

Nov. 1, 1932.

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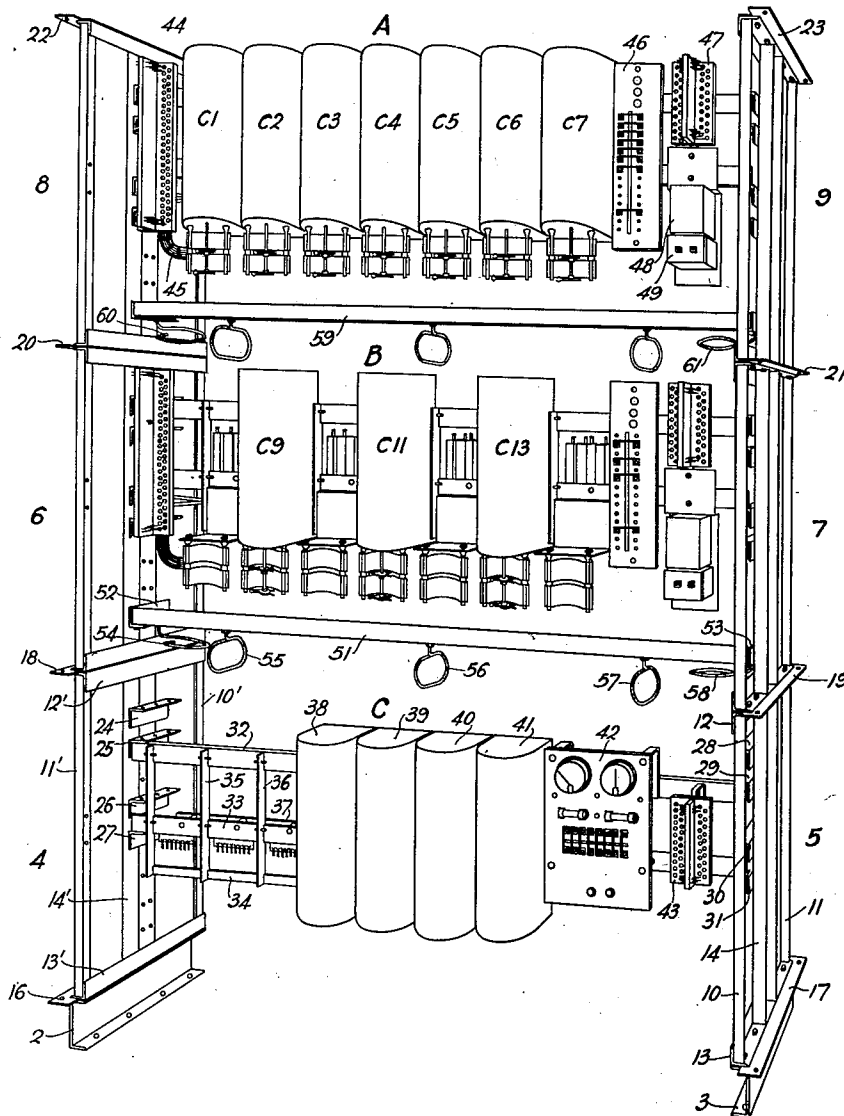
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TELEPHONE SYSTEM

Filed April 7, 1931

3 Sheets-Sheet 1

Fig. 1



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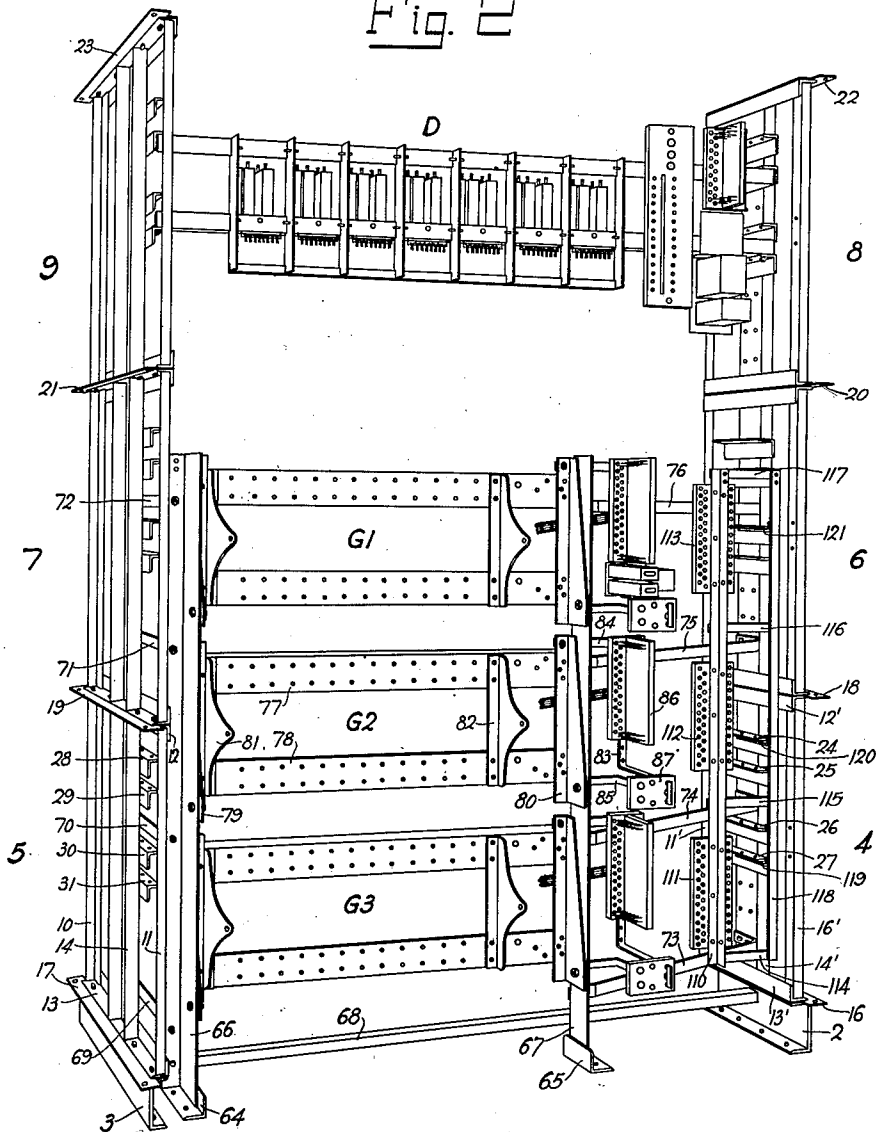
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3 Sheets-Sheet 2

Fig. 2



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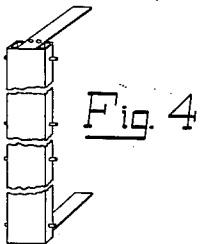
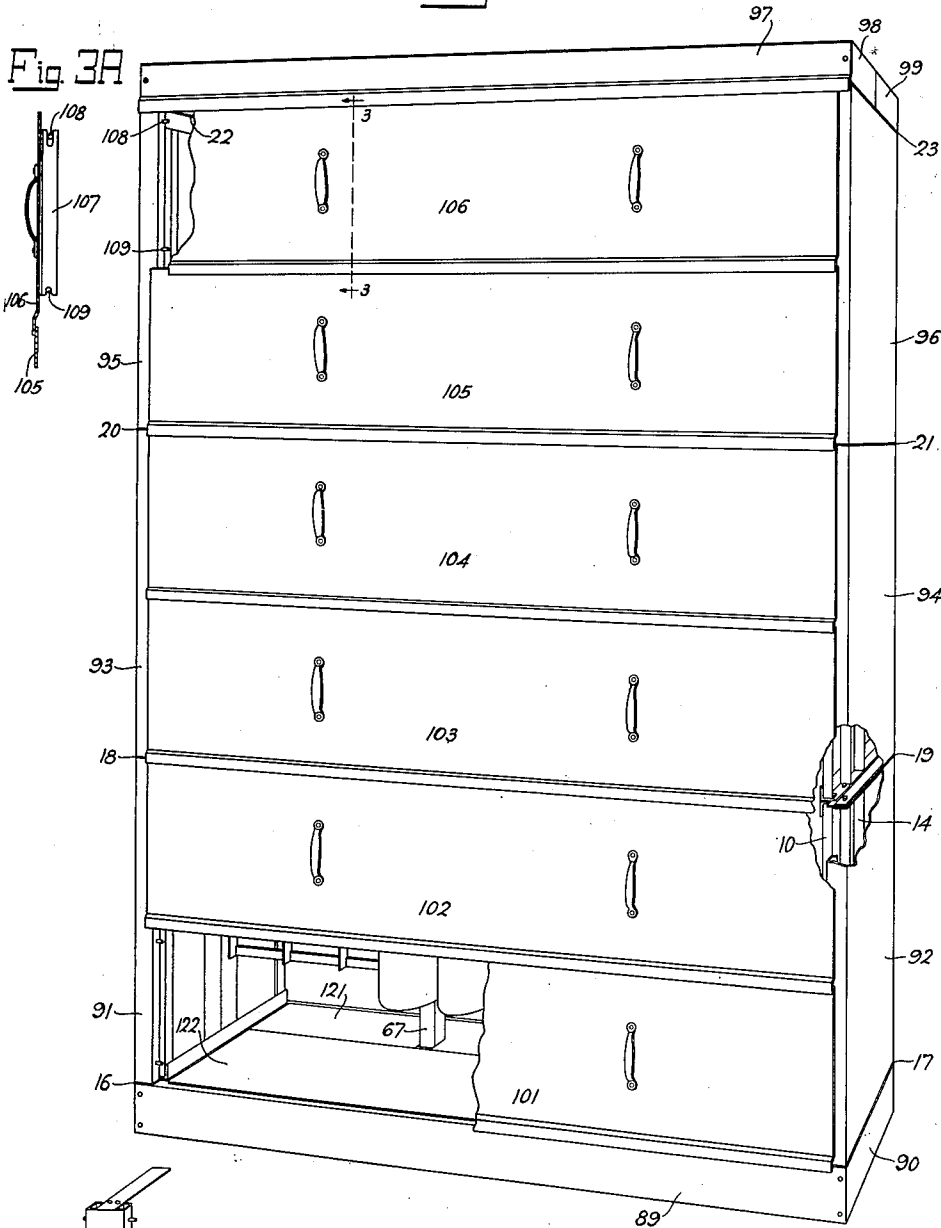
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TELEPHONE SYSTEM

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3 Sheets-Sheet 3

Fig. 3



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UNITED STATES PATENT OFFICE

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TELEPHONE SYSTEM

Application filed April 7, 1931. Serial No. 528,352.

The present invention relates to telephone systems, but is concerned more particularly with the provision of a new and improved switchboard for use in a telephone system employing automatic switching apparatus; and the main object may be stated to be the provision of a new and improved automatic switchboard composed of units of such construction that a switchboard of any desired capacity may be assembled from standard switchboard units.

It is a feature of the invention that an automatic switchboard may be assembled by placing the switchboard units or sections on top of each other to form a switchboard of any desired height, and that the switchboard units may also be placed side by side to form a switchboard of any desired length. As will appear hereinafter, by using these new units, an automatic switchboard may be built up of switchboard units or sections in substantially the same way that a sectional bookcase may be built up of bookcase sections to any desired height and length.

Other objects and features of the invention will be understood best from a further perusal of the specification in connection with the accompanying drawings comprising Figs. 1 to 3, 3A, and 4.

Referring now to the drawings, they show a sufficient amount of the apparatus of a sectional type switchboard built up of the new units or sections to enable the invention to be understood.

Fig. 1 is a perspective view of one side and an end of a sectional-type switchboard constructed in accordance with the present invention; Fig. 2 is a view of the opposite side and opposite end of the same switchboard; Fig. 3 is a view of the switchboard corresponding to Fig. 1 except that the enclosing sections are in place in Fig. 3, whereas they are omitted in Figs. 1 and 2 in order to give a clearer view of the construction; Fig. 3A is a sectional view of the door or panel 106 of Fig. 3, as seen along the line 3-3 in the direction indicated by the arrows; and Fig. 4 shows a stile strip arranged to join the ends of two abutting sections together and to sup-

port the adjacent ends of the enclosing panels, or doors.

Reference will now be had to Automatic Telephony (second edition) by Arthur Bessey Smith & Wilson Lee Campbell, published by the McGraw-Hill Book Company, Inc., New York and London. In this book, Figs. 44, 45, 47, and 86 are various views of mounted and unmounted lineswitches and master switches as used in an automatic telephone system; and Figs. 50 to 58, 87, 89, 90, and 92 to 94 are views of connector switches mounted and unmounted and of parts thereof. These drawings show the construction and the usual method of mounting automatic switching apparatus of the type shown mounted on the switchboard disclosed herein.

General arrangement

As shown best in Fig. 1, the switchboard shown in the drawings is composed of three sections placed one on top of the other, with the bottom section resting on the channel bars 2 and 3. The bottom section of the switchboard comprises the ends 4 and 5, together with the equipment shelf C, which holds the ends 4 and 5 together. All of the section ends are alike. The end 5, for example, is a frame-like structure composed of the top and bottom angle bars 12 and 13, connected together by the vertical angle bars 10 and 11 and by the vertical channel bar 14, all of these bars being welded together to form a rigid structure. The end 4 is similarly composed of the bars 12' to 14'.

Each of the ends 4 to 9 is provided with four relatively short angle bars welded to the upright channel bars, they are used principally to support the shelves of equipment. For example, the mounting bars 28 to 31 are welded to the channel bar 14 of end 5, and the mounting bars 24 to 27 are welded to the vertical channel bar 14' of end 4. The power shelf C, which is composed essentially of the two angle bars 32 and 33, held together by vertical spacing bars such as 36 and 37, is mounted on the ends 4 and 5 by means of the mounting angles 25 and 27 of end 4, and 29 and 31 of end 5; the shelf being secured in place by bolts passing through the mounting

bars and through the horizontal webs of the angle bars 32 and 33 as indicated in the drawings.

The top and bottom angle bars of the ends 4 to 9, the angle bars 12 and 13, for example, are each provided with four holes through which the bolts may be passed to secure the bottom angle of an end to the angle bar below or to a base member such as 2 or 3. The base members 2 and 3 are provided with similar holes to receive the bolts holding the bottom section of the switchboard to them and they are provided with additional holes, similarly spaced, through which they may be bolted to the floor.

The flat members 16 to 23 are included in the assembly in order to support the enclosing structure shown in Fig. 3. Each of the supporting members 16 to 23 is provided with six holes. Four of these holes are occupied by the bolts passing through the top and bottom end members such as 12 and 13, while the two outer holes are to receive bolts holding the enclosing end pieces in position in a manner to be explained hereinafter. It is to be noted that the members 16 to 23 have their inside corners cut away, the reason for which will be explained in connection with the explanation of the construction of the enclosing members.

The equipment shelves

As may be seen in Figs. 1 and 2, four equipment shelves A, B, C, and D are provided. The shelves A, B, and D are connector shelves, in that each is arranged to mount a maximum of seven connector switches, while shelf C is a so-called power shelf, arranged to mount certain equipment ordinarily referred to as power equipment. This includes such apparatus as tone generators and a ringing-current generator, in addition to the equipment shown mounted on the power panel 42 of the said power shelf C. This other apparatus referred to is mounted under the covers 38 to 41, which occupy four of the seven mounting sections of the power shelf. The shelf proper, in addition to the horizontal angle bars 32 and 33 with the spacing bars, such as 36 and 37, includes the lower horizontal bar 34 to which cable conductors of the shelf may be secured, and the condenser clamping bar 37. Condensers and similar pieces of apparatus are clamped between the bar 37 and the angle bar 33, as desired.

It is to be noted that each of the shelves is provided with one or more terminal blocks. All the wiring local to a shelf is terminated on these terminal blocks, and the connections between the shelves are carried through the jumper rings such as the jumper rings 54 to 58 mounted on the bar 51 and the similar jumper rings mounted on the bar 59 of the top section of the switchboard.

Connector shelf A is shown provided with

seven connectors, C1 to C7, each connector being shown mounted with its individual cover in place. Although the multiple is not shown in the drawings, as it is nearly impossible to indicate it clearly on a drawing of this scale, the banks of the connectors C1 to C9 are multiplied together in the usual way, and as indicated in Fig. 57 of "Automatic Telephony" hereinbefore referred to. The multiplied banks of the connectors C1 to C7 are connected through the conductors in bank cable 45 to the contacts on terminal block 44, from which jumper connections or to other shelves on the switchboard or cable connections to subscribers' lines may be made.

On the right-hand end of the shelf A there is a terminal block 47, which serves as a terminus for the conductors leading to the connectors C1 to C7, representing trunk lines incoming thereto from the lineswitches, and for such other conductors as are local to the shelf, including various tone conductors and a conductor carrying ringing current from the power shelf C. Mounted below the terminal block 47, the miscellaneous pieces of apparatus 48 and 49 may be seen. The fuse panel 46 is mounted on the shelf between the connector C7 and the block 47, and it contains a separate fuse for each of the connectors C1 to C7.

It will be noted that connector shelf B is similar to connector shelf A, except that it is shown provided with only three connectors, C9, C11, and C13. The connector positions 8, 10, 12, and 14 are left vacant, the banks at these positions being supported by the individual brackets, as shown.

The connector shelf C, Fig. 2, is shown without connectors in order that the appearance of the shelf structure may be more clearly seen. Since the connectors, along with their banks, are omitted, the bank-cable terminal block is omitted also. This is because the bank-cable terminal block is permanently wired to the multiplied banks by means of a bank cable such as the bank cable 45, associated with terminal block 44, mounted on shelf A, Fig. 1. The condensers, some of which may be seen mounted on the back of shelf D in Fig. 2, and mounted behind the mounting positions 8, 10, 12, and 14 of shelf B, Fig. 1, are held in place by clamping bars similar to the clamping bar 37, shown behind shelf 3, Fig. 1. The jack contacts are secured to the horizontal web of the lower angle bar of the shelf in the usual manner.

The mounting of the lineswitches

Referring now particularly to Fig. 2, the mounting of the lineswitches and associated apparatus will be explained. It will be noted that three lineswitch gates G1, G2, and G3 are shown. Each gate is arranged for twenty five lineswitches to be mounted thereon, and each gate has room for one master switch, al-

though one master switch ordinarily suffices for a group of seventy-five or more line-switches. The master switches and line-switches may be mounted on the gates G1 to G3 in the manner indicated in certain of the illustrations hereinbefore referred to in automatic telephony, and in a manner pointed out in the description accompanying the illustrations. The gates G1 to G3 are not mounted in the same way as the shelves A to D, as mounting the lineswitch gates in this way would be wasteful of space, in that the three gates G1 to G3 would take up one side of the three sections of the switchboard, one gate a section. Instead, the lineswitch gates are mounted on a separate mounting frame which is secured to the switchboard as shown in Fig. 2. This frame comprises essentially the vertical angle bars 66 and 67, which are resting on and are welded to the base members 64 and 65, provided with holes so that they may be bolted to the floor. The vertical bar 66 is secured to the section ends 5 and 7 by means of the brackets 69, 70, 71, and 72, which are bolted in place for this purpose. The holes in the back web of the angle bar 66 are so spaced that the brackets 69 and 72 are mounted to the channel bars of the section ends by bolts passing through holes in the channel bars placed there at the time of the manufacture of the section ends, thus avoiding the drilling of additional holes when gate-supporting frameworks of different sizes are installed. That is, each channel bar, such as the channel bars 14 and 14' of ends 5 and 4, is provided with four pairs of holes at the time of its manufacture, as may be seen upon reference to the channel bar 14', Fig. 1. All brackets and other equipment to be secured directly to the channel bars of the ends are arranged to utilize one or another of these sets of holes.

The gate-supporting angle bar 67 is fastened to the channel bars of the section ends 4 and 6 by the bolted brackets 73 and 74, secured to the angle bar 14' of end 4, and by the bolted brackets 75 and 76 secured to the channel angle bar of section end 6.

The horizontally hinged lineswitch gate G2, it will be noted, comprises essentially the horizontal angle bars 77 and 78, in which lineswitch and master switch mounting holes are drilled and tapped, and the end bars 79 and 80 which are riveted and welded to the angle bars 77 and 78. The shaft guide members 81 and 82 are riveted to the channel bars 77 and 78, and are provided with bearing holes for the usual controlling shaft of the lineswitches and master switch. The lineswitches are mounted between the members 81 and 82 of the gate G2, the space between the members 82 and 80 being provided for the mounting of a master switch and the auxiliary relays. The gates G1 and G3 are each similar to the gate G2, as may be seen.

The mounting bracket 83 is supported opposite the end of the gate G2 by the supporting brackets 84 and 85, which are welded to the mounting bar 83 at their right-hand ends and bolted to the vertical angle bar 67 at their left-hand ends. The left-hand end of the bracket 84 is extended to the left of the angle bar 67 to serve as a back stop for the gate G2, which is normally bolted to the back stop, as shown.

The block 86, secured to the upper end of the mounting bar 83, serves as a terminal block for the conductors local to the gate G2. The small panel 87, mounted on the lower end of bar 83, serves as a mounting panel for such miscellaneous equipment as may be required. Below the terminal block 86, two holes are shown in the mounting bar 83. It is through corresponding holes in the similar bar associated with the gate G1 that the metering equipment associated with the gate G1 is mounted. This metering equipment associated with the gate G1 is provided for the purpose of recording certain operations in connection with the master switch, assumed to be mounted on the gate G1. This space, of course, is left vacant opposite gates G2 and G3, as no master switches are mounted on the gates G2 and G3, the master switch of gate G1 controlling the three groups of line-switches by means of intershaft coupling in the usual manner.

The mounting of the line protectors

It will be noted that three fanning strips 111, 112, and 113 are mounted opposite the ends of the lineswitch gates, respectively. These fanning strips are mounted on the vertically-disposed angle bar 110 by means of screws as shown. The front web of the angle bar 110 is provided with a pair of holes in front of each fanning strip so that a group of twenty-five line protectors may be mounted in front of each fanning strip. The angle bar 110 and the flat bar 118 are secured together by the welded brackets 114 to 117. The flat bar 118 is securely fastened to the channel bars of section ends 4 and 6 by means of the brackets 119, 120, and 121, each of which is welded at the front end to the bar 118. The brackets 119, 120, and 121 are bolted to certain of the horizontal mounting bars secured to the vertical channel bars of ends 4 and 6, as may be seen in the drawings.

Interconnecting the units for service

The subscribers' lines are represented by conductors coming into the switchboard from the top thereof, extending through the jumper rings, and passing through the holes in the fanning strips 111 to 113, on the right-hand side of the angle bar 110, to the terminals of the protectors arranged to be mounted on the front web of the angle bar 110. From the left-hand side of the protectors, jumpers pass through the holes in the fanning strips

111—113 to the connector banks and to the lineswitches mounted on the gates G1 to G3, by way of the terminal blocks associated with the lineswitch gates and by way of jumper rings to the terminal blocks associated with the connector shelves. The jumpers run between the various mounting shelves, lineswitch gates, and protectors are passed through the jumper rings shown in Fig. 1, and including the jumpers mounted on the bars 51 and 59. It is to be noted that the jumpers mounted on bars 51 and 59 form horizontal jumper runs through which jumpers extending from one end of the unit to the other may pass; and that jumpers 58 and 61 form a vertical jumper run at the right-hand end of the board as seen in Fig. 1, while jumpers 54 and 60 form a vertical jumper run at the opposite end of the switchboard.

It is assumed that not more than seventy-five lines are needed when the switchboard is installed, and that ten connectors suffice to handle all of the traffic originated on the equipped lines. Accordingly, the ten connectors of shelves A and B, Fig. 1, have their banks interconnected by way of jumpers run from the terminal block 44 of shelf A and through the jumper ring 60 to the corresponding terminal block of shelf B, multiplying the banks of shelves A and B together. In addition, jumpers are run through jumper ring 54 from the terminal block at the left-hand end of shelf B to the protector blocks mounted on the vertical angle bar 110, Fig. 2, in front of the fanning strips 111 to 113, passing through the left-hand group of holes in each fanning strip. Also, additional jumpers are run from the switchboard-side of the protectors through the holes in the left-hand side of the fanning strips 111 to 113 to the terminal blocks associated with the lineswitch gates G1, G2, and G3, connecting each line to a separate lineswitch.

As mentioned hereinbefore, a master switch mounted on the gate G1 serves to control the lineswitches on all three gates. Therefore, the trunks extending from the banks of the lineswitches and represented by certain ones of the terminals on the associated terminal block, such as 86, are multiply connected together by means of jumpers, and ten jumpers are run from one of the lineswitch-gate blocks to the ten connectors mounted on shelves A and B, Fig. 1.

The current-supply conductors are brought in through the top of the switchboard, along with the subscribers' lines, and are extended through the jumper rings shown in Fig. 1 to the power shelf C, while the various necessary conductors are run from the power shelf C to the connector shelves and lineswitch gates by way of the jumper rings.

Handling increased traffic

In case the traffic increases to such an ex-

tent that the ten connectors mounted on shelves A and B of Fig. 1 are no longer able to handle the traffic, a separate master switch may be provided for each of the lineswitch gates G1, G2, and G3, so that a separate group of trunks may be taken from the banks of the lineswitches of each gate. In this case, the shelf D of Fig. 2 may be equipped with as many as seven connectors, while additional connectors may be installed on shelf B of Fig. 1. The connectors are divided into three groups, from a trunk standpoint, and a separate group of the connectors may be assigned to handle the traffic originated on each of the three gates of lineswitches, the jumpers being appropriately rearranged for this purpose.

Increasing the line capacity of the switchboard

In case the number of lines served by the switchboard increases to such a point that seventy-five lines are no longer sufficient, the capacity of the switchboard may be increased to one hundred lines by installing another gate of lineswitches above the gate G1. When this becomes necessary, shelf D of Fig. 2 is removed; short extension angle bars are secured to the upper ends of the vertical angle bars 66 and 67 by means of so-called "fish plates". For this purpose holes are normally provided in the upper end of the back web of the angle bars 66 and 67. These holes in the upper end of angle bar 66 are shown in the drawings. Such holes are made in the angle bars at the time of manufacture so as to allow for the installation of the extension bars. The extension bars are properly braced in a manner similar to the way in which the angle bars 66 and 67 are braced to the end sections, as hereinbefore pointed out. In a similar manner, the vertical bars 110 and 118 are extended so as to provide for the mounting of a fourth strip of twenty-five line protectors above the fanning strip 113. With the increase in the number of lines, it is probable that the traffic may have increased so that ten connectors are no longer sufficient to handle it. If this is the case, an additional switchboard section is installed above the section containing the shelf A, Fig. 1, and having ends 8 and 9. One or two shelves, as required, may be mounted on the additional section.

Enclosing the assembled switchboard

Referring now particularly to Fig. 3, the way in which the assembled switchboard is enclosed will now be described. It will be recalled that the flat supporting strips 16 to 23 are included in the assembly with the section ends 4 to 9 when the switchboard is being put together. One of these flat strips is placed between each section end and the adjacent section end, and between each bot-

tom section end and the base angle (such as 2 or 3) on which it rests. Also another of these flat strips is placed on top of each top section end. These supporting strips are held in place by the bolts passing through the top and bottom angle bars of the section ends.

The enclosure for the switchboard comprises sheet-metal enclosing sections secured to the switchboard through the medium of bolts passing through the outer holes in the flat strips 16 to 23. Each switchboard section is provided with a pair of the end enclosures 91 to 96, these enclosing sections being made from sheet metal cut to size and formed into the desired shape. Each of the end enclosures has an inwardly-turned top portion and an inwardly-turned bottom portion, turned at right angles to the main portion of the enclosing member so that each enclosing member fits snugly between a pair of the fastening plates 16 to 23. For example, the enclosing end-member 91 fits between the plates 16 and 18, while the enclosing end member 92 fits between the plates 17 and 19. Holes in the inwardly-turned portions of the enclosing end members register with the portion of the plates 16 to 23 which extend out beyond the main structure. Bolts passing through these holes serve to hold the enclosing end members in place. Each of the enclosing end members, end member 92, for example, has its vertical edges bent around to form the desired faces, as is shown by the cut-away portion of member 92.

In order to enclose the base of the switchboard, two similar enclosing members are provided (of which the member 90 may be seen in Fig. 3), and are secured to the fastening plates 16 and 17, Fig. 1, in the manner of the enclosing end members 91 to 96. A front piece 89 is bolted to the inwardly-turned portion of the end piece 90, and to the corresponding piece on the other end of the base. The enclosing piece 89 has the top part thereof bent inwardly in order to provide a finished appearance, and to give rigidity to the member, as well as to form a support for the inside bottom sheet 122. The back edge of the sheet 122 lies on the angle bar 68, Fig. 2, bolted to the upright angle bars 66 and 67 for this purpose. Suitable stiffening members are welded on the bottom side of the sheet 122 to prevent it from sagging. The bottom sheet 121 covers the remaining bottom portion of the switchboard, and is notched to fit around the angle bars 66 and 67, Fig. 2.

The switchboard cover comprises the cover members 98 and 99, which are bent downwardly and inwardly at the ends in order that they may be bolted to the outer holes in the plates 22 and 23, Figs. 1 to 2. The cover is in two sections so that it can be put in place after the incoming cables have been

brought into the switchboard from the top. The cover members are suitably notched so that they will fit around the incoming conductors.

The front-piece 97 is bolted to the turned-in front edges of the ends of the cover piece 98. The top of the front-piece 97 is turned back to form a support for the front edge of the cover 98. The back edge of the cover 98 is turned down to give the cover the required rigidity, and the turned-down portions of the pieces 98 and 99 are bolted together. A front-piece similar to 97 is provided for the other side of the unit.

The front of the switchboard, as shown in Fig. 3, is enclosed by means of the removable panels or doors 101 to 106. Each panel is provided with a pair of handles, as shown, and each panel has a notched member welded thereto near the end, arranged to register with pins placed on the inside of the end enclosures to hold the panels in place. The left-hand notched member of the panel 106 is shown in Fig. 3A, which is a slightly enlarged cross-section view of the panel 106, taken along the line 3—3 of Fig. 3, and in the direction indicated by the arrows. The pins 108 and 109, set in the enclosing end member 95 are shown in Fig. 3 and again in Fig. 3A in cooperation with the notches in the notched member 107, welded to the panel 106. It is to be noted that the upper notch in member 108 is cut deep enough to permit the panel 106 to be pushed up far enough to allow the lower end of member 107 to come above pin 109, so that the bottom part of the panel 106 may be brought in against the switchboard, after which the panel is dropped down to allow the lower notch of member 107 to fall over the pin 109. The opposite end of the panel 106 is manipulated in the same way at the same time. Each of the other panels is held in position in the same way, there being two removable panels for each switchboard section, as shown.

Similarly secured, removable panels, or doors, enclose the opposite side of the switchboard.

It is to be noted that the crown piece 97 is formed so that it overhangs the top of panel 106, while the bottom of each panel is formed to overhang the next lower panel, thus making the enclosure more-nearly dust proof.

Placing the sections end to end

When it is desired to build up a large switchboard of sections similar to those shown in the drawings, as many sections as desired may be placed end to end, and the switchboard may be built up to any desired height and length. In this case, the base and the top of each vertical group of sections is enclosed in the manner shown in Fig. 3 and described hereinbefore. The same

applies to the outer ends of the sections at either end of the assembled switchboard. The end enclosures, such as 92, 94, and 96, Fig. 3, however, are left off the abutting ends of the switchboard sections in order that jumper connections may be made between any unit in the complete switchboard and any other unit. In order to close up the space between the adjoining ends of the panels, such as 101 to 106, and in order to provide support for the ends of these panels, so-called stile strips are formed and bolted into place. Each of these stile strips is vertically disposed in the space between two abutting section ends and has each vertical edge bent around, similar to the front vertical edges of 91 to 96, Fig. 3, so that it serves as a finishing piece and as a panel support for the ends of adjacent panels. These stile strips are bent inwardly at the top and bottom and are provided with holes registering with the holes in the plates, such as 16 to 23, whereby they may be bolted rigidly in place. A perspective view of one of these stile strips, mounted in place is shown in Fig. 4. The long tongues on the inwardly-turned ends of the stile strip are for the purpose of catching any dust that may settle down into the switchboard between adjacent covers.

What is claimed is:

1. In combination, a switchboard built up of similar sections arranged and adapted so that one lies flat on top of the other, each section comprising two similar, parallelly disposed, frame-like section ends, a separate interconnecting framework for each section arranged to be fastened to both frame-like ends of the associated section, and facilities for mounting electrical switchboard apparatus on the interconnecting framework of each section.

2. In combination, a mounting shelf arranged for switchboard apparatus to be mounted thereon, two supporting end members, and means for securing the end members rigidly to said mounting shelf at points in a line parallel to and lying near the vertical centre line of the respective end members to form a unitary structure wherein the mounting shelf is supported by said end members, while the end members are held in an upright position by said mounting shelf.

3. In combination, a switchboard composed of similar sections resting one on top of the other, each section including a pair of section ends with the section ends of each section above the first resting on and lying entirely outside the confines of the section ends of the next lower section, mounting frames arranged to interconnect said section ends to form a rigid switchboard structure, and facilities for mounting switchboard apparatus on said mounting frames and within the confines of the section ends.

4. A switchboard section including two

rectangular section ends and an equipment shelf, and means for securing said equipment shelf rigidly to each of said section ends at points lying along a vertical line near the centre line of the section end so that the equipment shelf is supported by the section ends and the section ends are held vertically upright and parallel to one another.

5. A switchboard section including two rectangular section ends and an equipment shelf, and means for securing said equipment shelf rigidly to each of said section ends at points lying along a vertical line near the centre line of the section end so that the equipment shelf is supported by the section ends and the section ends are held vertically upright and parallel to one another and at right angles to said equipment shelf.

6. A section end arranged to form one end of a switchboard section, said section end including four bar members secured together at their ends to form a rectangular structure and an additional bar member rigidly secured to two opposite ones of the first-named bar members and parallel to the other two of the first-named bar members.

7. A section end arranged to form the end of a switchboard section, said section end being composed of four rectangularly disposed angle bars with a channel bar secured to two of the angle bars and extending across the middle of the rectangle formed by the angle bars.

8. A frame-like section end arranged to form the end of a switchboard section, said section end being composed of horizontal top and bottom members with a pair of vertically disposed end members connected to the top and bottom members to form the sides of the section end, and a vertically disposed support member interconnecting the middle of the bottom member with the middle of the top member.

9. A switchboard section arranged to form a section in a built-up switchboard, said section including two parallelly disposed section ends, each section end including three vertically disposed end members, and a base member and a top member interconnecting the ends of the end members at the bottom and top respectively.

10. A switchboard section arranged to form a section in a built up switchboard, said section including two parallelly disposed section ends, each section end including three vertically disposed end members, a base member and a top member interconnecting the ends of the end members at the bottom and top respectively, and means for mounting a shelf of switchboard equipment between the middle end member of one section end and the middle end member of the other section end.

11. A section end for a switchboard section, said section end comprising a vertically

disposed rectangular frame, a vertically disposed cross member extending vertically across the middle of said frame, and relatively short horizontal mounting bars secured to the cross member.

12. A switchboard including two switchboard ends interconnected by a mounting rack, base members arranged to support said ends respectively, flat support strips arranged to be held in place between the base members and the bottom of the section ends, respectively, other flat support members arranged to be held in place on top of the section ends, respectively, and enclosing members for said switchboard arranged to be secured to said support members to enclose the switchboard.

13. In combination, a switchboard composed of similar sections placed one on top of the other, similar enclosing members for enclosing the sides of each section, and a cover for covering the top of the top section so as to completely enclose the switchboard.

14. In combination, a switchboard composed of similar switchboard sections mounted one on top of the other with a base on which the bottom section rests, an enclosure for the base, separate side enclosures for enclosing each of said sections, and a cover for the top section of the switchboard.

15. In a switchboard composed of similar switchboard sections placed one on top of the other, enclosing end members for enclosing the ends of the respective sections, a cover for the top section, and removable panels or doors for enclosing the front and rear of the switchboard.

16. In a switchboard composed of similar switchboard sections placed one on top of the other, enclosing end members for enclosing the ends of the respective sections, a cover for the top section, and removable panels or doors for enclosing the front and rear of the switchboard, said removable panels or doors being removably attached to said enclosures for the section ends.

17. An automatic switchboard composed of sections laid one on top of another, separate equipment shelves for said sections, respectively, jumper terminals for said equipment shelves, respectively, and facilities including vertical and horizontal jumper runs composed of jumper rings for interconnecting said equipment shelves by means of jumpers.

18. In a switchboard composed of sections placed end to end and of sections placed on top of the first sections to build the switchboard up to the desired height and length, switchboard equipment mounted on said sections, respectively, a group of jumper terminals for each section, and facilities including jumper rings for running jumpers from the jumper terminals in any section to the jumper terminals in any other section.

19. In an automatic telephone switchboard, a group of terminals representing subscrib-

er's lines, automatic switches arranged to complete connections to said lines, other automatic switches arranged to extend connections from said lines, terminals associated with the first-named automatic switches, terminals associated with the second-named automatic switches, facilities for making jumper connections from said lines to the first named automatic switches to enable connections to be completed to said lines, and facilities for making jumper connections from the terminals of said lines to the terminals of said other automatic switches to enable connections to be extended from said lines.

20. In a switchboard composed of similar superimposed sections, each section including a pair of section ends with the section ends of each section above the first resting on the next lower section ends, a mounting framework arranged to occupy space within a plurality of said sections, means for securing said framework to the section ends of each section within which it is disposed, and facilities for mounting racks of switching apparatus on said framework.

21. In combination, a mounting shelf arranged for switchboard apparatus to be mounted thereon, two supporting end members, and means for securing the mounting shelf to each end member at points lying in a vertical line within the confines of the section ends and so that the mounting shelf and the apparatus mounted thereon lie wholly within the confines of the section ends, while the mounting shelf is supported by the end members and the end members are held in an upright position by said mounting shelf.

In witness whereof, I hereunto subscribe my name this fourth day of April, A. D., 1931.

EARL R. NEIR.

In witness whereof, I hereunto subscribe my name this fourth day of April, A. D., 1931.

SAMUEL E. WITT.