

Jan. 8, 1935.

H. E. HERSHEY

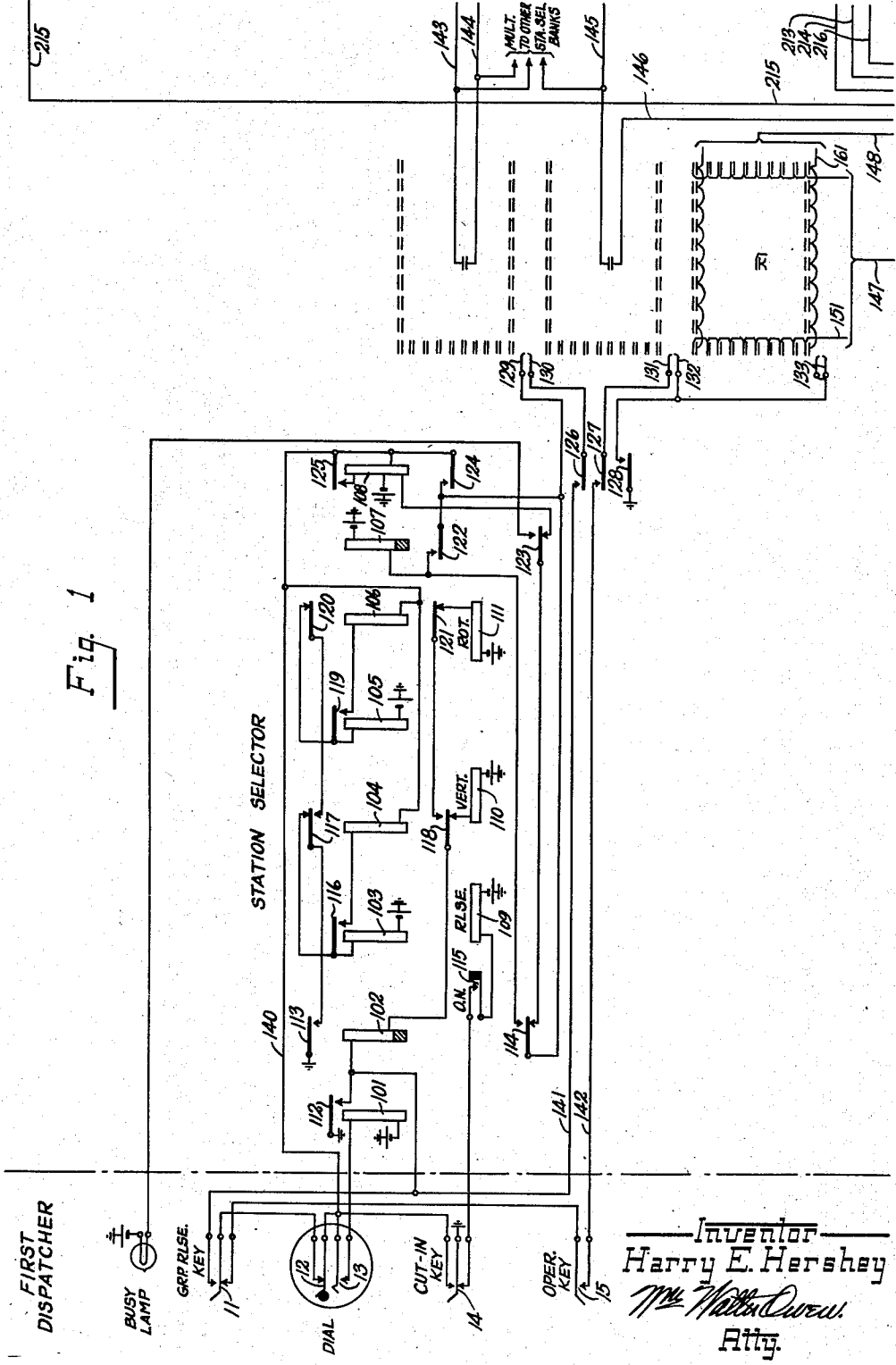
1,986,972

SELECTING SYSTEM

Filed Dec. 13, 1930

6 Sheets-Sheet 1

Fig. 1



Inventor
Harry E. Hershey
Att'y.

Jan. 8, 1935.

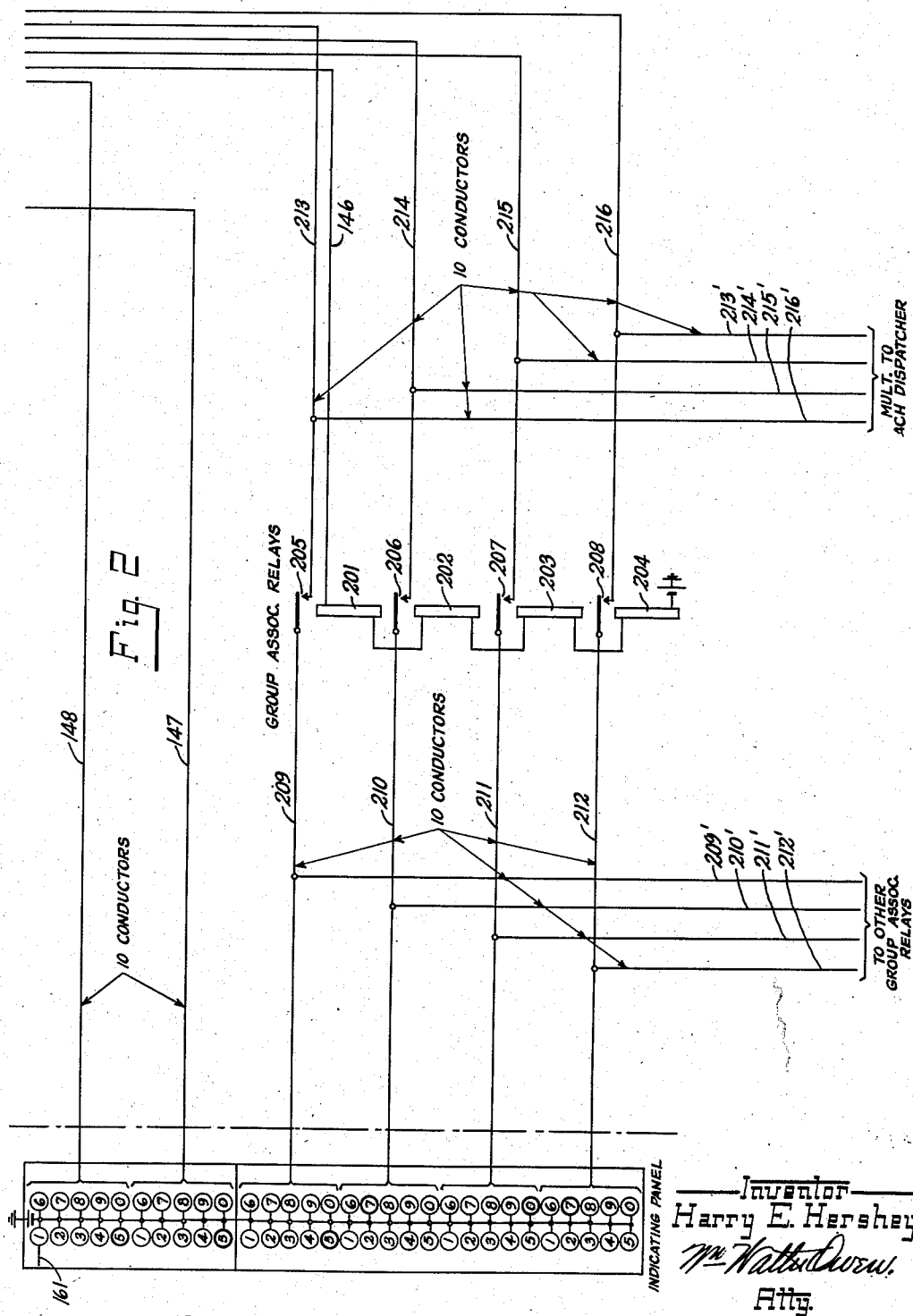
H. E. HERSHEY

1,986,972

SELECTING SYSTEM

Filed Dec. 13, 1930

6 Sheets-Sheet 2



Inventor
Harry E. Hershey
By *Walter C. Brown*
Att'y

Jan. 8, 1935.

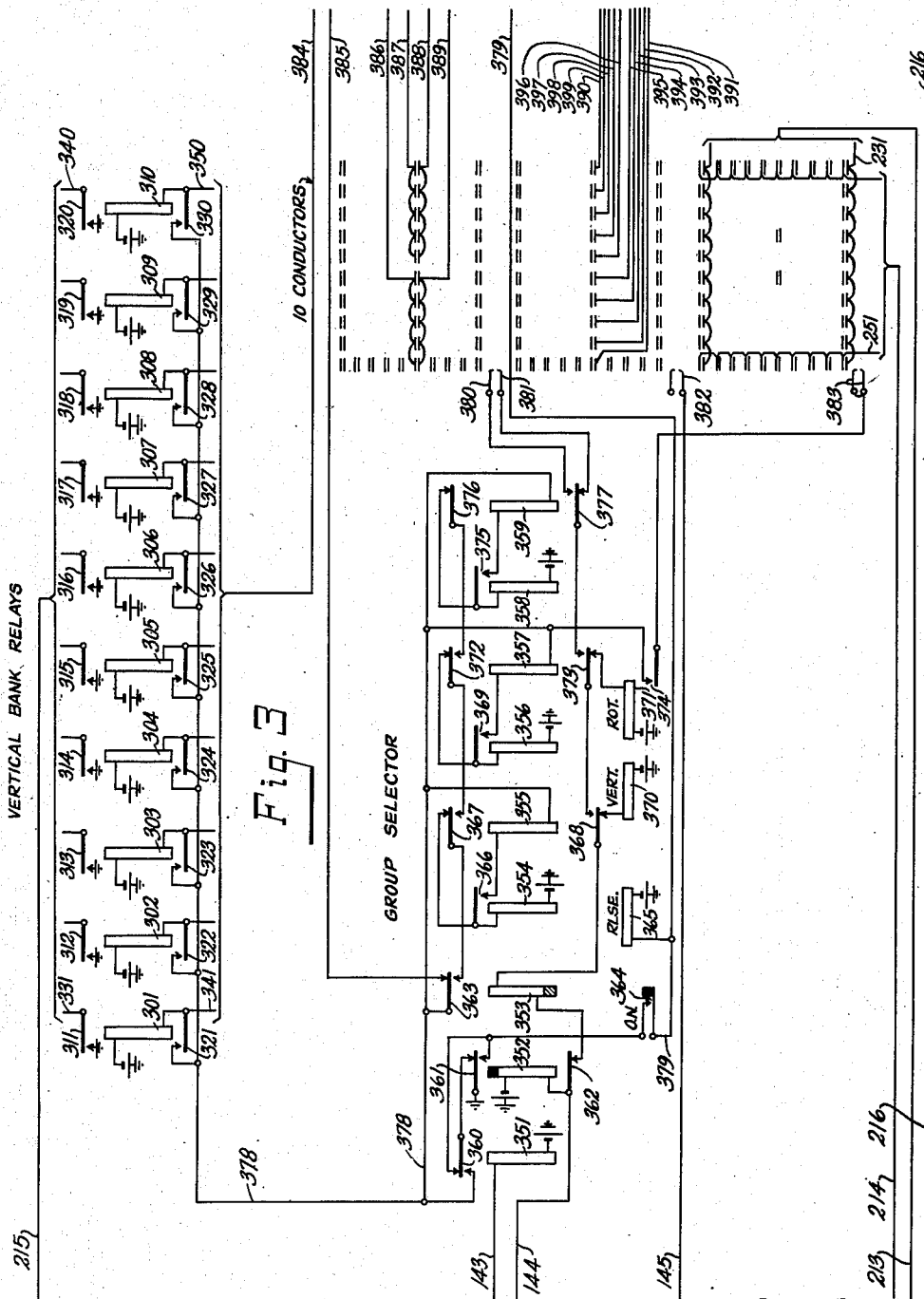
H. E. HERSHEY

1,986,972

SELECTING SYSTEM

Filed Dec. 13, 1930

6 Sheets-Sheet 3



INVENTOR
Harry E. Hershey
By *Walter C. Cullen*
Att'y.

Jan. 8, 1935.

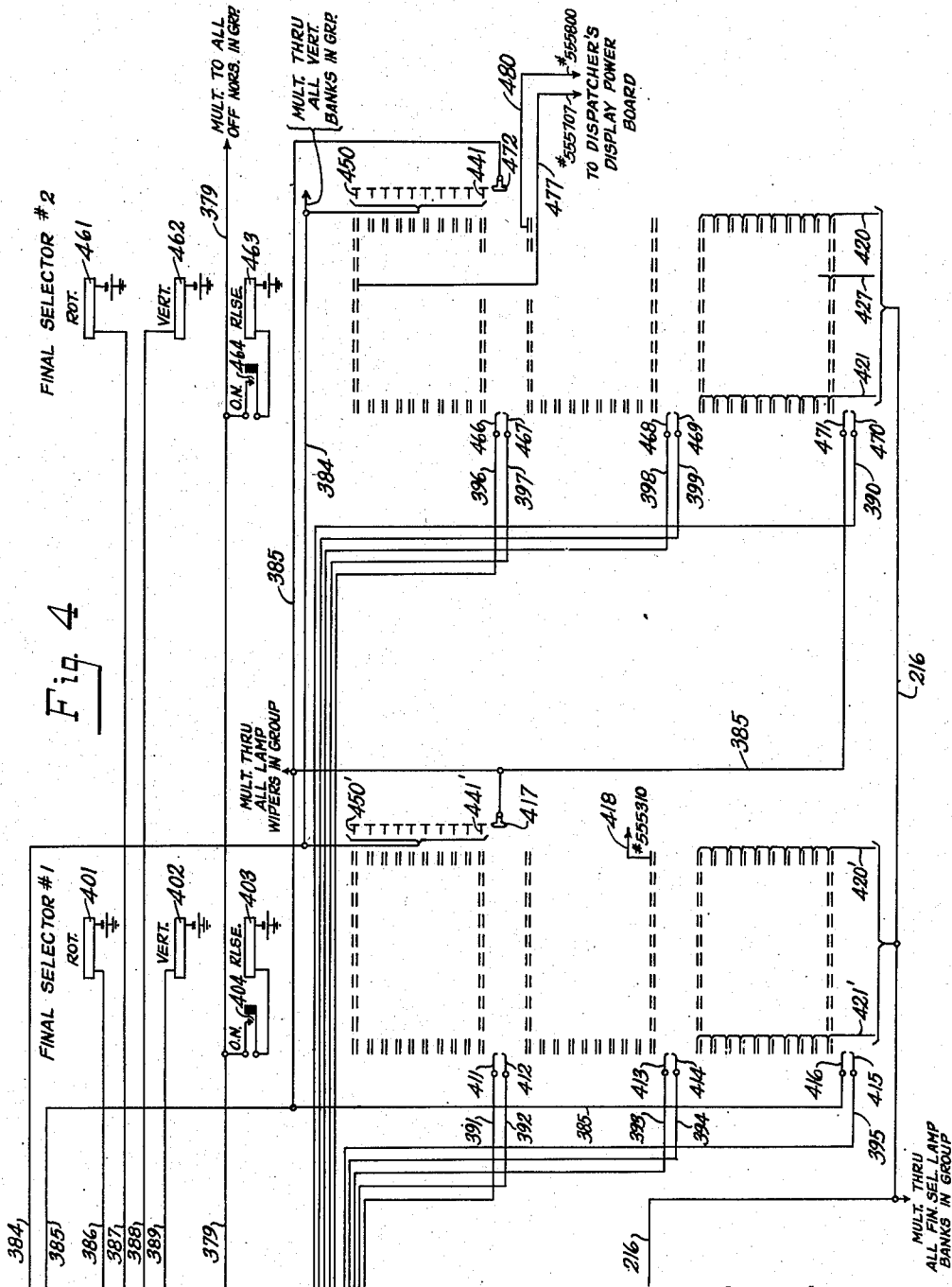
H. E. HERSHEY

1,986,972

SELECTING SYSTEM

Filed Dec. 13, 1930

6 Sheets-Sheet 4



INVENTOR
Harry E. Hershey
Wm. H. Owen.
Att'y.

Jan. 8, 1935.

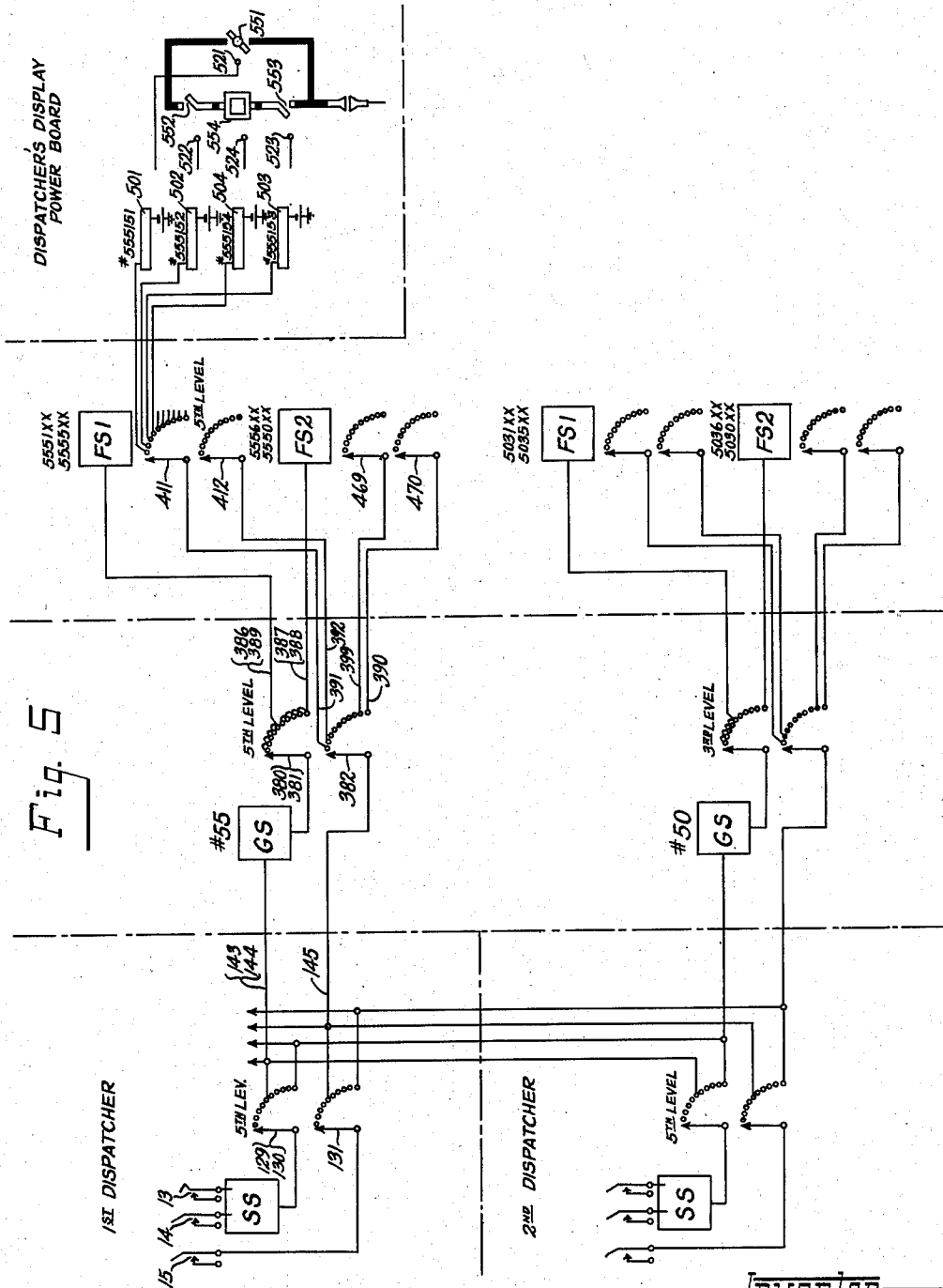
H. E. HERSHEY

1,986,972

SELECTING SYSTEM

Filed Dec. 13, 1930

6 Sheets-Sheet 5



Inventor
Harry E. Hershey
Wm. Walter Owen.
Att'y.

Jan. 8, 1935.

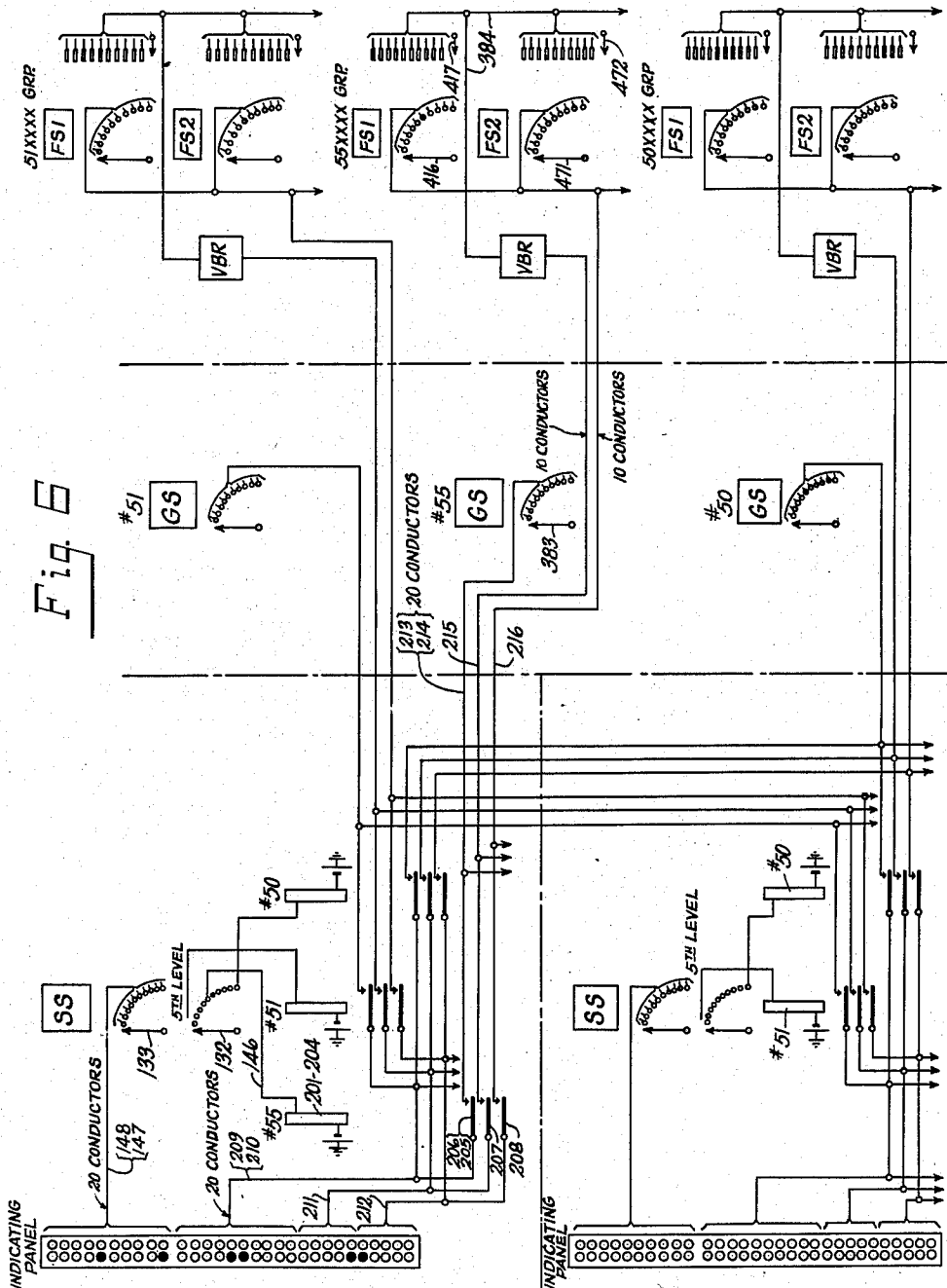
H. E. HERSHEY

1,986,972

SELECTING SYSTEM

Filed Dec. 13, 1930

6 Sheets-Sheet 6



Inventor
 Harry E. Hershey
Wm. H. H. H. H.
 Atty.

UNITED STATES PATENT OFFICE

1,986,972

SELECTING SYSTEM

Harry E. Hershey, Oak Park, Ill., assignor, by
mesne assignments, to Associated Electric Lab-
oratories, Inc., Chicago, Ill., a corporation of
Delaware

Application December 13, 1930, Serial No. 502,111

7 Claims. (Cl. 177—353)

This invention relates in general to selecting systems and the object of the invention, briefly stated, is the provision of an improved selecting system using large capacity type switches for selecting devices in accordance with the decimal system.

Another object of the invention is the provision of means for indicating the actual position of the various switch wipers after the same have been operated to their selecting positions.

A further object of the invention relates to the novel means for partially releasing only a certain number of switches in the switch train in case another selection is desired.

In the embodiment shown in the drawings, the invention is illustrated in connection with and for selecting the devices which control the symbols of the face equipment of the so-called "one-line diagram" of the dispatcher's display board, such as is disclosed in the White application, Serial No. 425,121, filed February 1, 1930. It will be understood, however, that this invention is applicable for use wherever selection and a check of such selection is desired and is not necessarily limited for use in connection with dispatcher's display boards.

Referring now to the drawings, Figs. 5 and 6, respectively, represent diagrammatic layouts of the selecting and indicating means in use in controlling a dispatcher's display board such as is disclosed in the aforesaid White application, while Figs. 1 to 4, inclusive, with Fig. 2 placed below Fig. 1 and Fig. 3 to the right of Fig. 1 and Fig. 4 to the right of Fig. 3 show by means of the usual circuit diagrams the selecting circuits and apparatus used.

To the left of the dotted line in Fig. 1 there is shown a busy lamp, a group release key, a well known calling device or dial, a cut-in key and an operate key. This equipment is located at the dispatcher's desk and is used by the dispatcher to control the apparatus illustrated. To the right of the dotted line there is shown a station selector which is also individual to this dispatcher's position. The station selector is of the well known type of Strowger vertical and rotary step-by-step switch in which the wipers 129 to 133, inclusive, are first operated step-by-step in a vertical direction by the vertical magnet and then rotated step-by-step by the rotary magnet over the bank contacts illustrated. The control circuits of the station selector have been shown in full while only a portion of the station selector banks are shown connected for use, it being understood that the remaining bank contacts are wired in a manner similar to those shown connected up for use. As shown in Fig. 1 the station selector switch banks comprise three sets of banks, the upper bank being connected to the different group selectors, one of which is shown in Fig. 3. The

lower set of bank contacts are multiplied in the manner illustrated and extend over conductors, such as conductors 151 to 161, to the indicating panel at the dispatcher's desk illustrated to the left of the dotted line in Fig. 2. Conductors 147 and 148 each designate ten conductors extending to the indicating panel. The indicating panel illustrated in Fig. 2 comprises a plurality of lamps which are connected in parallel to negative battery. The lower bank contacts in each horizontal row of the station selectors are connected by a conductor such as conductor 161 to the lamps Nos. 1 to 0, inclusive, in the top lamp set. The conductor 161 being connected to the lamp No. 1 and the lower bank contacts in the 0 level being connected to the 0 lamp of the first set. The upper bank contacts in each vertical row are connected by a ten-conductor trunk 147 to the second set of lamps Nos. 1 to 0, inclusive. The first vertical row is connected to the No. 1 lamp in the second set and the remaining rows connected, respectively, in a similar manner. The lower bank contacts in the middle set of bank contacts of the station selectors are connected by means of conductors, such as conductor 146, to relays, such as relays 201 to 204, inclusive, for preparing circuits to the remaining lamps in the indicating panel. The upper bank contacts in the middle set of bank contacts are connected to the various group selectors to extend the operating lead thereto.

Referring now to Fig. 2 the conductors 213 to 216, inclusive, each designate ten conductors extending to forty armature springs. Armature springs 205 to 208, inclusive, each designate ten armature springs for connecting the ten conductors to ten other conductors, each ten of which is designated by a single conductor 209, 210, 211 and 212. Each of these latter ten conductors extend to respective lamps in the indicating panel. The lamps 1 to 0, in each lamp set are respectively controlled from correspondingly numbered levels and rows of the bank contacts in the remaining switches in this system.

The group selector shown in Fig. 3 is mechanically the same as the station selector shown in Fig. 1, the circuits of which, however, are somewhat different in that they have been modified in accordance with one feature of the invention. Each group selector is accessible from the various station selectors over multiplied bank contacts. The lowermost set of bank contacts of the group selector is provided for controlling the third and fourth sets of lamps by way of the ten conductor trunks 213 and 214. In the illustration disclosed the first five contacts in the fifth horizontal row or level are multiplied together and connected to conductors 386 and 389 which extend to a particular final selector, for instance the final selector No. 1 in Fig. 4. The remaining contacts in this level are multiplied in a similar manner and

connected to conductors 387 and 388 which extend to the final selector No. 2. The other levels are connected and multiplied in a similar manner and extend to other final selectors. By this arrangement a final selector may be selected from any one of five bank contacts in a particular level. The bank contacts in the middle set of bank contacts are not multiplied and each individual contact is connected to a corresponding wiper of a final selector. In the case illustrated the first five contacts in the fifth level extend to five wipers in the final selector No. 1 while the last five contacts in the fifth level extend direct to five wipers in the final selector No. 2. The wiring arrangement as disclosed in the upper and middle bank sets discloses a means for selecting a particular final selector in any one of five different positions and for rendering only one of the wipers of the final selector effective for operation dependent upon the position in which the wiper of the group selector is stopped to select the final selector.

The vertical bank relays shown in the upper portion of Fig. 3 control armatures 311 to 320 in turn control the lamps in the fifth set by way of the ten conductor trunks 215 and 211. The conductor 331 controls the lamp No. 1 in the fifth lamp set and the remaining lamps in this set are controlled over the other conductors in a similar manner. Each of the vertical bank relays in Fig. 3 are, respectively, connected to the vertical bank contacts of the final selectors in this group by way of the ten conductor trunk 384. The conductor 341 is connected to conductors 441 and 441' while the conductor 350 is connected to the conductors 450 and 450'. The remaining individual conductors of the vertical bank relays are connected in a similar manner to the other vertical bank contacts. It will, therefore, be seen from the foregoing that each vertical bank contact opposite corresponding levels of all final selectors in the group are multiplied together.

The final selectors shown in Fig. 4 are mechanically similar to the station selector shown in Fig. 1 and comprise only a plurality of wipers and operating magnets for operating the same. The upper bank contacts in each vertical row of the lower bank set are multiplied and extend to the lamps in the sixth set. Each of the remaining bank contacts extend individually to a device which controls the lamp signals in the dispatcher's display power board. Each final selector, therefore, has access to five hundred such devices.

In the diagrammatic layout in Fig. 5 two dispatchers' positions are shown to the left of the dotted line together with their individual station selectors SS. Each station selector SS has access to one hundred group selectors GS and each group selector GS in turn has access to twenty final selectors FS such as illustrated as FS1 and FS2. Each final selector has access to five hundred different devices which control the operation of the lamps in the dispatcher's display board. It should be mentioned at this time that the devices such as 501 to 504, inclusive, are similar to the devices shown in Fig. 10 and devices 0100 and 0192 of Fig. 14 in the aforesaid White application. Throughout this diagrammatic drawing only one level has been shown in place of the usual ten and the reference characters in this layout correspond to similar apparatus in the other figures.

Before proceeding with the detailed description a brief outline of the operation will be described in connection with Fig. 5. For this purpose it will

be assumed that the first dispatcher desires to select device 501. The number necessary for the dispatcher to dial in order to connect with this device is number 555151. The dispatcher therefore operates the cut-in key 14 and dials the number 555151 in order to select the device 501. Responsive to the first two series of impulses the station selector SS is operated opposite the fifth level and then rotated into engagement with the fifth contact in the fifth level to seize the group selector GS, No. 55. Responsive to the next two series of impulses the group selector GS is operated opposite the fifth level and then rotated into engagement with the first bank contact therein to seize the final selector FS1 and to select wiper 411 of such final selector. Responsive to the next two series of impulses the final selector FS1 is operated opposite the fifth level and then rotated into engagement with the first contact thereby selecting the device 501 or the device having the number 555151. Before operating this device the operator will look at her indicating panel to see if the switches have been correctly set to select the desired device.

Referring now to Fig. 6 which diagrammatically shows only the lamp indicating circuits, it will be understood that the switches SS, GS No. 55, and FS1 are the same switches disclosed in Fig. 5 and that they have been operated in the manner described. The wipers 133, 383, 416 and 417 cause the lamps shown in heavy black circles to be illuminated in case the wipers of the switches have been properly set. In case the lamps indicate the number dialled by the dispatcher, the dispatcher may then operate her operate key 15 to set the device 501 in any desired position. The operating circuit extends by way of the operate key 15, wipers 131, 382 and 411 to device 501. After setting this device in the desired position the dispatcher may desire to successively set the devices 502, 503 and 504. The operator will, therefore, transmit another impulse to cause the final selector to step its wiper to the second or next bank contact in the level to which it has been operated. After observing the extinguishing of the No. 1 and the lighting of the No. 2 lamp of the last lamp set of the indicating panel the dispatcher will operate the operate key 15 to set the device 502 in any desired position. The next and succeeding devices accessible from this level and the wiper 411 may be selected in the same manner as just described. Referring now to the group selector GS No. 55 and in case its wipers were rotated into engagement with the second bank contact therein instead of the first, then the wiper 412 instead of 411 would be effective for selecting different devices in the dispatcher's display power board, it being understood that each wiper, such as wipers 411 to 415 (Fig. 4), has access to one hundred devices in the dispatcher's display power board.

Before proceeding with the detailed description it is believed advisable to describe the multiplying arrangement of the lamp indicating conductors shown in Fig. 6. This arrangement is necessary in order to prevent improper indications when more than one dispatcher is selecting and operating the devices. The first two sets of lamps are individual to the associated station selector and are connected in the manner previously described in connection with Fig. 1. Since each dispatcher has access to any group selector it is necessary to provide means for connecting the lamp conductors extending from all group and final selectors to each of the remaining dispatch-

ers' lamps. For this purpose the lamp conductors of all group selectors, such as 213 and 214, extend to each dispatcher's position and terminate in armature springs, such as springs 205 and 206. Also, all of the final selectors accessible to one group selector have their corresponding indicating bank contacts multiplied and extend over lamp conductors, such as 215 and 216, to each dispatcher's position where they terminate in armature springs, such as springs 207 and 208. A relay at each dispatcher's position which is individual to each group selector, in this illustration relay No. 55 which is individual to group selector No. 55 and the dispatcher's position, controls the armature springs, previously referred to, to connect the lamp conductors to the lamps of the remaining sets. The operation of the proper relay, therefore, connects the proper set of lamp conductors to the dispatcher's lamps.

From the foregoing description it can be seen that each station selector has access to the same one hundred group selectors, each group selector has access to twenty different final selectors and that each final selector has access to five hundred different devices. The capacity of this system, therefore, is the equivalent of a million line system.

In case a smaller system is desired, say for instance a thousand line system, only one dispatcher would be required and in this case a single motion directively controlled switch would be provided for the station selector individual to the dispatcher and this station selector would then have access to only two final selectors in the same manner as illustrated in the fifth level of the group selector in Fig. 3.

Having given a general description of the operation a more detailed description will now be given and for this purpose it will be assumed that the dispatcher operates the cut-in key 14 and then the calling device or dial in accordance with the number of the device the dispatcher desires to select. The operation of the cut-in key 14 prepares the impulsing circuit of the dial and also grounds the hold conductor 140. Assuming now that the dispatcher desires to select 555707, the dispatcher will first dial the digit 5 and by the operation of the dial springs 13 the impulsing relay 101 is energized and deenergized five times in accordance with the five closures at the impulse springs 13. Responsive to each energization of relay 101 a circuit is completed for operating the vertical magnet 110 in series with the slow-acting relay 102 as follows: ground by way of armature 112, winding of slow-to-release relay 102, armature 118 and its resting contact, and through the winding of vertical magnet 110 to battery. The vertical magnet is, therefore, energized and deenergized five times to raise the wipers 129 to 133, inclusive, opposite the fifth level of bank contacts. On the first vertical step of the wipers off-normal springs 115 are closed to prepare the circuit to release magnet 109 so that the release magnet may energize and release the switch when the cut-in key 14 is released to normal position. Slow-to-release relay 102 maintains its armature 113 in energized position throughout the series of impulses and closes a circuit for energizing relay 103 by way of armature 117 and its resting contact. Relay 103, upon energizing, at armature 116 prepares a circuit for relay 104. Relay 104 cannot energize at this time because it is short-circuited from ground at armature 113 and grounded hold conductor 140. When relay 102 deenergizes shortly after the first series of impulses

said relay at armature 113 removes the short-circuit from around relay 104 and the latter relay then energizes in series with relay 103. At armature 117 relay 104 prepares a circuit for relay 105 and at armature 118 disconnects the vertical magnet 110 and prepares the circuit of the rotary magnet 111.

Responsive to the next digit, impulsing relay 101 again follows the impulses and at this time energizes the rotary magnet over the following circuit: from ground at armature 112, winding of slow-acting relay 102, armature 118 and its working contact, armature 121 and through the winding of rotary magnet 111 to battery. The rotary magnet is, therefore, operated to rotate the wipers 129 to 133, inclusive, into engagement with the fifth set of bank contacts in the fifth level. Slow-acting relay 102 is again energized during this series of impulses and at armature 113 completes a circuit by way of armature 117 and its working contact and armature 120 for energizing relay 105. At armature 119 relay 105 prepares a circuit for relay 106 but this latter relay cannot energize because the same is short-circuited. In case the group selector, accessible from the contacts to which the wipers of the station selector have been rotated, is busy the bank contact terminating conductor 143 will have a ground potential applied thereto by the station selector which previously seized this group selector. In this case busy relay 107 will energize before slow-acting relay 102 deenergizes as follows: ground by way of grounded conductor 143, wiper 129, armature 114 and its working contact, and through the winding of busy relay 107 to battery. At armature 122 busy relay closes a locking circuit for itself independent of armature 114. At armature 123 busy relay 107 opens the energizing circuit of switching relay 108 in order to prevent this relay from energizing and at the working contact of armature 123 prepares a circuit for illuminating the busy lamp. After a short interval slow-to-release relay 102 deenergizes and at armature 113 removes the short circuit from ground relay 106, thereby permitting the latter relay to energize in series with relay 105 and at armature 114 closes a circuit for lighting the busy lamp as follows: from grounded conductor 143, wiper 129, armature 114 and its resting contact, armature 123 and its working contact and through the busy lamp to battery. Relay 106, upon energizing, at armature 120 opens a point in the original energizing circuit of relay 105 but this relay is now maintained energized in series with relay 106 and the grounded hold conductor 140. At armature 121 relay 106 opens the circuit to the rotary magnet 111. By the illumination of the busy lamp the dispatcher knows that the desired group selector is busy and the dispatcher may then either release the station selector or wait until the group selector becomes idle. If the dispatcher waits until the group selector becomes idle then ground will be removed from conductor 143 and the busy relay 107 will release and complete the circuit for the switching relay 108 at armature 123 and its back contact. When busy relay 107 falls back to complete a circuit for the switching relay or in case the busy relay 107 did not energize because the group selector at the time it was selected was idle then a circuit for energizing the switching relay 108 may be traced as follows: from grounded hold conductor 140, through the lower winding of switching relay 108, resting contact of armature 123 and said armature; resting contact 75

of armature 114 and said armature, wiper 129 and the engaged contact, conductor 143, and through the winding of relay 351 to battery. Switching relay 108 energizes in series with relay 351 and at armature 125 completes a locking circuit through its upper winding to the hold conductor 140. Relay 108 at armature 124 places a shunt around its lower winding; at armature 126 connects the impulsing lead 141 to wiper 130; at armature 127 connects the operate lead 142 to wiper 131; and at armature 128 connects ground to wipers 132 and 133 for energizing the relays 201 to 204, inclusive, and for illuminating the lamps in the first and second lamp sets in accordance with the position of wiper 133. The circuit for energizing relays 201 to 204, inclusive, extends from grounded armature 128 by way of wiper 132 and its engaged contact, conductor 146 and through the windings of relays 201 to 204, inclusive, to battery. As previously stated, each of these relays, upon energizing, close ten pairs of spring contacts in order to connect the lamps in the third, fourth, fifth and sixth lamp sets to the banks of the different selectors. Therefore, by the operation of these four relays forty conductors are connected instead of four as illustrated in Fig. 2. Since the wiper 133 is resting on bank contact 55 of its associated bank, a circuit may therefore be traced for energizing lamps five in the first and second lamp sets. The individual conductor connected to the fifth vertical row of bank contacts is connected direct to the number 5 lamp in the second set, therefore, completing the circuit from grounded armature 128, the wiper 133, through the individual fifth row conductor in the ten conductor trunk 147 to the individual lamp 5 and battery. In a similar manner all of the lower contacts in the fifth row or level are multiplied together and a conductor individual to this level is included in the ten conductor trunk 148 and said individual conductor extends to the No. 5 lamp in the first lamp set to battery.

When relay 351 (Fig. 3) energizes in series with switching relay 108, relay 351 at armature 360 opens a point in the release circuit of the group and final selectors, and at its working contact completes a circuit for grounding the hold conductor 378.

Responsive to the dispatcher dialling the next digit or digit 5 the impulse relay 101 again follows the impulses. Each time relay 101 energizes a circuit may be traced for operating vertical magnet 370 from grounded armature 112, impulse conductor 141, armature 126, wiper 130 and engaged bank contact, conductor 144, armature 362, winding of slow-to-release relay 353, armature 368 and its resting contact and through the vertical magnet 370 to battery. A branch of this circuit extends through the winding of slow-to-operate relay 352 to battery but this relay due to the copper slug on its upper end is made slow-to-operate and will not fully energize during the impulsing series because the grounded impulses are of insufficient duration. The vertical magnet 370 is operated to raise the wipers 380 to 383, inclusive, one vertical step for each impulse. The wipers 380 to 383 are, therefore, positioned opposite the fifth level in response to the five impulses transmitted by relay 101. Upon the first vertical step of the wipers the off-normal springs 364 are closed to prepare a circuit for releasing the group selector and the subsequent final selector. Slow-to-release relay 353 upon energizing in series with the vertical magnet 370 at armature

363 and its working contact completes a circuit for energizing relay 354 as follows: ground by way of armature 361 and its resting contact, armature 360 and its working contact, hold conductor 378, armature 363 and its working contact, armature 367 and its resting contact, and through the winding of relay 354 to battery. At armature 366 relay 354 prepares a circuit for energizing relay 355. A short time after the transmission of this series of impulses the slow-to-release relay 353 deenergizes and at armature 363 removes the short circuit from around relay 355 whereupon the latter relay energizes over the following circuit: grounded hold conductor 378, winding of relay 355, armature 366, and relay 354 to battery. Relays 354 and 355 are maintained energized over this circuit as long as the hold conductor 378 is grounded. At armature 367, relay 355 prepares a point in the circuit of relay 356 and at armature 368 and its resting contact opens the circuit extending to the vertical magnet 370 and at its working contact prepares a circuit to the rotary magnet 371.

Since the fifth level of the group selector has access to two final selectors and each final selector has five selecting wipers and each wiper has access to one hundred devices, the next digit to be dialled by the dispatcher determines the final selector and wiper thereof which will be used for completing the selection. In this case since it is desired to select device number 555707, the dispatcher will operate the dial to transmit seven impulses to impulse relay 101. Impulse relay 101 responds to these impulses and armature 112 transmits impulses over the impulsing conductors 141 and 144 to the rotary magnet 371 by way of the winding of slow-to-release relay 353, armature 368 and its working contact, armature 373 and its resting contact, and through the winding of rotary magnet 371 to battery. Rotary magnet 371 responds to these impulses and rotates the wipers 380 to 383, inclusive, into engagement with the seventh set of bank contacts in the fifth level. Relay 353 is again energized in this impulsing circuit and completes a circuit for energizing relay 356 as follows: from grounded hold conductor 378, armature 363 and its working contact, armature 367 and its working contact, armature 372 and its resting contact, and through the winding of relay 356 to battery. Relay 356, upon energizing, at armature 369 prepares a circuit for energizing relay 357. Shortly after this series of impulses slow-to-release relay 353 deenergizes thereby removing the short-circuit from around relay 357 and permitting this relay to energize in series with relay 356 as follows: from grounded hold conductor 378, through the winding of relay 357, armature 369, and through the winding of relay 356 to battery. The energization of relay 357 at armature 372 opens the original energizing circuit of relay 356, but this relay is maintained energized in series with relay 357 and at the working contact of armature 372 relay 357 prepares a circuit for energizing relay 358. At armature 373 relay 357 disconnects the rotary magnet 371 from the impulsing circuit and at its working contact connects the impulsing circuit to wiper 381 by way of armature 377. At armature 374 relay 357 connects ground to wiper 383 in order to ground the conductor extending from the fifth level of multiple bank contacts and also for grounding the conductor extending from the multiple contacts in the seventh vertical row. These conductors are included in the ten conductor trunks 213 and 214 and extend to arma-

tures, such as armatures 205 and 206 to the No. 5 and No. 7 lamps in the third and fourth lamp sets, respectively, for illuminating the No. 5 and No. 7 lamps therein.

5 The dispatcher has now selected a certain hundred group and in order to select one device out of this hundred group the dispatcher will now dial the next digit or digit 0. The impulse relay 101 is accordingly energized ten times to transmit ten impulses over the impulsing conductors 141 and 144 for operating the vertical magnet 462 of final selector No. 2 as follows: impulse conductor 144, winding of relay 353, armature 368 and its working contact, armature 373 and its working contact, armature 377 and its resting contact, wiper 381 and the lower seventh bank contact in the fifth level, conductor 388, and through the winding of vertical magnet 462 to battery. Vertical magnet 462 operates responsive to these 10 impulses to raise the wipers 466 to 471, inclusive, opposite the tenth level of bank contacts and vertical wiper 472 into engagement with the tenth vertical bank. Off-normal springs 464 close on the first vertical step of the wipers to prepare a circuit to the release magnet 463. Slow-to-release relay 353 is again energized in the impulsing circuit and at this time closes a circuit from grounded hold conductor 378 by way of armature 363 and its working contact, armature 367 and its working contact, armature 372 and its working contact, and through armature 376 for energizing relay 358. Relay 358 at armature 375 prepares a circuit for energizing relay 359 but the latter relay cannot energize because 25 it is short-circuited. However, as soon as the slow-to-release relay 353 deenergizes armature 363 removes the short circuit around relay 359 with the result that relay 359 energizes in series with relay 358 by way of hold conductor 378. At armature 376, relay 359 opens the original energizing circuit of relay 358 but the latter relay is maintained energized in series with relay 359 and at armature 377 disconnects the impulsing circuit from wiper 381 and connects it to wiper 380. 30 When slow-to-release relay 353 is fully deenergized said relay at armature 363 connects ground to conductor 385 for grounding wipers 471 and 472. The grounding of wiper 471 at this time is without effect but the grounding of wiper 472 completes a circuit by way of the tenth vertical bank contact, conductor 450, included in the ten conductor trunk 384, to conductor 350 for energizing relay 310 in the vertical bank relay group. Relay 310 upon energizing, at armature 330 completes a locking circuit for itself including the grounded hold conductor 378 and at armature 320 grounds conductor 340, which is included in the ten conductor trunk 215, extending through armature contact similar to contact 207, through conductor 211, through the No. 0 lamp to negative battery. The No. 0 lamp in the fifth lamp set is therefore illuminated over this circuit. Relay 310 is maintained energized over the hold conductor 378 because the vertical wiper 472 will rotate out of engagement with the tenth vertical bank contact responsive to the next series of impulses. 35

Responsive to the dialling of the final digit or digit 7 relay 101 again transmits the required number of impulses, this time the impulsing circuit extends by way of armature 377 and its working contact, wiper 380 and the upper seventh bank contact in the fifth level, conductor 387, and through the winding of rotary magnet 461 to battery. Responsive to the seven impulses trans-

mitted by relay 101, rotary magnet 461 rotates the wipers 466 to 471, inclusive, into engagement with the seventh set of bank contacts in the tenth level. When relay 353 deenergizes shortly after the last series of impulses said relay at armature 363 again grounds conductor 385 for grounding wiper 471. This ground extending by way of the upper multiplied contacts in the seventh vertical row, conductor 427 included in the ten conductor trunk 216 by way of armature springs similar to springs 208, conductor in the ten conductor trunk 212, and through the No. 7 lamp to battery. The No. 7 lamp in the sixth lamp set is also illuminated. It will be seen from the foregoing that the lamps having the heavy black circles there- 5 around are illuminated to indicate the positions to which the wipers of the selectors have been set. Since the wiper 382 of the group selector shown in Fig. 3 was rotated to the seventh bank contact in the fifth level wiper 467 of the final selector is, therefore, the only selecting wiper which is connected through and available for use. It can be readily seen that if the wiper 382 had been rotated to any other contact in the fifth level, say for instance the ninth bank contact, 10 then only the wiper 469 would be effective for selecting a device. When the dispatcher has finished dialling he will look at the indicating panel in order to verify the setting of the switches and the device to be operated. In case the indication to the dispatcher indicates that the proper device has been selected he may then operate the operate key 15 any number of times to cause the selected device to assume any desired position. The operating circuit may be traced as follows: 15 from ground by way of cut-in key 14 and its working contact, normally closed shunt springs 12 of the dial, normally closed springs of the group release key 11, operate key 15, operate conductor 142, armature 127, wiper 131, conductor 145, wiper 382, conductor 397, wiper 467, and through conductor 477 to device No. 555707. 20

After operating this device in the desired manner the dispatcher may desire to select the next or adjacent device, say for instance device No. 555708. The dispatcher thereupon merely sends one impulse over the aforementioned impulsing circuit for operating the rotary magnet 461 to cause the wipers 466 to 470, inclusive, to be rotated an additional step. The wiper 467 is, therefore, in engagement with the eighth bank contact in the tenth level. Since wiper 471 was also rotated into engagement with the eighth contact, the lamp No. 7 in the last lamp set will be extinguished and the No. 8 lamp illuminated instead in 25 a manner similar to that previously described. When the dispatcher verifies the new setting of the wipers of the final selector by glancing at the indicating panel he may then operate the selected device by the operation of the operate key 15 to any desired position. In a similar manner succeeding devices terminating in this level and accessible to wiper 467 may be selected and operated without releasing the switches. 30

In case the dispatcher desires to select another device, say for instance device No. 555310 he may do so by releasing only the final selector No. 2 and group selector in the following manner. The dispatcher merely operates her group release key 11 for an interval of time long enough to permit the slow-to-energize relay 352 in Fig. 3 to energize over the following circuit: ground by way of cut-in key 14 and its working contact, shunt springs 12 of the dial, spring 11 of the group release key and its working contact, impulse con- 35

ductor 141, armature 126, wiper 130 and engaged bank contact, conductor 144, and through the winding of slow-to-energize relay 352 to battery. After the interval of time for which it is adjusted slow-to-energize relay 352 energizes and at armature 362 opens a point in the impulsing circuit; at armature 361 removes ground from hold conductor 378 at its resting contact and at its working contact completes the release circuit. Responsive to the removal of ground from hold conductor 378 all of the vertical bank relays which are energized are now deenergized because their locking circuit has been opened and the relays 354 to 359, inclusive, also deenergize. Relay 352 at armature 361 and its working contact grounds the release trunk conductor 379 by way of off-normal springs 354 to energize the release magnet 365 to release the group selector and also to energize the release magnet 463 of the final selector by way of conductor 379 and off normal springs 464 to release the final selector. Responsive to the operation of the release magnets 365 and 463 the group selector and final selector are released in the well known manner. From the foregoing it can be seen that the dispatcher may release the group selector and the final selector without releasing the station selector by connecting ground to the impulsing circuit for a predetermined length of time. Responsive to the release of the group selector and final selector the lamps in the third, fourth, fifth and sixth sets are extinguished to indicate to the dispatcher the release of such selectors. The dispatcher may now dial only the digits 5310 to select device No. 555310 because the station selector in Fig. 1 did not release responsive to the operation of the group release key. The operation of the group selector in Fig. 3 and the final selector No. 1 in Fig. 4 is similar to that previously described and need not, therefore, be set forth.

After selection and operation of a device the dispatcher may release all of the selectors by restoring the cut-in key 14 to its normal position. Responsive to the restoration of the cut-in key 14 a circuit is completed by way of off-normal springs 115 for energizing the release magnet 109 of the station selector and at the working contact of the cut-in key ground is removed from the hold conductor 140, thereby releasing relays 103 to 106, inclusive, and switching relay 108. By the operation of the release magnet 109 the station selector is released in a well known manner. When ground is removed from the hold conductor 140 by the operation of the cut-in key ground is also removed from conductor 143 to release relay 351. Relay 351 upon deenergizing, at armature 360 and its working contact removes ground from the hold conductor 378 to release the relays in the group selector and the vertical bank relays in the same manner as previously described. At armature 360 and its resting contact relay 351 connects ground to the release trunk conductor 379 by way of off-normal springs 364 to release the group and final selectors in a manner similar to that previously described. When the wipers of the selector switches have been fully restored the off-normal springs in the respective switches are opened to open the circuits to their respective release magnets. All of the switches are now in normal position and may be used for further selection.

Having described the invention, what is considered new and is desired to have protected by Letters Patent will be set forth in the following claims.

What is claimed is:

1. In a selecting system for selecting devices, a first group of switches, a second group of switches terminating in the bank contacts of said first group of switches, a third group of switches divided into subgroups, each subgroup of switches terminating in the bank contacts of a different switch in said second group, means for operating a switch in the first group to select a switch in the second group by way of the first switch bank contacts, means for then operating the selected switch in the second group to select a switch in the subgroup accessible thereto by way of the second switch bank contacts, means for then operating the selected switch in the subgroup to select a desired device, an indicating panel individual to each switch in the first group, devices in each panel less in number than the bank contacts in said switches for decimally designating the bank contacts in all said switches, means responsive to the selecting operation of the first operated switch for preparing only the indicating panel individual to the first operated switch for operation, and means for operating only the devices in the prepared indicating panel to decimally indicate the bank contacts engaged by each of the operated switches.

2. In a selecting system for selecting devices, a first group of switches, a second group of switches terminating in the bank contacts of said first group of switches, a third group of switches divided into subgroups, each subgroup of switches terminating in the bank contacts of a different switch in said second group, means for operating a switch in the first group to select a switch in the second group by way of the first switch bank contacts, means for then operating the selected switch in the second group to select a switch in the subgroup accessible thereto by way of the second switch bank contacts, means for then operating the selected switch in the subgroup to select a desired device, an indicating panel individual to each switch in the first group, devices in each panel for decimally designating the bank contacts in all said switches, said indicating devices divided into groups corresponding to the switch groups, means responsive to the selecting operation of the first operated switch for operating the devices in the group individual to the first operated switch to decimally indicate the position of the wipers of said first operated switch and for preparing the second and third groups of devices for operation in only the indicating panel individual to the first operated switch, and means responsive to the selecting operations of said second and third group switches, for operating only the indicating devices in the corresponding groups in the prepared individual indicating panel to decimally indicate the bank contacts engaged by the second and third operated switches.

3. In a selecting system, a first group of switches, a second group of switches terminating in the bank contacts of the first group of switches, a third group of switches terminating in the bank contacts of said second group switches, an indicating panel individual to each switch in said first group, devices in each panel for decimally designating bank contacts in said switches, said indicating devices in each panel divided into a first, a second, and a third group, conductors connecting the bank contacts of each switch in the first group to its individual indicating devices in the first group, connecting means associated with each switch in the first group for connecting the bank contacts of each switch in the second group

to the second groups of indicating devices and for connecting the bank contacts of each switch in the third group to the third group of indicating devices, means for operating a switch in the first group to select a switch in the second group and a corresponding one of said connecting means by way of the first switch bank contacts, means for then operating the selected switch to select a switch in the third group, means for then operating the selected switch in the third group to select a desired device, and means responsive thereto for operating the indicating devices in the first group by way of said conductors and the devices in the second and third groups by way of said selected connecting means to decimally indicate at only the panel associated with the first operated switch the bank contacts engaged by the operated switches.

4. In a selecting system, a first and a second switch having wipers, an impulsing relay, and an impulsing conductor, means for connecting said conductor to the first switch, means for operating said relay to transmit a plurality of series of impulses over said conductor, primary and secondary magnets in the first switch directly operated over said conductor responsive to the first and second series of impulses for operating the wipers of the first switch in a primary and secondary movement to select the second switch, primary and secondary magnets in the second switch directly operated over said conductor and wipers of the first switch responsive to the third and fourth series of impulses for operating the wipers of the second switch in a primary and secondary movement to complete a selection, and means in the first switch operated once for each series of impulses for successively transferring the said impulsing conductor from the primary magnet of the first switch to the secondary magnet of the first switch, from the secondary magnet of the first switch to the primary magnet of the second switch by way of one of the wipers on said first switch, and from the primary magnet of the second switch to the secondary magnet of the second switch by way of another wiper of said first switch in the order named.

5. In a selecting system, a first, a second and a third switch having wipers, an impulsing relay and an impulsing conductor, means for operating the wipers of the first switch to connect said conductor to the second switch, means for operating said relay to intermittently connect ground to said conductor to transmit a plurality of series of grounded impulses over said conductor, primary and secondary magnets in the second switch directly operated over said conductor responsive to the first and second series of impulses for operating the wipers of the second switch in a primary and a secondary movement to select the third switch, primary and secondary magnets in the third switch directly operated over said conductor and wipers of the second switch responsive to the third and fourth series of impulses for operating the wipers of the third switch in a primary and secondary movement to complete a selection, means in the second switch operated once for each series of transmitted impulses for successively transferring the said impulsing conductor from the primary magnet of the second switch to the secondary magnet of the second switch, from the secondary magnet of the second switch to the primary magnet of

the third switch over a wiper of the second switch, and from the primary magnet of the third switch to the secondary magnet of the third switch over another wiper of the second switch in the order named, a relay in the second switch connected to said impulsing conductor, said relay being non-responsive to the impulses transmitted by said relay over said conductor, means for transmitting a ground impulse of longer duration than any one of said impulses in the series transmitted over said conductor for operating said relay in the second switch, means responsive to the operation of said second and third relay for releasing said switches without releasing said first switch, and another releasing means for controlling the release of all said switches in response to its operation.

6. In a selecting system, a first group of switches, a second group of switches terminating in the bank contacts of said first group switches, a third group of switches terminating in the bank contacts of said second group switches, an indicating panel individual to each first group switch, devices in each panel for decimally designating bank contacts in said switches, said devices in each panel divided into groups corresponding to said switch groups, conductors connecting the bank contacts of the first group switches to corresponding first group indicating devices, connecting means, there being an individual connecting means in each first group switch for each second group switch for connecting the bank contacts of each second group switch to corresponding second group indicating devices and for connecting the bank contacts of third group switches to corresponding third group indicating devices, means for operating a first group switch to select a second group switch and operate a connecting means corresponding to the selected second group switch by way of the first operated switch bank contacts, means for then operating the selected switch to select a third group switch, means for then operating the selected third group switch to complete a desired selection, and means responsive to said switch operations for operating only the indicating devices of the first, second, and third groups in the panel individual to the first operated switch by way of said conductors and said operated connecting means to decimally indicate the bank contacts engaged by the operated switches.

7. In a selecting system, a group selector switch, wipers therefor, contacts accessible to said wipers, a plurality of final selectors each having primary and secondary operating magnets and a plurality of wipers, each magnet of each final selector connected to one of said contacts, each of said wipers of the final selectors connected to one of said contacts, means for operating the group selector in response to impulses to move the wipers thereof simultaneously into engagement with the contacts connected to the primary and secondary operating magnets and one of the wipers of the desired final selector, and means for thereafter transmitting impulses over certain of said group selector wipers and contacts to operate the primary and secondary magnets of the seized final selector to operate the wipers of the said final selector in their primary and secondary movements to complete a selection.

HARRY E. HERSHEY.