Feb. 4, 1930. M. LANGER 1,745,999

AUTOMATIC TELEPHONE SYSTEM

Filed April 22, 1927 3 Sheets-Sheet 1

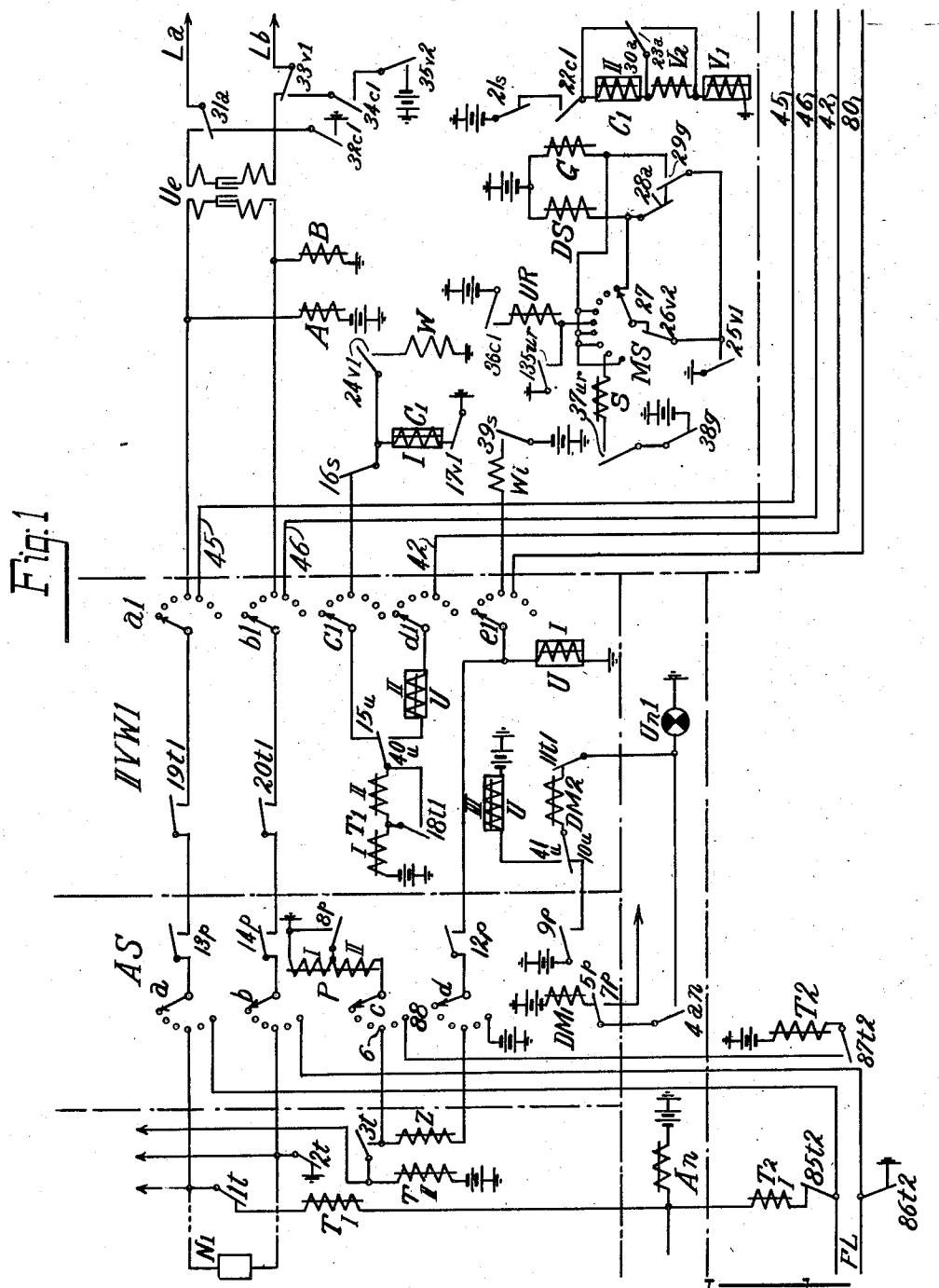


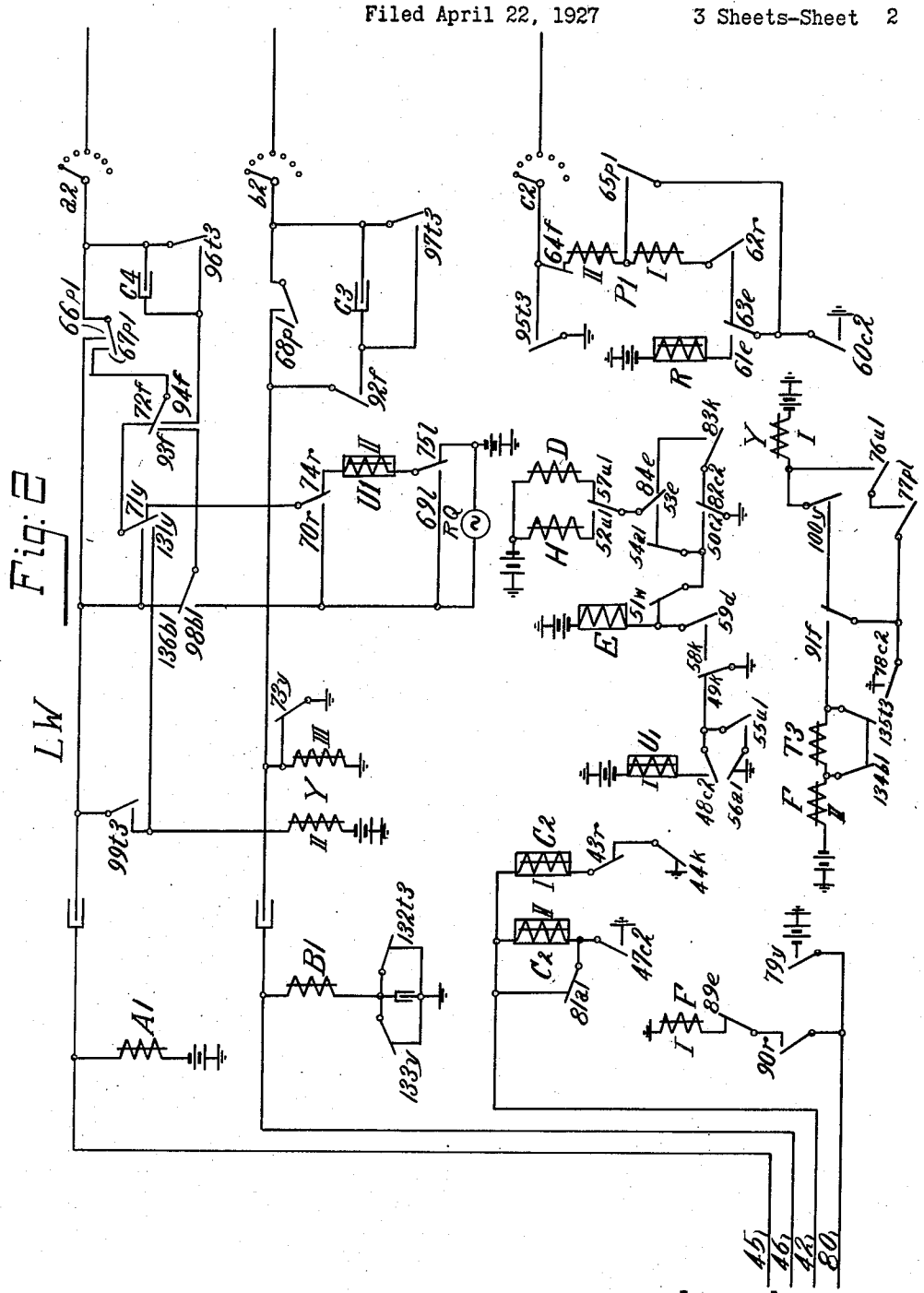
Fig. 1

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AUTOMATIC TELEPHONE SYSTEM

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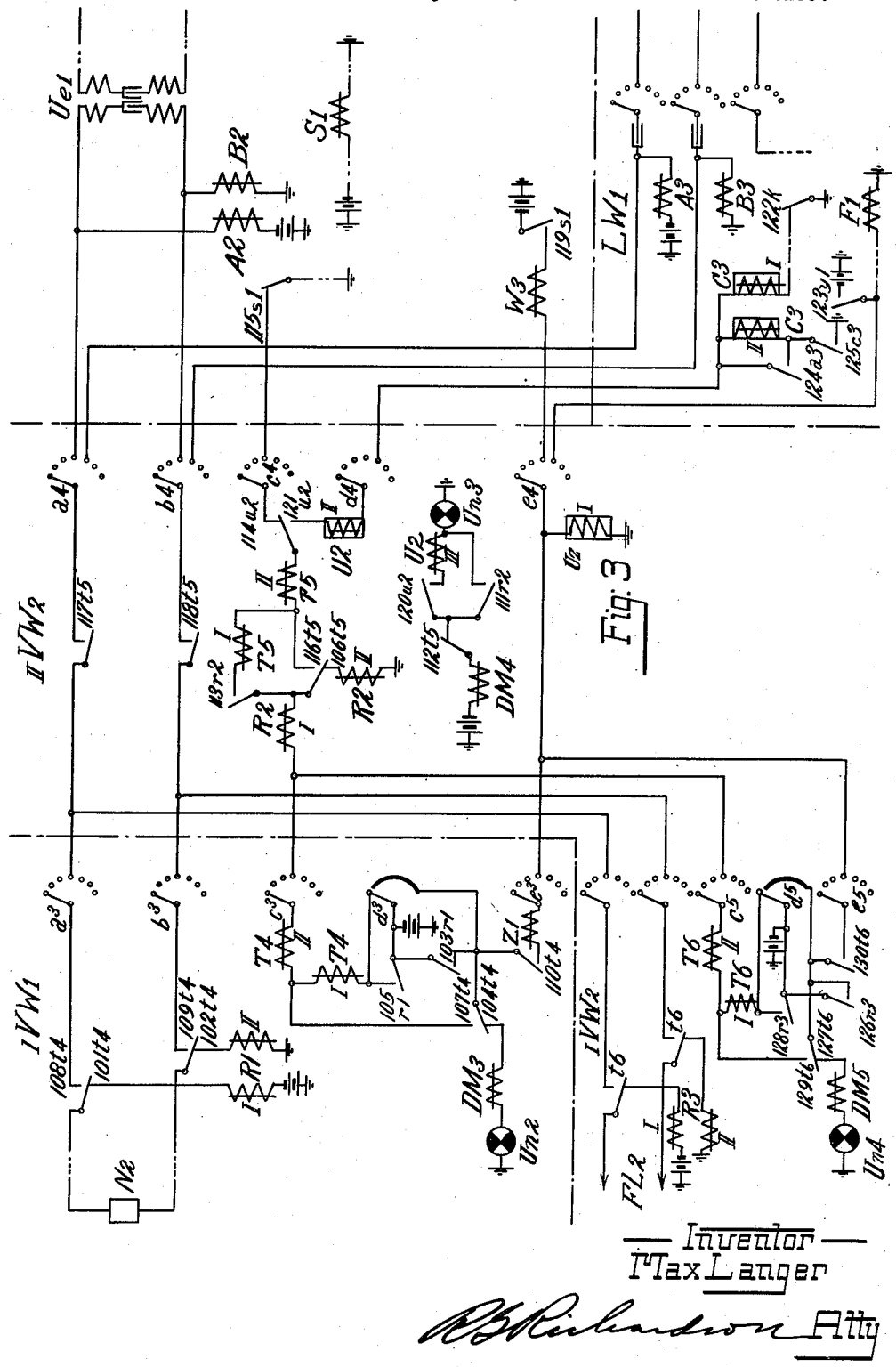


Fig. 3

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AUTOMATIC TELEPHONE SYSTEM

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The present invention relates to automatic telephone systems in general, and more particularly to the setting up of calls of different value in systems comprising main and sub-exchanges.

In such systems, it is known to locate in the main exchange a portion of the connection devices to be used by the sub-exchanges, and to take into use for setting up each call a junction line from the sub-exchange going to the main exchange. In that case when a call is made to a station belonging to the calling sub-exchange, a device (such as an auxiliary switch) associated with the junction line taken into use then frees this junction line and the connecting device taken into use at the main exchange, and the connection is switched over to the connecting devices at the sub-exchange. If high value calls (for example from a trunk position of the main exchange) are made to a sub-exchange and the junction lines be connected in the sub-exchange in the same manner as subscribers' lines, a junction line to the main exchange has to be taken into use likewise for these calls in the known arrangements, and the release of the seized junction line and the switching over to the connecting devices of this sub-exchange cannot take place until this sub-exchange has been designated.

Now the object of the invention is to obviate the needless taking into use of a junction to the main exchange in that case, this being achieved by providing the connecting devices at the sub-exchange and to be used for all calls with switching means, which in different ways affect the common connecting device according to the value of the connection to be set up; hence when a low value call is initiated, the calling line is connected to a junction line going to the main exchange, and when a high value call is initiated, the calling line is connected to a junction line going to another connecting device at the sub-exchange.

By way of example the drawings comprising Figures 1, 2, and 3, show the devices at a sub-exchange and the connecting devices to be used in common for the high and low value calls. In this example the incoming junction lines (trunk lines) are connected to the same or to similar preselecting devices at the sub-exchange as those used for subscribers' lines. The drawings show two types of these preselecting devices. Thus in Figure 1 a subscriber's station N 1 and an incoming trunk line FL are connected to the same call seeker AS, while in Figure 3 a subscriber's station N 2 is connected to a preselector I.VW 1 and an incoming trunk line FL 2 is connected to a preselector I.VW 2. The Figure 2 shows a final selector LW of the sub-exchange, which is suitable for setting up high and low value calls. The call seeker AS shown in Figure 1 is connected to a second preselector II.VW 1, over the bank contacts of which a group of junction lines going to the main exchange and to a group of final selectors is reached. The preselectors I.VW 1 and I.VW 2 (Figure 3) belonging respectively to a subscriber's station and a trunk line have common means of access to second preselectors, of the latter the Figure 3 shows the preselector II.VW 2.

The method of operating the arrangement shown in the Figures 1 and 2 will first be described. For this purpose it will be assumed that the subscriber's station N 1 wishes to set up a call to another subscriber's station of the sub-exchange.

When the subscriber N 1 takes down his receiver, the winding I of the calling relay T is energized in series with the winding of the starting relay A*n* common to a group of subscribers, the circuit extending over the back contacts 1 *t* and 2 *t*. The relay T is so constructed that when it is energized over the just described circuit, it only operates its contact 3 *t*, while the contacts 1 *t* and 2 *t* remain closed. At its contact 4 *an* the relay A*n* closes the following circuit for the rotary magnet DM 1 of the call seeker AS: earth, interrupter U*n* 1, contacts 4 *an*, 5 *p*, rotary magnet DM 1, battery, earth. The wipers *a*, *b*, *c*, and *d* of the call seeker AS are now operated step by step until the test wiper *c* reaches the bank contact 6 designated by the contact 3 *t*. The relay P is then energized in the following circuit: earth, windings I and II of P, wiper *c*, contacts 6 and 3 *t*, winding II of the relay T, battery, earth. The relay P at its

contact 5 *p* interrupts the circuit of the rotary magnet DM 1 and at its contact 7 *p* it switches the starting circuit extending over the contact 4 *an* over to the next idle call seeker of the same group. At the contact 8 *p* the high resistance winding I of the relay P is short-circuited, and over the contact 9 *p* the following circuit is closed for the second preselector II.VW 1 connected to the call seeker AS: battery, contacts 9 *p*, 10 *u*, winding of the rotary magnet DM 2, contact 11 *t* 1, interrupter U*n* 1, earth. At the contact 12 *p* a circuit for the change over relay U of the preselector II.VW 1, is closed, which extends from earth over the winding I of this relay, contact 12 *p*, wiper *d*, winding of the register magnet Z, contact 3 *t* and over the winding II of relay T to battery and earth. But in this circuit neither the relay U nor the register magnet Z can be operated in parallel with the low resistance winding II of the relay P.

Owing to the short circuiting of the high-resistance winding I of the relay P, the relay T is fully energized over its winding II, hence it opens its contact 1 *t* and 2 *t* and thus disconnects the starting relay A*n*. Furthermore, the relay P at its contacts 13 *p* and 14 *p* connects the incoming speaking leads over the wipers *a* and *b* of the call seeker AS through to the speaking leads of the second preselector II.VW 1. In the meantime this preselector has been started up as above described and it is arrested when it reaches an idle junction line going to the main exchange, at the outgoing end of which line there is an impulse and speech current repeater.

Assuming that the repeater marked U*e* in the Figure 1 is free, the following circuit for the test relay T 1 of II.VW 1 is established when the wiper *c* 1 reaches the test contact of this repeater: battery, windings I and II of T 1, contact 15 *u*, wiper *c* 1, contact 16 *s*, winding I of relay C 1, contact 17 *v* 1, earth. In this circuit the relays T 1 and C 1 are energized. The relay T 1 at its contact 11 *t* 1 interrupts the circuit of the rotary magnet DM 2, at its contact 18 *t* 1 it short circuits its high resistance winding II, and at its contacts 19 *t* 1 and 20 *t* 1 it connects the call through over the wipers *a* 1 and *b* 1 to the speaking leads of the repeater U*e* taken into use. Thereat the relays A and B are energized over the subscriber's loop. The relay C 1, which was energized when the repeater was taken into use, closes the following locking circuit over its winding II; battery, contacts 21 *s* and 22 *c* 1, winding II of relay C 1, contact 23 *a*, winding of relay V 1, earth. The relay V 1 is likewise energized over this locking circuit, and at contact 17 *v* 1 it opens the circuit for the winding I of the relay C 1 and by closing its contact 24 *v* 1 it maintains the marking engaged circuit for the relay T 1 of the second preselector II.VW 1 over the resistance W.

In addition to the repeater U*e*, the outgoing end of each junction line going to the main exchange is provided with an auxiliary switch MS, which in known manner releases the junction line going to the main exchange when a local call is made. On operating, the relay V 1 at its contact 25 *v* 1 closes the following circuit for the rotary magnet DS of the auxiliary switch MS: earth, contacts 25 *v* 1 and 26 *v* 2, wiper 27 of MS, winding of the rotary magnet DS, battery, earth. The wiper 27 of the auxiliary switch MS is moved on one step, whereupon the rotary magnet DS is placed under the control of the impulse receiving relay A.

If the first train of impulses now be transmitted by the calling subscriber's station N 1, the relay A falls back at each impulse, and at its contact 28 *a* it closes the following circuit for the rotary magnet DS of the auxiliary switch MS: earth, contacts 25 *v* 1, 29 *g*, 28 *a*, winding of DS, battery, earth. At the same time at each impulse the opening of contacts 23 *a* removes the short circuit from the winding of the relay V 2 and in place thereof the contacts 30 *a* close and short circuit the winding II of the relay C 1. The latter is, however, a slow acting relay and therefore does not fall back during the individual impulses. At the end of each impulse the winding of relay V 2 is again short-circuited at contacts 23 *a*, but as it is thereby rendered slow acting, the relay maintains its contacts in the operated position for the duration of the train of impulses. At contact 31 *a*, the impulses received by the relay A are repeated over the contact 32 *c* 1 and over the lead L*a* to the switch located at the incoming end of the junction line at the main exchange, while at the contacts 34 *c* 1 and 35 *v* 2 the steering current is applied to the other lead L*b*. If the first train of impulses consists of 3 impulses, the following circuit is closed at the end of this train of impulses over the wiper 27 of the auxiliary switch MS: earth, contacts 25 *v* 1, 26 *v* 2, wiper 27, winding of relay UR, contact 36 *c* 1, battery, earth. The relay UR at its contacts 135 *ur* closes a locking circuit for itself and at its contacts 37 *ur* prepares the circuit of the relay S, which effects the switching over to the connecting devices of the local sub-exchange. If the next train of impulses likewise consists of 3 impulses, at the end thereof the following circuit is closed for the relay S: battery, contact 38 *g*, 37 *ur*, winding of relay S, wiper 27, contacts 26 *v* 2 and 25 *v* 1, earth. The relay S is operated, at its contact 16 *s* it opens the circuit of relay T 1 at II.VW 1 and at its contact 39 *s* it closes a circuit for the winding I of the change over relay U over resistance W 1 and the wiper *e* 1 of II.VW 1. At the same time the contact 21 *s* opens the locking circuit of the winding II of relay C 1, which falls back after a little while and in known manner returns to their normal position the devices at the repeater

Ue and at the auxiliary switch MS. The relay G has the function of preventing the switching over taking place at the preselector II.VW 1 when two more trains of impulses are transmitted, consisting, for example, of 2 and 4 impulses, whereby the wiper 27 of MS is likewise positioned on the contact to which the relay S is connected. For two impulses position the wiper 27 onto the third contact, whereupon the relay G is energized after the relay V 2 has fallen back. The relay G opens its contact 29 *g* thus opening the impulse circuit for the rotary magnet DS.

When the relay U operates at the second preselector II.VW 1, the test relay T 1 of this switch is connected over the contact 40 *u* and over winding II of relay U to the second test wiper *d* 1 of the preselector. The rotary magnet DM 2 is connected up over the contact 41 *u* and over the low resistance winding III of the relay U. The wipers *a* 1, *b* 1, *c* 1, *d* 1 and *e* 1 of the second preselector II.VW 1 are now moved on until an idle succeeding switch has been found, for example the final selector LW shown in the Figure 2. In that case the following circuit is closed when the wiper *d* 1 reaches the test contact, to which the final selector LW is connected: battery, windings I and II of relay T 1, contact 40 *u*, winding II of relay U, wiper *d* 1, lead 42 (Figures 1 and 2), winding I of relay C 2, contact 43 *r*, off-normal contact 44 *k* of LW, earth. At the preselector II.VW 1 the relay T 1 is operated, its contact 11 *t* 1 interrupts the circuit of the rotary magnet DM 2 and its contacts 19 *t* 1 and 20 *t* 1 connect the subscriber's station N 1 to the speaking leads 45 and 46 going to the final selector LW.

Thereby the relays A 1 and B 1 of the final selector LW are energized over the line loop of the calling subscriber. The relay C 2 is energized when the final selector LW is taken into use and its contact 47 *c* 2 closes a locking circuit for its winding II and its contact 48 *c* 2 operates the relay U 1 over the off-normal contact 49 *k*. At the contact 50 *c* 2 a circuit is closed for the relay E extending over the shaft contact 51 *w*. The actuation of the relays U 1 and E prepares the final selector LW for the reception of the first train of impulses, because the contacts 52 *u* 1 and 53 *e* are closed in the circuit of the lifting magnet H. When the calling subscriber transmits the next train of impulses, the opening of the line loop at each impulse causes the relays A 1 and B 1 to fall back. At contact 54 *a* 1 the following circuit for the lifting magnet H is closed: earth, contacts 50 *c* 2, 54 *a* 1, 53 *e*, 52 *u* 1, winding of H, battery, earth. The wipers *a* 2, *b* 2, *c* 2 of the final selector LW are raised step by step by the lifting magnet H. At the first step of the switch the off-normal contact is opened hence the contact 44 *k* opens the circuit for energizing the winding I of the relay C 2 and the contact 49 *k* opens the circuit for energizing the winding I of the relay U 1. The relay C 2 is locked, however, over its contact 47 *c* 2 and its winding II, while the slow acting relay U 1 is maintained energized over its contact 55 *u* 1 and over contact 56 *a* 1, which is closed at each impulse. But at the end of this train of impulses the relay U 1 falls back, because the contact 56 *a* 1 is kept open for some time. Thereby the rotary magnet D is connected to the impulse circuit over the contact 57 *u* 1. Hence when the next train of impulses is transmitted from the subscriber's station N 1 the rotary magnet D is energized at each impulse over the following route: earth, contacts 50 *c* 2, 54 *a* 1, 53 *e*, 57 *u* 1, winding of D, battery, earth. The shaft contact 51 *w* is opened at the first rotary step, thereby interrupting the circuit for energizing the relay E. But this remains energized for the duration of this train of impulses over the off-normal contact 58 *k* and the contact 59 *d* of the rotary magnet. It should also be mentioned that the relay R was energized over the contacts 60 *c* 2 and 61 *e*, and at its contact 62 *r* it prepares the test circuit for the relay P 1. Shortly after the end of the last train of impulses the relay E falls back and closes the following circuit for the test relay P 1: earth, contacts 60 *c* 2, 63 *e*, 62 *r*, windings I and II of P 1, contact 64 *f*, wiper *c* 2 of the final selector LW and over the winding II of the calling relay T (not shown) belonging to the wanted subscriber's station. The relay P 1 at its contact 65 *p* 1 short circuits its high resistance winding I and it closes its contact 66 *p* 1, 67 *p* 1 and 68 *p* 1, thereby applying ringing current to the wanted subscriber's line as follows: battery, source of ringing current RQ, contacts 70 *r*, 71 *y*, 72 *f*, 67 *p* 1, wiper *a* 2, upper lead of the subscriber's line, bell at the subscriber's station, lower lead of the subscriber's line, wiper *b* 2, contacts 68 *p* 1, 73 *y*, earth. Shortly afterwards the relay R falls back and closes the following circuit for the intermittent ringing: from the source of ringing current RQ over contact 69 1, winding II of the relay U 1, contact 74 *r* and over the ringing route previously decribed. The contact 69 1 is closed periodically in known manner by a ringing relay, for example every 10 seconds.

When the wanted subscriber answers the call, the relay U 1, which only responds to direct current, is operated over the contact 75 1 and the above described ringing circuit to earth at contact 73 *y*. The relay then closes at its contact 76 *u* 1 a circuit for the winding I of relay Y extending over the contacts 77 *p* 1 and 78 *c* 2. At the same time the ringing circuit is opened at the contact 71 *y* and at contact 73 *y* the windings II and III of the relay Y are energized in the following circuit:

battery, winding II of Y, contacts 131 *y*, 72 *f*, 67 *p* 1, wiper *a* 2, subscriber's loop, wiper *b* 2, contact 68 *p* 1, winding III of Y, earth. At contact 79 *y* battery is applied to the lead 80, hence the meter magnet Z of the calling subscriber's meter is energized over the wiper *e* 1 of the preselector II.VW 1, contact 12 *p*, wiper *d* of the call seeker AS, bank contact 6 and wiper *c* of AS, winding II and contact 8 *p* of relay P to earth.

At the end of the conversation when the receiver is hung up at the calling subscriber's station N 1, the relays A 1 and B 1 fall back. The locking winding II of the relay C 2 is short circuited at contact 81 *a* 1, and the relay falls back after a little while. At contact 82 *c* 2 the following circuit is closed for the rotary magnet D: earth, contacts 82 *c* 2, 83 *k*, 84 *e*, 57 *u* 1, winding of the rotary magnet D, battery, earth. At contact 59 *d* is closed a circuit for the relay E extending over the contact 58 *k*. This effects the interruption of the circuit of the rotary magnet D at contact 84 *e*. The rotary magnet opens its contact 59 *d*, whereupon the relay E falls back again, and at contact 84 *e* again closes the circuit of the rotary magnet. The interaction between the rotary magnet and the relay E continues until the wipers have been moved beyond the row of bank contacts on which they happen to be standing, the switch shaft is then returned to the normal position. In the normal position the contacts 83 *k* and 58 *k* are opened, hence the rotary magnet D cannot be again operated. At contact 60 *c* 2 is opened the circuit of the test relay P 1, thus also causing the release of the relay Y. At the release of the relay C 2 the contact 47 *c* 2 is opened and it removes earth from the lead 42, thus causing the relays T 1 and U to fall back at the preselector II.VW 1. Thereupon the second preselector II.VW 1 and the call seeker AS in known manner are returned to the normal position.

The method of setting up a trunk call to a subscriber of the sub-exchange will now be described. Upon initiating a call over the trunk line FL shown in Figure 1, the relay T 2 is energized over its winding I and over the contacts 85 *t* 2 and 86 *t* 2 in series with the starting relay A*n*. The relay T 2 closes its contact 87 *t* 2, thereby applying battery over the winding II of this relay to the test contact 88 of the call seeker AS, while the contacts 85 *t* 2 and 86 *t* 2 remain closed for the present. The call seeker AS is positioned in the manner described above. When the wipers *a*, *b*, *c*, and *d* of the call seeker have been positioned onto the bank contacts of the calling line, the winding I of the relay U at the second preselector is energized over the wiper *d*, contact 12 *p*, winding I of relay U. At contact 40 *u* the test relay T 1 is connected to the wiper *d* 1 of II.VW 1, over which only the connecting devices of the local exchange can be tested. Hence the trunk call is thus switched over to a final selector of the sub-exchange as soon as the second preselector II.VW 1 is taken into use.

The seizing of the final selector LW and its positioning onto the wanted subscriber's line takes place in the manner described above for a low value call, so it need not be further described. However, upon the release of the relay E at the end of the last train of impulses for positioning the final selector the relay F is energized in the following circuit until the relay R falls back; earth, winding I of F, contacts 89 *e*, 90 *r*, lead 80, wiper *e* 1 of II.VW 1, contact 12 *p*, wiper *d* of AS, battery. The relay F at its contact 91 *f* closes over contacts 134 *b* 1 and 135 *t* 3 a locking circuit over its winding II. At contact 64 *f* the circuit of the test relay P 1 of the final selector LW is opened, while at the contacts 92 *f*, 93 *f* and 94 *f* the speaking leads 45, 46 of the final selector LW are switched through over the condensers C 3 and C 4 and over the wipers *a* 2 and *b* 2 of the final selector LW to the wanted station. If the wanted subscriber's station be engaged, the calling trunk operator notifies him that he is wanted for a trunk call, and the operator can then in known manner effect the release of the local call. If the receiver has been hung up in the meantime at the wanted station, the relay B 1 is energized by the trunk operator and thus ringing current is applied to the line of the wanted subscriber's station. At contact 134 *b* 1 the short circuit is removed from the winding of relay T 3, which is then operated. The contacts 96 *t* 3 and 97 *t* 3 bridge over the condensers C 3 and C 4, the wanted line is marked engaged over contact 95 *t* 3 and the contacts 132 *t* 3 and 135 *t* 3 are opened. The ringing current takes the following route: source of ringing current RQ, contacts 98 *b* 1, 93 *f*, 94 *f* and 96 *t* 3, wiper *a* 2, subscriber's line, wiper *b* 2, contacts 97 *t* 3, 92 *f* and 73 *y*, earth. When the wanted subscriber answers during a pause in the ringing, that is to say when the relay B 1 has fallen back, the relay Y is then operated over the contacts 99 *t* 3, 136 *b* 1, 93 *f*, 94 *f*, 96 *t* 3, wiper *a* 2, subscriber's line, wiper *b* 2, contacts 97 *t* 3, 92 *f*, and 73 *y*, earth. At the end of the conversation the connection is released in a manner similar to that described above for a low value call, so it need not be further described.

The second example shown in Fig. 3 will now be further described. In it the subscribers' lines and the trunk lines incoming from the main exchange terminate at preselectors. When a call is originated by the subscriber's station N 2 belonging to the sub-exchange the relay R 1 is operated, its windings I and II being connected to the subscriber's loop over the contacts 101 *t* 4 and 102 *t* 4. At contact 103 *r* 1 the following circuit is closed for the rotary magnet: battery,

contacts 103 *r* 1 and 104 *t* 4, winding of the rotary magnet DM 3, interrupter U*n* 2, earth. The wipers *a* 3, *b* 3, *c* 3, *d* 3 and *e* 3 of the preselector I.VW 1 are now moved on until an idle second preselector, for example, the preselector II.VW 2 shown in Figure 3, has been found. The following circuit is then established: battery, contact 105 *r* 1, windings I and II of relay T 4, wiper *c* 3, winding I of relay R 2, contact 106 *t* 5, winding II of the relay R 2, earth. The relays T 4 and R 2 are energized in this circuit. The relay T at its contact 104 *t* 4 opens the circuit of the rotary magnet and at its contact 107 *t* 4 short circuits the high resistance winding I of the relay T 4. At the contacts 101 *t* 4 and 102 *t* 4 the calling relay R 1 is disconnected from the subscriber's line and at the contacts 108 *t* 4 and 109 *t* 4 the line is switched through to the wipers *a* 3 and *b* 3 of the first preselector I.VW 1. Over the contact 110 *t* 4 battery is applied to the register magnet Z 1, which is connected to the wiper *e* 3. However, the change-over relay U 2 of the second preselector II.VW 2 cannot operate in series with the winding of the register magnet Z 1.

At contact 111 *r* 2 the following circuit is closed for the rotary magnet of the preselector II.VW 2: earth, interrupter U*n* 3, contacts 111 *r* 2 and 112 *t* 5, winding of the rotary magnet DM 4, battery, earth. At contact 113 *r* 2 is prepared the test circuit of the second preselector II.VW 2. The wipers *a* 4, *b* 4, *c* 4, *d* 4 and *e* 4 are now moved on until an idle repeater, for example U*e* 1, located at the outgoing end of a junction line going to the main exchange has been found. Thereupon the following test circuit is established: battery, wiper *d* 3 of I.VW 1, contact 107 *t* 4, winding II of relay T 4, wiper *c* 3, winding I of relay R 2, contact 113 *r* 2, windings I and II of relay T 5, contact 114 *u* 2, wiper *c* 4, contact 115 *s* 1 to earth. The relay T 5 operated in this circuit opens at its contact 112 *t* 5 the circuit of the rotary magnet DM 4, at contact 116 *t* 5 short circuits its high resistance winding I and at contacts 117 *t* 5 and 118 *t* 5 switches through the calling subscriber's line over the wipers *a* 4 and *b* 4 to the repeater U*e* 1. Thereat the relays A 2 and B 2 are energized, whereupon the impulse transmission from the calling subscriber's station can be commenced. If the first or the first and second train of impulses designate the local exchange, the not shown auxiliary switch causes the relay S 1 to be operated in the manner already described with reference to the Figure 1. The relay at its contact 119 *s* 1 energizes the winding I of the change over relay U 2 over the resistance W 3, while at contact 115 *s* 1 is opened the circuit of the relay T 5. The relay U 2 is operated and establishes the following circuit for the rotary magnet DM 4 of the second preselector II.VW 2: earth, interrupter U*n* 3, winding III of relay U 2, contacts 120 *u* 2, 112 *t* 5, winding of the rotary magnet DM 4, battery, earth. When the relay U 2 operates, it also closes the contact 121 *u* 2 and thus connects its winding II to the wiper *d* 4. The rotary magnet now rotates the preselector II.VW 2 until an idle final selector has been found belonging to the sub-exchange, for example, the switch LW 1 shown in the Figure 3. Thereupon the relay T 5 is energized over the winding II of relay U 2, winding I of relay C 3 and over the off-normal contact 122 *k* of the final selector LW 1. When the contacts 117 *t* 5 and 118 *t* 5 at the preselector II.VW 2 are then closed, the relays A 3 and B 3 of the final selector LW 1 are operated over the subscriber's loop. The final selector is positioned and the call is completed in the manner described above. When the wanted subscriber's station answers the call, the contact 123 *y* 1 is closed operating the register magnet Z 1 of the calling subscriber's station N 2 over the wipers *e* 4 of II.VW 2 and *e* 3 of I.VW 1. When the receiver is hung up at the calling station, the winding II of relay C 3 is short circuited at the contact 124 *a* 3, whereupon the relay C 3 falls back and at its contact 125 *c* 3 opens the circuit of the relays U 2, T 5, R 2 and T 4. The preselectors I.VW 1 and II.VW 2 are then released in known manner.

Should, however, a call be made over the trunk line FL 2, the relay R 3 is operated and at its contact 126 *r* 3 it closes a circuit for the rotary magnet DM 5 of the first preselector I.VW 2, extending over the contact 127 *t* 6 and over the interrupter U*n* 4. When an idle second preselector, for example, the preselector II.VW 2 has been found, the relay T 6 is operated over the following circuit: battery, contact 128 *r* 3, windings I and II of T 6, wiper *c* 5, winding I of relay R 2, contact 106 *t* 5, winding II of relay R 2, earth. The circuit of the rotary magnet DM 5 is opened at contact 127 *t* 6 and winding I of relay T 6 is short circuited at contact 129 *t* 6. However, when a trunk line is calling, the relay U 2 is energized as follows: battery, wiper *d* 5 of I.VW 2, contact 130 *t* 6, wiper *e* 5, winding I of relay U 2, earth. At its contacts 114 *u* 2 and 121 *u* 2 the relay U 2 switches the test relay T 5 of the second preselector II.VW 2 over from the wiper *c* 4 to the wiper *d* 4. The preselector II.VW 2 being now started up over contact 111 *r* 2, only the final selector of the local sub-exchange can be tested over the wiper *d* 4. An idle final selector such as LW 1 is taken into use and positioned in the manner above described. But at the end of its rotary movement the relay F 1 is energized over the wipers *e* 4 and *e* 5, contact 130 *t* 6 and over the wiper *d* 5, and it effects the switching over for trunk traffic at the final selector LW 1 in the manner described above.

What is claimed is:

1. In a telephone system, a finder, a selector connected to said finder, lines of two classes terminating in the banks of said finder, trunks of two classes accessible in the banks of said selector, a switch associated with each trunk of the first class, means for operating said finder to find the calling line when a call is initiated over any of said lines, means for operating said selector to select an idle trunk of said first class when the calling line is of one class, means controlled over the calling line for operating the switch associated with the selected trunk, means for causing said selector to select an idle trunk of the second class when the switch associated with the selector trunk of the first class is operated to a predetermined extent, and means for operating said selector to select an idle trunk of the second class immediately when the calling line is of the other class.

2. In a telephone system, a selector switch, trunks of two classes accessible to said switch, a discriminating switch associated with each trunk of the first class, two classes of calling lines, means for connecting a calling line of either class to said selector, means responsive to said first means for operating said selector to automatically select an idle trunk of the first class when the calling line is of one class, means controlled over the calling line for variably operating the switch associated with the selected trunk, means for causing said selector to release the selected trunk of the first class and select an idle trunk of the second class when the switch associated with the selected trunk of the first class is operated to a certain extent, and means for operating said selector to select an idle trunk of the second class immediately when the calling line is of the other class.

3. In a telephone system, a selector switch, trunks of two classes accessible to said switch, a discriminating switch associated with each trunk of the first class, two classes of calling lines, means for connecting a calling line of either class to said selector, means responsive to said first means for operating said selector to automatically select an idle trunk of the first class when the calling line is of one class, means controlled over the calling line for variably operating the switch associated with the selected trunk, means for causing said selector to release the selected trunk of the first class and select an idle trunk of the second class when the switch associated with the selected trunk of the first class is operated to a certain extent, means for operating said selector to select an idle trunk of the second class immediately when the calling line is of the other class, a combination toll and local connector terminating each trunk of the second class, and means for causing the connector terminating the selected trunk of the second class to operate as a local connector or as a toll connector depending on the class of the calling line.

4. In a telephone system, a selector, two classes of trunks accessible to said selector, two classes of lines, means for connecting a line of either class to said selector, means automatically responsive to the establishment of said connection for causing said selector to select an idle trunk of the particular class corresponding to the class to which the connected line belongs, and means controlled over the connected line, providing the connected line is of a particular class for causing the selector to select an idle trunk of the non-corresponding class.

5. In a telephone system, a trunk hunting selector, a first and a second class of trunks accessible to said selector, a first and a second line over which said selector may be controlled, means for causing said selector to find a trunk of the first class when the control thereof is exercised over said first line, and for causing said selector to find a trunk of the second class when the control of said selector is exercised over said second line, and means controlled over said first line for causing said selector after it has found a trunk of the first class to continue hunting until it finds a trunk of the second class.

6. In a telephone system, a finder, a selector connected to said finder, subscribers' lines and incoming interoffice trunks terminating in the banks of said finder, outgoing interoffice trunks and local trunks accessible in the banks of said selector, means for operating said finder to find the calling subscriber's line or the calling incoming interoffice trunk when a call is extended over any one of said subscribers' lines or any one of said incoming interoffice trunks, and means for operating said selector to hunt an idle one of said outgoing interoffice trunks whenever said finder finds a calling subscriber's line, and for operating said selector to hunt an idle one of said local trunks whenever said finder finds a calling incoming interoffice trunk.

7. In a telephone system, a trunk hunting switch for extending calls, two classes of trunks accessible to said switch, a test wiper for testing one class of trunks, a test wiper for testing the other class of trunks, means for starting the hunting operation of said switch when the switch is taken for use to extend a call, a test relay and means for associating it with either wiper depending on the class of trunks over which the call is to be extended, and a circuit for energizing said relay to stop the hunting operation of said switch when it has found an idle trunk in the class of trunks tested, said circuit including the wiper with which the relay is associated.

8. In a telephone system, a switch having one hunting movement under certain conditions and two hunting movements under certain other conditions, a second switch acces-

sible to said first switch, and means for causing said second switch to operate in either of two distinct manners, the manner of operation depending on whether the seizure thereof by said first switch followed one hunting movement or two hunting movements.

9. In a telephone system, a hunting switch, a plurality of trunks of two classes accessible to said switch, subscribers' lines, incoming trunk lines, means for extending a connection from any of said lines to said switch, and means responsive when a connection is extended for operating said switch to automatically select an idle trunk of one class when the connection is extended from a subscriber's line and an idle trunk of the other class when the connection is extended from a trunk line.

10. In a telephone system, a line switch, local trunks and outgoing trunks accessible to said switch, subscribers' lines and incoming trunks having access to said switch, means for extending a call from said lines or from said incoming trunks to said switch, means responsive when a call is extended from a subscriber's line for operating said switch to automatically select an idle one of said outgoing trunks, and means responsive when a call is extended from an incoming trunk for operating said switch to automatically select an idle one of said local trunks.

In witness whereof, I hereunto subscribe my name this 1st day of April, A. D. 1927.

MAX LANGER.