditions of service at the positions at office D and it is evident that at no time will conditions arise where no indicating lamps will light even though all of the operators in attendance at office D may be busy at the time a connection is desired.

What is claimed is:

1. An indicating system, comprising a plurality of operators' positions, a plurality of groups of trunks each group terminating in a different operator's position, means for rendering a group of trunks non-available during an operator's absence from her position, means for indicating the idle condition of a trunk in one of said groups effective when an operator is present at the position in which said group terminates, and means for indicating the idle condition of a trunk in another of said groups effective when all of the trunks in the first group are busy and

when the operator for the position in which said second group terminates is absent.

2. A trunk indicating system comprising a plurality of operators' positions, a plurality of groups of trunks each group terminating in a different operator's position, means for rendering a group of trunks non-available during an operator's absence from her position, lamps associated with the originating ends of the trunks of said groups, means for lighting lamps of one of the trunks in each of said groups if said trunks are idle effective when the operators are present at the positions at which said trunks terminate, and means for lighting the lamps of one of the idle trunks of one group effective when all of the trunks of another group are busy and when the operator is absent from the position in which the group of trunks at which the lamps are lighted terminates.

3. A trunk indicating system, comprising a plurality of operators' positions, a plurality of groups of trunks each group terminating in a different operator's position, means for rendering a group of trunks non-available during an operator's absence from her position, means for indicating the idle condition of a trunk in one of said groups at the originating end thereof effective when an operator is present at the position in which said group terminates, and means for shifting the indicating of idle trunks from one group to another effective when all of the trunks in a preceding group are busy and when the operators for the position at the succeeding groups are absent.

4. A trunk indicating system, comprising a plurality of operators' positions, a plurality of groups of trunks each group terminating in a different operator's position, means for rendering the groups of trunks in a plurality of positions non-available when the operators for these positions are absent, means for indicating the idle condition of a trunk in one of said groups effective when an operator is present at the position in which said group terminates, and means for indicating the idle condition of a trunk in a plurality of other groups, effective when all of the trunks in said first group are busy and when the operators for the positions in which said second mentioned groups terminate are absent.

5. A trunk indicating system, a plurality of offices, a plurality of groups of trunks outgoing from each of said offices, a common office having a plurality of operators' positions with a group of trunks from several of said offices terminating in each position, means for indicating the idle condition of a trunk in each of the groups terminating in any position said indicating taking place at the offices from which said groups originate effective when operators are present at said

positions, means for rendering the groups of trunks originating in various offices non-available when the operator at the position in which said groups of trunks terminate is
5 absent, and means for indicating the idle condition of a trunk in one of said last mentioned groups effective when all of the trunks in a group outgoing from a particular office and terminating at one position are
10 busy and when the operator at another position in which a group outgoing from said particular office terminates is absent.

6. A trunk indicating system, comprising a plurality of operators' positions, a plurality of groups of trunks each group terminating in a different operator's position,
15 means for rendering a group of trunks non-available during an operator's absence from her position, means for indicating the idle

condition of a trunk in one of said groups at the originating end thereof effective when
20 an operator is present at the position in which said group terminates, means for normally disabling the indicating for said group effective when the operator at said
25 position is busy, and means for continuing said indicating of an idle trunk in said group and for indicating idle trunks in groups terminating at other positions effective whether said operator is busy or idle
30 and when the operators at said other positions are absent.

In witness whereof, we hereunto subscribe our names this 5th day of August A. D., 1926.

HERBERT B. JOHNSON.
LLOYD LA FAYETTE EAGON.