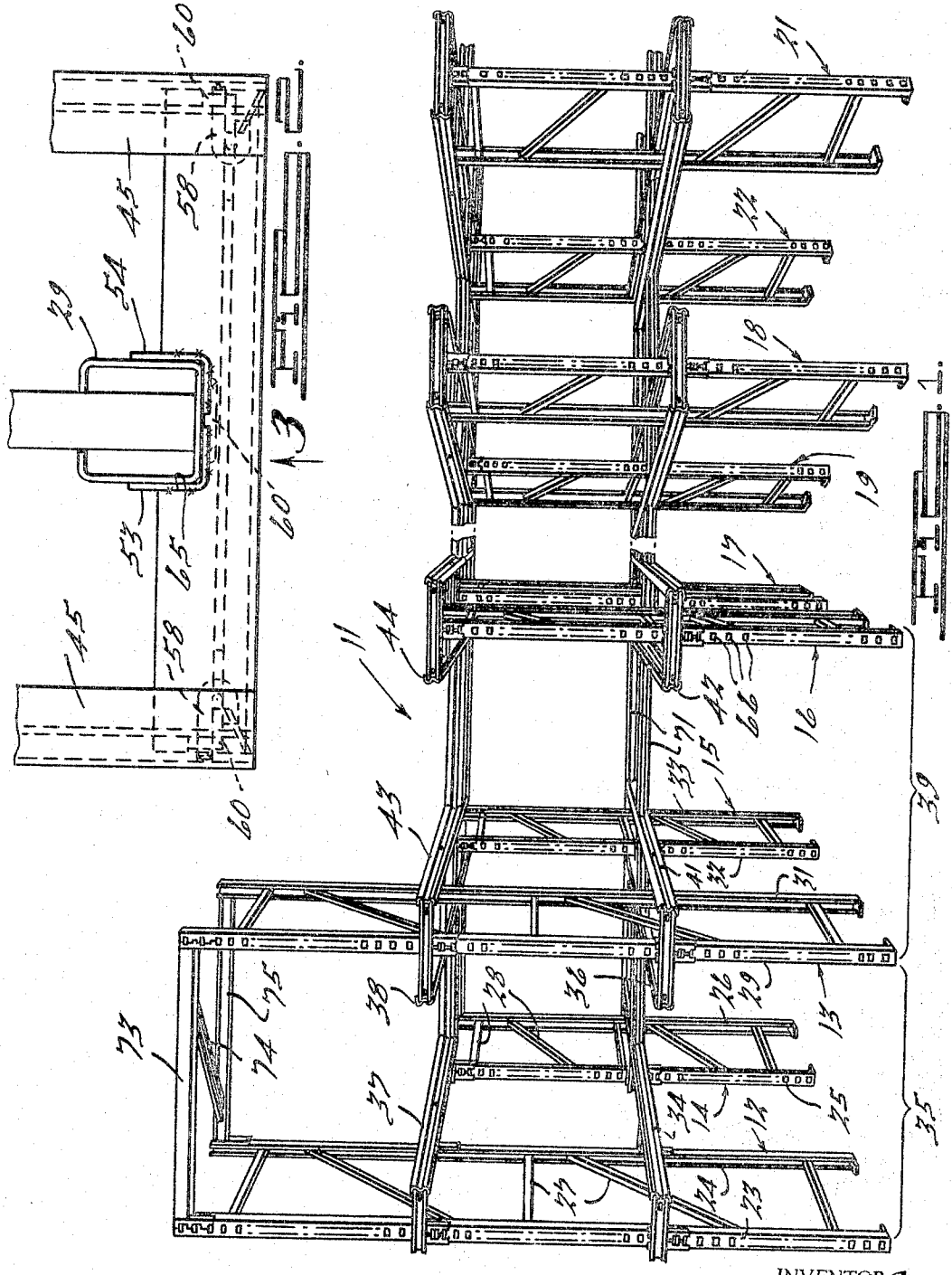
June 6, 1967 D. A. FORAN ET AL 3,323,655

DRIVE-IN AND DRIVE-THROUGH STORAGE RACKS

Filed Sept. 27, 1965 4 Sheets-Sheet 1



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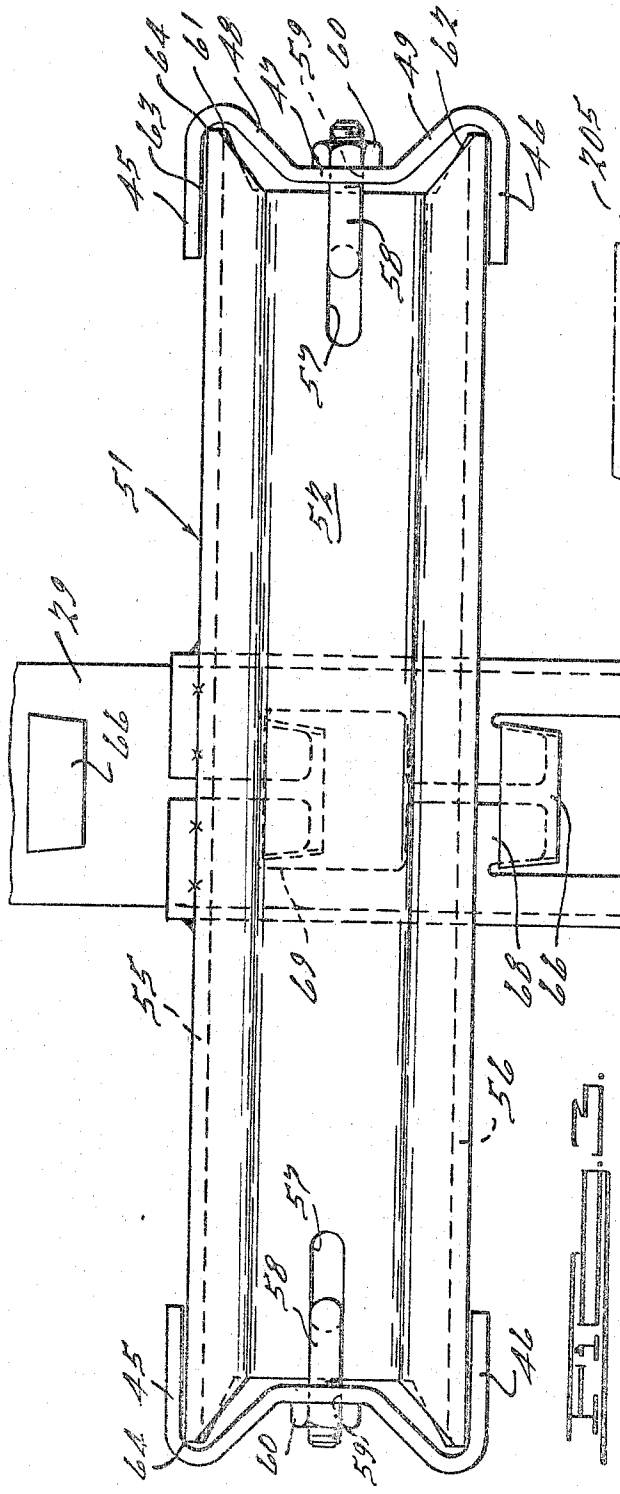

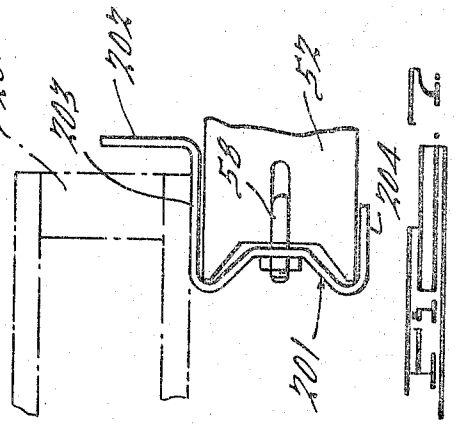

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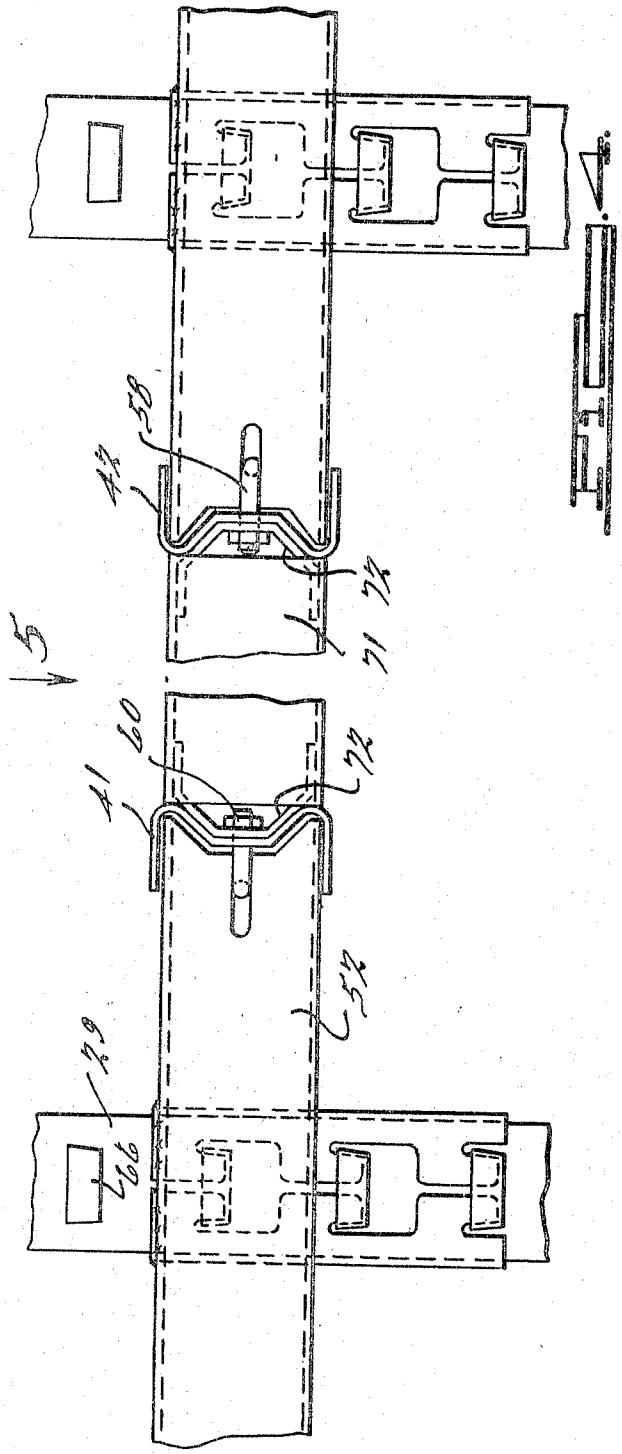
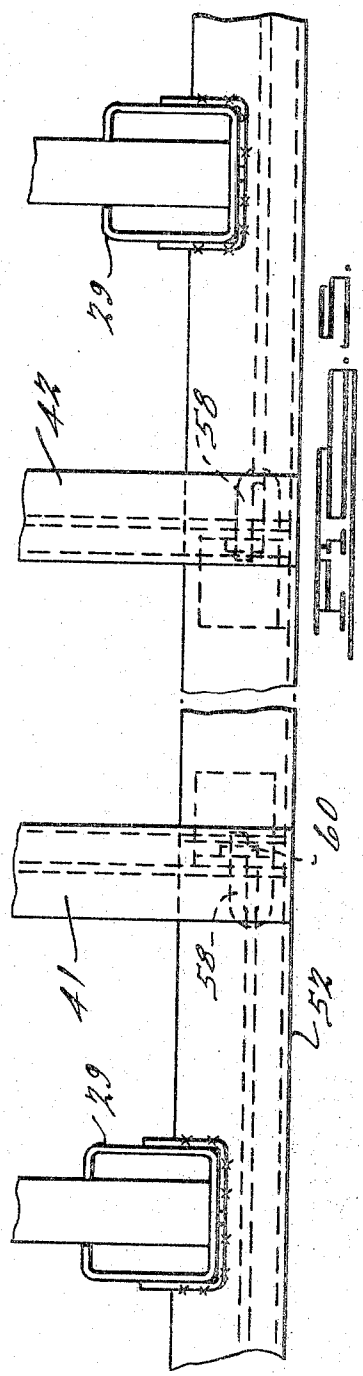
DRIVE-IN AND DRIVE-THROUGH STORAGE RACKS

Filed Sept. 27, 1965 4 Sheets-Sheet 3





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DRIVE-IN AND DRIVE-THROUGH STORAGE RACKS

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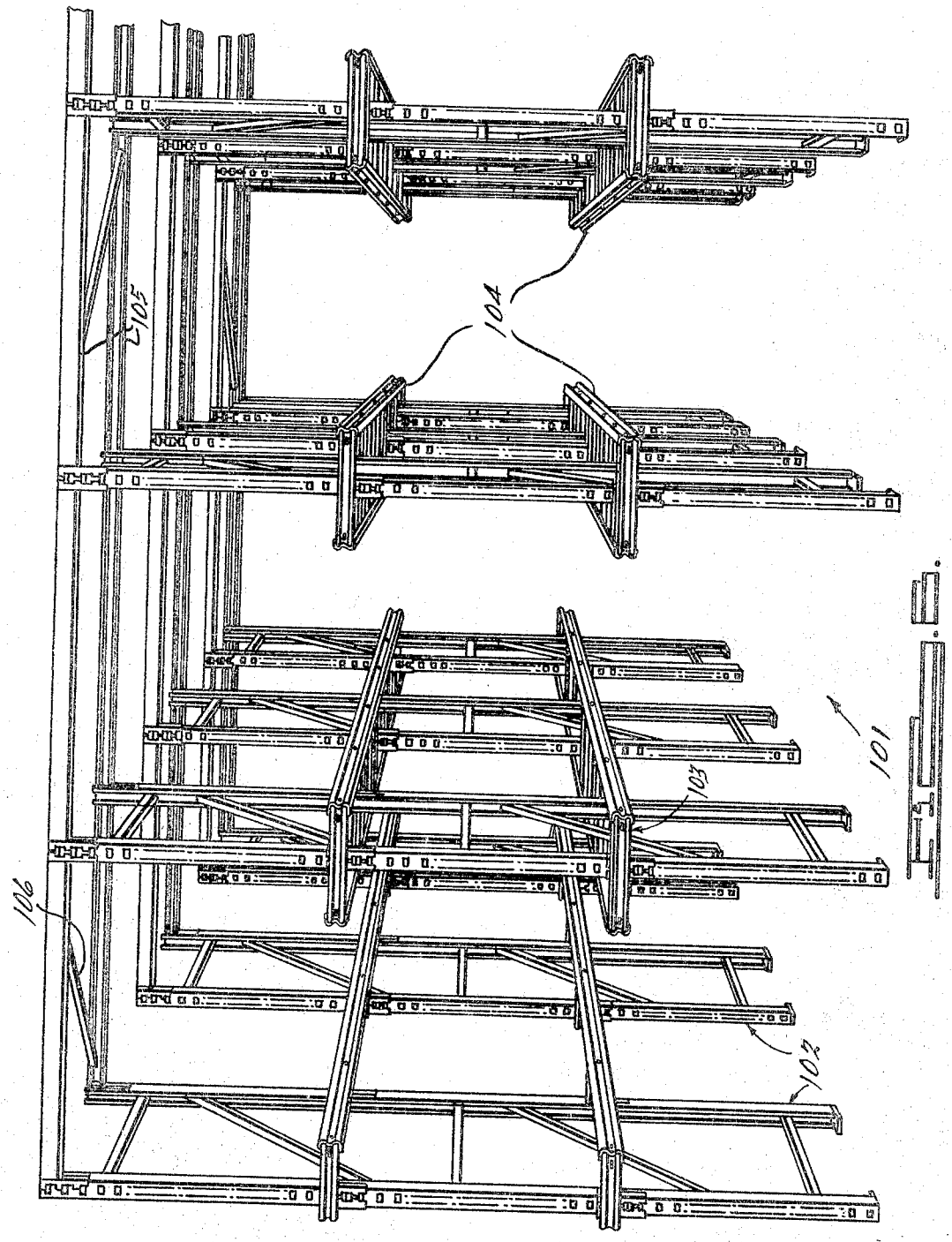
4 Sheets-Sheet 4



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DRIVE-IN AND DRIVE-THROUGH STORAGE RACKS

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This invention relates to drive-in and drive-through storage racks, and more particularly to industrial storage racks of the collapsible type which are used to store pallet-supported or other merchandise handled by fork lift trucks or the like.

It is an object to provide a novel and improved storage rack of this character in which the there is a relatively greater amount of space in a vertical direction for a given weight capacity.

It is another object to provide an improved storage rack of this character in which the danger of loads catching on projecting parts of the storage rack while being moved into or out of the rack is greatly lessened.

It is also an object to provide an improved storage rack having these characteristics which greatly reduces the number of posts or vertical supporting members necessary in a rack of given capacity.

Other objects, features and advantages of the present invention will become apparent from the subsequent description, taken in conjunction wtih the accompanying drawings.

In the drawings:

FIGURE 1 is a perspective view of a drive-in storage rack incorporating the principles of the present invention.

FIGURE 2 is a fragmentary top elevational view of a rail support and its adjacent parts.

FIGURE 3 is an enlarged front elevational view of the rail support taken in the direction of the arrow 3 of FIGURE 2.

FIGURE 4 is an enlarged front elevational view of a rail tie with its connected parts.

FIGURE 5 is a top plan view of the parts shown in FIGURE 4, taken in the direction of the arrow 5 thereof.

FIGURE 6 is a perspective view of a portion of a drive-through rack incorporating the present invention, and

FIGURE 7 is a fragmentary front elevational view of a storage rack showing a modified form of rail which incorporates a pallet guide flange.

Briefly, each of the illustrated embodiments of the invention comprises a collapsible storage rack having a plurality of rows of post assemblies, each post assembly having a pair of spaced posts with the posts in each row of post assemblies being aligned. The rows are spaced apart a sufficient distance to permit entry of a load such as merchandise carried by a pallet and transported by a fork lift truck. In each space are pairs of rails at different levels, the rails in each pair being at the same level and spaced from the posts. Each rail comprises a metal beam having a cross-sectional configuration like that shown and described in Patent No. 3,194,408, issued July 13, 1965, to J. C. Kimpton, entitled Storage Rack Construction. The two rails at each level which are on opposite sides of each row of posts are mounted on the posts by rail supports. Each rail support comprises a short beam of cross-sectional configuration similar to that of the rails, but of lesser height, the central portion of the rail support having a pair of connecting members with downwardly extended teeth adapted to fit into outwardly pressed portions on the post webs. The upper and lower flanges of the rails mounted on each set of rail supports fit over and under the rail supports respectively, so that the rails and

rail supports at each level are substantially at the same level rather than the rails resting on the rail supports. The connecting means between the rail supports and posts are closely adjacent the posts and do not project substantially outwardly therefrom. For drive-in racks, rail ties may be provided, these comprising channels with ends which interfit with the rails. The rail ties will be aligned with the rail supports at the back of the drive-in rack. Securing means in the form of J-shaped bolts are provided for connecting the rail supports with the rails, and these are also usable for connecting the rail ties to the rails and rail supports.

Referring more particularly to the drawings, a drive-in storage rack is generally indicated at 11 and comprises a plurality of horizontally spaced rows of post assemblies. Two such assemblies are of greater height than the others and are generally indicated at 12 and 13 respectively. A shorter post assembly 14 forms a row with assembly 12 and a shorter post assembly 15 forms a row with assembly 13. A third row consists of assemblies 16 and 17 and fourth and fifth rows 18, 19, 21 and 22 are also shown.

Post assembly 12 comprises a front post 23 and a rear post 24 and post assembly 14 comprises a front post 25 and rear post 26. Posts 24 to 26 are approximately evenly spaced apart. Interconnecting members 27 secure posts 23 and 24 together in a rigid assembly, and interconnecting members 28 do likewise for posts 25 and 26.

Similarly, post assembly 13 has a front post 29 and a rear post 31 while post assembly 15 has a front post 32 and a rear post 33. The other post assemblies also each have a front post and a rear post rigidly interconnected.

A rail 34 is disposed in the space between the first and second rows of post assemblies reading from the left, this spaced being indicated at 35. A second rail 36 is also disposed within space 35 at the same level as post 34. Rail 34 is spaced somewhat inwardly from and parallel to post assemblies 12 and 14, whereas rail 36 is spaced inwardly from and parallel to post assemblies 13 and 15. The space between rails 34 and 36 is sufficient to permit entry of a fork lift truck or other load to be placed on the rails.

A similar pair of rails 37 and 38 are spaced above rails 34 and 36 respectively. The succeeding bays or spaces also each have a lower pair of rails and an upper pair of rails; in the next bay 39 these are designated at 41 and 42 at the lower level and 43 and 44 at the upper level.

Each rail has a cross-sectional configuration similar to that shown and described in the aforementioned patent. That is, each rail has an upper horizontal flange 45 (FIGURE 3), a lower horizontal flange 46, a central vertical web 47 between the flanges and spaced inwardly from the edges thereof, and inclined portions 48 and 49 connecting the edges of flanges 45 and 46 away from the posts with web 47.

The means for securing the rails to the post assemblies comprises a plurality of rail support assemblies, one of which is indicated generally at 51 in FIGURE 3. Each rail support assembly comprises a rail support 52 and a pair of connecting members 53 and 54. Rail support 52 is a short beam having a configuration similar to that of the rails but with upper flange 55 and lower flange 56 closer together by an amount which will permit the ends of the support to fit into the space between flanges 45 and 46 of each rail, as seen in FIGURE 3. The opposite ends of each rail support are notched at 50 to provide clearance for portions 47, 48 and 49 of the rail. An elongated slot 57 is provided adjacent each end notch, and a J-shaped bolt 58 is used to secure the rail to the rail support, seen in FIGURES 2 and 3. The shorter end of this bolt will be hooked into slot 57 and the longer end will project through an aperture 59 in web 47 of the rail. The longer end of the

bolt is threaded and a nut **60** is mounted thereon and when tightened will draw the rail against the rail support.

The edges of the rail support are skewed as indicated at **61** and **62** in FIGURE 3. The purpose of this is to avoid contact between the rail and rail support in the area indicated at **63** but instead to achieve line contact at **64**. This will avoid a twisting moment on the rail when it is subjected to load and increase its stability; this is especially important when the rail is connected to rail ties as described below.

The central portions of flanges **55** and **56** of each rail support **52** are notched, as indicated at **65** in FIGURE 2, and connecting members **53** and **54** are disposed within these notches. These connecting members have angular cross-sectional shapes and together are adapted to fit around a post such as post **29** indicated in FIGURE 2. The posts have rectangular cross-sectional shapes with smooth side surfaces and outwardly pressed portions **66** on their webs as indicated in FIGURES 1 and 3. Connecting members **53** and **54** have downwardly facing teeth **67**, **68** and **69** formed thereon, these teeth being one above the other with recesses therebetween. Both connecting members **53** and **54** are secured by welding or other means to rail support **52** to form a rigid assembly therewith. The arrangement is such that connecting members **53** and **54** may be slipped onto a post with teeth **69** between outwardly pressed portions **66**, and then slipped down the post so that teeth **69** enter the upwardly facing spaces formed by outwardly pressed portions **66**. In this manner the weight exerted on rail support assembly **51** will be transferred to the post. The sides of outwardly pressed portions **66** are tapered downwardly toward each other and so are the corresponding edges of teeth **69**, so that these surfaces will engage each other.

At the left hand end of storage rack **11** the rail supports do not extend to the left of the posts as great a distance as they extend to the right. This will permit erection of the storage rack adjacent a wall.

The outwardly pressed portions **66** of posts **24** and **26**, and of posts **31** and **33**, face rearwardly instead of forwardly, and the rail support assemblies **51** will be mounted on these posts from the rear instead of from the front. The same applies to the rear posts of the other post assemblies **16** through **22**. Rail supports will be mounted on all these ports and connected to the rails as described above.

At the rear of the storage rack a plurality of rail ties **71** are provided. The purpose of these ties is to interconnect adjacent post assemblies and provide additional load supporting means. The construction of a rail tie **71** and the manner in which it is connected to the remainder of the storage rack is seen in FIGURES 4 and 5. Each rail tie comprises a channel-shaped member with a height the same as the height of a rail support **52**. Connecting brackets **72** are secured to the opposite ends of each rail tie, these connecting brackets comprising straps with their opposite ends secured to the insides of the rail tie flanges and the central portion projecting outwardly from the rail tie. This central portion has a shape complementary to the shape of a rail such as rails **41** and **42** in FIGURES 4 and 5 so that it will interfit with portions **47**, **48** and **49** of the rail. Brackets **72** are apertured to receive J bolts **58** so that the rail will nest between a rail support **52** and a bracket **72**. Tightening of nut **60** will thus draw the rail support, rail and rail tie into securely fastened relation. In the embodiment of FIGURE 1, two rail ties **71** will be provided at each of the two levels in each bay, and four rail support assemblies will be provided at each level for each row of two post assemblies, with the two rear rail supports being aligned with the rail ties. To further rigidify the structure, additional interconnecting members **73**, **74** and **75** may be provided for the upper ends of posts **23**, **24**, **29** and **31**.

It will be noted that in the novel storage rack the rails are not disposed above the rail supports but are at the same level. This will provide increased vertical stacking space between levels. Furthermore, there are no brackets or other projections adjacent the rails which might interfere with movement of loads into and out of the bays. Because of the greater beam strength of the rails as compared with conventional channel shaped rails, they can be supported at more widely spaced points. For example, in the present embodiment, each rail is supported at four points along its length, whereas if a conventional channel shaped rail were used of equivalent outside dimensions, it would have to be supported at perhaps six points along its length, thus requiring an additional post assembly in each row.

FIGURE 6 shows a modified form of drive-in rack, namely a drive-through rack generally indicated at **101** which is basically similar to rack **11** but does not have the rail ties, so that it can be loaded or unloaded from either the front or the rear. The post assemblies are here indicated at **102** and the rail support asemblies at **103**. The post assemblies and rail support assemblies, as well as rails **104**, will be constructed in a manner similar to that described above. Here again the novel construction will result in the rails being at the same level as the rail supports rather than above them, without projecting brackets adjacent the rails, and with a minimum of necessary post assemblies for a given length of rails. Overhead tie members **105** and **106** may be provided to secure the rows of post assemblies into a rigid construction.

FIGURE 7 shows a modified form of rail generally indicated at **201**. This rail has an additional upward flange **202** extending from an upper horizontal flange **203** which is wider than the lower flange **204**. The purpose of flange **202** is for guiding purposes and it will tend to maintain the position of a pallet or other load indicated in dot dash lines **205** as the latter is moved into and out of the bay. FIGURE 7 shows rail **201** as being secured to a rail support **52** by a bolt **58** in the same manner as before. It is thus seen that the novel construction permits the addition of load guiding means integrally formed with the rails, thus avoiding the necessity of additional parts or labor.

While it is apparent that the preferred embodiments of the invention disclosed are well calculated to fulfill the objects above stated, it will be appreciated that the invention is susceptible to modification, variation and changes without departing from the proper scope or fair meaning of the subjoined claims.

What is claimed is:

1. In a drive-in storage rack, at least two rows of posts forming a bay therebetween, a pair of rails in said bay extended parallel to said rows of posts, each rail comprising upper and lower horizontal flanges, a central vertical web between such flanges, and inclined web portions connecting corresponding edges of such flanges with the upper and lower edges of said web, said inclined web portions being on the sides of said rails facing each other, and rail support assemblies connecting each post in each row with its corresponding rail, each of said rail support assemblies comprising a rail support having upper and lower flanges the ends of which are disposed within the vertical confines of said upper and lower rail flanges, web means connecting said rail support flanges, a notched portion at the end of said rail support within said rail to provide clearance for said vertical and inclined rail webs, and means detachably connecting said rail support with said post.

2. The combination according to claim **1**, further provided with means for securing each rail to each of its rail supports, each of said means comprising a J-shaped bolt having its short end disposed with an apertured portion in the rail support web means and its threaded long end disposed within an apertured portion in the central rail web, and a nut on said threaded bolt portion.

3. The combination according to claim 1, said connecting means between each rail support and post comprising an elongated connecting member of angular cross-sectional shape, outwardly pressed portions on said post, and downwardly extending spaced teeth on said connecting member inserted in the spaces formed between said outwardly pressed post portions and the remainder of the posts.

4. The combination according to claim 2, further provided with a rail tie between two rails and aligned with two aligned rail supports, said rail tie comprising a channel-shaped member with connecting brackets secured to the ends thereof, said connecting brackets interfitting with the facing surfaces of said rails and being apertured to receive said J-bolts, whereby tightening of said nuts will draw together said rail tie and rail supports with the rails therebetween.

5. In a drive-in storage rack, a plurality of rows of post assemblies forming bays therebetween, each row of post assemblies comprising at least two post assemblies, each post assembly having a pair of rigidly interconnected posts, each post having an angular cross-sectional shape wtih parallel side flanges, the front post of each post assembly having a forwardly facing web with vertically spaced pressed-out portions forming upwardly facing slots, each rear post having a rearwardly facing web with vertically spaced pressed-out portions forming upwardly facing slots, a plurality of rail support assemblies mounted at one level on said posts, each rail support assembly comprising a horizontally extending rail support at right angles to said row, the rail support comprising a short beam with upper and lower flanges, a central vertical web, and inclined upper and lower webs connecting the edges

of said flanges away from said post with said central web, aligned notched-out portions in said flanges, a pair of elongated connecting members in said notched-out portions adapted to fit around a post, vertically spaced downwardly extending teeth on said connecting members received by said post slots, rails extending along said bays at said level, each rail comprising upper and lower horizontal flanges, a vertical central web between such flanges, and inclined webs connecting the edges of said rail flanges away from said posts with the upper and lower edges of said vertical web, said rail flanges fitting over said rail support flanges, the ends of said rail support being notched out to receive said rails, and means fastening said rail support webs to said rail webs.

6. The combination according to claim 5, the edges of said notched-out rail support portions being skewed whereby said rails will have line contact with said rail supports at the juncture of said upper rail flange with the adjacent inclined web.

7. The combination according to claim 5, each rail being further provided with a vertical guide flange extending upwardly from the edge of said upper rail flange facing said posts.

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