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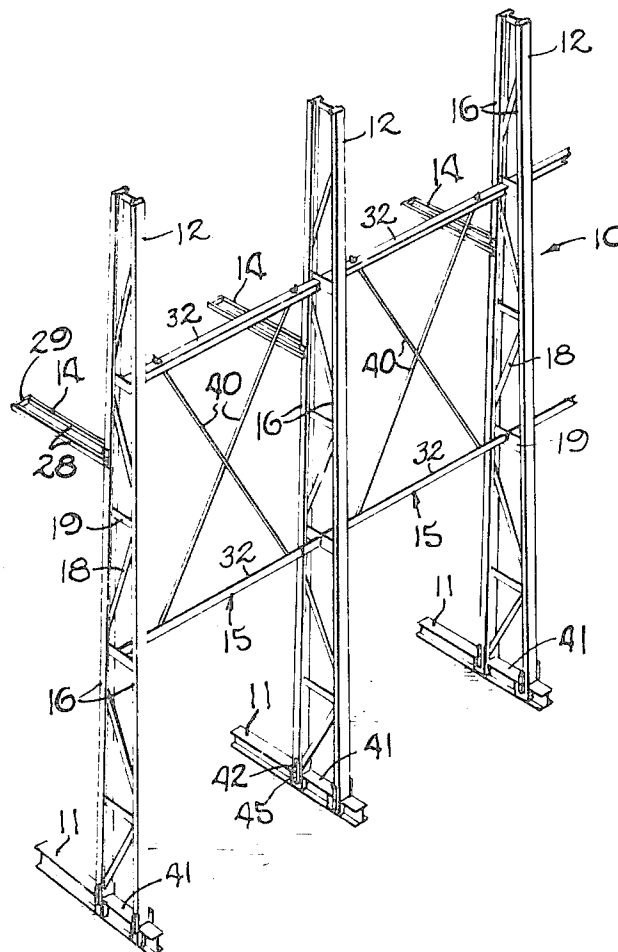
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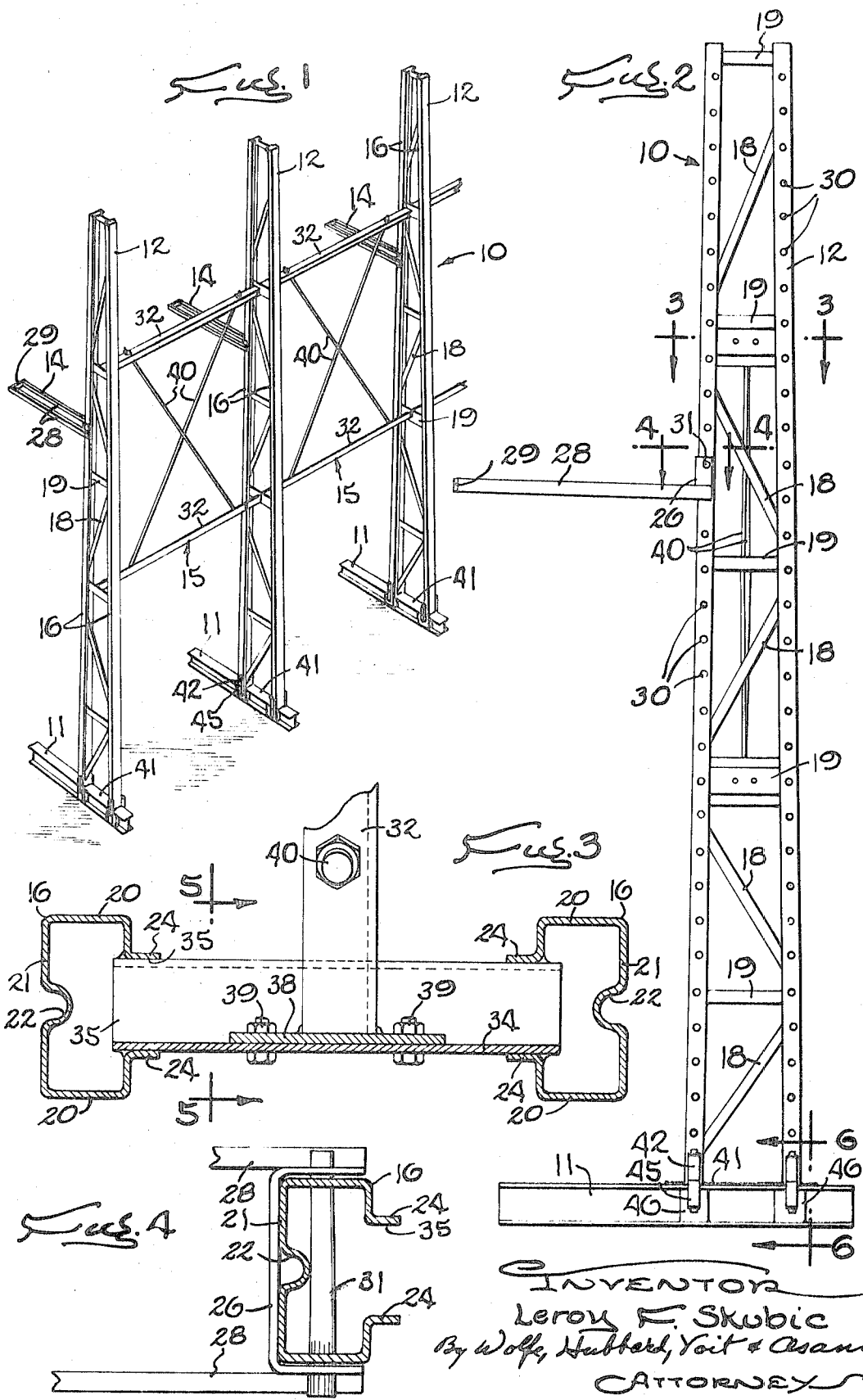
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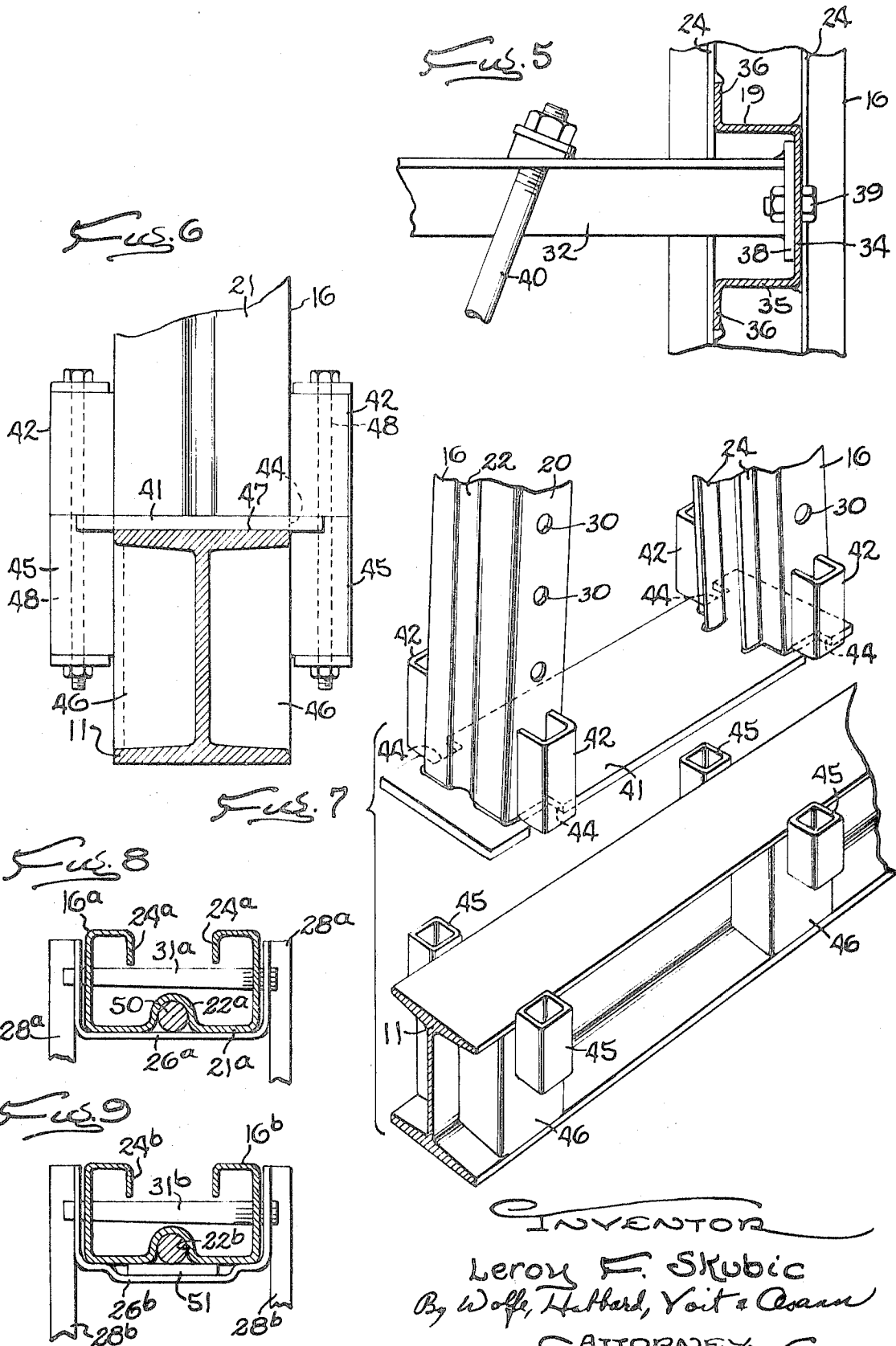
[54] **CANTILEVER RACK WITH TRUSS UPRIGHTS**
 5 Claims, 9 Drawing Figs.

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ABSTRACT: A cantilever rack having upright columns formed of a truss construction and being tapered upwardly to provide a structure of maximum strength and stability with a minimum of material. The columns each include a pair of generally C-shaped channels which are inclined toward each other to provide a wider column base than top and are interconnected by horizontal and diagonal truss members. The upright columns are secured to the rack base by tension fasteners which incur only minimal shearing stresses.







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CANTILEVER RACK WITH TRUSS UPRIGHTS

This invention relates to cantilever racks, and more particularly to adjustable cantilever racks for storing heavy industrial items such as bars, tubes, sheets and other industrial material.

In the past, the upright columns of such cantilever racks often have been constructed from sheet metal panels which are sheared to size and then bent in a press brake. One of the drawbacks of such a construction is that the dimensions of the panel are limited to the size of the press. In addition, the large mass of steel making up the panel and the time and labor required in cutting and forming the upright cause the construction to be quite expensive.

When rolled members are used in constructing the upright column of cantilever rack, the height of the rack may be significantly taller. However, when such racks are loaded on only one side of the column, particularly when the load is near the top of the rack, the column often experiences slight deflection, causing the rack arm to encroach upon the aisle adjacent the rack.

It is an object of the present invention to provide a cantilever rack which affords a high degree of stability and strength and may be constructed and assembled with a substantial saving of time, labor and material.

Another object is to provide a cantilever rack as characterized above which may be constructed to a substantial height from rolled members and which has stability and strength comparable to uprights formed from more massive pressed panels.

A further object is to provide a cantilever rack of the character set forth above which when loaded on only one side may incur a slight deflection of the upright column without the load-supporting arm encroaching upon the aisle adjacent the rack.

Still another object is to provide the above-type cantilever rack in which the uprights may be readily secured to the rack base by tension fasteners which incur only minimal shearing stresses.

Other objects and advantages of the invention will become apparent from the attached detailed description and upon reference to the drawings, in which:

FIG. 1 is a perspective view of a cantilever rack embodying the present invention;

FIG. 2 is an enlarged side elevation view of the cantilever rack shown in FIG. 1;

FIG. 3 is an enlarged fragmentary section taken in the plane of line 3—3 of FIG. 2;

FIG. 4 is an enlarged fragmentary section showing the connection of the cantilever arm to the column, taken in the plane of line 4—4 of FIG. 2;

FIG. 5 is a fragmentary section taken in the plane of line 5—5 of FIG. 3;

FIG. 6 is an enlarged fragmentary section showing the fastening means for securing the upright column to the rack base, taken in the plane of line 6—6 in FIG. 2;

FIG. 7 is a perspective view showing a portion of the rack base with the upright column disassembled and spaced therefrom;

FIGS. 8 and 9 show alternative reinforced constructions of the members forming the upright column of the rack.

While the invention is susceptible to various modifications and alternative forms, certain specific embodiments thereof are shown by way of example in the drawings and will be described herein. It should be understood, however, that it is not intended to limit the invention to the particular forms disclosed, but on the contrary, the invention is to cover all modifications, equivalents, and alternatives, falling within the spirit and scope of the invention.

Referring more particularly to FIGS. 1 and 2 of the drawings, the invention is there exemplified in an illustrative cantilever rack 10 which comprises a base 11 in the form of a series of I-beams, each supporting an upright column 12 having a vertically adjustable load-supporting cantilever arm 14. Interconnecting means, generally indicated at 15, ties the columns 12 together and secures them against relative lateral movement.

In accordance with the present invention, the rack columns are formed of a truss construction and are tapered upwardly so as to produce an upright structure of maximum strength and stability with a minimum amount of material. The illustrated columns 12 each include a pair of opposed channels 16 inclined slightly toward each other so that the base of the column is wider than the top when viewed from the side, as in FIG. 2. Diagonal and horizontal truss members 18, 19 interconnect the two channels to form a rigid column structure.

In keeping with the invention, the channel members 16 of the truss column 12 are designed for maximum strength. Each channel has a substantially C-shaped cross section, having oppositely disposed legs 20 joined by an outwardly facing web 21. Increased reinforcement of the channel is achieved by an inwardly depressed concave central portion 22 which extends the full length of the channel. In addition, the legs 20 curve inwardly and terminate with short flanges 24 which define a longitudinal opening 25 to the channel interior which is narrower than the width of the channel. The diagonal and horizontal truss members 18, 19, which may be U-shaped channels or any other type of rigid member, can be readily secured to the parallel flanges 24 by welding or other appropriate fastening means.

It will be appreciated that the column channels 16 may be produced in long uninterrupted segments by commonly used rolling techniques so that the rack may be made much taller than heretofore possible with pressed sheet metal panels. It has been found that the tapered truss construction has the load supporting strength and stability comparable to the more massive panel-type constructions.

The tapered column construction also permits the upright to experience slight deflection when loaded on only one side of the column without the cantilever arm encroaching upon the adjacent aisle. As the load-supporting arm 14 is positioned higher on the column 12, the taper of the column causes the arm to be set back proportionally a greater distance from the aisle. Thus, any slight column deflection which might occur when the load is near the top of the column is compensated for by the taper of the column.

The support arm 14 of the illustrated rack comprises a bracket 26 having a channel shape complementary to the outer surface of the column channel 16 and a pair of arm members 28 extend outwardly from the lower side portion of the bracket. The outer ends of the arm members 28 are joined by a tie rod 29. While in the illustrated structure a rack arm is shown on only one side of the columns, it is understood that a similar arm could be provided on the opposite side.

In order to adjustable position the arm 14 at various vertical positions on the column 12, each column channel 16 is formed with a series of equally spaced apertures 30 along its entire length. The upper portion of support arm bracket 26 is formed with a pair of similar horizontally aligned apertures so that the bracket is positioned on the column channel and secured thereto by placing a pin 31 through the bracket apertures and selected corresponding column apertures 30. As shown in FIG. 4, neither the reinforcing concave recess 22 of the channel nor the flanges 24 to which the truss members 18, 19 are secured interfere with the insertion of the pin 31 through any aperture 30 along the length of the column.

Securing the arm to the column by a single pin through the upper portion of the bracket as illustrated permits the arm 14 to be swung upwardly when accidentally struck by the force of a lifting device so as to prevent damage to the arm. If desired, however, the arm may be rigidly secured to the column by a pair of pins. Preferably, the arm 14 should be constructed so that when mounted on the column the upper load supporting surface of the arm is tilted slightly upwardly, as shown in FIG. 2, which tends to prevent goods from accidentally sliding off the end of the arm.

The connecting means 15 includes horizontal angles 32 secured between horizontal truss members 19 of the adjacent columns 12. To facilitate connecting the angles 32 to the column, the horizontal truss members 19 to which the angles 32 are secured may be in the form of a large channel, as shown

in FIGS. 3 and 5, having a web 34 and opposed legs 35 which terminate in outwardly flared flanges 36 parallel to the web. The web 34 and flanges 36 of the truss member 19 are welded at each end to the flanges 24 of the column channel 16. The connecting angle 32 has welded end plates 38 which are secured by bolts 39 to the web 34 of the truss channel 19. To further increase the rigidity of the rack structure, diagonal tension rods 40 are secured between parallel connecting angles 32.

In accordance with another aspect of the invention, each column 12 may be readily secured to its respective base 11 by a fastening means which incurs only minimal shearing stresses. As best shown in FIGS. 6 and 7, a mounting plate 41 connects the bottoms of the two channels 16 of each column. Sleeves 42 are welded on opposite sides of each column channel immediately above the mounting plate 41, and the portion of the mounting plate below each sleeve 42 is removed to form a notch 44. Similar sleeves 45 are secured to the base 11 at positions corresponding to the location of the column sleeves 42. To facilitate mounting the sleeves 45 to the base I-beams 11, appropriate support blocks 46 are provided. The sleeves 45 are disposed on the base 11 in such manner that they protrude above the top surface 47 of the base 11 the approximate thickness of the baseplate 41. Thus, when the column 12 is positioned on the base the sleeves 42, 45 are in axial alignment, with the upper portion of the base sleeves 45 being received in the mounting plate notches 44 to prevent the lateral shifting movement of the column on the base. To prevent vertical movement of the column from the base, appropriate bolts 48 secure the sleeves 42, 45 together. It will be appreciated that the bolts 48 experience primarily tensile stresses and only minimal shearing stresses since relative lateral movement of the column and base is secured by the engagement of the sleeves 45 in mounting plate notches 44. The disadvantage of shearing such fastening bolts 48 by forces created in a heavily loaded rack is thereby eliminated.

In view of the foregoing, it can be seen that the cantilever rack of the present invention has a high degree of stability and strength and yet may be easily and economically constructed and assembled. The tapered truss columns of the rack provides the maximum strength and rigidity with the minimum of materials.

To further increase the strength of the columns 12, the column construction may be modified as shown in FIGS. 8 and 9, wherein similar parts have been given numbers corresponding to those previously described with the distinguishing suffix "a" and "b" added, respectively. In FIG. 8, the concave recess 22a in the web 21a of the column channel 16a serves not only to stiffen the web, but also provides a recess into which a long steel rod 50 is inserted and welded. The rod 50 adds to the load capacity of the rack while not interfering with the assembly of the arm bracket 26a on the column since the rod 50 is contained below the outer surface of the web 21a. In this case, the flanges 24a of the channel legs 20a terminate inwardly rather than outwardly, but again do not interfere with the insertion of the arm securing pin 31. FIG. 9 shows a column construction, similar to that shown in FIG. 8, but also including an additional flat reinforcing plate 51 welded to the outer web surface of the channel 16b, thus further increasing the load capacity of the column. The arm bracket 26b in this case is modified to closely conform to the shape of the reinforcing plate 51 and channel 16b.

The following is claimed as my invention:

1. A cantilever rack comprising a base, a plurality of upright columns supported by said base in spaced side-by-side intervals, means securing said columns to said base, said columns each having a truss construction consisting of a pair of opposed individual uninterrupted channels interconnected by alternating horizontal and diagonal truss members, the lower ends of alternate diagonal truss members of each column being secured to the same channel of that column and the lower ends of the other diagonal truss members being secured to the other channel of said column, said channels each having a pair of parallel legs joined by a web, said channels of each pair being inclined toward each other to form an upwardly tapered column having a base wider than the top when viewed from the side, connecting rods secured to corresponding horizontal truss members of adjacent columns for preventing relative lateral movement of said columns, diagonal tension rods joining said connecting rods, a load-supporting arm secured to and vertically positionable on one side channel of each column, said load-supporting arm having a bracket shaped to conform closely to the outer surface of one of said column channels and an arm members extending outwardly from said bracket, said bracket having axially aligned apertures, said channel legs upon which said arm is positionable each having aligned vertically spaced apertures, and a pin for insertion through said bracket apertures and selected channel apertures to selectively position said arm at a predetermined elevation on said column with said bracket closely engaging said channel.

2. The cantilever rack of claim 1 in which said channel legs terminate with flanges which define a longitudinal opening to the interior of said channel which is narrower than the width of said channel, and said truss members connecting said column channels are secured to said flanges.

3. The cantilever rack of claim 1 in which a reinforcing rod is disposed adjacent the outside surface of each channel web within said concave recess, said recess and reinforcing rod having relatively small cross-sectional dimensions in comparison to said channel so as not to obstruct the insertion of said shelf-securing pins through said channel legs, and said rod being contained in said recess below the outer surface of the web to permit mounting of said arm bracket on said column channel immediately adjacent said web.

4. The cantilever rack of claim 1 in which a reinforcing rod is disposed within the concave recess of said column channel below the outer surface of said web, a flat reinforcing plate secured to the outer channel web surface and extending longitudinally along said channel, and said arm bracket being shaped to conform closely to the outer surface of said reinforcing plate and column channel.

5. The cantilever rack of claim 1 in which said means for securing each said column to said base includes sleeves mounted near the bottom of said column channel, said base having sleeves at corresponding positions below said column sleeves, a mounting plate connecting the lower ends of the channels of each column and being formed with notches which receive the upper portion of said base sleeves to prevent relative lateral movement of said column relative to said base, and tension fastening means securing said column sleeves and corresponding base sleeves to prevent vertical movement of said column with respect to said base.