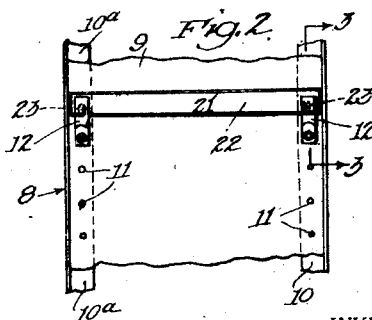
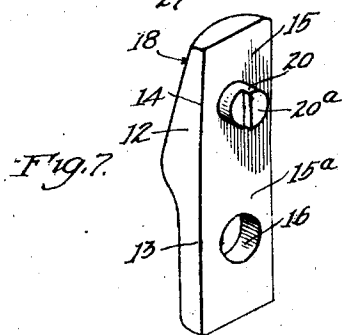
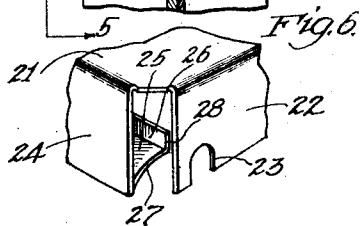
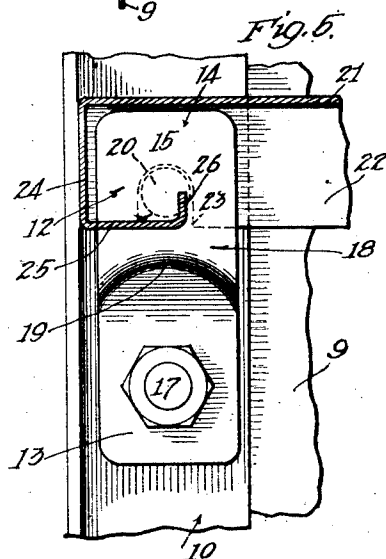
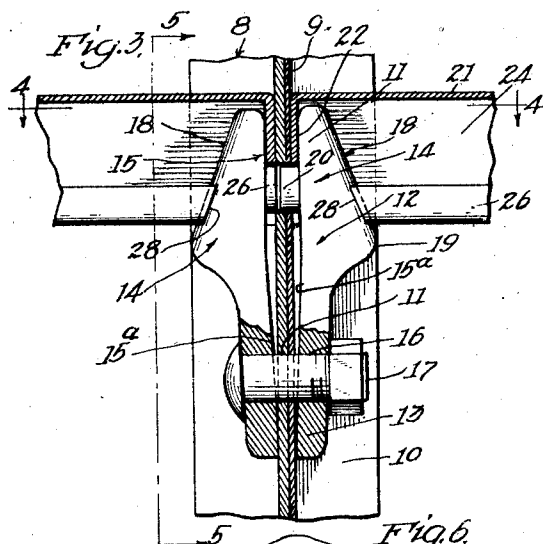
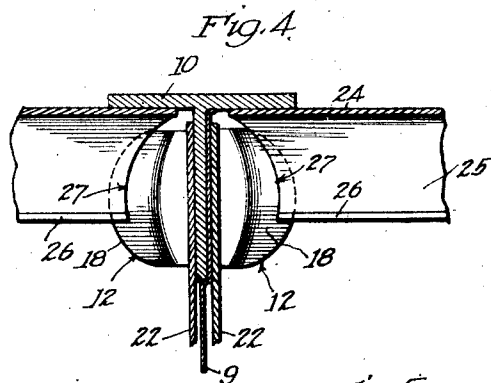
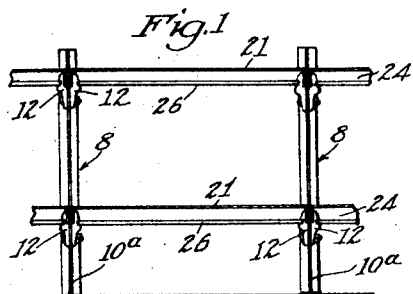


Feb. 28, 1928.

1,660,898

J. WORLEY, JR
SECTIONAL SHELVING
Filed Nov. 1, 1923



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UNITED STATES PATENT OFFICE.

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SECTIONAL SHELVING.

Application filed November 1, 1923. Serial No. 672,091.

This invention relates to shelving and more particularly to sectional shelving used for supporting and storing tools, machine parts, records, etc.

Shelving of this nature is shipped from the factory in "knocked-down" or disassembled condition, the interfitting elements, making it up, being fabricated in such a manner that the shelving may be assembled and erected at place of use by relatively unskilled workmen and with minimum effort.

In order that shelf elements of standard form and dimensions may be adaptable to the various requirements of different users, which requirements, of course, vary according to the nature of the service to be performed by the shelving, it is necessary that the shelves be vertically adjustable to vary the clearance between them, and that the shelving be capable of erection in sections of varying number, which number may be changed after initial installation to meet changing conditions.

To comply with the above, the shelving elements must be detachably joined rather than permanently bonded, and the non-permanent nature of the joints renders it difficult to provide an assembled structure having the requisite degree of rigidity and stability.

Therefore it is among the objects of my invention to provide an economical and easily assembled form of sectional shelving having the qualities of adjustability, adaptability to various situations, and of little weight considering the load supported; and also a structure wherein the elements are made up, arranged and adapted to coact with one another in a manner to insure the proper rigidity and stability to the erected structure, and wherein the stresses and strains arising from shelf loads are transmitted to the vertical shelf-supporting members and by them resisted.

In general, I accomplish this by the use of removable corner clips adapted to clamp shelf-end flanges to uprights arranged at each corner of a shelf unit, and providing the standards, clips and shelves with coacting portions which tie the structure together in a manner to stiffen it as a unit against weaving or wrecking, and also to stiffen the individual members to increase their resistance to flexure, etc.

The invention is applicable to shelving of either "closed end" or "skeleton" type, as will be apparent from the following detailed description in which I will point out further features of novelty and objects of the invention. Reference will be had to the accompanying drawings, in which:

Figure 1 is a vertical section taken longitudinally through a rack made up of my improved shelving.

Fig. 2 is a vertical transverse section of such a rack.

Fig. 3 is an enlarged vertical section on line 3—3 of Fig. 2, part of the clip and shelf-flanging being shown in elevation.

Fig. 4 is a section on line 4—4 of Fig. 3.

Fig. 5 is a section on line 5—5 of Fig. 3.

Fig. 6 is a fragmentary perspective showing the corner formation of the shelf; and

Fig. 7 is a perspective of one of my improved clips.

I have shown and will hereinafter describe my invention as particularly applied to the "closed end" type of shelving wherein the end members 8 of each shelf unit or rack are made up of vertical partition plates 9 welded or otherwise suitably secured to the front and rear uprights or standards 10 and 10*, respectively. In this type of shelving the partition plates serve to laterally space the uprights and to laterally stiffen the rack structure, but I may apply the invention with equal advantage to "skeleton" type shelving wherein the partition plates are omitted and the horizontal shelf forms the sole connection between the front and rear uprights to laterally space and brace them.

In connection with the following description of the various elements and their relative arrangement, I will point out certain coactions between them whereby certain outstanding results are obtained, but I will not attempt to mention all of the beneficial results so obtained. Therefore, I do not wish it to be inferred that I have here exhaustively described all the possible actions and reactions occurring throughout the structure when it is in loaded or unloaded condition.

While uprights 10 may be of any cross section which will give the member the desired strength and present proper attachment surfaces, I prefer to utilize T-irons for this purpose as they have the quality of being exceptionally strong and rigid, al-

though of relatively little weight, and present exterior surfaces which are especially well suited for the attachment of flat plates and flanges. Each of the four uprights, there being one at each corner of the rack, is provided with vertically aligned and equally spaced apertures 11, there being, of course, registering apertures in the partition plates.

10 Beneath each shelf corner is a clip 12, which will now be described in detail, although the reason for certain of the peculiarities in the configuration of the clip will be left for later discussion.

15 Clip 12 consists of a shank 13, carrying a wedge 14 at one extremity, the underside of the clip opposite the inclined face of the wedge preferably being flat and presenting a clamping face 15. The clip is apertured at 16, whereby a bolt 17, extending through one of the apertures 11, may be utilized for removably holding the clip to an upright and for drawing the clip into clamping relation with said upright, it being noted that 20 the face 15^a angles away from face 15 in order that the end of the shank may bear on the upright when face 15 is held spaced from and substantially parallel to said uprights by the interposition of a shelf flange, 25 as clearly shown in Fig. 3.

The wedge face 18 inclines upwardly and inwardly from the upper extremity of the clip and is transversely convexed about the longitudinal axis of the clip, or, in other words, the wedge is of variable plano-convex cross section along its longitudinal axis. 35 Preferably, and as clearly shown in Fig. 4, the degree of convexity is relatively small at the point of the wedge but progressively increases from the wedge point towards and to the wedge heel 19. The reason for these peculiar characteristics of the clip and an explanation of certain variations in the clip configuration which may be made without departing from the scope of my claims, will be discussed to better advantage after the following description of certain elements adapted to coact with the clip.

Extending laterally from clamping face 15 is a pin 20, the distance between the center of this pin and the center of aperture 16 being equal to center distance between apertures 11 in uprights 10 or 10^a, so the clip may be shifted vertically along its respective upright to bring aperture 16 and pin 20 in register with different pairs of adjacent apertures in the uprights.

Shelf 21 has depending end flanges 22 with openings or notches 23 along their lower edges, the flanges being adapted to be lowered between uprights 10, 10^a and the clamping faces on the corner clip when the shelf is lowered into operative position on the uprights. Notches 23 are spaced apart 65 so they register with laterally spaced pins

20 as carried by front and rear corner clips, the coaction between notches and pins serving to guide the shelf into approximately proper lateral position with respect to the upright. The shelf comes to rest with the lower flange edges, which define the notch crotches, in engagement with the top of the pin. Since these pins are supported at one end by clips 12 and at the other by uprights 10 or 10^a (due to the passage through and fit of the pins in apertures 11), and since the points of pin support are close together, it will be seen I have provided a very desirable form of supporting means between uprights and shelf. By taking up bolts 17, clip 12 may be drawn toward the upright to securely clamp the shelf flange thereto, whereupon the shelf and shelf flange act as stiffeners between uprights.

When used in connection with "skeleton" construction, the coaction between pins and notches and the clamping action of the clip on the shelf flanges, permit the shelf to serve as a spacer between uprights, no other spacing means then being necessary.

When two shelf units are to be arranged side by side, a single, centrally arranged member 8 may serve to support adjacent ends of shelves in the two units, and, when the shelves in the units are on the same level (as is true in Fig. 3) a single bolt 17 may serve to clamp both the opposed clips. In this situation, I cut back the end of the pins to leave semi-cylindrical lips 20^a, the lips on the two opposed clip pin ends being complementary so they overlap (as clearly shown in Fig. 3) to form, in effect, a single pin supported in the opposed clips and extending through and partially supported by the interposed uprights. The length of the pins and projecting lip are, of course, so proportioned that there is sufficient clearance between their ends to allow the clips to be drawn tightly into clamping position without pin or lip interference.

Shelf 21 has depending and substantially coextensive side strips 24 which are bent back and beneath the shelf to form horizontal flanges 25, the edges of these flanges, in turn, being bent upwardly to form vertical flanges 26. Disregarding, for the moment, certain peculiar functions of the strips and flanges in coaction with other shelf elements, it will be seen that the shelf is materially reinforced by the marginal strips and flanges, and that said strips and flanges, in turn, are of mutual benefit as reinforcements.

The ends 27 of horizontal flanges 25, and preferably the ends of strips 24, are cut back with respect to the ends of the shelf to allow wedges 14 to pass between end flanges 22 and said horizontal flanges and flange ends 27 are cut in a manner to be substantially complementary to and engage the convex wedge 130

face 18 when shelf 21 is in operative position on the upright. By reason of the tapered nature of the upper end of the clip, it will be seen that the shelf may be easily lowered into position without interference from the clip, and, furthermore, that by reason of the inclined face 18, the horizontal flange will shoulder against it in spite of slight discrepancies in the notch and pin sizes or location.

The ends 28 of vertical flanges 26 are preferably cut parallel to the inclined plane of the wedge, so, when the shelf is lowered into position, these ends engage and have a relatively large surface bearing on the clip. The advantage of varying the degree of wedge convexity from end to end will now be apparent. The relatively flat point of the wedge, that is, relatively flat as considered in cross section, makes it possible to more readily lower the shelf into operative position without interference between shelf and clip, while the increased convexity of the lower part of the wedge provides additional "swell" to form ample shoulder surface for the end of the horizontal flange, and also gives a more sharply defined interlock between clips and horizontal flange whereby relative horizontal movement therebetween is more effectively resisted. In this connection it will be noted that the arcuate ends 27 of flanges 25 extend around both sides of the longitudinal axis of the wedge face, so, after clips 12 have been clamped tightly against the end flange, the coaction between clips and horizontal flange definitely positions the shelf with respect to clips and uprights, and indirectly stiffens the rack structure against lateral weaving. Furthermore, any tendency of the shelf to flex laterally causes end 28 of the vertical flange, and the adjacent face of flange end 27, to press inwardly on the clip, and by this coaction between flanges and clips, such lateral flexure is resisted.

At this point, I wish to make mention of the fact that the convexity of the wedge face need not be necessarily regular nor have the characteristics of a curve or arc. For instance, the sides of face 18 might rise to a central point or ridge and ends 27 be provided with complementary V-notches, and still the clips and horizontal flange would coact and function as above. Therefore, all references to wedge face "convexity", either in the description or the appended claims, are to be construed broadly.

In addition to its general function of a shelf reinforcement, horizontal flange 25 acts as a tension member for shelf 21, so, when the shelf is put under load, said flange tends towards elongation, but such elongation, and consequently the shelf flexure, is resisted by the engagement of flange ends 27 and 28 with the wedge face of the clip. The spacing of

flange 25 an appreciable distance below the shelf increases the effectiveness of this method of shelf bracing.

The stresses and strains arising from loads on the shelf are thus transmitted to the uprights; and the bends between the shelf and its end flanges, which bends are relatively weak points of the structure and ordinarily called upon to bear such strains, are relieved from the detrimental effects arising from shelf loads.

By thus reinforcing and stiffening the shelf, the rigidity and stability of the entire rack structure is increased. It will be apparent to those skilled in the art that I have provided a simple and effective method of joining the shelf elements, and that the coaction between elements is such that the assembled structure is braced against horizontal, longitudinal, and vertical weaving and buckling.

I wish to make the reservation that the drawings and description are to be considered as illustrative of and not as restrictive on the broader claims appended hereto, for it is evident that certain changes in structure and design may be made without departing from the spirit and scope of said claims.

Having described a preferred form of my invention, I claim:

1. Sectional shelving embodying spaced uprights, a shelf having a depending end flange, clips on the uprights and adapted to clamp the flange to the uprights and to support the shelf, depending side strips on the shelf, said strips being turned back at their lower edges to provide horizontal flanges vertically spaced from the bottom of the shelf, the ends of the strips being adapted to engage the clips with variable pressure when the shelf tends to flex under variable load.

2. Sectional shelving embodying an upright, a shelf having a depending side strip, the side strip being turned back at its lower edge to provide a horizontal flange underlying and substantially parallel to the shelf, a clip on the upright for supporting the shelf, the flange being adapted to engage the clip with variable pressure when the shelf tends to flex under variable load.

3. Sectional shelving embodying an upright, a shelf having a depending end flange and a depending side strip, said strip being turned back at its lower edge to provide a horizontal flange underlying and substantially parallel to the shelf and terminating short of the end flange, a clip on the upright engaging both the end flange and the terminal of the horizontal flange, a pin extending laterally from the clip and registering with a notch provided in the lower edge of the end flange and with an aperture provided in the upright, the pin being adapted

to support the shelf and to coact with the notch for guiding the shelf into position; and the clip, end flanges and horizontal flanges coacting to fix the lateral positioning of the shelf with respect to the upright.

4. Sectional shelving embodying an upright, a shelf having a depending side strip turned back at its lower edge to provide a horizontal flange below the shelf, a clip secured to the upright for supporting the shelf, an upwardly pointing wedge on the clip, said horizontal flange being cut back with respect to the end of the shelf in a manner whereby its end contacts with and seats on the incline of said wedge when the shelf is lowered.

5. Sectional shelving embodying an upright, a shelf having a depending side strip turned back at its lower edge to provide a horizontal flange below the shelf, a clip secured to the upright for supporting the shelf, an upwardly pointing wedge on the clip, the inclined face of the wedge being transversely convexed, and the end of the horizontal flange being cut back with respect to the end of the shelf to admit the wedge end between the upright and the horizontal flange, the end of the flange being complementary in outline to the convex face of the wedge whereby said flange end contacts with and seats on the convex wedge face when the shelf is lowered.

6. Sectional shelving embodying an apertured upright, a pair of clips on opposite sides of the upright, said clips having clamping faces disposed towards but laterally spaced from the upright, and pins extending laterally from said clamping faces and into an aperture in the upright from opposite sides thereof, the ends of the pins interfitting in a manner to form a continuous pin through the aperture from the clamping face of one clip to the clamping face of the other and the interfitting portions of the two pins lying within said aperture.

7. Sectional shelving embodying an apertured upright, a pair of movable clips on opposite sides of the upright, said clips having clamping faces disposed towards but laterally spaced from the uprights, pins extending laterally from said clamping faces and into an aperture in the upright from opposite sides thereof, the ends of the pins interfitting in a manner to form a continuous pin through the aperture from the clamping face of one clip to the clamping face of the other, and the interfitting portions of the two pins lying within said aperture; and means common to both clips for simultaneously moving them in a manner to bring their clamping faces toward the upright.

8. A clip for sectional shelving, embodying a shank, and a longitudinally extending wedge on the shank, one of the wedge faces inclining upwardly and inwardly from one end of the clip and being transversely convexed.

9. A clip for sectional shelving, embodying a shank, a longitudinally extending wedge on the shank, one of the wedge faces inclining upwardly and inwardly from one end of the clip and being convexed about the longitudinal axis of the clip, and a pin extending laterally from the opposite wedge face.

10. Sectional shelving embodying spaced uprights, a shelf having a depending end flange, clips on the uprights and adapted to clamp the flange to the uprights and to support the shelf, depending side strips on the shelf and terminating short of the ends of the shelf, said strips being turned back at their lower edges to provide horizontal flanges vertically spaced from the bottom of the shelf, said horizontal flanges being turned up at their inner edges to form vertical flanges, the ends of the vertical and horizontal flanges both being adapted to engage the clips with variable pressure when the end flange is clamped to the uprights and the shelf tends to flex under variable load.

11. Sectional shelving embodying an upright, a shelf having a depending side strip turned back at its lower edge to provide a horizontal flange below the shelf, a clip secured to the upright for supporting the shelf, a portion of the clip being transversely convexed, and the end of the horizontal flange being complementary in outline to said convexed portion and adapted to engage said portion when the shelf is in operative position.

12. Sectional shelving embodying an upright, a shelf having a depending side strip turned back at its lower edge to provide a horizontal flange below the shelf, a clip secured to the upright for supporting the shelf, an upwardly pointing wedge on the clip, the wedge being of variable thickness in transverse cross-section, the end of the horizontal flange being cut back with respect to the end of the shelf to admit the wedge end between the upright and the horizontal flange, and the end of the flange being substantially complementary in outline to one of the wedge faces whereby said flange end contacts with and seats on said wedge face when the shelf is lowered.

In witness that I claim the foregoing I have hereunto subscribed my name this 22nd day of October, 1923.

JOHN WORLEY, JR.