

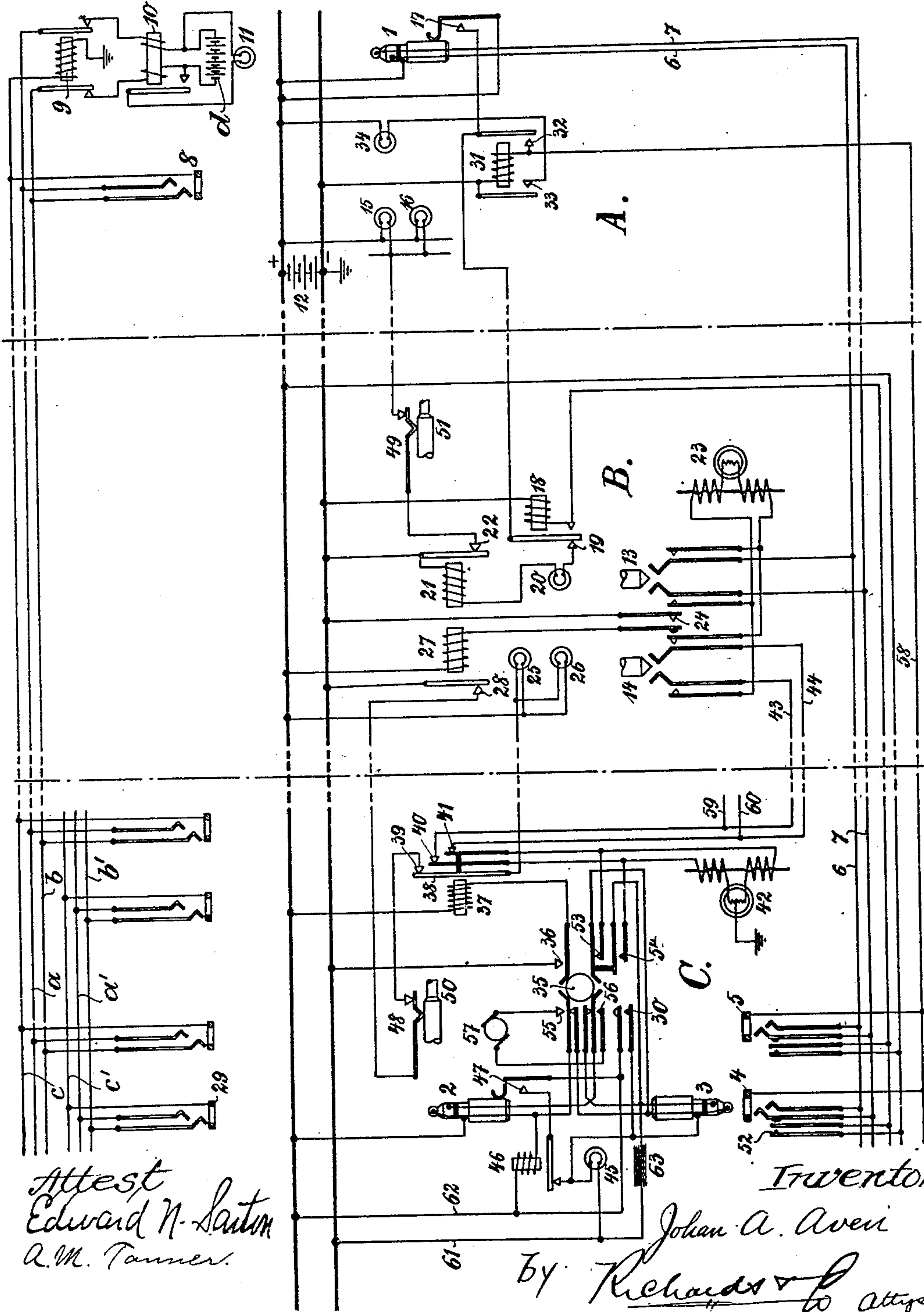
179. TELEPHONE SYSTEMS,
Divided central,
Through ringing,
Centralized energy.

No. 837,894.

Draftsman.

PATENTED DEC. 4, 1906.

J. A. AVEN.
TELEPHONE SYSTEM.
APPLICATION FILED AUG. 22, 1905.



UNITED STATES PATENT OFFICE.

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TELEPHONE SYSTEM.

No. 837,894.

Specification of Letters Patent.

Patented Dec. 4, 1906.

Application filed August 22, 1905. Serial No. 275,252.

To all whom it may concern:

Be it known that I, JOHAN ANTON AVÉN, engineer, a subject of the King of Sweden, residing at Stockholm, Sweden, have invented
5 new and useful Improvements in Telephone Systems, of which the following is a specification.

My invention relates to a telephone-call-distributing system, and is materially distinguished from the usual systems of that kind
10 by a third board being inserted between the annunciator and the multiple connecting-board. The operator at the said third board, which I will designate "inquiring-board,"
15 has only to answer the calls of the subscribers and to communicate to the operator at the multiple connecting-board the number of the called subscriber and that of the trunk-line employed by the operator at the annunciator-board, while the operator at the inquiring-board has not to deal with any plug connection at all. The operators at the inquiring-board are indicated by suitable signals, as
20 "busy" or "free" at some or all of the positions of the annunciator-board, whereas the operators at the connecting-board are indicated by signals at all positions of the inquiring-board. The signal indicating that an operator is free is preferably given by lighting a signal-lamp, and the signal indicating
25 that an operator is busy by extinguishing the lamp.

All of the subscribers' lines traverse the jack-field of the connecting-board and branch
35 off in the latter for its different positions in a well-known manner to multiple jacks. Each subscriber's line terminates at the annunciator-board, where it has a signal and in close proximity thereof an answering-jack. Each
40 position of the annunciator-board is provided with a certain number of answering-plugs, which are connected with the listening-keys at the inquiring-board and with jacks arranged in multiple at the connecting-board.

45 In order to connect a subscriber after the appearance of its line-signal, merely the answering-plug is inserted at the annunciator-board, the operator at this board selecting such a plug, the trunk-line of which leads to
50 an operator at the inquiring-board who is indicated to be free. The inquiring operator receives a signal when the plug at the annunciator-board is raised, which signal causes her to connect her telephone set by means of

a suitable key with the annunciator-board 55 and to inquire of or answer the call of the calling subscriber. Simultaneously with the appearance of the signal at her board the inquiring operator concerned is automatically indicated as busy at all the positions at the
60 annunciator-board from which she is attainable. This signal preferably consists in lamps extinguishing while they generally are lighted up.

When the inquiring operator has inquired 65 of or answered the call of the subscriber, she releases her key, which automatically returns into the position of rest, and presses an order-key, which places her directly in connection with the telephone set of one of the
70 operators at the connecting-board and puts herself into connection with such a connecting operator as is indicated to her as free at the time by the glowing of the lamp appertaining to said operator. Simultaneously 75 with the pressing of the order-key a circuit for a relay controlling the signals of the connecting operator at the inquiring-board is closed, and this relay attracts its armature and interrupts the circuit of the said signals, so
80 that the same indicate the connecting operator as busy. She now communicates to the latter the number of the trunk-line employed by the annunciator operator, as well as the number of the desired subscriber. If the
85 connecting operator has understood both, she inserts one of her two connecting-plugs into the nearest jack of the trunk-line employed and tests with the other connecting-plug the line of the desired subscriber in the
90 well-known manner to ascertain whether he is busy or not.

The insertion of the first plug into the jack connected by means of the trunk-line with the plug at the annunciator-board brings 95 about besides the connection of the calling subscriber with the connecting-plug pair the closure of the contact of a local circuit in which lies a relay controlling a signal at the annunciator-board and appertaining to the
100 plug employed there. The relay attracts its armature, interrupts the circuit of the said signal, and closes a contact by means of which the falling back of the armature and the rediscovery of the signal during the con- 105 tinuance of the connection is avoided. The extinction of the signal indicates to the inquiring operator that the connecting oper-

ator has taken the correct trunk-line. The connecting operator now tests in the well-known manner the line of the desired subscriber by means of the tip of her second plug. If said line is busy, she announces this briefly to the calling subscriber and gives the clearing-out signal to the annunciator operator by-pressing a special key. Thereupon the annunciator operator for her part breaks the connection and the connecting operator removes the first plug from its jack.

If the line of the desired subscriber is free, the connecting operator inserts the second plug into the jack in question and brings her combined calling and listening key into the calling position, from which it automatically returns into the through-speaking position. In the listening position an additional special contact is closed by the key, which contact closes the circuit of a relay which separates in a well-known manner the order-wires of the inquiring operator from the telephone set of the connecting operator and simultaneously opens another contact of the signal-circuit of the connecting operator at the inquiring-board.

When the subscribers' conversation is finished, both the connecting operator and also the annunciator operator automatically receive a clearing-out signal, and this signal remains at the annunciator-board, even when the connecting operator has already put an end to the connection by withdrawing her plugs. The clearing-out signal at the annunciator-board does not become extinguished until the answering-plug is put back into its position of rest and until the resulting opening of a plug-contact has been effected.

In the accompanying drawing the subject-matter of the present invention is diagrammatically illustrated in one form.

The telephone-office has three boards A, B, and C, the boundaries of which are indicated by broken lines, A being the annunciator-board, B the inquiring-board, C the multiple connecting-board. The subscribers' lines *a a' b b'* and also the local wires *c c'* of the cut-off relays are connected in multiple with the jacks at the connecting-board C and terminate at the annunciator-board A in an answering-jack 8 and the armature of a cut-off relay 9. The back contacts of the relay 9 are connected with the line-relay 10 and a battery *d*. The line-relay controls the annunciator or line-lamp 11 in the usual way.

When a subscriber calls, the lamp 11 is lighted up at the annunciator-board A. The A operator seeing from the signals 15 16 which B operator is free at the time, takes the answering-plug 1 of a free B operator and inserts it in the jack 8, wherewith her duty is discharged *ad interim*. On raising the plug 1 from its seat the plug-contact 17 becomes closed. Current now flows from one pole of

the battery 12 via the plug-contact 17 to the B board and there via the armature and back contact 19 of a relay 18, the signal 20, the relay 21, and back to the other pole of the battery. The relay 21 attracts its armature and by opening the contact 22 interrupts the circuit of the lamps 15 16, which are now extinguished, and thus indicate at the A board that the B operator is busy. On the B operator noticing the signal 20 she presses the listening-key 13 indicated by said signal, and thereby connects her telephone set 23 with the wires 6 and 7 of the plug 1 or with the calling subscriber. When the subscriber has communicated the desired number to the B operator, the latter releases the listening-key 13, which automatically returns into its position of rest and presses the order-key 14, by means of which she connects her set 23 with the telephone set of a C operator at the connecting-board who is free at the time. This C operator is recognizable by the B operators by means of the signals 25 26. The latter are lighted up when the corresponding C operator is free, and are extinguished, as I will later explain, when the corresponding C operator is busy. The B operator now informs the C operator of the number of the trunk-line 6 7 employed and of the number of the subscriber to be called. By pressing on the order-key 14 a contact 24 is closed, the closure of which results in the working of a relay 27. This relay opens its back contact 28, and consequently the circuit of the signals 25 and 26, by means of which the C operator in question is immediately indicated as busy at all positions on the B board. If the C operator has understood the numbers communicated to her, she inserts the connecting-plug 3 in the nearest jack 4 of the trunk-lines 6 7 of the answering-plug 1, which lines are connected in multiple to the jacks 4 5, and tests with the tip of the second connecting-plug 2 the jack of the desired subscriber's line—for example, 29—in the well-known manner, so as to ascertain whether he is busy or not. By the insertion of the plug 3 in the jack 4 the contact 52 in the jack 4 is closed. Now the relay 18 attracts its armature and extinguishes the lamp 20 by opening the contact 19. The extinction of the lamp 20 indicates to the B operator that the C operator has employed the correct trunk-line. The armature of the relay 21 returns against its back contact 22, and consequently the circuit of the lamps 15 16 is again closed, whereby the B operator is again indicated as free at the annunciator-board A.

During the test of the jack 29 the combined calling and listening key 35 is turned to the right, whereby the C operator's set 42 is connected by way of the contacts 53 54 with the tip and sleeve strands of the cord connecting the plugs 2 3. If already a plug 1 or 2 is inserted in one of the jacks 8 or 29 of the line

$a' b' c'$, the wire c' is connected through the sleeve of the plug in question with the free pole of the battery 12; but, on the other hand, if none of the jacks of a line is busy their test-rings are only connected over the line-relay—as, for instance, 9—with the earth—i. e., with the grounded pole of the battery 12. In the latter case no current flows during the test of the wire c' to the tip of the plug 2, while if the called subscriber's line is busy a circuit is closed from the free pole of the battery 12 over the sleeve of a plug, (inserted at another position,) the test-ring of jack 29, tip of plug 2, contact 53 of the key 35, one coil of the receiver 42 to ground, whereby the well-known click occurs in the receiver.

If the line appears to be busy, the C operator informs of it the calling subscriber, the receiver 42 being connected with the plug 1 by the contacts 53 54 of the key 35, the plug 3, and the trunk-lines 6 7. She further presses the key 30, whereby the relay 31 is excited and remains so even after the key 30 has been released, a current passing from one pole of the battery 12 to the closed plug-seat contact 17, the right-hand armature of relay 31, its front contact 32, the relay 31, and to the other pole of the battery 12. At the same time a circuit is closed containing the left-hand armature of relay 31, its front contact 33, and the signal 34. When the latter appears, the A operator withdraws her plug 1 from the jack 8.

If the line appears to be free, the C operator inserts the plug 2 in the jack 29, and thereby connects the trunk-lines 6 7 with the line $a' b'$, so that the conversation of the two subscribers may take place. Now she turns the key 35 to the left and connects the lines $a' b'$ over the contacts 55 56 for a certain time with a source of alternating current 57, whereby the desired subscriber is called. During the conversation the key 35 remains in the position shown.

When for testing purposes the key 35 is turned to the right, a relay 37 is excited over the contact 36 and attracts its armature 38 from the back contacts 39 40 41. Hereby first the receiver 42 is disconnected from the wires 43 44 and other wires 59 60, which may be connected to other keys 14, so that the C operator cannot be disturbed during his work by a false call of one of the B operators; second, the armature 38 opens the contact 39 before the key 14 is released and prevents thus the signals 25 26 from being excited during the test and before the subscriber to be called is called. Therefore the signals 25 26 remain unexcited and indicate at the positions of the B board the C operator as busy as long as she has to.

When the conversation is finished, the subscribers hang up their receivers and interrupt the circuit whereby the relay 46 is cut out. Its armature falls back and makes the super-

visory lamp 45 glow. A circuit is further closed from the free pole of battery 12, wire 62, contact 47, armature of relay 46, plug 3, test-ring of jack 4, wire 58, and relay 31 to the other pole of battery 12, so that the lamp 34 is lighted up, as already described. Now both the A and C operators pull the plugs 1 2 3 out of the jacks 8 4 29.

The plugs 50 51 are inserted in so-called "position-jacks" as long as the corresponding B or C operator is at her place. If the said operators leave their places, they pull the plugs out, so that the lamps 15 16 or 25 26, respectively, extinguish, whereby the position in question is indicated as busy.

It is to be understood that instead of providing the trunk-line 6 7 at the connecting-board with multiple jacks they also may terminate in multiple plugs. In this case the C operator would have to handle only one plug 2 in making a connection.

Having now described my invention and in what manner the same is to be performed, what I claim, and desire to secure by Letters Patent, is—

1. In a call-distributing system comprising telephone-lines, each having a terminal jack and a signaling instrument in an annunciator-board, and a terminal socket in each of several sections in a multiple connecting-board, a trunk-line extending from the annunciator-board to one section of an inquiring-board and to a plurality of sections of the multiple connecting-board, signaling-circuits extending between all the boards and an order-circuit extending between the inquiring-board and the multiple connecting-board; whereby several connecting operators have access to the same trunk-lines to equitably distribute the inquiries to the inquiring operators and from the latter the connections to be made to the connecting operators, substantially as described.

2. In a call-distributing system comprising telephone-lines, each having a terminal jack and a signaling instrument in an annunciator-board, and a terminal socket in each of several sections in a multiple connecting-board, a trunk-line extending from the annunciator-board to one section of an inquiring-board and to a plurality of sections of the multiple connecting-board, a plug-seat contact at the annunciator-board and a signal associated therewith at the inquiring-board, a relay at the latter and controlling a plurality of lamps at the annunciator-board, signaling-circuits extending from the connecting-board to the annunciator-board and the inquiring-board, and an order-circuit extending between the inquiring-board and the connecting-board; whereby an inquiring operator is notified by an annunciator operator to inquire of the call and all annunciator operators are apprised of the readiness of an inquiring operator to inquire of the calls, substantially as described.

3. In a call-distributing system comprising telephone-lines, each having a terminal jack and a signaling instrument in an annunciator-board, and a terminal socket in each of several sections in a multiple connecting-board, a trunk-line extending from the annunciator-board to one section of an inquiring-board and to a plurality of sections of the multiple connecting-board, signaling-circuits extending between the annunciator-board and the inquiring-board, an order-circuit extending from the inquiring-board to the connecting-board, a signaling-circuit extending from the connecting-board to the inquiring-board, said circuit being controlled by a relay at the inquiring-board and a relay at the connecting-board; whereby a connecting operator is notified by an inquiring operator to make a connection and all the inquiring operators are apprised of the readiness of a connecting operator to make connections, substantially as described.

4. In a call-distributing system comprising telephone-lines, each having a terminal jack and a signaling instrument in an annunciator-board, and a terminal socket in each of several sections in a multiple connecting-board, a trunk-line extending from the annunciator-board to one section of an inquiring-board and to a plurality of sections of the multiple connecting-board, signaling-circuits extending between the annunciator-board and the inquiring-board and between the inquiring-board and the connecting-board, an order-circuit extending between the inquiring-board and the connecting-board, a signaling-

circuit extending from the connecting-board to the annunciator-board, said circuit including a signal at the annunciator-board and a key and a relay at the connecting-board; whereby an annunciator operator is notified by the connecting operator of a connection being not to be had and of a connection being to be broken, substantially as described.

5. In a call-distributing system comprising telephone-lines, each having a terminal jack and a signaling instrument in an annunciator-board, and a terminal socket in each of several sections in a multiple connecting-board, a trunk-line extending from the annunciator-board to one section of an inquiring-board and to a plurality of sections of the multiple connecting-board, signaling-circuits extending between all the boards and an order-circuit extending between the inquiring-board and the multiple connecting-board, switches in the signaling-circuits extending between the inquiring-board on the one hand to the annunciator-board and the connecting-board on the other hand; whereby a position at the inquiring-board and at the connecting-board can be notified as engaged at the annunciator-board and the inquiring-board respectively, if said position is not attended to by an operator, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

JOHAN ANTON AVÉN.

Witnesses:

GEORG FAERSTER,
M. SITTENMANN.