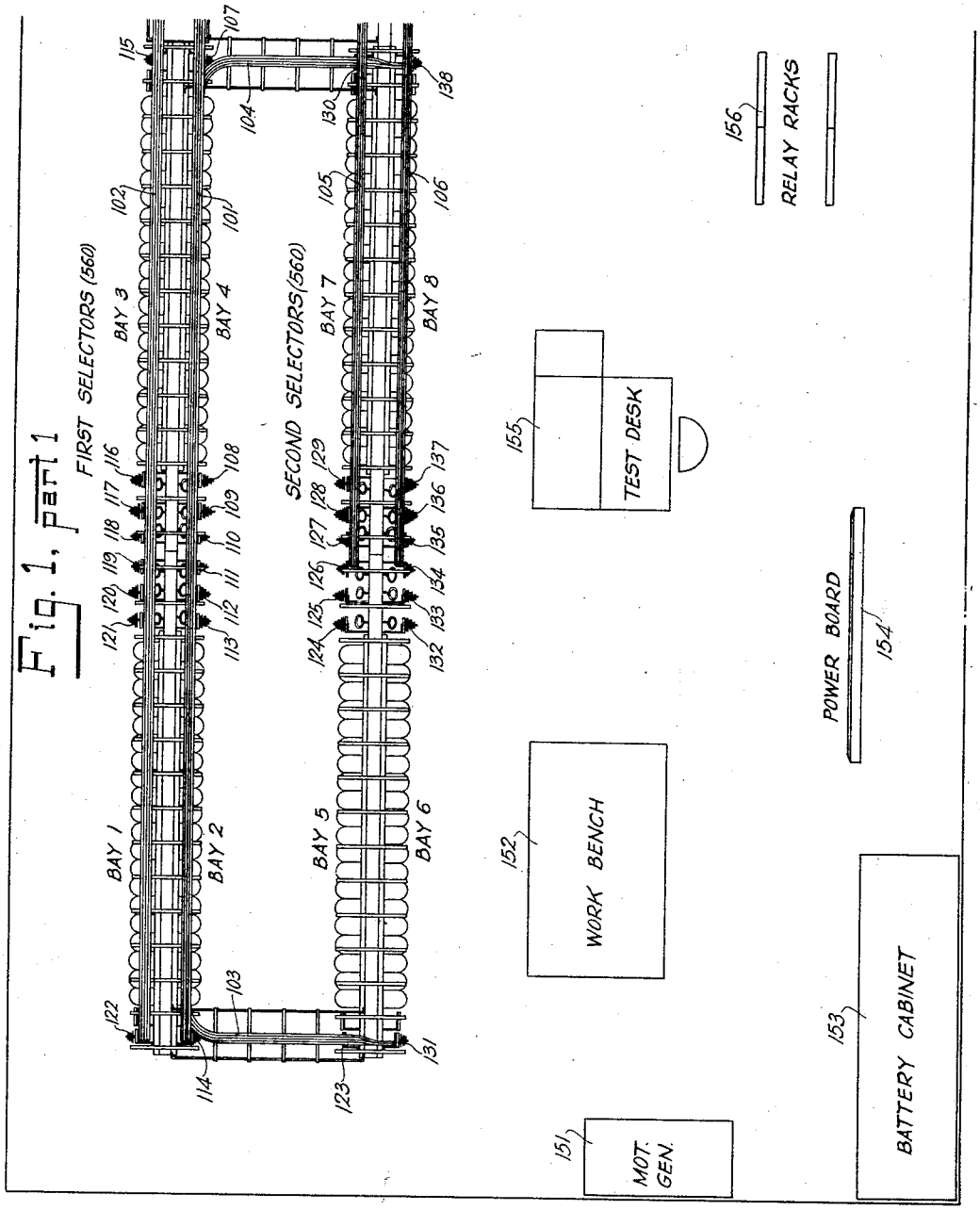
May 31, 1932. E. R. NEIR ET AL 1,861,224

TELEPHONE SYSTEM

Filed Feb. 17, 1930 10 Sheets-Sheet 1

Fig. 1, part 1



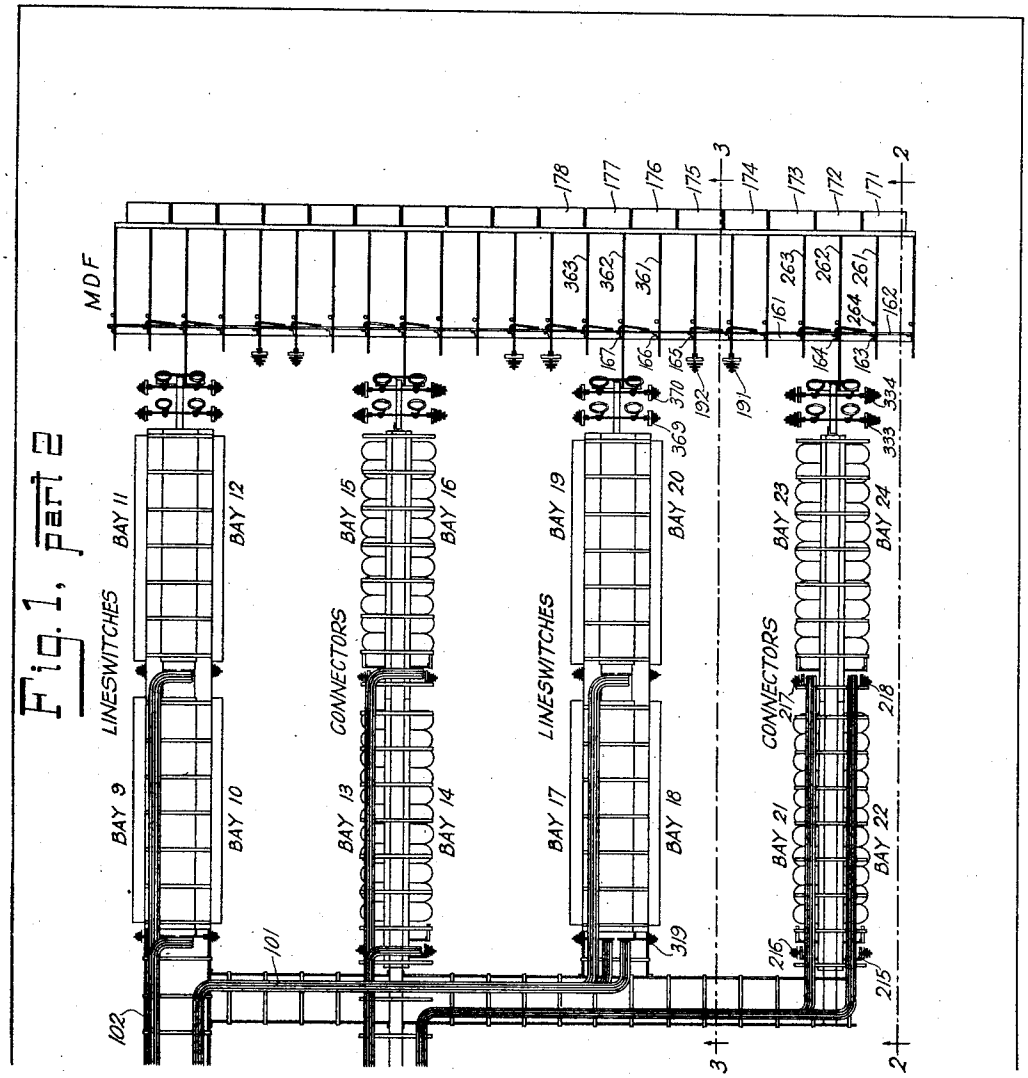
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Fig. 1, part 2



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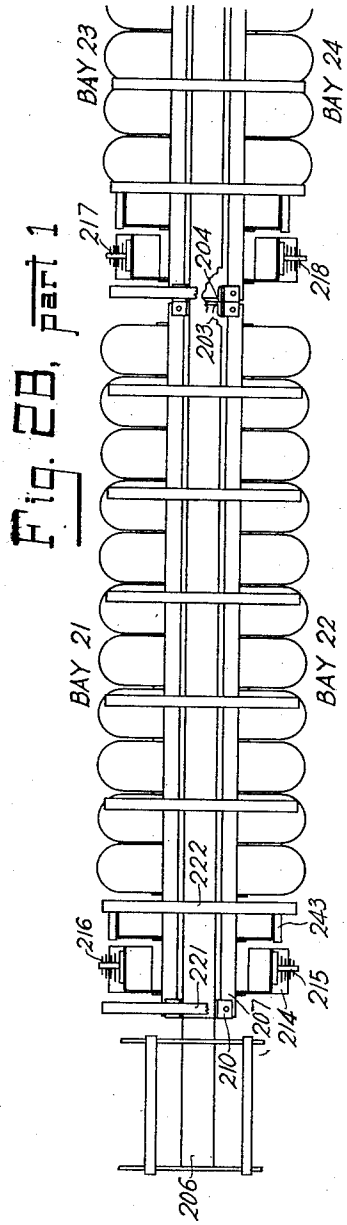


Fig. 2B, part 1

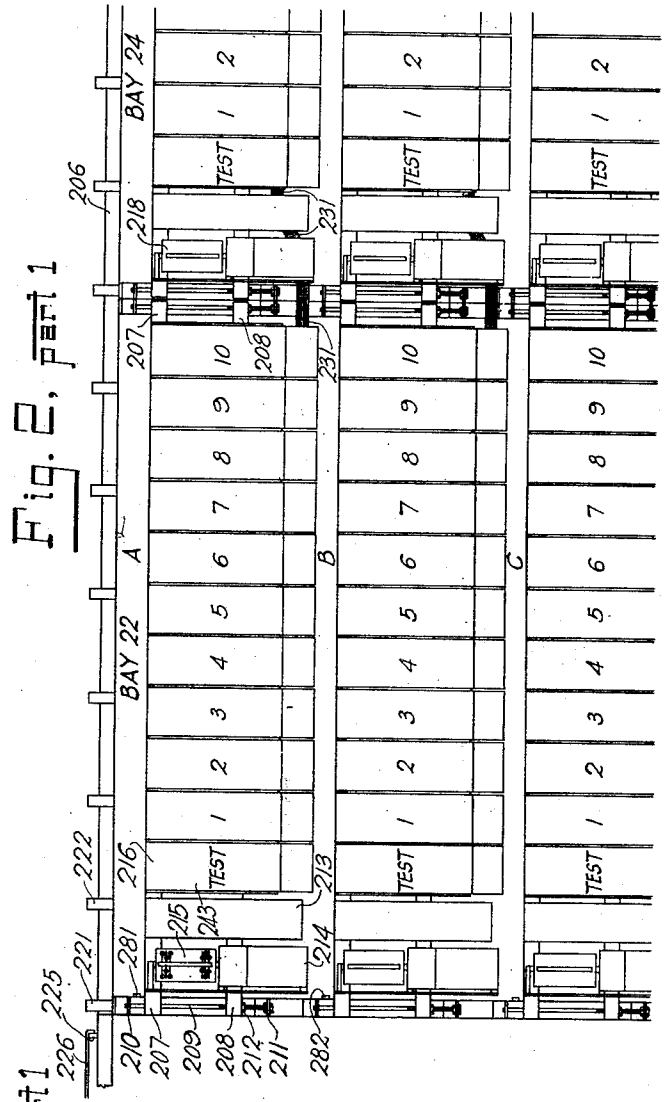


Fig. 2, part 1

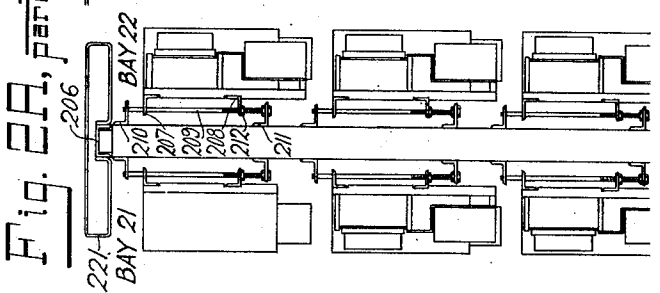


Fig. 2A, part 1

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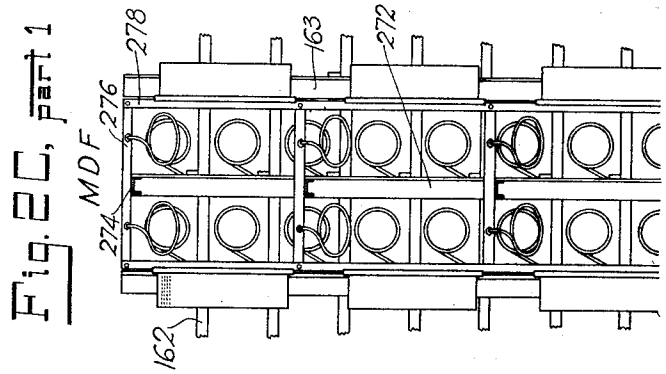


Fig. 2C, part 1

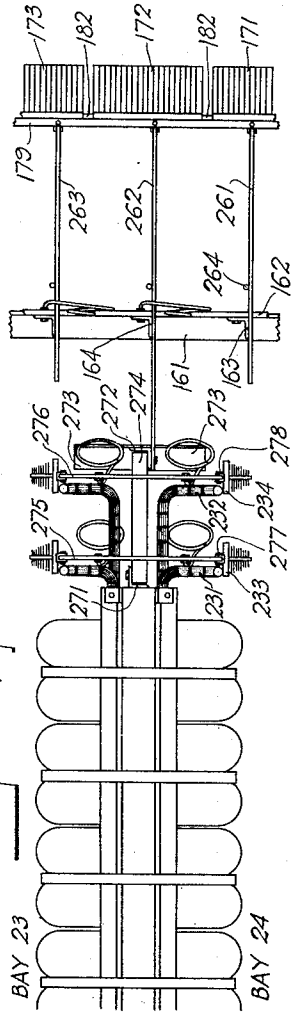


Fig. 2B, part 2

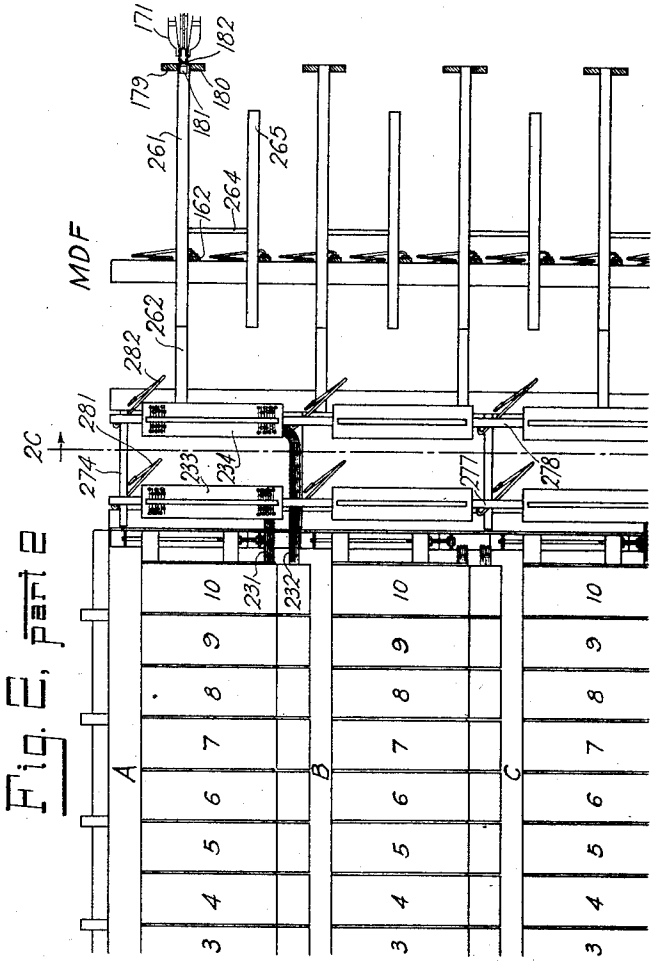


Fig. 2, part 2

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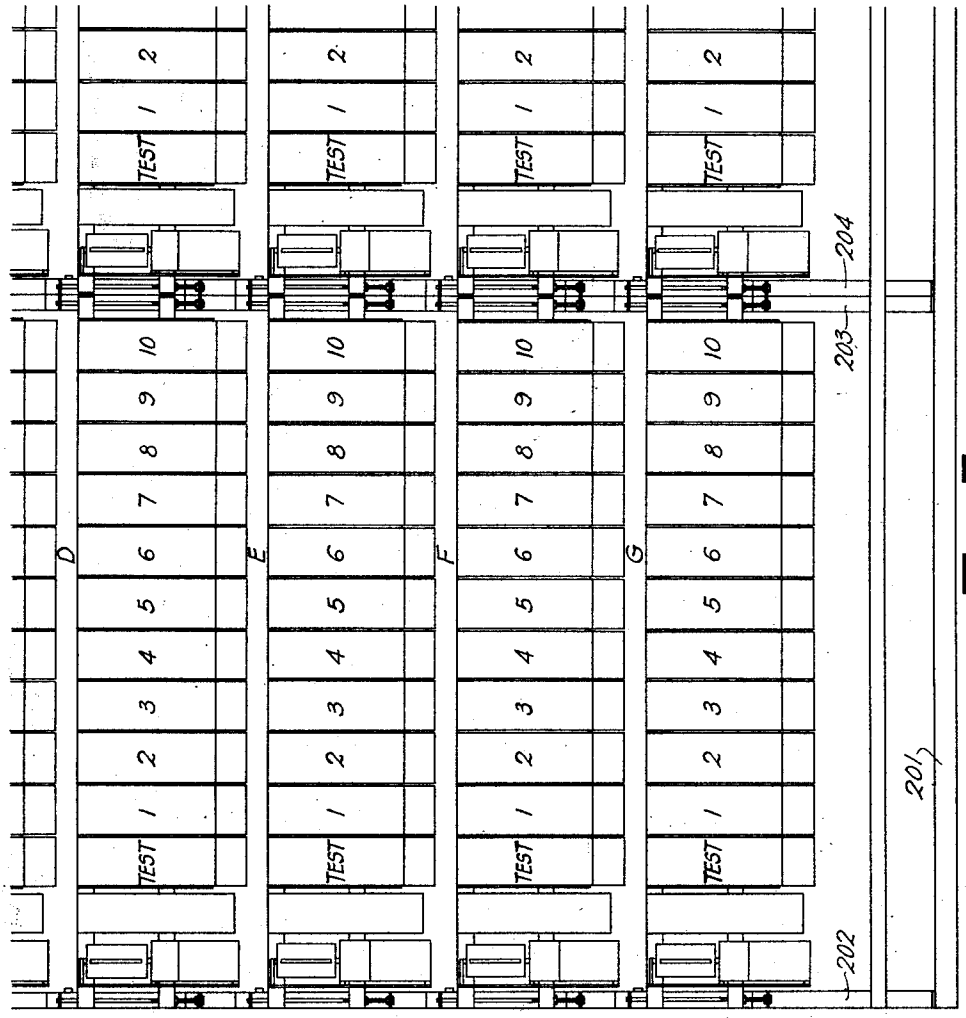


Fig. 2, part 3

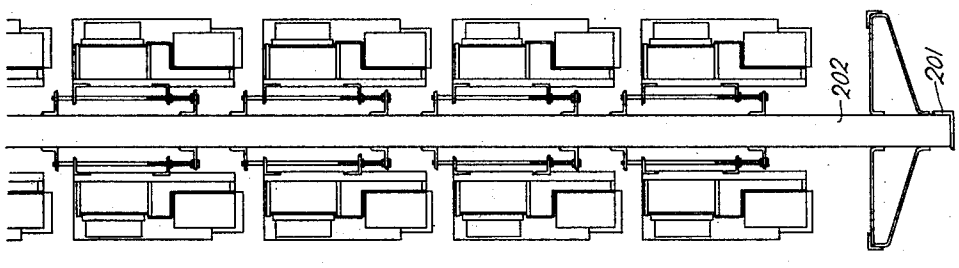


Fig. 2A, part 2

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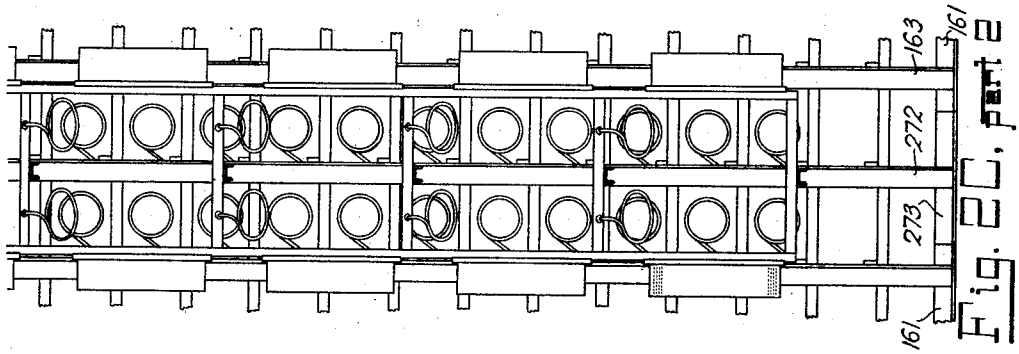


Fig. 2C, part 3

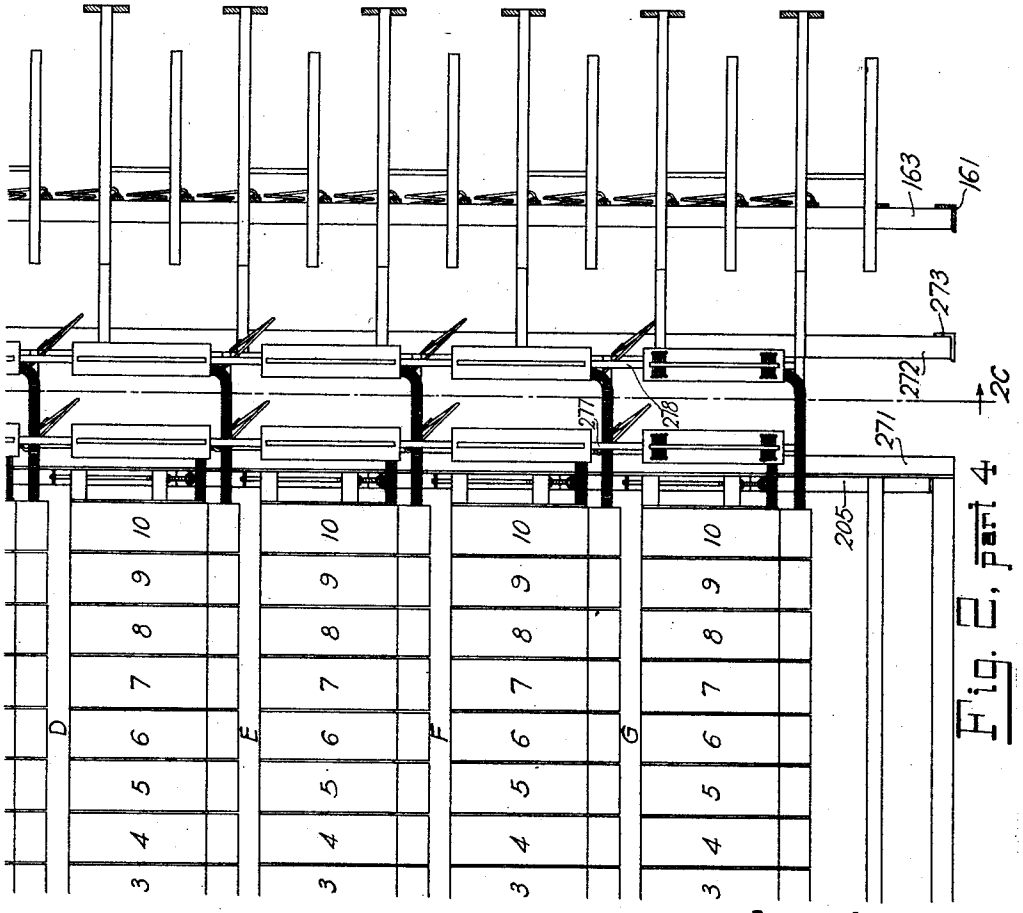


Fig. 2, part 4

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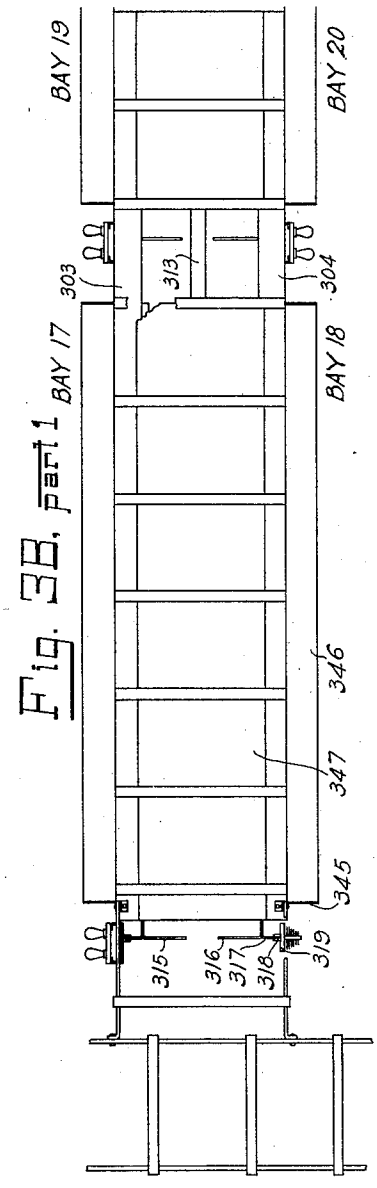


Fig. 3B, part 1

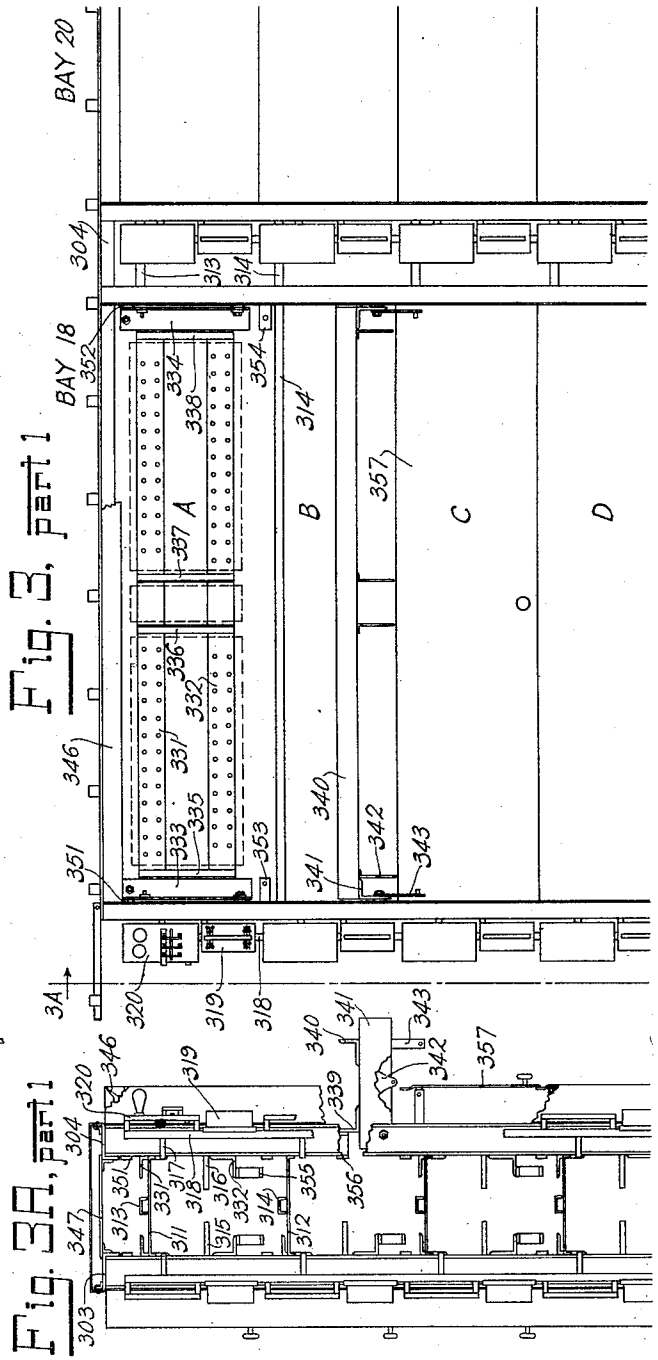


Fig. 3, part 1

Fig. 3A, part 1

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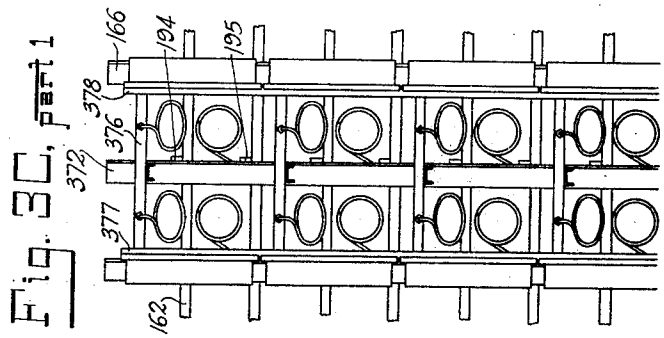


Fig. 3C, part 1

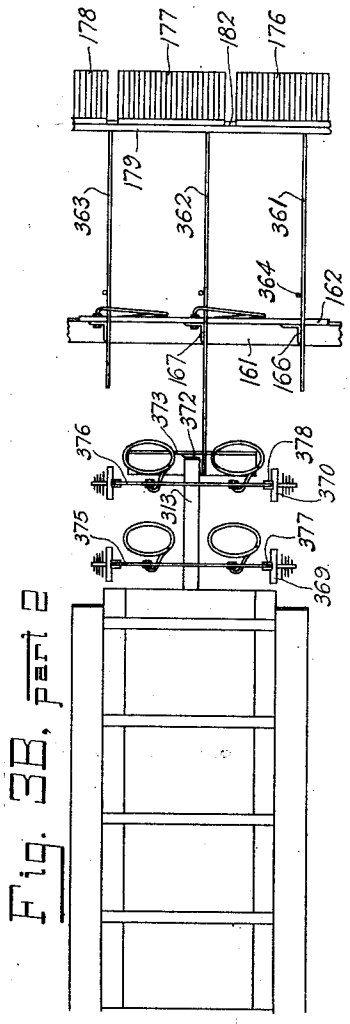


Fig. 3B, part 2

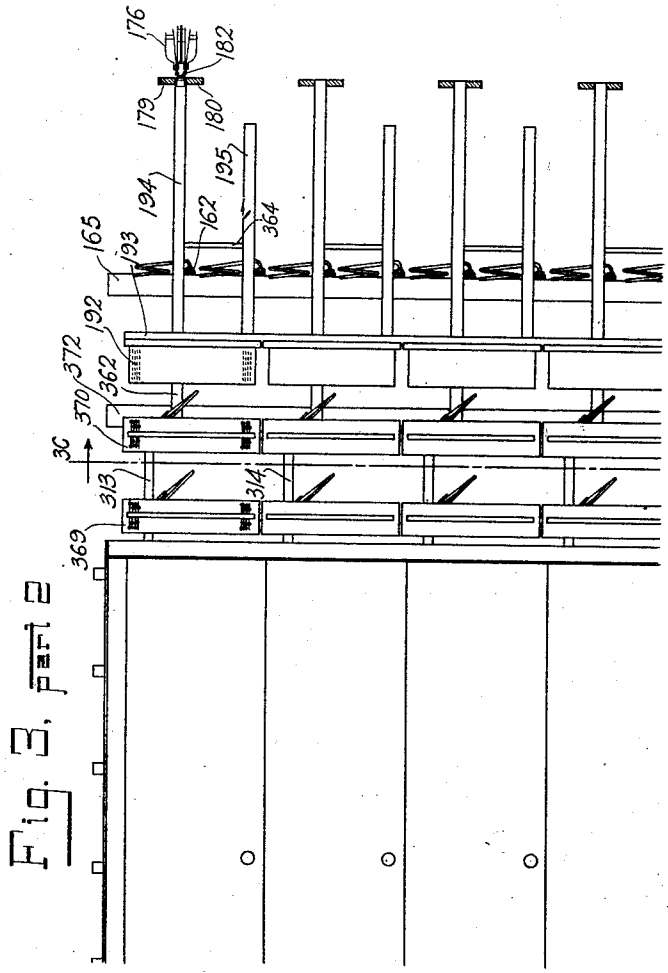


Fig. 3, part 2

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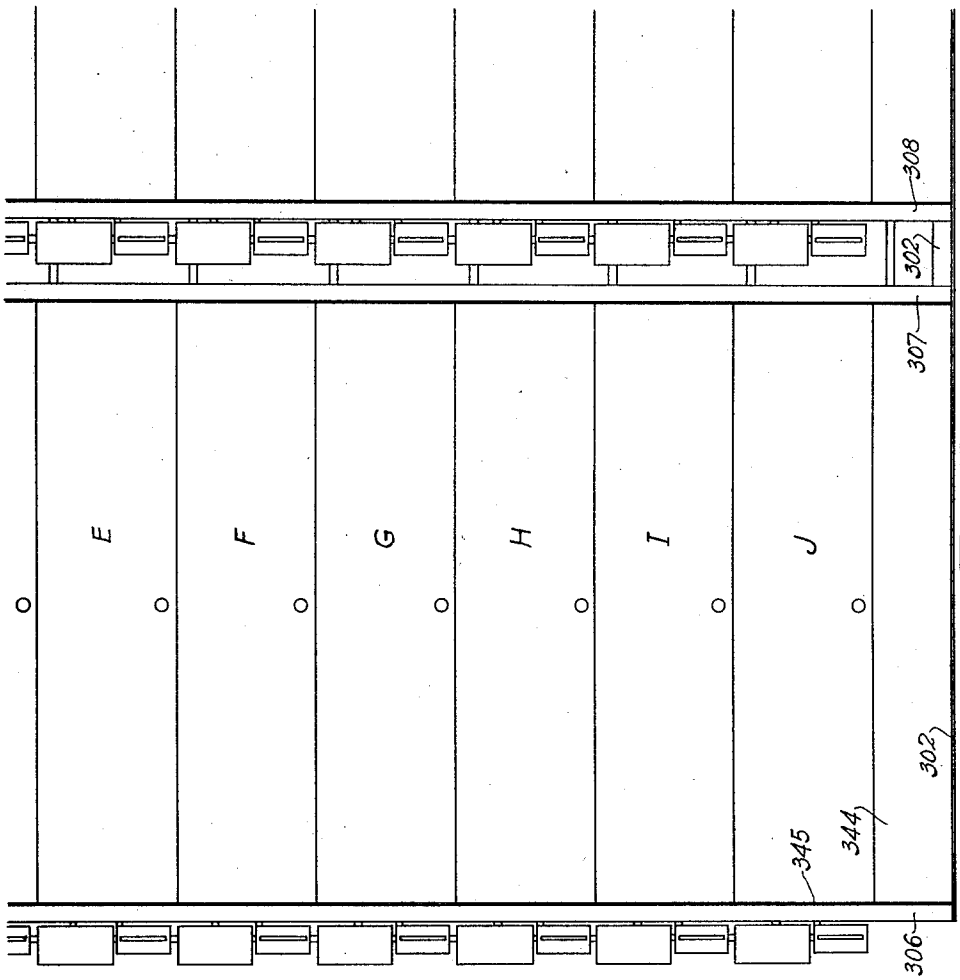


Fig. 3, part 3

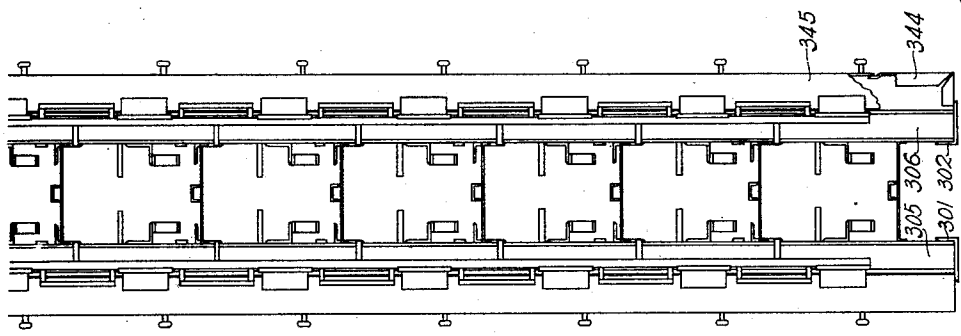


Fig. 3A, part 2

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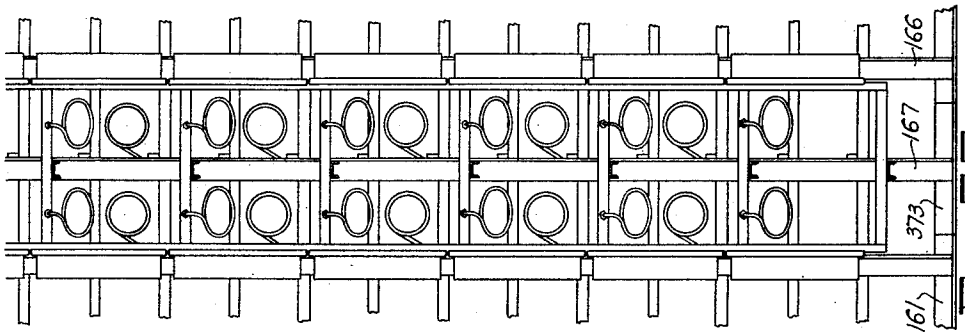


Fig. 3C, part 2

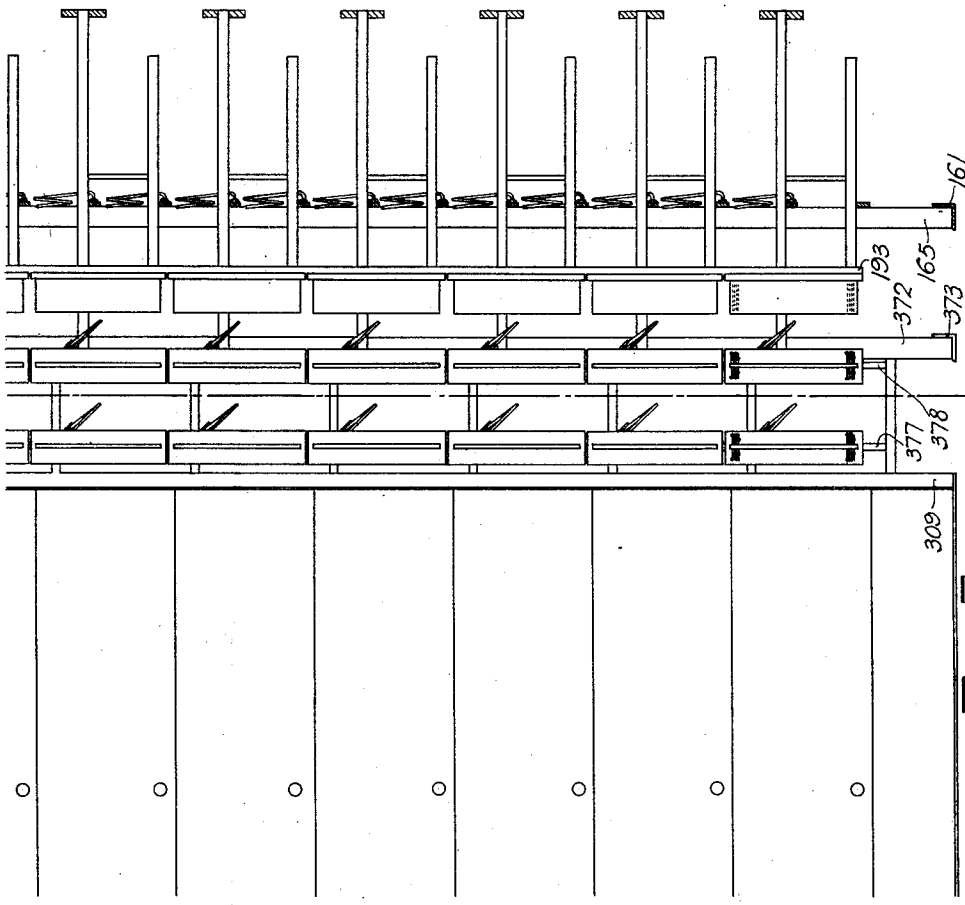


Fig. 3, part 4

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Patented May 31, 1932 1,861,224

UNITED STATES PATENT OFFICE

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TELEPHONE SYSTEM

Application filed February 17, 1930. Serial No. 429,012.

The present invention relates in general to telephone systems, but is concerned more particularly with the provision of new and improved switchboards, distributing frames, and relative arrangement of apparatus; and the main object, broadly stated, is the provision of a new and improved arrangement of equipment in an automatic telephone system whereby the amount of space occupied by such equipment may be materially reduced and whereby the required amount of interconnecting cable may be reduced also.

More in particular, it is an object of the invention to combine the intermediate distributing frame (which is used to make variable connections between subscribers' lines and the lineswitches through the medium of which calls are extended from the subscribers' lines) with the main distributing frame (which is used to make readily-changeable connections between the called terminals of subscribers' lines and the cable conductors leading to the subscribers' telephones).

It is a further object to provide a new and improved layout of the equipment whereby full advantage in the saving of floor space and the saving of interconnecting cable is taken of the possibilities arising from the improved distributing frame. A feature of the new layout of equipment is that the lineswitch boards (handling calls away from lines) and the connector boards (handling calls to the lines) are placed parallel to one another with one end of each board adjacent the new distributing frame, with the connector boards and the lineswitch boards suitably interspersed.

It is an object to still further reduce the floor space required by mounting switches on both sides of the mounting frames, thereby practically doubling the number of switches which may be installed in a given switch room. A feature of this mounting arrangement is that the switch shelves mounting selector and connector switches may be bodily raised and lowered a few inches, and the hinged shelves mounting the lineswitches may be swung out and down to expose the wiring for inspection and repair.

A further object is to provide the connector boards and lineswitch boards with suitable terminal blocks and jumper rings so that the blocks which terminate the cables extending toward the distributing frame from the lineswitches and extending toward the distributing frame from the banks of the connectors may serve as part of the distributing frame.

A feature of the new distributing frame is that separate shelves have been provided thereon for the jumpers extending to the lineswitches and the jumpers extending to the outside lines.

A further feature of the new distributing frame is that the so-called bunching blocks ordinarily provided on the intermediate distributing frame in party-line systems are mounted on the new distributing frame in vertical rows at the end of the aisles between the lineswitch boards and connector boards.

A further feature of the new distributing frame is that the protectors are mounted in horizontal rows on the side of the frame opposite the lineswitch and connector boards, thereby protecting the jumpers, in addition to the other inside equipment, against the intrusion of foreign current brought in by the outside lines to the frame, and also facilitating the running of jumpers by maintaining the usual form of distributing frame with the blocks on one side vertically disposed and the blocks on the other side horizontally disposed.

Other objects and features of the invention, for the most part incidental to those expressed above, will become apparent upon a further perusal of the specification.

Although the new distributing frame is described herein in connection with an automatic telephone system employing lineswitches for extending connections away from subscribers' lines, it will be understood that this distributing frame may be used in an automatic layout wherein so-called finder switches are employed to hunt for and connect with subscribers' lines, in which case finder-switch boards may be substituted for the lineswitch boards in the layout disclosed herein.

Other objects and features, for the most part incidental to those enumerated above,

will appear upon a further perusal of the specification.

Reference is now had to automatic telephony, second edition, by Smith and Campbell, published in 1921 by the McGraw-Hill Book Company, Inc., New York City. Plunger lineswitches of the general type assumed to be used in the exchange layout disclosed herein are described therein on pages 44 and 49, and master switches suitable for use with these lineswitches are described on pages 49 and 50. Figs. 44, 45, 46, and 47 of this book are photographs and circuit drawings of lineswitches and master switches. Fig. 86, page 107, shows a full view of one hundred lineswitches served by two master switches, making two groups of fifty lineswitches each for trunking purposes.

In the printed matter beginning on page 53 of the above-mentioned book, and ending on page 62, connector switches are described. Various views of connector switches and parts thereof are shown in Figs. 50, 51, 52, and 54 to 59; and Figs. 60 and 61 are circuit drawings pertaining to a connector switch. In addition, Figs. 87, 90, and 92 to 94 show various views of connector switches mounted with covers in place, together with related apparatus.

On pages 62 to 65 of the above-mentioned book, a selector switch is described, and Figs. 62 and 63 are respectively a photograph and a circuit drawing of a selector switch. Fig. 98, page 115, shows selectors mounted with their covers in place.

In addition to the references made to the above-mentioned book, reference is now made to the patent to McElyea #1,633,118, June 21, 1927, and to the application of Hovland, Serial No. 321,353, filed November 23, 1928. The McElyea patent explains the inter connection between the banks of selector switches and the next order of switches, and the application of Hovland discloses what may be referred to as a standard arrangement for interconnecting connector banks, lineswitches, and subscribers' lines.

Referring now to the ten accompanying sheets of drawings comprising Figs. 1, 2, 2A, 2B, 2C, 3, 3A, 3B, and 3C, drawn on Sheets 1 to 10, they show a sufficient amount of equipment in an automatic telephone exchange embodying the features of the invention to enable the invention to be understood.

In order for these drawings to be understood best, Sheet 2 should be placed to the right of Sheet 1; Sheet 4 should be placed to the right of Sheet 3, with Sheets 5 and 6 under Sheets 3 and 4; and Sheet 8 should be placed to the right of Sheet 7, with Sheets 9 and 10 under Sheets 7 and 8. When the drawings are thus arranged, Fig. 1, shown on Sheets 1 and 2, shows a floor plan of a complete automatic telephone exchange with an ultimate capacity of four thousand lines, having mounting space for four thousand line switches, arranged in eighty groups of fifty lineswitches each; space for 560 connectors, arranged in fifty-six groups of ten connectors each, giving 5600 telephone numbers; ultimate mounting space for 640 first selectors, arranged in sixty-four groups of ten selectors each; and ultimate mounting space for 640 second selectors, arranged in sixty-four groups of ten selectors each.

Fig. 2, Sheets 3, 4, 5, and 6, is drawn to a larger scale than Figs. 1 and 2 and is a sectional view of a connector board and associated apparatus of Fig. 1, part 2, along the line 2—2 in the direction indicated by the arrows. Fig. 2A is a left-end view of the connector board shown in Fig. 2; Fig. 2B is a top view of the same connector board and of a section of the distributing frame; and Fig. 2B is a sectional view of a portion of the distributing frame along the line 2C—2C, Fig. 2.

Fig. 3, Sheets 7, 8, 9, and 10, is a view of a lineswitch board and associated equipment of Fig. 1, part 2, along the line 3—3 in the direction of the arrows. Fig. 3A is a left-end view of the lineswitch board shown in Fig. 3; Fig. 3B is a top view of the same switchboard and of a section of the distributing frame; and Fig. 3C is a sectional view of the distributing frame along the line 3C—3C, Fig. 3, in the direction of the arrows.

In Fig. 1 a top view is seen of shelves of lineswitches, connectors, and selectors mounted in bays 1 to 24. It may be pointed out that a shelf is a horizontal row of switches (either lineswitches, selectors or connectors) arranged to be mounted as a unit upon a suitable mounting frame, and that a bay is a group of shelves mounted horizontally one above the other on a parallelogram-shaped mounting frame placed in an upright position. It will be seen that each mounting frame has a bay of switches mounted on each side. This double-sided mounting arrangement is used to increase the switching mounting capacity of the frames and thereby save floor space.

In Fig. 1, part 1, the covers of the first selectors of the top shelves of bays 1—4, the covers of the top shelves of the second selectors in bays 5—8 may be seen. As may be seen in the drawings, a selector shelf comprises 20 selectors. Each selector bay has mounting space for eight shelves, giving a capacity of 160 selectors a bay. Each shelf of 20 is further subdivided into two groups of ten selectors each. The banks of selectors in a group of ten are multipled together and a separate bank table is brought out to the end of the bay for each group of ten. Some times, especially when referring to

selectors from a standpoint of the interconnection of their bank contacts with the next order of switches, a group of ten switches (comprising half a shelf) is referred to as a shelf. For this purpose, the groups formed by switches 1 to 10 in the eight shelves of a bay are lettered as "shelves" A to G reading from top to bottom; and the groups formed by the switches 11 to 20 of the eight shelves in the bay are designated "shelves" I to P.

Since each bay provides a mounting space for 160 selectors, the first selector bays, 1 to 4, provide mounting space for 640 first selectors. Similarly, the second selector bays 5 to 8, provide mounting space for 640 second selectors. For reasons which will appear later, however, it is assumed that only 560 first selectors, arranged in fifty-six groups of ten selectors each, and 560 second selectors arranged in fifty-six groups of ten selectors each are used. Accordingly, the shelves that are left vacant on the first-selector and second-selector mounting frames may be occupied by miscellaneous switches such as the so-called test distributor used by the wire chief, reverting call switches, and toll switches; the latter being used by the toll operators in setting up toll connections.

In Fig. 1, part 2, it will be seen that eight bays of connectors are provided, bays 13 to 16 and 21 to 24. It is assumed that all mounting space in these connector bays will be taken when the ultimate capacity of the exchange is utilized. As may be seen in Fig. 2, a connector shelf comprises ten regular connectors and a test connector, the test connector being used by the wire chief in extending connections to lines to be tested. Each connector bay is arranged to mount seven connector shelves, lettered A to G. Accordingly, the eight connector bays shown in Fig. 1 provide mounting space for 560 regular connectors arranged in fifty-six groups of ten regular connectors each. Since each connector represents one hundred telephone numbers, the exchange has an ultimate capacity of 5600 telephone numbers.

As may be seen in Fig. 3, each of the eight lineswitch bays (9—12 and 17—20) provides mounting space for ten shelves of lineswitches, fifty lineswitches a shelf, making a total of five hundred lineswitches a bay. Accordingly, the eight lineswitch bays provide an ultimate mounting space for four thousand lineswitches.

It has been found that about four thousand lineswitches will suffice for an exchange using about fifty six hundred connector numbers, because a party line requires from two to four numbers, but only one lineswitch.

In Fig. 3, it will be noted that each lineswitch shelf, shelf A, for example, has a mounting space for two groups of lineswitches, twenty-five lineswitches to a group, and a space between the two groups for one master switch, making it possible to operate fifty lineswitches as a single group, having access to ten trunks leading to a group of ten first selectors. It has been found in practice that an average exchange of about the size disclosed herein has a traffic requirement per line such that some lineswitches may be conveniently grouped in groups of fifty, while other lineswitches may be grouped in groups of seventy-five, each group having access to a separate group of ten trunks each leading to a separate group of first selectors. It is assumed that the lineswitches in each bay are arranged as follows: Shelves A, B, D, E, G, H, and J, are provided with a master switch each. The fifty lineswitches of shelf A have common access to ten first selectors, being controlled by the associated master switch. The fifty lineswitches of shelf B, together with twenty-five lineswitches of shelf C are controlled by the master switch of shelf B and have common access to another group of ten selectors, and the fifty lineswitches of shelf D, together with the remaining twenty-five lineswitches of shelf C are controlled by the master switch of shelf D and have common access to a further group of ten first selectors. In the same way, the 150 lineswitches of shelves E, F, and G, are divided into two groups of seventy-five lineswitches each and are controlled by the master switches of shelves E and G, and a similar arrangement is provided in connection with the 150 lineswitches of the shelves H, I, and J, which are divided into two groups of seventy-five lineswitches each controlled by the master switches of shelves H and J.

When the above arrangement is carried out, there are seven trunk groups, each trunk group comprising ten trunks leading to ten first selectors. Accordingly, seventy first selectors are required to handle the traffic from the five hundred lineswitches of any bay, the lineswitches being subdivided into seven groups as above outlined for trunking purposes. Since there are eight bays of lineswitches, each bay requiring seventy first selectors, 560 first selectors are required when the ultimate number, four thousand, of lineswitches is installed.

Using the ordinary trunking arrangement, 560 second selectors arranged in fifty-six groups of ten selectors each are required to handle the traffic from 560 first selectors; and 560 connectors, arranged in fifty-six groups of ten connectors each are required to handle the traffic from 560 second selectors. The four connector bays, 13 to 16 and 21 to 24, it will be recalled, mount exactly 560 regular connectors, arranged in fifty-six groups of ten regular connectors each.

Suitable cable terminal blocks, as may be seen in the drawings, and as will be hereinafter explained more in detail, are provided

at the end of each bay of lineswitches, connectors, and selectors. Cables are run along the cable runways over the top of the equipment between these various cable terminal blocks in order to connect the banks of the lineswitches with the first selectors; connect the banks of the first selectors with the second selectors; and to connect the banks of the second selectors with the connectors.

The way in which the trunk cables interconnect the lineswitches, selectors, and connectors of Fig. 1, will now be explained. The cable run 101 is made up of cables coming from the banks of the lineswitches of bays 17 to 20 by way of terminal blocks, such as terminal block 319. Part of the cables in this run extend to the vertical row of block 107 of first selector bay 4, and the remainder extend to the vertical row of terminal blocks 114 of bay 2. These vertical rows of terminal blocks 107 and 114 terminate short local cables leading to the switches of bays 2 and 4. The cables in the cable run 102 connect the banks of the lineswitches in bays 9 to 12 with the first selectors in bays 1 and 3 by way of the terminal blocks in vertical rows 115 and 122.

The usual bank cables (not shown) connect the several groups of selectors of bay 1 with the vertical rows of blocks 121 and 120. In the same way, the groups of selectors in bay 2 are connected with the vertical rows of blocks 113 and 112; the banks of the groups of selectors in bay 3 are connected with the vertical rows of blocks 116 and 117; and the banks of the selectors in bay 4 are connected with the vertical rows of blocks 108 and 109. Jumpers are used to connect the terminals of the blocks in the vertical rows together in suitable groups, as explained above in the McElyea patent, and other jumpers are used to connect these groups with the rows of cable terminal blocks 110, 111, 118, and 119. From the four vertical rows of terminal blocks last mentioned, cables extend to the second selectors in bays 4 to 8. These cables come up behind the rows of blocks 110 and 111, some of the cables coming vertically from rows 110 and 111, while others may come across the selector distributing frame from the blocks 118 and 119. Some of these cables go to the left under the cable run 101, forming the cable run 103, while others go to the right and form the cable run 104. The cables in run 103 connect to the vertical rows of shelf blocks 123 and 131, while the cables in group 104 are secured to the shelf blocks 130 and 138.

As in the case of the first selectors, the bank cables of the second selectors are connected to the vertical rows of blocks 124 and 125, 128 and 129, 132 and 133, and 136 and 137. Jumpers interconnect these vertical rows of blocks and connect them to the trunk-cable blocks arranged in vertical rows 126 and 127, and 134 and 135. From the last-named blocks, cable groups 105 and 106 extend to the connectors in bays 13 to 16 and bays 21 to 24. The cables in group 106 connect to the terminal blocks associated with the connectors in bays 21 to 24, the terminal blocks for the top shelves of these bays being 215, 216, 217, and 218. The cables in group 105 connect to the terminal blocks in the connector bays 13 to 16 in the same manner.

The jumper connections between the lineswitches, the banks of the connectors, and the subscribers' lines will be explained subsequently. A general view of the main distributing frame MDF and its relation to the switches mounted in bays 9—24 may be gathered immediately, however, by observing Fig. 1, part 2, the outside lines terminated at the protector blocks mounted on the side of the distributing frame away from the switches.

Referring now to Figs. 2, 2A, 2B, and 2C, the mounting of the connectors will be described. The mounting frame for bays 21 to 24 comprises the floor angle 201 and the horizontal top channel 206, together with the vertical channels 202, 203, 204, and 205. The channels 203 and 204 are placed together back to back with the inside of channel 203 facing channel 202, and the inside of channel 204 facing channel 205. The back-to-back location of channels 203 and 204 may be seen best in the portion of Fig. 2B, part 1, where the top channel 206 is broken away. The vertical channels 202—205 may be secured to the floor angle 201 by bolts or rivets, as desired. The top channel 206 rests directly on the ends of the vertical channels 202—205 as may be seen best in Fig. 2A, part 1. The top channel 206 is secured to the vertical channels by means of angle brackets and bolts or rivets. It will be noted that cable slats, such as the slat 221, are welded directly to the top channel 206. The relation of slat 221 to the channel 206 may be seen best in Fig. 2A.

In order to provide for the supporting of the shelves of switches, angle brackets such as the angle brackets 210 and 211, by means of which the left end of shelf A of bay 22 is supported, are welded to the sides of the vertical channels. Seven pairs of these angle brackets are welded to each side of each of the vertical channels 202 to 205, providing means for mounting the twenty-eight shelves of connector switches of the four bays.

Each shelf, it will be noted, comprises essentially a pair of angles, such as the angles 207 and 208 of shelf A, one angle facing in and down and the other angle facing in and up as best seen in Fig. 2A. The shelf angles are secured together by thin flat bars, such as bar 243, Fig. 2, there being one of these bars between any pair of switches and a bar before the first switch and one after the last

switch of the shelf. These bars have the usual short mounting pins extending therethrough, over which the backs of the switches are hooked to hold them in place. Each shelf is provided with a pair of mounting rods, such as the rod 9, Figs. 2 and 2A. Each rod is secured to the lower shelf bracket by a pair of nuts, and a nut, such as the nut 212, is provided to regulate the height of the shelf. By this means, one shelf may be lowered about an inch and a half, and the shelf on the opposite bay may be raised about an inch and a half, in order that the wiring on the backs of the shelves may be accessible after the shelves are mounted, the switches in front of the wiring to be inspected or changed being removed.

In addition to a test connector and ten regular connectors, each shelf is arranged to mount a fuse panel 213, certain covered auxiliary equipment 214, and the cable-terminal block 215, which block terminates the local cable leading to the individual switches of the shelf, on one side, and a trunk cable, on the other side, incoming from the selector switches. From the multiply-connected banks of each shelf, a bank cable extends to a terminal block on the end of the switchboard at the main distributing frame MDF. For example, the bank cable 231 extends from the multiply connected banks of shelf A of bay 22 to the terminal block 233, and the bank cable 232 extends from the multiply-connected banks of shelf A of bay 24 to the terminal block 234.

Referring now to Figs. 3, 3A, 3B, and 3C, the construction of the lineswitch board on which the bays of lineswitches 17 to 20 are mounted will now be explained. The frame on which bays 17 to 20 are mounted comprises the floor angles 301 and 302, best seen in Fig. 3A, the corresponding horizontal top angles 303 and 304, and eight vertical channels. The vertical channels 305 and 306 face out away from the left end of the lineswitch board as may be seen best in Fig. 3A. A side view of angles 306 to 309 may be seen in Fig. 3. The angle bars 302—304 are suitably bolted or riveted to the eight upright channel bars, such as the channel bars 305—309. Flat bars are welded to the upright channel bars and serve to hold them together in pairs. For example, the bars such as 311 and 312 are welded to the upright channels 305 and 306. Accordingly, when the angle bars 301—304 are bolted or riveted to the upright bars in the position indicated in the drawings, a unitary framework results.

The structure shown in Figs. 3, 3A, and 3B provides mounting space for four bays of lineswitches, bays 17 to 20, there being ten shelves of lineswitches (shelves A to J) in each bay. Each shelf of lineswitches is provided with its individual cover, and the covers are arranged to swing out and up in a manner similar to the covers of a bookcase. The covers of shelves A and B of bay 18 are omitted, and shelves A and B are shown with the lineswitches and master switches removed. The hinged frame of shelf A is shown in its normal position, while the frame of shelf B is shown lowered for inspection.

The frame work of a shelf, shelf A, for example, comprises essentially two horizontal angle bars 331 and 332 welded to two vertical angle bars 333 and 334, forming a rigid parallelogram-shaped mounting frame. Shelf A is hinged to the upright channels 306 and 307 at a point near the lower ends of the vertical angle bars 333 and 334, permitting the shelf to be lowered when desired until it assumes a position like the position in which shelf B is shown.

In order to maintain the shelves in a vertical position, the tops of the bars, such as bars 333 and 334, are bolted to the short flat brackets welded on the inside of the vertical channel bars, such as the brackets 351 and 352 of shelf A, and brackets 353 and 354 of shelf B.

Each shelf is provided with a pair of brackets for supporting the shelf in a horizontal position when a shelf is lowered as is the shelf B in the drawings. The left-end holding bracket of shelf A of bay 18 is the bracket 355. This is a U-shaped bracket, having a short arm and a long arm. The short arm is welded to the horizontal angle bar 332, and the long arm protrudes out far enough to catch against the side of the upright channel bar 306 when the shelf is lowered. This may be seen in connection with the similar holding bracket 356 of shelf B.

The members 335 and 336 of shelf A are provided to serve as bearings for the guide shaft of the twenty-five lineswitches which may be mounted on the left end of the shelf, while the members 337 and 338 furnish bearings for the lineswitches which may be mounted on the right end of the shelf. A master switch may be mounted between the members 336 and 337. The general contour of the member 342, a duplicate of member 335 of shelf A, may be seen by comparing Figs. 3 and 3A.

In order to enclose the shelves of lineswitches, each bay is provided with a box-like construction consisting of sides, a top, and a bottom, so that, when the covers (the cover 357 of the shelf C, bay 18, for example) are in place, the apparatus within is enclosed in a dust-proof compartment. The bottom enclosing member for bay 18 is the formed sheet 344. The side enclosing strips or the strip 345 for the left-hand side and a similar strip for the right-hand side. Strip 345 is fastened to the inside edges of the upright channel bars 306 and 307. The top enclosing member and the bottom member 344 are fitted between the side strips, such as 345, as shown.

Each of the upright shelf angles, such as the angle 341 of lowered shelf B, is provided with a member, such as the member 343, so arranged that a cover may be hinged or pivoted thereon in a manner shown best in connection with the cover 357 of shelf C, Fig. 3A, part 1. The angle brackets secured to the covers are notched at the bottom so that they fit over the pins carried by the brackets, such as 343, in such a way that the cover may be swung out for the purpose of inspecting the lineswitches, or may be removed upon being lifted up.

A suitable end strip is provided to enclose the space at either end of each bay between the channel bars, such as 305 and 306, but these end strips are omitted in the drawings in order that the construction may be seen more clearly. A sheet cover 347 is provided for the top of bays 17 and 18. This cover is wide enough to rest on the top angle bars 303 and 304, and sidewise movement on the cover strip is prevented by the small angle bars welded thereto and shown best in Fig. 3A, part 1.

Each shelf is provided with a cable-terminal block, such as 319 and a fuse-and-lamp panel, such as 320. The panels and brackets of bay 18 are secured to the small vertical channel bar 318, which is bolted to the ends of brackets, such as 317, secured to the side of channel bar 306, 315, and 316 are brackets, also secured to the sides of the main upright channels, to which cables outgoing from the cable blocks to first selectors are laced.

In Fig. 3B, the fuse-and-lamp panel 320 is omitted in order that a top view of the terminal block 319 may appear in Fig. 3B.

The construction of the main distributing frame, together with the way in which it is secured to the switchboards of Fig. 1, part 2, to form a unitary structure will now be explained. The main frame rests on a floor angle 161, Fig. 1, part 2, which extends the entire length of the frame. This floor angle is suitably bolted or otherwise fastened to the floor, and the vertical angle bars, such as angle bars 163—167, are bolted or riveted to the floor angle bar 161. These vertical angle bars are secured together at intervals throughout their length by flat horizontal bars, such as bar 162. These bars may be seen in cross section in Figs. 2 and 3, and sections of them may be seen from the side in the sectional drawings, Figs. 2C and 3C. These horizontal bars are suitably bolted or riveted to the vertical angle bars. In order to provide mounting facilities for the protector blocks, such as the protector blocks 171—178, and in order to provide separate horizontal levels at which the jumpers to be run on the frame may lie, horizontal bars, such as the bars 261—263 and 361—363, seen in Fig. 1, and in Figs. 2B and 3B, are bolted or riveted to the upright angle bars, such as the bars 163—167. The bars such as 262 and 362 are longer on the switchboard end than the intermediate bars, so as to connect up with the associated connector board or the lineswitch board as the case may be. Beneath each of the bars, such as the bar 261, there is a bar, such as 265, Fig. 2, likewise riveted or bolted to the adjacent upright angle bar. These shorter bars provide a separate jumper shelf for supporting the jumpers that extend from the terminal blocks on the lineswitch board to the terminal blocks on the connector board, keeping these jumpers separate from the jumpers which run from one side of the frame to the other. There is a short round rod 264, Figs. 2 and 2B, which is welded to the bars 261 and 265, giving rigidity to the bars 261 and 265 and also serving to hold the jumpers out from the jumper rings and the vertical angles, giving clearing space for the running of jumpers through the jumper rings. Being round, these rods prevent injury to the jumpers in case they are pulled tight.

Referring now particularly to Figs. 2, 2B, and 2C, the way in which the vertically-disposed terminal blocks, such as 233 and 234, are mounted will now be explained. The frame section on which these blocks are mounted comprises two vertical angle bars 271 and 272, the angle bar 271 being riveted or bolted to the back of the channel bar 205, and the angle bar 272 being bolted or riveted to the short floor angle bar 273. At intervals throughout their length, the vertical angle bars 271 and 272 are bound together by the horizontal channel bars, such as the channel bar 274, seen at the top of Figs. 2, 2B, and 2C. The blocks, such as 233 and 234, of bay 24 are mounted on the channel bars 277 and 278, which, together with the corresponding channel bars of bay 23 are mounted on the horizontal bars, such as 275 and 276, which, in turn, are welded to the bars, such as 274. The upright angle bar 272 is, in addition, riveted or bolted to the bars of the main frame, such as bar 262, rigidly connecting the main frame with the connector board.

Referring now particularly to Figs. 3, 3B, and 3C, the way in which the section of the frame on which the terminal blocks, such as the terminal blocks 369 and 370, are mounted will now be explained. This frame section comprises essentially the vertical angle bar 372, which is welded or otherwise secured to the short floor angle bar 373 at the bottom, and at various places along its length is secured to the horizontal bars, such as 313 and 314, extending out from the lineswitch board, and this angle bar 372 is secured to the bars, such as 362, of the main frame. The horizontal bars, such as 375 and 376, Fig. 3B, are welded or otherwise secured to the horizontal bars, such as 313, and the vertical channel bars, such as 377 and 378, on which the blocks, such as 369 and 370, are mounted by means

of screws, are secured to the ends of the mounting bars, such as 375 and 376.

By referring to Fig. 1, certain vertical rows of terminal blocks, called bunching blocks, are seen to be mounted on the main distributing frame between the lineswitch boards and connector boards, rows 191 and 192 being shown between the switchboards of Figs. 2 and 3. The row of bunching blocks 192 may be seen also in Fig. 3. These blocks are screwed to the vertical channel bar 193, which bar is, in turn bolted or riveted to the ends of the horizontal main frame bars, such as 194 and 195.

Referring now to the mounting of the protector blocks, the mounting of the top row of protector blocks as shown in Fig. 1 and including protector blocks 171—178 will now be explained. The channel bar 182, best seen in Figs. 2 and 3 and in Figs. 2B and 3B, is secured to the outer ends of the bars, such as the bars 261—263, Fig. 2B, and 361—363, Fig. 3B, by means of angle brackets, such as the angle bracket 181, Fig. 2. Each protector block is provided with flat mounting plates and one plate lies above the channel bar 182 and the other plate below the channel bar 182 when the protector block is in place. This channel bar is suitably drilled so that the protector block can be bolted thereto by means of short vertical bolts. A fanning strip 179, Figs. 2, 2B, 3 and 3B, is laid on top of the bars, such as 261—263 and 361—363, and is provided with the usual holes through which the jumpers are extended to the upper terminals of the protector blocks, while a similar fanning strip 180 is placed below the fanning strip 179 and has holes through which the conductors from the outside cables connect to the lower terminals of the protector blocks. These fanning strips are held in place by bolts extending through both fanning strips and through the ends of the bars, such as 261—263 and 361—363.

The ends of the bars, such as 194 and 261 of Figs. 3 and 2, are shown equipped with protector blocks only at the top of the frame, fanning strips only being shown on the ends of the corresponding bars on the lower portions of the frame. The protector blocks are omitted, in the drawings, on the levels other than the top level merely to save the labor required to draw them.

The outside cables may be brought up through the floor between the floor angle bar 161 on which the main frame rests and the switchboards, and the cables may be laced to the cross bars adjacent the vertical angle bars, such as 163—167. The bar to which the cables lace are the cross bars, such as 265 and 261, Fig. 2, and 195 and 194, Fig. 3. The outside cables, of course, are "fanned out" and the conductors are carried across the frame at the various levels just underneath the long cross bars, such as the bars 261, Fig. 2, and 194, Fig. 3.

Referring now to Fig. 2, it may be pointed out that shelf cables (not shown) connect each terminal block, such as the terminal blocks 215 and 218 to all the connectors in the associated shelf; that bank cables, such as 231, connect the banks of the shelves of the bay 22 to the vertical row of bank cable blocks of which the top block is 233; and that bank cables, such as 231, connect the banks on the shelves in bay 24 to the row of blocks of which the block 234 is the top one. Similar cables are provided for each of the other connector bays.

Referring now to Fig. 3, a line cable (not shown) connects each shelf of lineswitches in bay 18 to the vertical row of blocks of which the block 369 is the top one. In this way each terminal set in this row of blocks is connected to a separate one of the lineswitches in bay 18. Similarly, each terminal set in the row of blocks containing the block 370 is connected to a lineswitch by means of shelf cables in the bay 20.

Referring now to bay 18, it will be noted that each shelf provides mounting space for two groups of lineswitches, twenty-five lineswitches to a group, the ten sets of contacts in the bank of the lineswitches in one group of twenty-five are multipled together and cabled to ten sets of contacts in the block 319. A similar cable connects the multipled bank contacts of the second group of twenty-five of the same shelf to another set of terminals in the block 319. In the same way, cables connect the two respective sets of each of the other shelves in bay 18 to the remaining terminal blocks, and other cables are provided to make similar connections to the corresponding blocks associated with bay 20. In this way, the lineswitches may be grouped together in groups of fifty, seventy-five, or one-hundred as desired by making suitable multiple connections between the terminals on the blocks, such as 319. The cables leading to the selectors connect to the outside ends of the terminals on these blocks, as hereinbefore mentioned.

The cables leading to the lineswitches from the blocks such as 369, as well as the cables leading from the lineswitches to the terminal blocks such as 319, are secured to the horizontal channel bars such as 313 and 314. The cables may be secured directly to the bars by means of lacing twine in the usual manner, or they may be secured by lacing twine to insulated pin bolt set in the channel bars, such as 313 and 314. Sufficient slack is left in these cables to permit the lineswitch shelves to be swung down to a horizontal position.

Referring now to Fig. 2, it will be noted that the short bars, such as 281 and 283, are welded to the inside edges of the vertical channel bars 202 and 204. The cables incom-

ing to the connector switches are laced to these short horizontal bars after being brought in underneath the top channel bar 206, in the space between this channel bar and the top shelf of connectors. The cables are brought in in a wide, thin layer so as to leave space sufficient for the top shelf to be raised as hereinbefore pointed out. Sufficient slack is left in the cables connecting to the switches, as well as in the bank cables 231 and 232 to allow any shelf to be raised and again lowered without placing a strain on the connecting cables.

At this point it may be mentioned that the selectors of Fig. 1, part 1, are mounted and connected up in substantially the same way as the connectors.

Referring now again to the party-line bunching blocks, such as the bunching blocks mounted in rows 191 and 192, Fig. 1, of which the row 192 can be seen in Fig. 3, the terminal sets on these blocks are connected together in groups, and one terminal set of the group is connected to a lineswitch by means of a jumper, and by means of another jumper to an outside line; while separate jumpers are run from the other terminal sets of the group to the connector bank terminals to which access is had to the party line. If desired, of course, these bunching blocks may be omitted entirely, in which case jumpers are run directly between the various connector bank terminals through which access is had to a party line; and the terminals thus multipled together are connected by means of one jumper to a lineswitch, and by means of another jumper to a cable pair leading to the outside line.

It will be noted that the various views of the main distributing frame MDF show suitable jumper rings provided so that jumpers from any of the blocks may be run through the rings and thus guided from the point of origin to the point of destination on the distributing frame.

It may be pointed out also that a jumper extending from a connector-block terminal to a protector-block terminal is run through the associated jumper rings at the connector block, and is run upward or downward as the case may be in the space between the row of blocks containing the block 243, Fig. 2, and the main frame proper, to the level containing the protector block to which the other end of the jumper is attached; and that the jumper is then run to the right or to the left a sufficient distance to encounter the desired protector block. In the case of a jumper extending between two blocks on the same side of the frame, all of the vertical run may be made at one end of the jumper, or a portion of it may be made at one end, and the other portion at the other end. It will be understood, of course, that the lateral run of jumpers between blocks on the same side of the frame is made on the auxiliary shelves formed by the shorter bars, such as the bar 195, Fig. 3, and the bar 265, Fig. 2, these jumpers being held away from the main-frame jumper rings by means of the connecting rods, such as the rod 264, Fig. 2.

While it has been explained hereinbefore that the jumpers are run from the connector blocks to the protector blocks, jumpers may be run to the protector blocks from the lineswitch blocks instead, if so desired. In this event, it is necessary to provide jumper rings on the main frame above the bars such as 194, Fig. 3C, opposite the lineswitch boards, in addition to the rings shown in Fig. 3C above the short bars such as 195. Rings are provided in the corresponding positions opposite the connector boards, as seen in Figs. 2 and 2C.

A number of modified arrangements using the apparatus disclosed herein will now be described.

In case it is desired to leave an aisle space between the lineswitch boards and connector boards on the one hand, on the main frame on the other hand, the main frame may be set away from these switchboards and provided with suitable bracing to hold it in an upright position and be provided with cable-terminal blocks on the switchboard side. With the main frame thus separated from the switchboards so as to leave an aisle space along the main frame on the switchboard side thereof, cables may be run between the blocks, such as 333, 334, 369, and 370, Fig. 1, and the above-mentioned blocks placed on the switchboard side of the main frame. These cables, of course, run over the equipment on suitable cable runways, a separate runway preferably connecting each lineswitch board and each connector board to the main frame. This modified layout is especially desirable in large exchanges of, for example, ten-thousand lines, wherein a longer main frame than the one shown in the drawings is used.

Some operating companies prefer mounting the protectors as close as possible to the place at which the outside cables enter the building. Accordingly, if the equipment shown in Fig. 1 is located on the second floor, the protector would be placed on the first floor, or even in the basement. In this case, it is necessary merely to provide a cable-terminal frame arranged to mount protector blocks only, without provisions for jumpers. The outside cables are connected to one side of the protectors, and cables are run from the other side of the protectors to the outside of the main frame shown in Fig. 1. In this case, the protectors shown on the outside of the main frame are replaced by regular terminal blocks.

In some installations, the number of outside cable pairs greatly exceeds the number of lines in actual use. This is especially true for exchanges serving sparsely-settled areas. When this condition is encountered, it may

prove more satisfactory to provide a regular standard main frame at a point where the outside cables enter the building. The outside cables are all terminated on one side of this main frame at the usual protector blocks. Only sufficient cables to handle the requirements are run from the inside of the main frame to the outside of the frame shown in Fig. 1. In this case, as in the case above mentioned, the protector blocks on the outside of the frame shown in Fig. 1 are replaced by regular terminal blocks. The frame shown in Fig. 1, in this case, may be considered merely as an intermediate distributing frame, although the construction thereof need not be altered except to replace the protector blocks by the regular, less-expensive, terminal blocks.

A further situation to be considered is one met with when two or more telephone offices are housed in the same building, usually on separate floors. In case it is possible to obtain a room large enough to house both offices, one long main frame may be used for both of them, the lineswitches and connector board being arranged adjacent thereto as shown in Fig. 1. In case this is not possible or desirable, the two offices may be provided with separate main frames arranged as in Fig. 1.

It is desirable when two offices are housed in the same building to provide arrangements so that a subscriber moving from one office area to another office area may retain his original telephone number. Accordingly, it is desirable to provide arrangements so that a jumper connection can be made to connect any connector-bank terminal set of either office to any one of the outside cable pairs. This may be done in two ways. By slightly extending the main frame of Fig. 1 at one end or at both ends, space may be obtained for the mounting of tie-cable blocks on both sides of the extended portion of the frame. Corresponding tie-cable blocks may be mounted on the main frame of the other unit. Cables are run between the tie-cable blocks on one frame and the tie-cable blocks on the other frame, tying the two distributing frames together so that a connector-bank terminal set at either frame may be connected with an outside cable pair at the other frame by means of a jumper from the connector-bank terminal set of the first frame to a tie-cable block and another jumper on the second distributing frame from the corresponding tie-cable block to the outside cable pair.

In case the probable requirements for the tying-in from connector-bank terminal sets of one office to the outside cable pairs of the other office exceed the amount of extra main-frame space that can be provided on the main-frame space that can be provided on the main frames as shown in Fig. 1, an alternative arrangement may be adopted. This alternative arrangement constitutes the provision of a single main frame of the usual construction common to both office units. This main frame may be located at the place where the cables enter the building. From the inside of this main frame, the required number of cables may be run to the outside of the frame shown in Fig. 1, and from another portion of the inside of the main frame, cables may be run to the outside of the local distributing frame of the other office unit. In this case, the frame as shown in Fig. 1 may be considered merely a distributing frame, and any desired connection between connector-bank terminals and outside cable pairs may be effected by the running of suitable jumpers on the combined main frame and on one local distributing frame or the other, as the case may be.

It will be understood that the new distributing-frame arrangement described hereinbefore is not limited to use in connection with automatic telephone systems, but may be used in connection with manual telephone systems, in which case the outside lines may terminate on one side of the distributing frame as disclosed herein, while conductors extended from the multiple jacks and the line jacks of the manual switchboard may be connected to the other side of the distributing frame, permitting any line jack to be connected by means of a jumper with any desired group of multiple jacks, and permitting any desired jacks so interconnected to be connected to any subscriber's line by means of another jumper.

What is claimed is:

1. In combination, a distributing frame having terminal blocks mounted on both sides thereof, automatic switches mounted in bays, cables directly connecting the switches of a plurality of said bays to terminal blocks on one side of said distributing frame, and facilities for running jumpers between switch-cable blocks and for running jumpers from switch-cable blocks across the frame to the other terminal blocks.

2. A combination switch-mounting frame and distributing frame comprising parallelly disposed mounting sections for mounting automatic switches in parallel vertical planes, and a vertical distributing section connecting all of said mounting frames together and having facilities thereon whereby jumpers may be run from one mounting frame to another at a plurality of separate levels.

3. A distributing frame comprising a frame section having terminal blocks mounted on one side thereof all in one vertical plane, and terminal blocks mounted on the other side of said distributing frame in a plurality of vertical planes parallel to each other and at right angles to the first-mentioned plane.

4. A distributing frame comprising a ver-

tical frame section having terminal blocks mounted thereon in a vertical plane parallel to the frame, and two groups of terminal blocks mounted on the other side of said frame in different vertical planes, both of said different planes being parallel to the distributing frame.

5. A distributing frame comprising a relatively long vertical main section and a plurality of shorter vertical branch sections extending from the main section and at right angles thereto, said main section and said branch sections having facilities for mounting terminal blocks thereon and for making jumper connections between said blocks.

6. A distributing frame comprising a main section, and a plurality of parallel branch sections extending from the main section and at right angles thereto, there being facilities for mounting terminal blocks on one side of the main section and facilities for mounting terminal blocks on both sides of the branch sections.

7. In combination, lineswitch and connector boards, each board mounting superimposed shelves of switches, said boards being arranged parallel to each other in a row, a distributing frame positioned at right angles to said boards and adjacent the ends thereof, lineswitch cables running from the lineswitch boards to blocks on the switchboard side of said frame, connector-bank cables running to blocks on the same side of said frame, and line cables terminating in blocks on the opposite side of said frame.

8. In combination, switchboards having switches mounted thereon arranged to extend connections away from calling telephone lines, switchboards having switches thereon arranged to extend connections to called telephone lines, said switchboards being arranged parallel to each other in a row, a distributing frame positioned along said row adjacent the ends of said switchboards, cables extending from each switchboard to blocks on one side of said distributing frame, and line cables terminating in blocks on the opposite side of said frame.

9. In combination, automatic switchboards having switches mounted thereon arranged to extend connections to called telephone lines, said switchboards being mounted parallel to one another in a row, other switchboards having switches mounted thereon arranged to extend connections from calling telephone lines, said other switchboards being interspersed in the said row with the first switchboards, a distributing frame having terminal blocks on both sides thereof, said distributing frame being located parallel to said row and adjacent the ends of said switchboards, cables connecting said switchboards to the blocks on one side of said distributing frame, and line cables connected to the terminal blocks on the other side of the distributing frame.

10. In combination, automatic switchboards having switches mounted thereon arranged to extend connections to called telephone lines, said switchboards being mounted parallel to one another in a row, other switchboards having switches mounted thereon arranged to extend connections from calling telephone lines, said other switchboards being interspersed in the said row with the first switchboards, a distributing frame having terminal blocks on both sides thereof, said distributing frame being located parallel to said row and adjacent the ends of said switchboards, cables connecting said switchboards to the blocks on one side of said distributing frame, line cables connected to the terminal blocks on the other side of the distributing frame, and facilities for making a jumper connection from a terminal block associated with a switchboard of one kind to a terminal block on said distributing frame associated with a switchboard of the other kind, and for running a jumper from one of the two said blocks to any terminal block on the opposite side of the frame.

11. In combination, automatic switchboards arranged parallel to one another in a row, a distributing frame arranged along said row and adjacent the ends of said switchboards, terminal blocks at the end of each switchboard terminating cables from the switchboards, terminal blocks on the opposite side of said distributing frame terminating line cables, and bunching blocks on the switchboard side of said distributing frame mounted on said frame at the ends of the aisles between the switchboards.

12. In combination, automatic switchboards arranged parallel to one another in a row, a distributing frame arranged along said row and adjacent the ends of said switchboards, terminal blocks at the end of each switchboard terminating cables from the switchboards, terminal blocks on the opposite side of said distributing frame terminating line cables, bunching blocks on the switchboard side of said distributing frame mounted on said frame at the end of the aisle between the switchboards, and facilities on said frame for making jumper connections from any block to any other block.

13. In combination, a row of switchboards mounting automatic switches, said switchboards being disposed parallel to one another in said row, a main distributing frame common to all the switchboards and located parallel to the row, terminal blocks on the side of said frame away from said switchboards terminating line cables, other terminal blocks mounted at the ends of said switchboards between the switchboards and the distributing frame, and facilities for making jumper connections between said other ter-

minal blocks and the terminal blocks on the side of the frame away from the switchboards.

14. A sectional structure for use in automatic telephone exchanges comprising a distributing frame, a plurality of switchboards arranged parallel to one another in a row parallel to said distributing frame, a terminal-block mounting section between the end of each switchboard and said frame, each of said terminal-block mounting sections being secured to said distributing frame and to the adjacent switchboard.

15. In an automatic telephone exchange, a main distributing frame, and a plurality of automatic switchboards arranged parallel to one another in a row parallel to said frame, a terminal-block section disposed between each of said switchboards and said frame, cables connecting each switchboard to the terminal blocks on the associated section, and jumpers extending from the terminal blocks of each section to the said distributing frame.

16. In a telephone exchange arranged to accommodate party lines and individual lines, a plurality of switchboards representing called terminals of telephone lines arranged parallel to each other in a row, a plurality of switchboards representing calling terminals of telephone lines arranged parallel to each other in the same row and interspersed with the first-mentioned switchboards, a distributing frame arranged parallel to said row and having facilities on the side thereof away from said switchboards for terminating outside line cables, switchboard cable blocks at the end of each switchboard arranged to terminate cables from the said switchboards, bunching blocks mounted on said distributing frame between said switchboards, facilities on said distributing frame for making a jumper connection from any called terminal to any line terminal on the opposite side of the frame and to any calling terminal, and facilities for making connections from any desired number of calling terminals to one of said bunching blocks and for making connection from the bunched called terminals to a line on the opposite side of the frame and to a calling terminal.

17. In a telephone exchange, terminal blocks representing outside telephone lines, terminal blocks representing called telephone numbers, other terminal blocks representing calling terminals of telephone lines, and facilities for running jumpers between the said blocks to interconnect a line with any one of said calling terminals and with any one of said called terminals.

18. In a telephone exchange, terminal blocks representing outside telephone lines, terminal blocks representing called telephone numbers, other terminal blocks representing calling terminals of telephone lines, and facilities for making a jumper connection from a calling terminal block to a called terminal block, and for making a jumper connection from a called terminal block to a line terminal block.

19. A layout for the equipment in an automatic exchange comprising switchboards having automatic switching apparatus mounted thereon arranged to extend connections away from calling lines, other switchboards having switching apparatus mounted thereon arranged to extend connections to called lines, all of said switchboards being mounted parallel to one another in a row with a distributing frame parallel to the row, and selector switches arranged to extend connections from switchboards of the first type to switchboards of the second type, said selectors being mounted on switchboards located on the opposite side of said row of switchboards from the distributing frame.

20. A layout for automatic telephone exchange located in a rectangular switchroom, said layout including lineswitch boards, selector boards, connector boards, a distributing frame, and miscellaneous apparatus, said distributing frame being arranged with the length thereof extending across the switchroom at one end thereof, said lineswitch boards and connector boards being arranged parallel to one another in a row parallel to the distributing frame and adjacent thereto, the selector boards being arranged in a short row parallel to the first-mentioned row and in the end of the switchroom opposite the distributing frame, and said miscellaneous equipment being arranged in substantial alignment with the row containing the selector boards.

21. An arrangement of equipment in an automatic telephone exchange including a distributing frame, lineswitch boards, selector boards, and connector boards; the lineswitch boards and connector boards interspersed in a row parallel to one another, said distributing frame arranged parallel to said row and adjacent the ends of the boards therein, and said selector boards arranged parallel to one another in a second row parallel to the first row of switchboards.

22. In combination, automatic switches mounted in rows on separate racks, a mounting frame arranged for racks of automatic switches to be mounted on both sides thereof with the backs of the switches of the two sides close together, and means for adjusting the vertical height of a rack of switches on either side so that the mounting racks of the switches may be raised or lowered to permit access to the wiring behind the switch racks.

23. A mounting for a rectangular shelf of automatic switches comprising two rods arranged to pass through holes in the end of the switch shelf, means for rigidly holding said mounting rods in place in an upright posi-

tion, and means including a nut threaded on the lower portion of each of said mounting rods for adjusting the height of a mounted shelf of switches.

24. In combination, a mounting frame having horizontal rows of automatic switches mounted in superimposed position thereon, said rows of switches being arranged to be bodily raised and lowered after being mounted, and means for maintaining the raised or lowered position of any shelf of switches.

25. A mounting frame for automatic switches comprising two upright end posts connected together to form a double-sided rectangular frame, and facilities for adjustably mounting racks of switches on both sides of said frame between said end posts.

26. In combination, a switch mounting frame having superimposed racks of switches mounted on both sides thereof, an extension frame secured to one end of said mounting frame, terminal blocks mounted on both sides of said extension frame, and cables connecting all the racks of switches with said terminal blocks.

27. In combination, a mounting frame for automatic switches comprising two end posts, together with means for holding them in an upright position, and rectangular switch-mounting frames hinged in superimposed positions on and between said end posts.

28. In combination a mounting frame for automatic switches comprising two end posts secured in an upright position and two other end posts set adjacent the first-mentioned end posts, respectively, and secured in an upright position to form a double-sided mounting frame, switch-mounting shelves secured to the two mounting posts which form one side of the frame, and other shelves secured to the posts forming the other side of the frame, all of said shelves being hinged to rotate about a horizontal axis so that the shelves may be lowered to permit the backs thereof to be inspected.

29. In a distributing frame for use in a telephone system, horizontally-disposed protector blocks mounted on one side of said frame and arranged to terminate outside cables, vertically-disposed terminal blocks mounted on the other side of the frame and arranged to terminate switchboard cables, and facilities for running jumpers between the terminal blocks on one side of the frame and the terminal blocks on the other side of the frame.

30. A combination main and intermediate distributing frame for a telephone system comprising an upright framework with blocks on one side thereof arranged to terminate outside cables, blocks on the other side of the frame arranged to terminate cables used in extending connections to called lines, and other blocks on the said other side of the frame interspersed with the first-mentioned blocks and arranged to terminate cables used in extending connections away from calling lines.

31. In a telephone system, a distributing frame arranged to serve as a terminus for outside-line cables, for cables over which connections are extended to called lines, and for cables over which connections are extended from calling lines, terminal blocks on said distributing frame in which all said cables terminate, the calling-terminal blocks and the called-terminal blocks being interspersed, and facilities for making jumper connections between called terminal blocks and calling terminal blocks, and for jumpering the calling and called terminal blocks to the outside-line terminal blocks.

32. In combination, a distributing frame having terminal blocks mounted on both sides thereof, the terminal blocks on one side being vertically disposed and mounted in vertical rows, the terminal blocks on the other side being horizontally disposed and mounted in horizontal rows, facilities for running jumpers between terminal blocks on the opposite sides of the distributing frame comprising jumper rings and jumper-supporting members extending through the frame and lying in horizontal alignment at a plurality of levels, and facilities for running jumpers between terminal blocks in different vertical rows on the same side of the frame comprising jumper rings and other members lying crosswise the frame and in horizontal alignment at a plurality of levels alternating with the first-named plurality of levels.

33. A distributing frame comprising a plurality of vertical posts secured together in a row, long horizontal bars secured to each of said posts at right angles to said row, the respective bars on the different posts being in horizontal alignment with the corresponding bars on the other posts, shorter horizontal bars secured to each of said posts in vertical alignment with the longer bars and alternating with them, means for mounting terminal blocks on both sides of said frame, facilities for running jumpers between terminal blocks located on the same side of the frame and for running jumpers between terminal blocks located on opposite sides of the frame, facilities including jumper rings for guiding the jumpers which go across the frame to points above the levels of long bars so that such jumpers lie on the long bars, and facilities including jumper rings for guiding the jumpers which extend between blocks on the same side of the frame to a point just above the short bars so that they lie upon the short bars.

34. A distributing frame comprising a plurality of vertical posts secured together in a row, long horizontal bars secured to each of

said posts at right angles to said row, the respective bars on the different posts being in horizontal alignment with the corresponding bars on the other posts, shorter horizontal bars secured to each of said posts in vertical alignment with the longer bars and alternating with them, means for mounting terminal blocks on both sides of said frame, facilities for running jumpers between terminal blocks located on the same side of the frame and for running jumpers between terminal blocks located on opposite sides of the frame, facilities including jumper rings for guiding the jumpers which go across the frame to points above the levels of long bars so that such jumpers lie on the long bars, facilities including jumper rings for guiding the jumpers which extend between blocks on the same side of the frame to a point just above the short bars so that they lie upon the short bars, and means including short vertical rods connecting the long bars and the short bars together in pairs for holding the last-mentioned jumpers away from the upright posts.

35. In combination, a distributing frame, a plurality of switch-mounting frames located adjacent said distributing frame on one side thereof, groups of switch-cable terminal blocks specific to said mounting frames, respectively, and mounted on the same side of said distributing frame, other terminal blocks common to all said mounting frames and located opposite the switch-cable terminal blocks and on the opposite side of the frame, facilities including jumper rings for running jumpers across the frame between the specific and common terminal blocks, and means for securing said distributing frame to each of said mounting frames to form a single unitary structure so that each frame tends to brace the entire structure.

36. A combination switch-mounting frame and distributing frame comprising parallelly disposed mounting sections for mounting automatic switches in parallel vertical planes, switch-cable terminal blocks disposed one above another on each of said mounting frames, and a vertical distributing section connecting all of said mounting frames together and having facilities thereon whereby jumpers may be run from the said terminal blocks on one mounting frame to the said terminal blocks on another mounting frame at a plurality of separate levels.

In witness whereof, I hereunto subscribe my name this 14th day of February, A. D. 1930.

EARL R. NEIR.

In witness whereof, I hereunto subscribe my name this 14th day of February, A. D. 1930.

SAMUEL E. WITT.