

Sept. 23, 1969

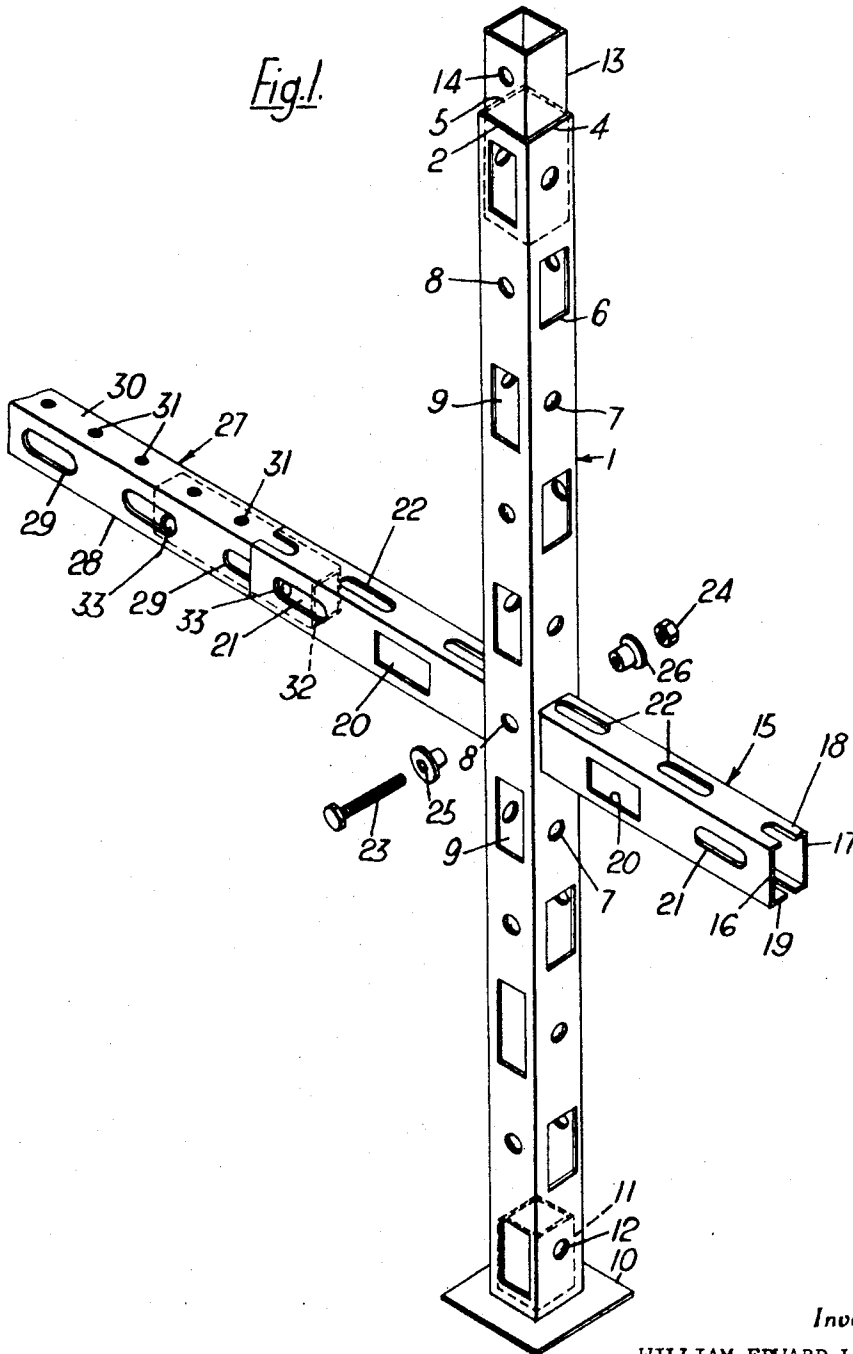
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3,468,430

STRUCTURAL ELEMENTS TO FORM RACKS

Filed June 6, 1967

4 Sheets-Sheet 1



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STRUCTURAL ELEMENTS TO FORM RACKS

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4 Sheets-Sheet 2

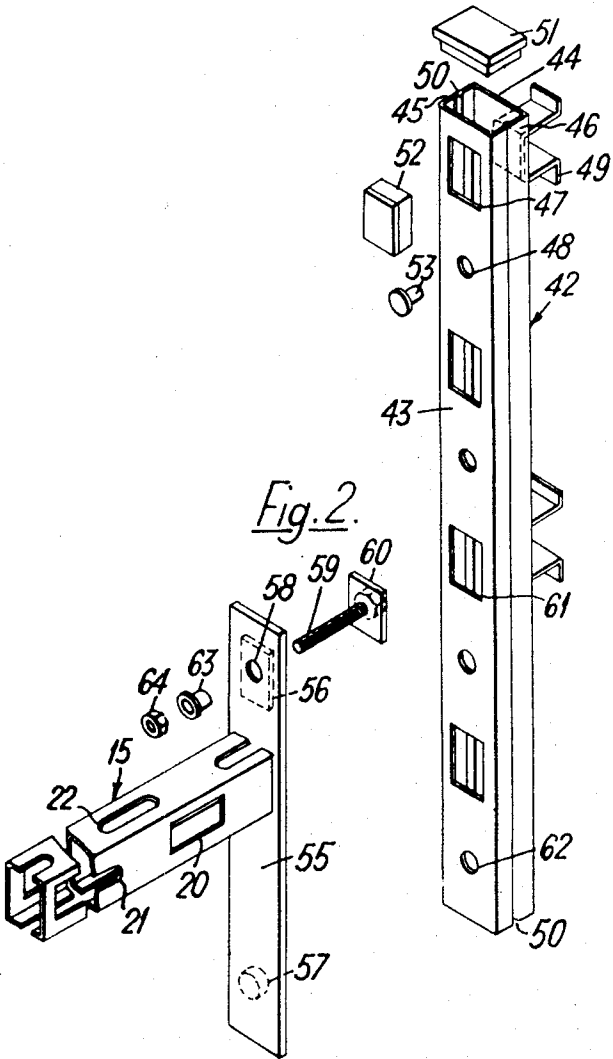
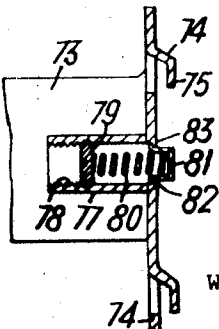


Fig. 4.



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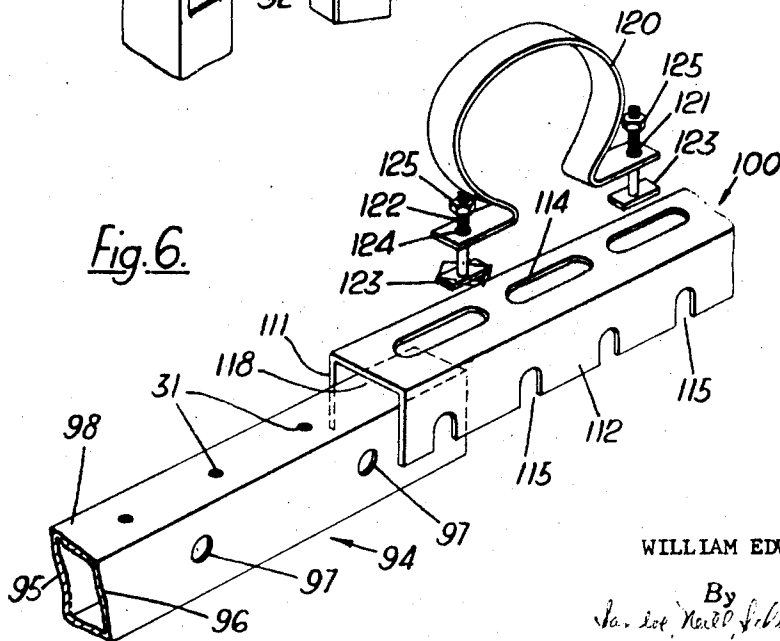
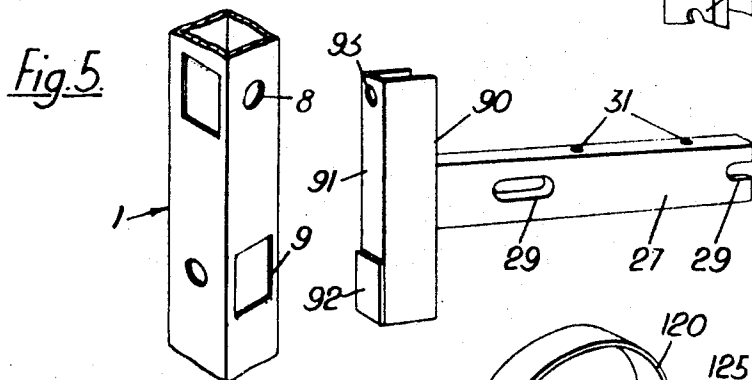
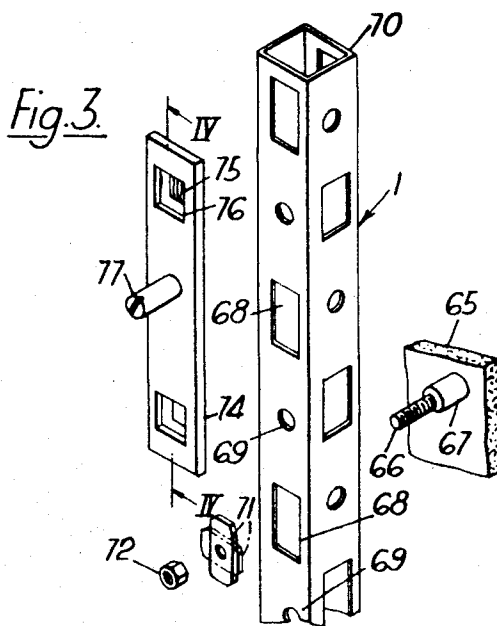
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STRUCTURAL ELEMENTS TO FORM RACKS

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4 Sheets-Sheet 3



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STRUCTURAL ELEMENTS TO FORM RACKS

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Fig. 7.

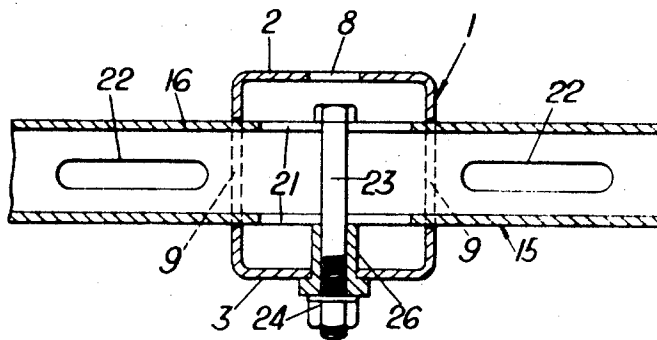
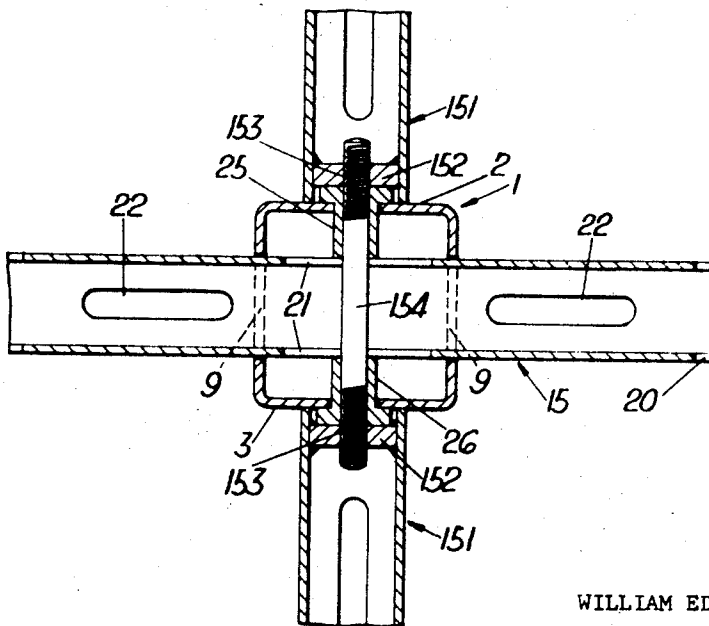


Fig. 8.



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STRUCTURAL ELEMENTS TO FORM RACKS
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Continuation-in-part of application Ser. No. 369,917,
May 25, 1964. This application June 6, 1967, Ser.
No. 643,963

Int. Cl. A47f 5/10, 5/00

U.S. Cl. 211—182

8 Claims

ABSTRACT OF THE DISCLOSURE

A structural means to form racks comprising a first hollow post element rectangular in cross-section having apertures in opposed pair of the walls and a second element dimensioned to fit into the apertures and be held therein by bolt means extending through bolt holes located in a median plane transverse to the apertures in the walls. The structural means may further comprise a second post element having elongated apertures spaced along one side wall into which is fitted a plate secured to an end fitting on the second element and means to secure together said second element and said second post element.

This application is a continuation-in-part of my prior application Ser. No. 369,917 filed May 25, 1964, now abandoned, and has for an object to provide structural elements designed for assembly to form racks, particularly racks or supports for electric cables or pipes. The elements which the invention provides can be assembled in a number of ways, and can be secured to walls or be self-supporting so as to provide stable support for relatively heavy elongated articles.

Another object of the invention is to provide structural means comprising a first element serving as a post, of hollow, substantially rectangular cross-section having in one opposed pair of its walls a number of equally spaced, substantially rectangular apertures, the apertures in said pair of walls being of the same size and in register, two longitudinal sides of each aperture being parallel to the length of the element, and having a number of registering pairs of bolt holes in the other opposed pair of walls, said bolt holes being located in the transverse median planes of successive apertures in said one pair of walls; a second element, of hollow substantially rectangular cross-section and of dimensions such that said second element fits through a registering pair of apertures in the first element and is supported upon lower transverse sides of said apertures, and having registering pairs of bolt holes in its pair of walls that are fitted to said two longitudinal sides of said apertures in the first element; and bolt means which extend through a pair of bolt holes in said second element and at least one bolt hole in said first element holding the two elements together with the second element extending horizontally through the first element.

The structural means according to the invention may further comprise a third element to serve as another post, of hollow substantially rectangular cross-section, having in at least one of its walls a number of equally spaced, substantially rectangular apertures, two sides of each aperture being parallel to the length of the third element; and said second element having fixed to one of its ends, remote from said first element, a plate, the plate bearing, on the side facing away from the second element, locating means for co-operating with at least one aperture in said third element, and having means whereby said second element is securable to the third element to hold

the second element in a required position relative to the third element.

Structural elements according to the invention, together with structural means built up therefrom will now be described in more detail by way of examples with reference to the accompanying drawings in which:

FIGURE 1 shows structural post and beam elements and illustrates how these may be assembled together.

FIGURE 2 shows a further form of structural element and also illustrates a method of fixing further elements to it,

FIGURE 3 shows a further way of assembling structural elements together;

FIGURE 4 is a section on the line IV—IV of FIGURE 3,

FIGURE 5 shows an alternative mode of assembling structural elements together,

FIGURE 6 is a perspective view of a member for use with the structural elements,

FIGURE 7 is a horizontal section through the median plane of a beam intersecting a post as shown in FIGURE 1, and

FIGURE 8 is a similar section of a modified assembly.

In FIGURE 1, the element shown generally as 1 is for use as a post. The element is of square, hollow section, having sides 2 and 3 opposite to each other and sides 4 and 5 opposite to each other. In each one of the four sides there is formed a series of rectangular apertures 6 and a series of bolt holes 7. The apertures and bolt holes alternate along the length of the element and the centre of each bolt hole lies on the longitudinal median plane of two adjacent apertures in the same wall. The apertures are all of the same size, and these and the bolt holes in opposite walls are in register with each other. The centre of each bolt hole in each wall lies on the transverse median plane of a registering pair of rectangular apertures of the adjacent walls. Thus the bolt hole 8 in the wall 2 lies on the transverse median plane of the rectangular aperture 6 in the wall 4, and the bolt hole 7 in the wall 4 lies on the transverse median plane of the rectangular aperture 9 in the wall 2. Although the apertures 6, 9 are shown in the figure as being exactly rectangular, in practice it is desirable that the corners be rounded off to make the apertures substantially rectangular.

As shown in FIGURE 1 the post 1 may be free standing, supported on the floor by a base plate 10 having a projecting square boss 11 of dimensions such that it fits closely within the square element 1. If the boss 11 is a push fit within the element 1 then no further fixing means are necessary, but if not then the boss can be designed to receive a fixing bolt passing through the bolt hole 12 and the hole in register with this in the opposite wall.

The posts may be manufactured to standard lengths, but the height of an assembly using the posts can be varied by joining a number of posts together using connecting elements such as the element 13. This element is in the form of a sleeve which again is a close fit within the square element 1 and is formed with bolt holes such as 14 for registering with bolt holes in the walls of the element 1 and an adjoining element so that the two elements are firmly held together.

FIGURE 1 also illustrates a second structural element 15 of rectangular cross-section to serve as a beam. In this case the opposite walls 16 and 17 are longer than the opposite walls 18 and 19. The walls 16 and 17 are formed with alternate substantially rectangular apertures 20 and bolt holes in the form of elongated slots 21. The centre line of each slot 21 lies on the longitudinal median plane of two adjacent rectangular apertures. The apertures and slots in the opposite walls 16 and 17 are again

in register with each other. The walls 18 and 19 are formed with bolt holes in the form of slots 22 only, and have no rectangular apertures. The external dimensions of the element 15 are such that it may be passed through registering rectangular apertures 9 in opposite walls of the first element 1 as shown in the figure. The two elements 1 and 15 are then held together by a bolt 23 and nut 24 passing through reducing washers 25 and 26 and through aligned bolt holes 8 and 21 in the elements 1 and 15 respectively. The dimensions of the rectangular apertures in the member 15 are the same as those in the member 1 so that a second length of the member 15 can be passed through apertures in a first length of this member.

The diameter of the bolt holes 8 in the element 1, as more clearly shown in FIG. 7, is greater than the size of the head of the bolt 23, which is in turn larger than the width of the slot-form bolt holes 21 in the element 15. If, therefore, the reducing washer 25 is omitted, the head of the bolt will be able to be located against the wall 16 of the element 15 and within the bolt hole 8, so that the wall 2 of the element 1 will have no protrusion therefrom.

A third type of structural beam element is shown at 27 in FIGURE 1. It will be seen that this is again rectangular and of the same dimensions as the element 15. In the element 27 the wall 28 and its opposite wall are formed with elongated slots 29 only, and the wall 30 and the opposite wall are formed with smaller bolt holes 31 only, intended to receive self-tapping screws. The bolt holes 31 are uniformly spaced. The slots 29 are of the same dimensions as the slots 21 in the element 15.

Two lengths of the element 15 can be joined together end to end, or a length of the element 15 can be joined axially to a length of the element 27, as shown in FIGURE 1, by a connecting piece 32 having external dimensions such that it is a push fit within the elements to be joined. The connecting piece 32 may again be formed with bolt holes 33 for registering with bolt holes or slots in the elements to be joined to make a fixed connection.

FIGURE 2 shows a supplementary type of post element 42. Again the element is of rectangular cross-section having opposite walls 43 and 44 and opposite walls 45 and 46. Rectangular apertures 47 and bolt holes 48 are alternately formed only in the wall 43 and the centre of each bolt hole lies on the longitudinal median plane of two adjacent apertures. The wall 44 opposite to the wall 43 has spot welded to it sections of mild steel strip 49. The walls 45 and 46 both have a central longitudinal groove 50 for strengthening purposes. The element 42 is designed for use during building construction when it is positioned behind concrete shuttering and held by nails or wires to the back of the shuttering in a temporary manner until concrete has been poured. After removal of the shuttering the wall 43 of the element is the only wall showing and the mild steel sections 49 act as firm anchors for the member within the concrete. When the concrete is poured care must be taken that it is not allowed to enter into the section of the element, and to this end plastic caps 51, 52 and 53 are provided, which are respectively press fits within the end of the element 42, within the rectangular apertures 47, and within the bolt holes 48. After the concrete has been poured and the shuttering removed the caps 52 and 53 can be removed from the apertures in the bolt holes, although it will be seen that the cap 51 remains a fixture in the concrete.

FIGURE 2 also shows the method of attaching a structural element to the post element 42. In this case the structural element to be attached is shown by way of example as the element 15 which is supported at a distance from the element 42 by a post element 1 as shown in FIGURE 1. The element 15 is welded at its end to the front surface of a plate 55, the rear surface of which carries to locating projections, a rectangular projection 56

and a circular projection 57. A bolt hole 58 is formed through the location projection 56.

To fix the member 15 to the post element 42 a bolt 59 with a rectangular washer 60 which is welded to the bolt head is first inserted into a rectangular aperture 61. The washer 60 is of such dimensions that in one position it will pass through the aperture 61 but when rotated 45° from this position it will bear against the inner face of the wall 43 in which the aperture 61 is formed. After the washer has been turned to this position the plate 55 is then brought up to the wall 43, and the bolt is passed through the bolt hole 58 in the plate. The locating projection 56 on the plate is fitted into the aperture 61, and the locating projection 57 on the plate is fitted into the bolt hole 62, in each case the locating projections being of such a size that they are a close fit within the aperture and bolt hole respectively. A reducing washer 63 is then passed over the end of the bolt 59, and a nut 64 is screwed along the bolt into tight engagement with the front face of the plate 55. This arrangement provides a firm cantilever support for the element 15.

FIGURE 3 again shows the post element 1 as described with reference to FIGURE 1, and shows how this may be attached to a wall 65 rather than used as a free standing element. The wall 65 has projecting therefrom a bolt 66 on which is optionally fitted a spacing boss 67. The bolt 66 passes through registering apertures, one of which is shown as 68, in opposite walls 69 and 70 of the element 1. A pair of rectangular washers 71 with their corners relieved are passed through the aperture 68 when in the position shown in solid lines in FIGURE 3, and the inner one of these washers is then passed through that aperture in wall 70 which is opposite aperture 68. The two washers are then rotated through 90° to the position shown in broken lines in this figure. The washers can thus bear against the inner and outer faces of the wall 70. A nut 72 is then screwed onto the end of the bolt 66 by a box spanner inserted through the aperture 68 and it will be seen that the nut bearing on the outer washer which in turn bears on the inner face of the wall 70 holds the element 1 in position spaced from the wall 65 by the spacing boss 67 and inner washer 71.

FIGURE 3 also shows, in conjunction with FIGURE 4, yet another alternative method of supporting a member 73 on the post 1 in cantilever fashion. Again the member may be of any form, particularly the form of member 15 or 27 as shown in FIGURE 1. The member is welded to a plate 74 in which two rectangular cuts are made, the cut out material being bent back from the plate as shown at 75 in FIGURE 4. The distance 76 between the rear face of the plate 74 and the front of the bent back part 75 is slightly greater than the thickness of the wall of the post member 1. Projecting from the front face of the plate 74 is a hollow circular boss 77, the inner surface of the outer part of which is threaded as shown at 78. A threaded head 79 can be screwed into the boss 77, and the head carries a compression spring 80 which bears on a locking member 81 of circular cross-section projecting through a circular hole 82 in the plate 74. The locking member 81 has at its inner end an outwardly turned flange 83 which engages against the sides of the hole 82 to hold the member captive within the boss 77.

To fit the plate to the post member 1 the bent back parts 75 are aligned with two adjacent rectangular apertures 68 in a wall of the element and the plate 74 is pressed into contact with the wall of the element so moving the locking member 81 into the boss 77 against the action of the spring 80. When the plate 74 is flush against the wall of the element the bent back parts 75 are located within the element 1 so that a downward movement of the plate 74 causes the parts 75 to engage behind the inner face of the wall of the element below the apertures through which they have been passed. When the locking member 81 comes into axial alignment with the hole 69 in the element 1 between the two apertures 68 then the

spring 80 acts to force the element 81 into that hole to lock the plate 74 in the required position. To remove the plate the head 79 is screwed outwardly along the boss 77 to withdraw the spring and thus withdraw the locking member 81 to which the end of the spring is fixed. When the locking member is withdrawn from the hole the plate 74 can be lifted to withdraw the parts 75 from the wall of the element 1.

It has already been stated that the diameter of the bolt holes 8 in the element, is greater than the size of the head of the bolt 23 so that the head of this bolt can rest within the bolt hole 8 when the reducing washer 25 is omitted. This feature allows the plate 74 to be secured to the element 1 as described in such a position that the locking member 81 can engage, for example as shown in FIGURE 7, the same bolt hole 8 through which the head of a bolt 23 has been passed.

FIGURE 5 shows an alternative form of the part shown in FIGURE 4, and usable in the same way as that part. The part of FIGURE 5 comprises a channel section element 90 within which an end of an element such as the element 27 is welded. The outer surface 91 of the base of the element 90 has welded to it, or formed integrally with it, a rectangular projection 92 of a size to fit in an aperture 9 of a post element 1, or an aperture 61 of an element 42 (FIG. 2). Above the projection 92 is a bolt hole 93, spaced from the projection 92 to register with a bolt hole 8 in the post 1 (or a bolt hole 62 in the element 42).

In use, when the element 90 is to be secured to a post 1 (or 42) the projection 92 is inserted through a rectangular aperture 9 in the post 1 (or 68 in the post 42), and a bolt (not shown) is passed through the registering holes 8 and 93, and secured by tightening a nut thereon. In the arrangement shown in FIG. 5, such bolt may be passed outwardly through said holes from the interior of the post 1, after first being entered through the rectangular aperture adjacent the bolt hole 8. The head of said bolt may be held by a key inserted through said aperture while the nut, located within the channel element 90, is being tightened on the bolt.

The part as just described has the advantage over that shown in FIGURE 4 that only one rectangular aperture of the post element is utilised rather than two, and the capacity of such post element is thus doubled.

FIGURE 6 shows a member for use with elements such as 27 or 15 (FIGURE 1) having a cross-section such that they can be passed through rectangular apertures in a post. Elements of this cross-section can be formed with any required configuration of bolt holes relative to the rectangular apertures, and in fact the element 94 shown in FIG. 6 is a modification of the element 27 having in its side walls 95, 96 uniformly spaced bolt holes 97 (in place of the slots 29 of element 27) and in at least its upper wall 98 uniformly spaced smaller holes 31 adapted to receive self tapping screws.

Elements such as 27 or 94 with bolt holes 31 in their upper walls can be used for supporting cable trays directly, but when cable cleats are to be used for securing a cable then an element 15 with elongated slots 22, rather than circular bolt holes is desirably to be used. The member 100 shown in FIGURE 6 forms an adapter allowing cable cleats to be secured to an element such as 27 or 94 with bolt holes in the upper wall.

The adapter 100 takes the form of an inverted U-shaped member having a top wall 110 and two side walls 111 and 112, the dimensions being such that the adapter will fit over an element 94 (or 27) having the cross-section to fit within apertures 9 of a post. The top wall 110 is punched with a series of elongated slots 114 arranged with a shorter distance between adjacent slots than is the case with any of the structural elements themselves. The lower edges of the side walls have notches 115 with semi-circular bases of a diameter equal to the diameter of the bolt holes 97 in the opposite walls 95, 96 of

the element 113. The depth of the side walls 111 and 112 is such that when the adapter 100 is resting with its notches 115 engaging on bolts passed through the bolt holes 97 in the element 94 then a clearance 118 is left between the top wall 110 of the adapter and the surface 119 of the element. The pitch of notches 115 is half the pitch of bolt holes 97, so as to afford convenient adjustability of the adapter 100 along the member 94.

To secure a cable cleat 120 to the adapter when in position on the element, two key bolts 121 and 122 are used which have heads 123 of such dimensions that they can pass through the slots in one angular position, but not when rotated 45° from this position. The heads of the bolts are passed through the required slots, and then turned through 45° to lock the heads in the space 118 between the adapter and the element 94, with the heads resting on the surface 98 of the element. A cleat of any required form then has its bolt holes 124 passed over the bolts and is locked in position on the bolts by nuts 125.

The provision of the space 118 between the element and the adapter and the use of key bolts means that cleats can be added to or removed from the assembly without disturbing any other cleats or their associated cables.

Use of this adapter allows a full range of possible positions for the cleats, due to the slots, and yet enables the cleats to be supported by an element of very strong section. Although the adapter has been described when positioned above the element 113, it will be appreciated that it can equally well be positioned below the element.

FIGURE 8 illustrates a modification of the structure shown in FIGURE 1, being a section on the common horizontal median plane of a pair of apertures 9 in a post 1 and of an element 15 passing through and secured in said apertures. Generally, a rack constructed of means according to the invention, for supporting electric cables, will consist of a plurality of assemblies each comprising a free standing post 1 with at least one horizontal beam as shown in FIGURE 1, the cables extending substantially at right angles to the lengths of the beams. The horizontal beams may be extended so as to be supported in one of the various modes described by a wall element 42 as shown in FIGURE 2 or by another post 1 secured to a wall as shown in FIGURE 3. In the modification according to FIGURE 8 a plurality of assemblies as aforesaid is connected together by longitudinal stringers 151, each of which may be of the same form as any of the beam elements 15, 27 or 94 hereinbefore described. Such elements 151 have welded into their interiors, across each end, and spaced by a suitable distance from the end, a plate 152 which has a tapped hole 153 at its middle to receive one screwed end of a stud 154. The beam 15 is located in the apertures 9 of the post 1 and is secured by said stud 154 passing through a registering pair of the slots 21 in the side walls of said beam. Reducing washers 25 and 26 are passed over the respective ends of the stud so that as shown the inner ends of said washers bear upon the side walls of the beam 15, and the enlarged head portions of said washers are accommodated between the outer surfaces of the walls 2 and 3 of the post and the adjacent surfaces of the plates 152 in the ends of the stringer beams 151. These beams 151 are turned in the appropriate direction to screw the plates 152 up on the threaded ends of the stud 154, so that the end surfaces of the hollow sections of the beams 151 tightly engage upon the surfaces of the walls 2 and 3 of the post. A rack structure comprising several post and transverse beam assemblies is thus braced longitudinally by the presence of at least one beam element 151 between each two of the free standing posts.

It will be appreciated that all the parts that have been described are inter-usable with each other and it is a simple matter to decide what parts are necessary to build up any desired rack structure. It will also be obvious that a number of elements not shown and described specifically

can also be designed, for example with different configurations of bolt holes relative to the rectangular apertures.

The elements described are not of course limited to any particular dimensions. For heavy duty cable supports and other applications where high loading is expected the elements are preferably made from 10 gauge steel. For lighter loads 12 or 14 gauge steel is preferable. Convenient dimensions for the post element 1 when using 12 gauge (.104 inch) steel are that it may have overall dimensions of 2" x 2", with side walls which are flat both internally and externally over a width of at least 1½" and are joined by slightly rounded portions as shown in FIGURES 7 and 8 rather than meeting in the exact right angle shown in the other drawings. The series of alternate rectangular apertures and bolt holes are symmetrical about the longitudinal mean plane, and are also symmetrical about transverse planes at a unit longitudinal spacing of 3". The rectangular apertures are slightly more than 1" wide in the transverse direction by slightly more than 1½" long, and the bolt holes are of a size suitable for the passage therethrough of the head of a selected standard bolt, for example 1¼" to allow the passage of the head of a ¾" bolt.

The elements 15, 27 and 94 have external dimensions allowing them to be passed through the rectangular 1" x 1½" wide apertures in the element 1. The wider flat walls 16 and 17 of the element 15 have the apertures 20 again of a size slightly more than 1" wide by 1½" long, while the slots 21 are ¼" wide to provide clearance for the shank but not the head of a ¾" bolt, but are 1½" in length. The bolt holes 97 of element 94 are also ¼" diameter. The slots 22 in the walls 18 and 19 of the elements 15, and the slots 29 of element 27, are of the same size as the slots 21 and in addition the spacing between the slots 22 and 29 is again 1½". This arrangement of slots 21 and 29 means that the element 15 or 27 can be adjusted to any required length from the post element by varying the position of the bolt in the slot. In a particular example where the elements 15 are used as beams between two posts at the side of, say a tunnel, the elongated holes in the section 15 allow adjustment of 3" due to the fact that the elongated hole at each end is 1½" in length thus giving this adjustment at either end. To adjust by more than this 3" the next slot along the member is used, and the fact that the nearest ends of the slots are 1½" apart means that the member 15 may be adjusted to any desired width. When using 14 gauge sheet the dimensions of the elements can be suitably scaled down. The holes 31 in elements 27 (FIGURE 1) and 94 (FIGURE 6) may for example be of .209 inch diameter to receive No. 14 self-tapping screws, for the direct securing of cable trays and like supports to the beam elements.

Structural elements according to the invention are adapted to afford a variety of racks affording a multiplicity of anchorages for pipe or cable clips, hangers or other supports of various forms designed to support pipes or cable singly or in groups, or perforated tray plating which is often employed, in various widths, for supporting numbers of electric cables.

What I claim and desire to protect by Letters Patent is:

1. Structural means comprising a first element serving as a post, of hollow, substantially rectangular cross-section having in one opposed pair of its walls a number of equally spaced, substantially rectangular apertures, the apertures in said pair of walls being of the same size and in register, two longitudinal sides of each aperture being parallel to the length of the element, and having a number of registering pairs of bolt holes in the other opposed pair of walls, said bolt holes being located in the transverse median planes of successive apertures in said one pair of walls; a second element, of hollow substantially rectangular cross-section and of dimensions such that said second element fits through a registering pair of apertures in the first element and is supported upon lower transverse sides of said apertures, and having a series of registering

pairs of bolt holes in its pair of walls that are fitted to said two longitudinal sides of said apertures in the first element; and bolt means which extend through a pair of bolt holes in said second element and at least one bolt hole in said first element holding the two elements together with the second element extending horizontally through the first element.

2. Structural means according to claim 1, wherein said first element has bolt holes of a size to permit the passage of a head of a bolt and said second element has bolt holes of a size to permit the passage of a shank and prevent the passage of said head of the same bolt, said bolt means which hold the two elements together comprising two reducing washers located upon said bolt, each in one of a registering pair of bolt holes in said first element, with a head of said bolt and a nut member respectively engaging tightly each upon one of said washers.

3. Structural means according to claim 1, wherein said first element has bolt holes of a size to permit the passage of a head of a bolt and said second element has bolt holes of a size to permit the passage of a shank and prevent the passage of said head of the same bolt, said bolt means which hold the two elements together comprising such a bolt with its head bearing against one wall of said second element and thereby housed within said first element, a reducing washer located upon said bolt in one of the bolt holes of said first element and bearing upon one wall of said first element, and nut means engaging said bolt and tightened upon said reducing washer.

4. Structural means according to claim 1, wherein said bolt means comprises a stud having two screw threaded ends extending through a pair of bolt holes in said first element and a pair of bolt holes in said second element, two reducing washers located in said bolt holes of the first element each upon one end of the stud, the inner ends of said washers bearing upon the lateral surfaces of said second element, and two longitudinal stringer elements each having in one end a recess and a tapped hole to engage one end of said stud, the two stringer elements being rotated with said tapped hole in engagement with the stud to tighten the ends of said stringer elements upon opposite walls of said first element, said recesses accommodating the head portions of the reducing washers.

5. Structural means according to claim 4, wherein each of said stringer elements has a hollow section similar to that of said second element, and a plate welded within the section at a suitable spacing from the end, said tapped hole being formed in the plate.

6. Structural means comprising a first element serving as a post, of substantially square hollow section, each two opposed pairs of its walls having series of rectangular apertures, upper and lower sides of each aperture being perpendicular to the length of the element, and bolt holes alternate with said apertures, the apertures in opposite walls being of the same size and in register, the bolt holes in opposite walls being in register, and the bolt holes in each pair of walls being located on the transverse median planes of the rectangular apertures in the other pair of walls; and a second element passing through an opposed pair of apertures in the first element, and having in one opposed pair of walls spaced series of co-axial bolt holes so disposed that a pair of bolt holes in the second element register with a pair of bolt holes in the first element for the passage of bolt means locking the two elements together with the second element extending horizontally and transversely to the first element, and supported on said lower sides of the pair of apertures through which it passes.

7. Structural means according to claim 1, further comprising a third element intended to serve as another post, of hollow substantially rectangular cross-section, having in at least one of its walls a number of equally spaced, substantially rectangular apertures, two sides of each aperture being parallel to the length of the third element; and said second element having fixed to one of its ends, re-

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mote from said first element, a plate, the plate bearing, on the side facing away from the second element, locating means for co-operating with at least one aperture in said third element, and having means whereby said second element is securable to the third element to hold the second element in a required position relative to the third element.

8. Structural means according to claim 1, further comprising a third element intended to serve as another post, of hollow, substantially rectangular cross-section, having in at least one of its walls a number of equally spaced, substantially rectangular apertures with two sides of each aperture parallel to the length of the third element, and a number of bolt holes alternate with and equally spaced between said apertures; and said second element having a plate fixed to one of its ends, remote from said first element, the plate bearing, on the side facing away from the second element, locating means for co-operating with at least one aperture in said third element, and said plate further having means to co-operate with a bolt hole adjacent said one aperture in the third element, for the securing of said plate and therewith the end of the second element to said third element.

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211—177