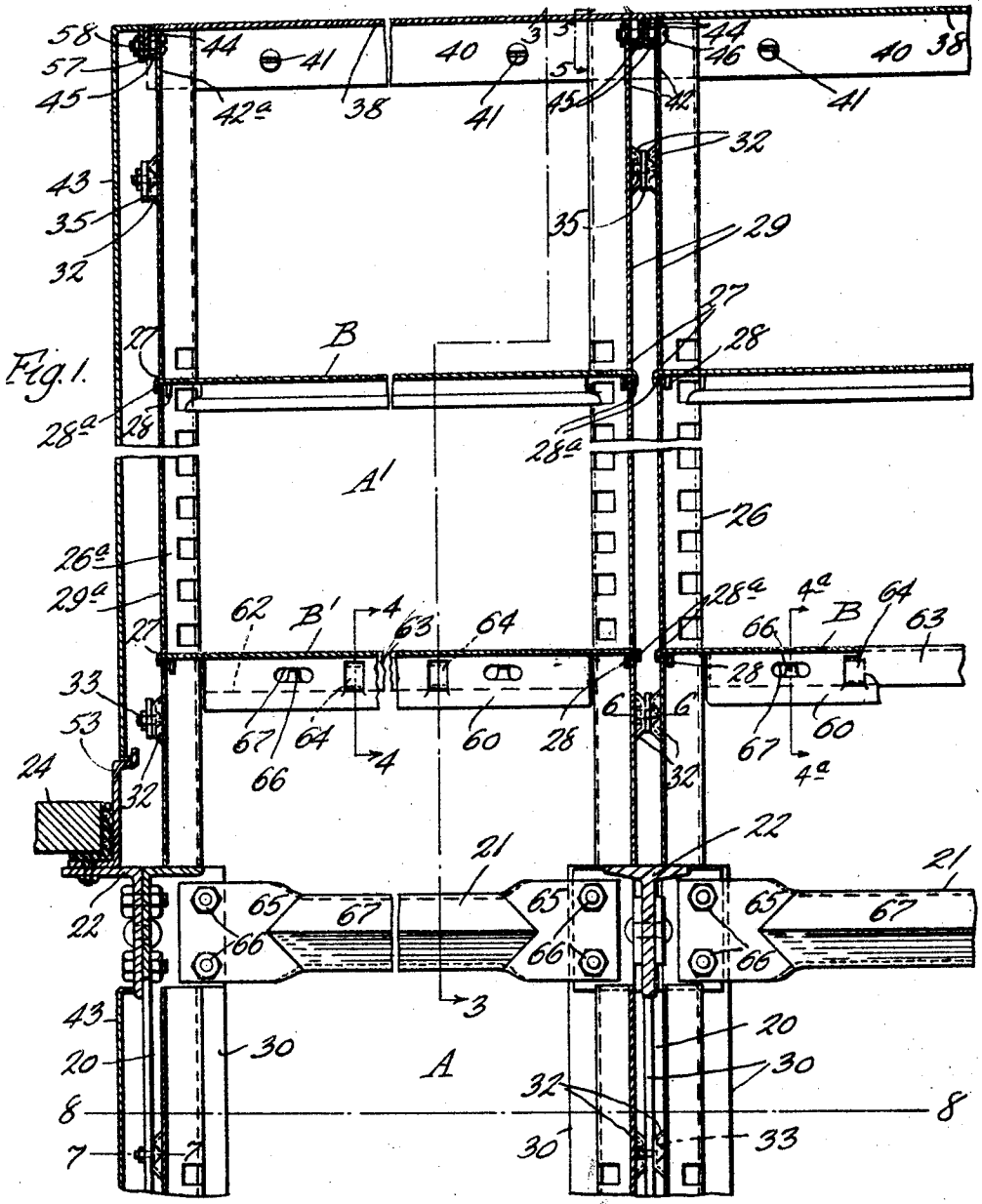
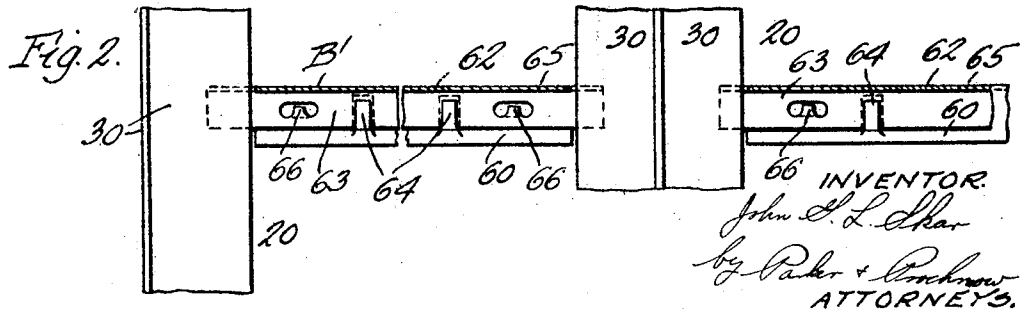
Sept. 8, 1931. J. G. L. SKAR 1,821,990

METALLIC LIBRARY OR BOOK STACK

Filed May 13, 1930 3 Sheets-Sheet 1




INVENTOR.
John G. L. Skar
by Parker & Prickman
ATTORNEYS.

Sept. 8, 1931. J. G. L. SKAR 1,821,990

METALLIC LIBRARY OR BOOK STACK

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Fig. 3.

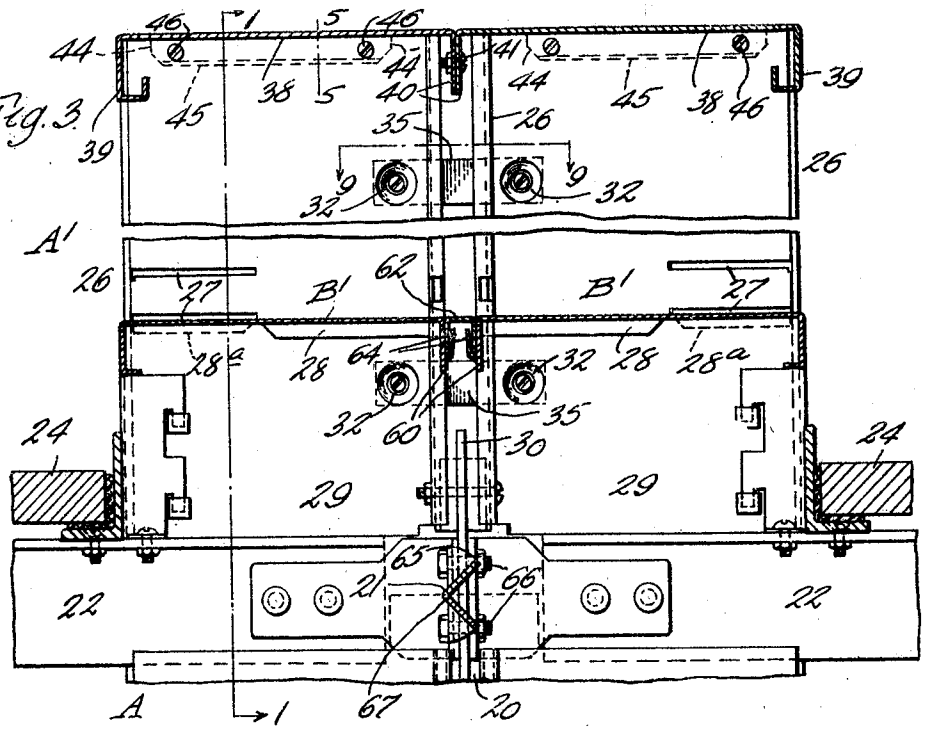
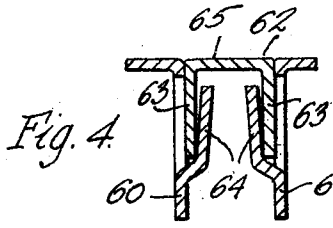



Fig. 4.



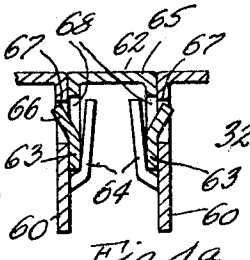




Fig. 4a.

Fig. 6.

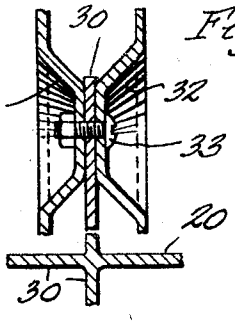



Fig. 5.

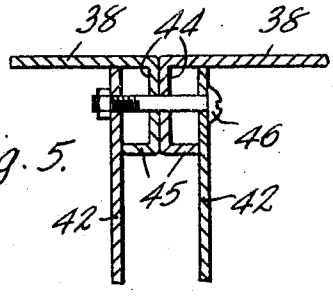
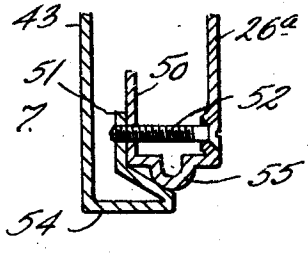



Fig. 7.



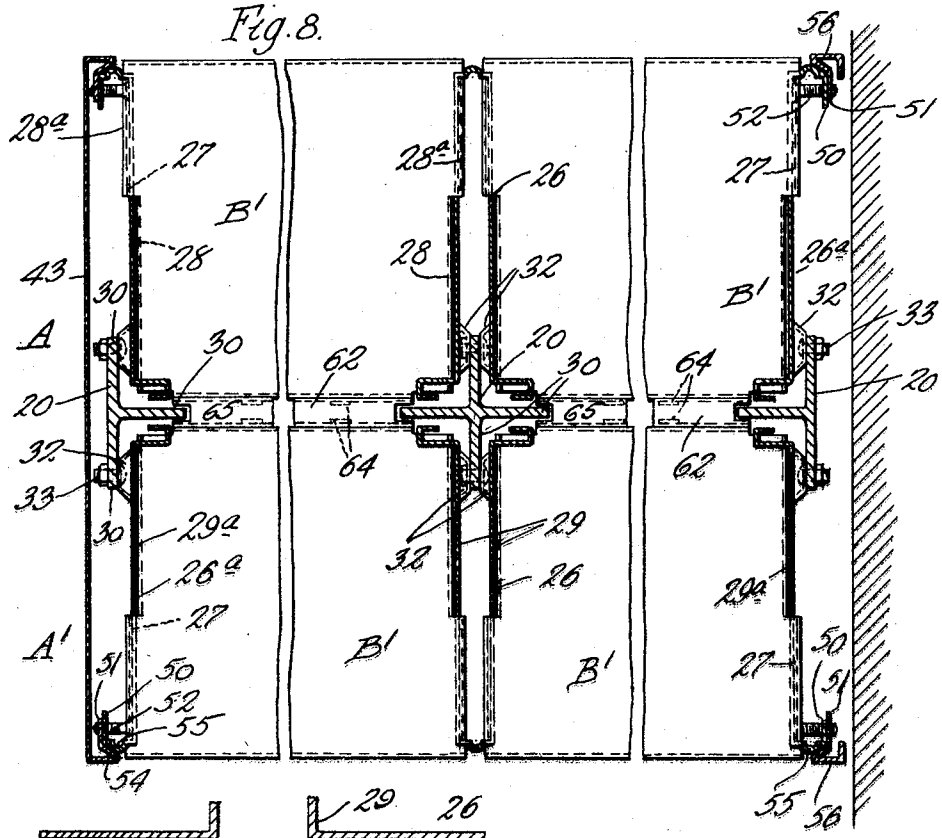

INVENTOR.
John G. L. Skar
by Parker & Prentiss
ATTORNEYS.

Sept. 8, 1931. J. G. L. SKAR 1,821,990

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Fig. 8.



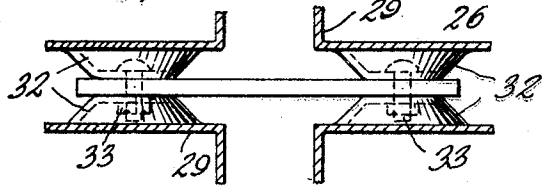




Fig. 9.

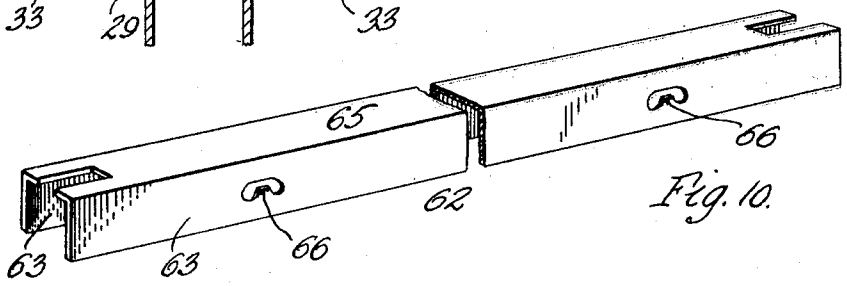



Fig. 10.

INVENTOR.
John G. L. Skar
by Parker & Prindle
ATTORNEYS.

Patented Sept. 8, 1931

1,821,990

# UNITED STATES PATENT OFFICE

JOHN G. L. SKAR, OF JAMESTOWN, NEW YORK, ASSIGNOR TO ART METAL CONSTRUCTION COMPANY, OF JAMESTOWN, NEW YORK

## METALLIC LIBRARY OR BOOK STACK

Application filed May 13, 1930. Serial No. 451,928.

This invention relates to improvements in metallic library or book stacks.

More particularly the invention relates to that class of metallic book stacks or structures used in libraries and other buildings, and having a plurality of tiers or stories supported one on another. Such a structure includes a skeleton framework comprising spaced vertical columns connected together at intervals by tie members extending in two directions at right angles, and vertical shelf supports secured to and extending out from the columns and formed to detachably support a plurality of shelves by inter-engaging connections.

The objects of the present invention are to provide and construct a metallic stack or structure of the sort described having improved connections between the sheet metal shelf supports and the columns of the skeleton frame work; also to provide a structure of this sort having top plates or members extending over the upper tiers of the stack and to provide novel interfitting connections between said top plates and the shelf supports; also to provide a book stack or structure wherein the end portions of individual units may be covered or enclosed by end or finishing panels and to provide concealed fastenings for these panels so as to eliminate sharp edges or projecting parts; also to provide a book stack having improved locking or securing means between certain of the shelves thereof for assisting in detachably retaining them in position on the shelf supports; and also to provide an improved tie member or connection between the upright spaced columns of the book stack frames.

Other objects are to improve and simplify the construction of metallic library or book stacks in the other respects hereinafter set forth and claimed.

In the drawings:

Fig. 1 is a fragmentary, vertical section approximately on the line 1—1 of Fig. 3, of a portion of a metallic library or book stack disclosing one embodiment of this invention;

Fig. 2 is a similar view showing the detachable, interfitting locking member or connection between two adjacent oppositely extending shelves of the book stack;

Fig. 3 is a fragmentary, sectional elevation of the book stack taken approximately on the line 3—3 of Fig. 1;

Fig. 4 is a sectional, detail view on an enlarged scale thereof, on the line 4—4, of Fig. 1;

Fig. 4*a* is a similar view on line 4*a*—4*a* of Fig. 1;

Fig. 5 is a similar view on line 5—5 of Fig. 3;

Fig. 6 is a fragmentary, horizontal section thereof on the line 6—6 of Fig. 1;

Fig. 7 is a similar view thereof, approximately on the line 7—7 of Fig. 1;

Fig. 8 is a fragmentary, horizontal section of the book stack on the line 8—8 of Fig. 1;

Fig. 9 is a fragmentary, horizontal section on line 9—9 of Fig. 3;

Fig. 10 is a fragmentary perspective view of a locking or key member for detachably connecting the inner edges of certain of the shelves of a stack together.

The book stack illustrating the improvements of the present invention is of the double facing type, that is, with the shelves and shelf supports extending in opposite directions from and relatively to a row of columns, but certain features of the invention are equally applicable to a single facing stack projecting from one side only of a row of columns.

The book stack shown in the drawings comprises generally a series of lower and intermediate tiers or stories A and an upper story or tier $A^1$. The lower and intermediate tiers A include a frame work consisting of a plurality of spaced vertical uprights 20 which are arranged in rows, one row being employed for each double faced set of shelves B. These columns are connected lengthwise of the shelves B by horizontal tie bars or members 21, and at right angles thereto by horizontal frame members or floor beams 22 which also constitute supports for floors or galleries 24 which extend lengthwise of the shelves and in front

of the same to permit access thereto. There extends crosswise of the shelves B and projecting in opposite directions from and secured to each column 20, a plurality of vertical shelf supports. The intermediate supports 26 of the stack are of U-shaped cross section, preferably fabricated of sheet metal, and the supports are each provided with a plurality of horizontal slots 27 for the reception of the ends of the book shelves B which are also preferably formed of sheet metal, said ends being formed with downturned flanges 28 and $28^a$ extending on opposite sides of the spaced walls 29 of the shelf supports 26 for preventing endwise movements of the shelves relatively to said supports.

The columns 20 may be of any suitable form adapted to provide four radial webs or flanges 30 to which the ends of the horizontal frame members 21 and 22 are connected, excepting in the case of the end columns, wherein one or more of the webs are omitted.

As shown in Fig. 8, the shelf supports $26^a$ at the ends of each tier are preferably formed of only a single wall $29^a$ and these walls as well as the spaced or double walls 29 of the intermediate shelf supports are connected to the adjacent upright flanges 30 of the columns 20 in the following novel manner, such that the securing means will not project beyond the outer faces of the walls 29. For this purpose, those parts of said walls which extend adjacent the flanges 30 are provided at intervals with depressed portions or sockets 32, each having a flat bottom wall adapted to bear against the flanges 30 and which is apertured for the passage therethrough of a bolt or other fastening device 33. The bolts 33 also pass through registering holes in the flanges 30, and when tightened, securely hold the rear portions of the shelf supports to the columns 20. The sockets 32 are made sufficiently deep to prevent the heads or nut of the bolts from extending beyond the faces of the shelf supports in the direction of the shelves. In this way, moderate variations in the thickness of the column flanges may be accommodated between the walls of the intermediate shelf supports, and in addition, books or other objects on the shelves will not be marred or injured by the heads or nuts of the bolts in the sockets.

Since the top tier $A^1$ in the structure illustrated does not reach the ceiling of the building, the framework columns 20 are not extended into this tier, and the inner ends of the adjacent opposed walls 29, $29^a$ of the shelf supports are therefore connected together by other means than the columns 20. For this purpose, as shown in Figs. 1, 3 and 9, there is provided a plurality of short horizontal strips or members 35, each of which extends transversely of the tier $A^1$ back of or across the space between the inner ends of said supports. Each strip 35 is formed with a hole at each end for the reception of the bolts or securing devices 33 in the sockets 32. When the bolts 32 are tightened the bottoms of the sockets are drawn tightly against the strips 35.

In order to provide a finished appearance to the upper tier $A^1$, there is provided a plurality of top plates or panels 38 which extend horizontally lengthwise of the tier or stack over the shelves B thereof from one shelf support 26 or $26^a$ to another. The front edges of these top plates are formed with flanges 39 in simulation of the front edges of the shelves B, and the rear edges are provided with flanges 40. The flanges 40 of those top plates 38 extending along one side of the tier $A^1$ project down into the space between the groups of shelves and shelf supports at opposite sides of the tier, and butt against the corresponding flanges 40 of those top plates extending over the other groups of shelves. The abutting flanges 40 are preferably secured together by bolts or fastenings 41.

The opposite end edges of the top plates 38 are fashioned so as to be secured to and act as spreaders or positioning means for the free upper edges 42 of the spaced pairs of walls 29 of the shelf supports 26, and also cooperate in a similar manner between the top edges $42a$ of the single end shelf support walls $29a$ and end finishing panels or member 43, to be described.

For this purpose each end of a top plate 32 rests on and extends over one of said top edges 42 or $42a$ of the shelf supports and is formed with a downwardly extending integral flange or part 44, and at the lower edge of which is an inwardly directed flange 45. This construction provides a return bend or flange at each end of a top plate which extends down along the face of a shelf-support wall at the side remote from the shelves supported thereby. The flanges 44 of the adjacent ends of two top plates abut while the flanges 45 thereof extend in opposite directions into engagement with the respective adjacent face of a wall 29 or $29a$ of a shelf support 26 or $26a$, see Figs. 1 and 5. The flanges or parts 44 and the walls of the shelf supports are formed with registering holes for the reception of bolts or securing devices 46, which when tightened, act to draw the abutting flanges 44 together and the walls of the shelf supports against the edges of the flanges 45. In this way the upper ends of the shelf supports are held rigidly in their proper position. The top plates further act to prevent weaving of the top tier when the shelves are disconnected from their supports.

The end finishing panels 43 before men-

tioned, extend transversely across the ends of the tiers of a stack that terminates away from a wall of the building. The vertical edges of the end or adjacent shelf supports 26*a* are turned rearwardly to form flanges 50, and each panel 43 has its vertical side edges formed into rearwardly extending flanges 51 adapted to engage the flanges 50 of one of said supports. These abutting flanges, (see Figs. 7 and 8) are provided with registering threaded holes for the reception of screws 52, the heads of which engage in seats in the shelf support. This construction permits the end panel to be drawn firmly in place and forms a concealed connection.

The flange 51 of the end panel is preferably formed with an offset portion 54 which abuts against the vertical, front portion 55 of the adjacent shelf support 26*a* and forms a stop, affords a more rigid connection between the parts, and takes considerable strain from the screws 52.

As shown in Fig. 8, when a stack terminates near a wall, the end panels may, if desired, be replaced by finishing strips or mouldings 56, which are similar in form to the upright flanged edge portions of the panels 43 and are secured to the adjacent shelf supports 26*a* in a like manner by the screws 52.

The lower edges of the panels 43 rest on the top edge portions of curb bars or members 53, Fig. 1, extending lengthwise of the stacks at the edges of the floor sections 24.

The upper edges of the finishing panel or panels for the top tier $A^1$ are turned inwardly and then downwardly to form a return flange 57 (see Fig. 1) which abuts against and extends flush with the return bend of an adjacent top plate or plates 38. Bolts or fastening devices 58 passing through holes in said flanges 57, in the flanges 44 of the top plates, and in the wall of the adjacent shelf support serve to provide a concealed fastening for connecting the panel and top plates to the stack.

Each tier of the book stack (see Figs. 1, 3 and 8) is provided with bottom shelves or members $B^1$ which are formed at their ends for connection to the shelf supports 26, $26^a$ in a manner similar to the other shelves B. These shelves B being near the floors or galleries 24 are subject to displacement. The rear edges of said sleeves, however, are bent downwardly to produce flanges 60, the ends of which extend between and terminate at the shelf supports. The flanges 60 of opposed sets of shelves $B^1$ extend in parallel spaced relation (see Figs. 3 and 4), and are formed to be detachably connected together by the use of locking or key members 62 in a manner to prevent the aforementioned shifting of these shelves on their supports.

Preferably a single key member 62 is used for locking together two opposed shelves $B^1$. Each key member is in the form of an inverted channel, having depending parallel flanges or legs 63. The flanges 60 of the shelves $B^1$ are formed with offset tongues or hooks 64 which are struck out of the metal of each flange and extend upwardly into the space between adjacent inner edges of a pair of shelves. To connect a pair of the shelves $B^1$, a key member 62 is inserted downwardly between their flanges 60 with the legs 63 of said member engaging behind the tongues 64, or between said hooks and the corresponding flanges 60, as shown in Fig. 4. The top or web 65 of the channel 62 extends flush and forms a continuous surface with the top faces of the shelves $B^1$.

In order to maintain the keys 62 in operative relation and prevent the faces or webs 65 from projecting above the shelves $B^1$, said keys are preferably formed with small offset spring tongues or projections 66, which when the keys are moved to locking position snap or spring into engagement with shoulders 67. Each shoulder 67 may be conveniently formed by the top edge of a hole 68 in the adjacent shelf flange 60 into which the corresponding tongue 66 is received. Thus the key members detachably connect the shelves $B^1$, but they can nevertheless be removed at any time by springing the tongues 66 out of the holes 68. In this way, the connected pairs of shelves $B^1$ are prevented from relative transverse movements or displacement on the shelf supports, and the key members 62 are prevented from becoming detached from the shelves.

As shown in Figs. 1 and 3, the longitudinal tie members 21 of the book stack frame, while having their ends 65 flattened for connection to the columns 20 by means of the bolts or fastenings 66, are formed intermediate of said ends of angular cross section as seen at 67. These relatively long tie members are thus stiffened and prevented from buckling or flexing when the stack is loaded to capacity.

I claim as my invention:

1. In a structure of the character described, the combination of an upright column having a vertical flange extending lengthwise thereof, a metal shelf support having a vertical side wall extending adjacent said flange, a socket in and projecting from said side wall towards said column flange, and securing means in said socket passing through the same and through said flange, whereby said socket is drawn against the face of said column flange to connect the shelf support to said column.

2. In a structure of the character described, the combination of an upright column having a vertical flange extending

lengthwise thereof, a U-shaped metal shelf support having spaced vertical side walls arranged to straddle said column flange, a socket projecting inwardly from each side wall adjacent said column flange, securing means in said sockets adapted to pass through the bottoms thereof and through said flange whereby said sockets may be drawn against the opposite faces of said column flange to connect said shelf support thereto, a plurality of shelves, and interfitting parts on said shelves and said shelf support for releasably supporting said shelves, and said securing means for said shelf support being located in said sockets inwardly beyond the outer faces of said side walls to permit the shelf space to be unobstructed.

3. In a stack structure of the character described, the combination of a U-shaped sheet metal shelf support having spaced, vertical side walls, shelves supported on said side walls and extending away from said support in opposite directions, a sheet metal top plate extending at each side of said shelf support over said shelves and across the tops of said walls, and a return flange on each of said top plates extending downwardly therefrom between said side walls and abutting against each other and extending into engagement with the opposing faces of said side walls for maintaining the spaced relation between said walls.

4. In a stack structure of the character described, the combination of a U-shaped sheet metal shelf support having spaced, vertical side walls, shelves supported on said side walls and extending away from said support in opposite directions, a sheet metal top plate extending at each side of said shelf support over said shelves and across the tops of said side walls, said top plates having flanges extending downwardly between said side walls of said shelf support and abutting against each other and thence extending laterally into engagement with said side walls, and securing devices passing through said flanges and side walls for securing said top plates to said shelf support.

5. In a stack structure of the character described having a plurality of shelves and shelf supports for said shelves, the combination of an end finishing panel for said stack, a top plate extending over said shelves, concealed connections between said panel and said shelf supports comprising inturned flanges extending along the vertical edges of said panel and engaging portions of said shelf supports, securing devices extending through said support into said panel side flanges, and concealed connections between said shelf supports, said finishing panel and said top plate comprising downturned abutting flanges on said panel and top plate extending along said side shelf supports, and securing devices passing through said flanges and through said shelf supports.

6. In a stack structure of the character described having a plurality of shelves and shelf supports for said shelves, said supports having spaced parallel wall portions connected by a front edge wall, the combination of a sheet metal, end finishing panel for said stack, and a concealed connection between said panel and an adjacent shelf support comprising an inside rearwardly directed flange forming part of a return bend extending along an edge of said panel, said flange being adapted to bear against one of said wall portions of said shelf support, securing screw devices extending through said support with the head of each of said screw devices engaging in a seat in said support and the threaded ends thereof engaging in threaded holes in said flange to draw the same against said support, and said panel flange having an offset portion adapted to abut against the front edge wall of said support to form a stop for said panel and also to relieve said securing devices of undue strain.

7. In a stack structure of the character described having a plurality of shelves and shelf supports for said shelves, the combination of a detachable end finishing panel for said stack, and a concealed connection between said panel and an adjacent shelf support comprising an inside, rearwardly directed flange forming a part of a return bend extending along an edge of said side panel, said flange being adapted to bear against a part of said shelf support, and detachable securing devices extending through said shelf support into said flange for removably securing said end panel in place, said securing devices being concealed by said panel.

8. In a stack structure of the character described, the combination of shelf supports, a pair of shelves supported thereon and extending in opposite directions with a side edge of one shelf in spaced relation to the corresponding edge of the other, and a locking member disposed between and extending lengthwise of said side edges of said shelves and having parts interfitting with parts on said edges for holding said shelves in position on said supports.

9. In a stack structure of the character described, the combination of shelf supports, a pair of shelves supported thereon and extending in opposite directions with a side edge of one shelf in spaced relation to the corresponding edge of the other, releasable interfitting connections between the ends of said shelves and said supports, and a locking member extending lengthwise of said shelves between and engaging said side edges thereof, and interfitting connections

between said member and said shelves for preventing unintentional release of said shelves from said shelf supports.

10. In a stack structure of the character described, the combination of shelf supports, a pair of shelves supported thereon and extending in opposite directions and each having a side flange extending in parallel spaced relation to a corresponding flange on the other, projections on said flanges, and a locking channel extending lengthwise between said shelves with its flanges engaging said projections for holding said shelves in position on said supports.

11. In a stack structure of the character described, the combination of shelf supports, a pair of shelves supported thereon and extending in opposite directions and each having a side flange extending in parallel spaced relation to a corresponding flange on the other, upwardly extending offset projections on said flanges, a locking member of inverted channel section, which is inserted downwardly between said flanges with the edge portions of its flanges engaging back of said projections, and spring tongues on said member which engages shoulders on said shelf flanges when said member assumes its locking position to prevent unintentional disengagement of said locking member.

12. In a stack structure of the character described, the combination of shelf supports, a pair of shelves supported thereon and extending in opposite directions with a side edge of one shelf in spaced relation to the corresponding edge of the other, a locking member disposed between and extending lengthwise of said side edges of said shelves and having parts interfitting with parts on said edges for holding said shelves in position on said supports, and interfitting parts on said locking member and said shelves for preventing unintentional disengagement of said member after the same has been disposed in its locking position.

13. In a stack structure of the character described, the combination of spaced upright columns having vertical flanges, extending lengthwise thereof, shelf supports connected to said columns, shelves thereon extending between said columns, and tie members extending between said columns and having flattened end portions fastened to said vertical flanges thereof and intermediate portions of angle cross section for stiffening said tie members.

JOHN G. L. SKAR.