Sept. 23, 1952 J. F. RONEY 2,611,422

DEMOUNTABLE GRANDSTAND SEAT PLANKS

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Fig. 1

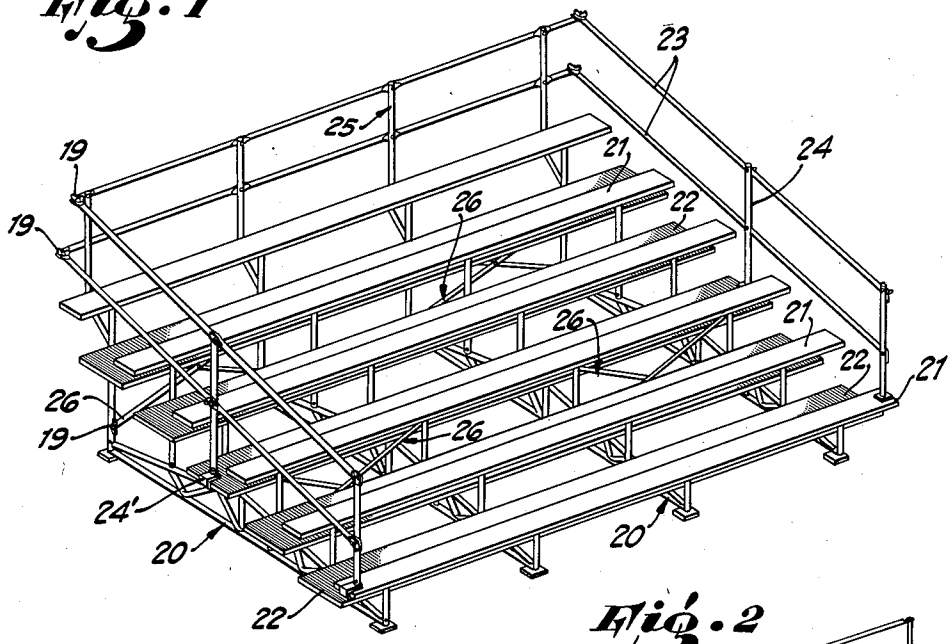
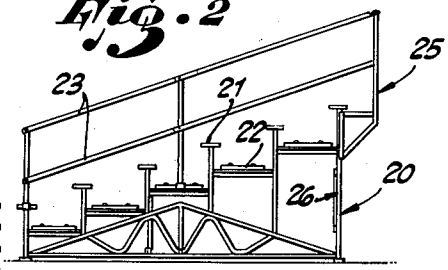



Fig. 2



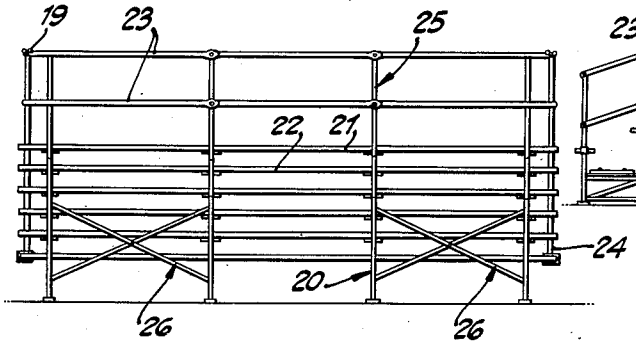




Fig. 3

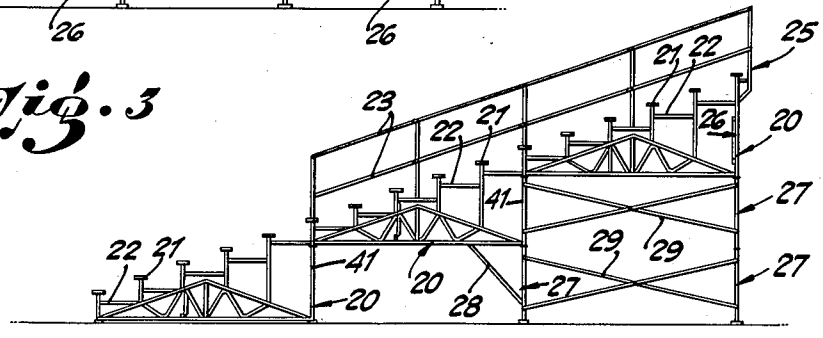



Fig. 4

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DEMOUNTABLE GRANDSTAND SEAT PLANKS

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Fig. 5

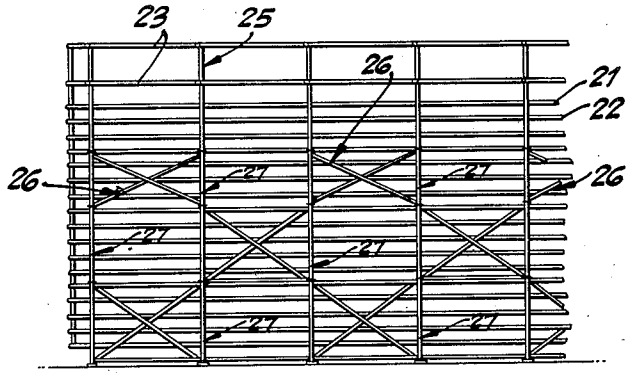



Fig. 6

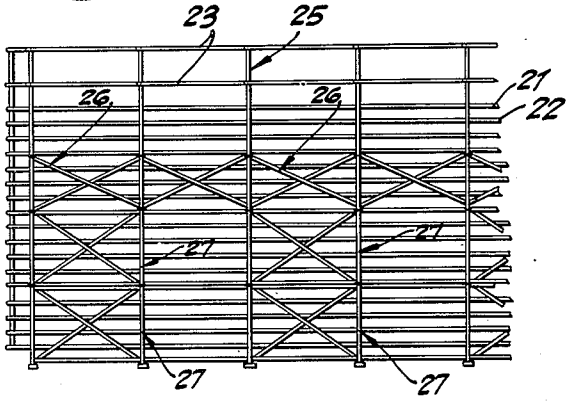



Fig. 7a

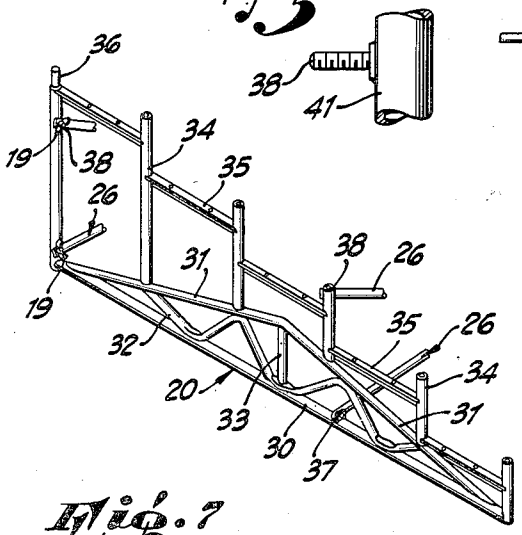



Fig. 7

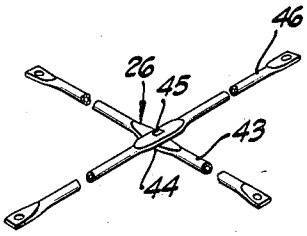



Fig. 8a

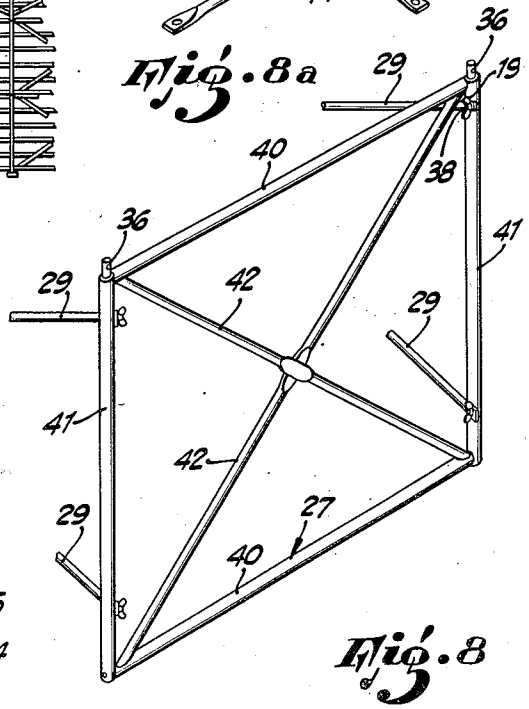



Fig. 8

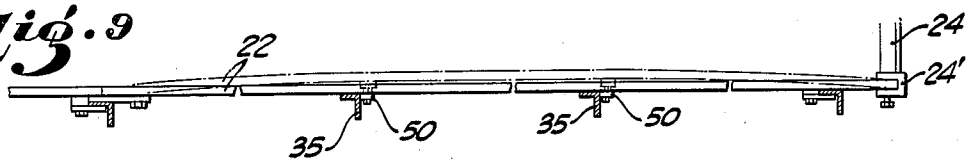
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Sept. 23, 1952 J. F. RONEY 2,611,422

DEMOUNTABLE GRANDSTAND SEAT PLANKS

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Fig. 9



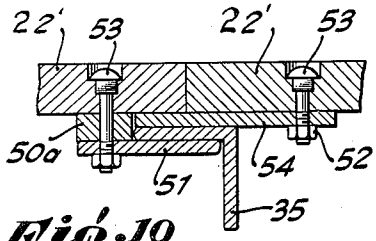




Fig. 10

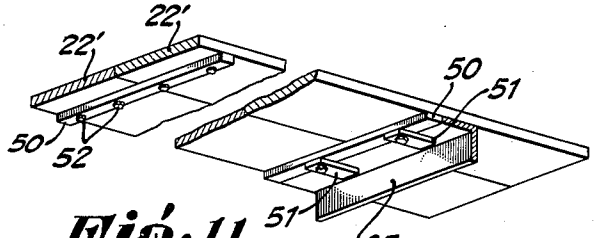



Fig. 11

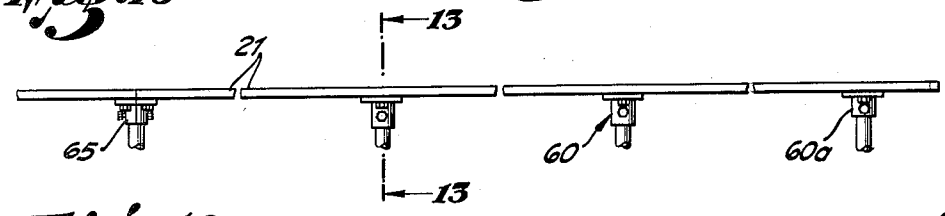



Fig. 12

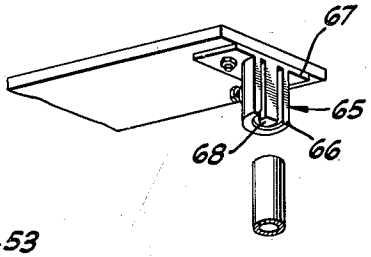
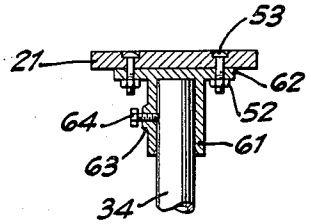



Fig. 13

Fig. 14



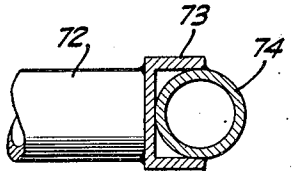




Fig. 16

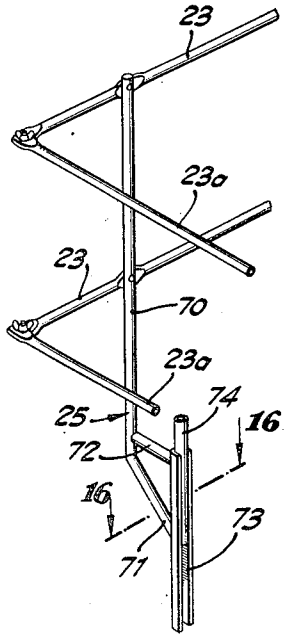



Fig. 15

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Patented Sept. 23, 1952 2,611,422

# UNITED STATES PATENT OFFICE

2,611,422

## DEMOUNTABLE GRANDSTAND SEAT PLANKS

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Application July 28, 1947, Serial No. 764,235

2 Claims. (Cl. 155—130)

1

My invention relates generally to grandstands for seating spectators, and more particularly to a grandstand of this class which is demountable and composed of sections comprising standard structural elements which may be combined in various combinations to erect grandstands of various sizes and seating capacity.

Such demountable grandstands as have been available heretofore, have not always been of a type of construction consistent with the requirements of public safety. For example, wooden sawhorse-like supports are frequently used to support the seats and floor planks, and due to the failure of such supporting elements, serious and sometimes fatal accidents have occurred. Accidents of this sort are sometimes attributable to lack of adequate interconnecting and bracing members, and sometimes to the unsatisfactory quality of the wood itself as a material for structural members.

Although wood is frequently employed in the supporting members of demountable grandstands, it is particularly unsatisfactory as a material for this purpose, particularly for structures which must be frequently erected and demounted. Frequent fastening and unfastening of wooden structural members tends to wear the bolt holes and other fastening means so that the joints become loose and permit swaying and sagging, eventually leading to the failure of such attachment joints with the possible collapse of the entire structure.

Another cause contributing to the failure of previous grandstand structures has been a lack of adequate and positive means for securing the seats and floor planks to the supporting framework. Such attachment means has usually consisted merely in notches in the supporting members to receive risers having stairstep upper edges. Frequently the seats are merely laid on the stairsteps and no provision is made to prevent them from sliding endwise off of the supporting risers.

In addition to the structural weaknesses just described, wooden grandstands of previous construction have required an inordinate amount of assembly time and must be frequently repaired to maintain them in a safe condition. The inter-fitting notch members which are often used to secure the various members together have a tendency, as mentioned, to become chipped, cracked, and worn after little use, and when so worn require special attention during assembly to assure an adequate joint. Furthermore, the seats and floor planks, if fastened at all, are often secured by tying to the supporting structures with wire or rope. This is a laborious and time-consuming assembly process and is not particularly satisfactory, even when completed.

With the inadequacies of previous structures in mind then, it is a major object of my invention to provide a demountable grandstand of the

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class described in which the structural elements are quickly and securely assembled.

Another object of my invention is to provide means in a demountable grandstand for removably securing the floor planks and seats in place without the necessity of the time-consuming tying operation above referred to.

Still another object of my invention is to provide a structure of the class described which is comprised of standard members of a few stock sizes and shapes adapted to be superimposed and interconnected whereby grandstands of various sizes and seating capacities may be assembled by multiplying the number of said structural members used.

A further object of my invention is to provide a demountable grandstand having standard structural elements which may be assembled and disassembled many times without destroying the efficiency of the interconnecting means.

The foregoing and other objects and advantages of my invention will become apparent as the description proceeds.

Briefly, the structural members employed in my novel grandstand structure are:

1. A number of longitudinal risers or trusses which support seats and floor planks;
2. Upright frame members having integral diagonal braces and adapted to support some of said risers in structures employing two or more longitudinally adjacent risers at each section;
3. Scissor braces to inter-brace said risers and frames;
4. Seat planks secured to said risers in conventional stairstep relationship;
5. Walkways secured to said risers in front of and below each of said seat planks;
6. A guard rail assembly secured along the sides and back of the assembled grandstand.

The various forms of grandstand illustrated herein and embodying my invention, may all be assembled from the above standard members which are attached together and secured by attachment means which, as will be described, are adapted to be quickly and easily removed to disassemble the structure.

For a more detailed description of grandstands embodying and illustrating my invention, reference should now be had to the attached drawings in which:

Figure 1 is a perspective view of one tier, single section grandstand employing the structural elements of my invention;

Figure 2 is an end elevation of the structure shown in Figure 1;

Figure 3 is a rear elevation of the structure shown in Figure 1;

Figure 4 is an end elevation of a three tier, multiple grandstand employing substantially the same elements as the grandstand illustrated in Figure 1;

Figure 5 is a partial rear elevation of the structure of Figure 4 showing one arrangement of supporting elements;

Figure 6 is a rear elevation similar to Figure 5 but showing an alternate arrangement of supporting elements;

Figure 7 is a perspective view of the riser members and parts of the scissor bracing employed in the structures of Figures 1 through 6;

Figure 7*a* is an enlarged detail of an integral attachment bolt used on various members of the structures illustrated;

Figure 8 is a perspective view of one of the upright frames and a portion of the scissor bracing employed in the structures of Figures 4 through 6;

Figure 8*a* is a fragmentary elevational view of a scissor brace of the type used in the various structures;

Figure 9 is a front elevational view of adjoining sections of walkway or floor planking illustrating the means of attaching the same to the supporting risers;

Figure 10 is an enlarged, front elevational, sectioned view of the butt joint in the planking shown in Figure 9 further illustrating the attaching means;

Figure 11 is an enlarged perspective view of the planking shown in Figure 9 further illustrating the attachment means;

Figure 12 is a front elevational view of adjoining sections of seat planking illustrating the means for attaching the same to the supporting risers;

Figure 13 is an elevational section taken on the line 13—13 in Figure 12;

Figure 14 is a fragmentary perspective view of a seat plank illustrating a seat attaching member employed at the joint between adjacent sections;

Figure 15 is a perspective view of a guard rail supporting member employed at the rear of the grandstand illustrated in Figures 1 and 4; and,

Figure 16 is an enlarged plan section taken on the line 16—16 in Figure 15.

Reference is first made to Figure 1 wherein it will be noted that the single tier grandstand illustrated therein is comprised of various structural elements including a number of truss risers **20** which are in turn comprised of individual welded elements as will be described hereinafter, and tiered sections of seat planks **21** and walkway planking **22** secured to the risers.

Guard rails **23** are supported along the ends and back of the grandstand by end stanchions **24** which are clamped to the ends of the planks, and rear stanchions **25** which form a part of the structure at the rear of the grandstand as will be described in more detail hereinafter.

The laterally adjacent risers **20** are interconnected by crossed and pivoted scissor bracing **26** whereby to brace the entire structure against lateral sway.

A three tier grandstand, making use of the same structural elements as those employed in the structure of Figures 1 through 3, is illustrated in Figures 4 through 6. In addition to the elements of the grandstand of Figure 1, the three tier structure employs extra long scissor braces **29**, upright frames **27**, and single diagonal brace members **28**. By reference to Figure 4 it will be noted that in the three tier grandstand each of the two front risers **20** supports the rearwardly adjacent riser and the two rearward risers are additionally supported by upright frames **27**.

It is obvious that by adding risers **20** and superimposing upright frames **27**, the size of the grandstand may be increased to almost any desired height. The size and seating capacity of the grandstand may also be increased by placing units such as that illustrated in Figure 1, side-by-side, in which case the seats **21** and the floor planks **22** are joined end-to-end at a section defined by one of the risers **20**. The method and means of supporting the seats and floor planks in such end-to-end relationship will be described later herein.



When a structure of three or more tiers is erected, the frames **27** may be either superimposed directly on each other as shown in Figure 6 or preferably staggered as in Figure 5.

All of the structural elements of the grandstand described herein are constructed principally of steel tubing or suitable tubular material. The diameters of substantially all of the vertical members are the same whereby to facilitate the interconnection of superimposed members in a manner to be described hereinafter.

For a detailed description of tthe riser **20**, reference should now be had to Figures 7 and 7*a*. The riser **20** is so constructed that the entire load distributed over the various seats **21** and walkways **22** supported thereon is carried at the forward and rear ends of the support member. In this manner no intermediate vertical support is required for any of the risers used in the multiple tier structure such as that illustrated in Figure 4. To this end the lower portion of the riser **20** is constructed in the form of a roof truss, the members of such truss including a lower horizontal member **30**, a pair of slanting thrust members **31**, and a number of diagonal struts comprising a single zig-zag member **32**. A vertical strut **33** is also provided at the apex of the thrust members **31**. All the members comprising the truss portion of the riser are welded together to form a single integral unit.

Rising from the panel points of the truss portion just described, are a series of vertical posts **34** of graduated heights, each of which is welded to the truss portion, the upper portions of such posts **34** being further interconnected by horizontal floor-supporting angles **35** welded thereto. It should be noted that the posts **34** at the extreme ends of the riser are open both at the top and the bottom, and that the rear vertical post carries an upwardly projecting pin **36** which is of a diameter to enter any vertical tube members whereby to attach another superimposed riser or other member to the riser carrying the pin **36**.

At various points on the truss **20**, attachment bolts **38** are welded as shown in Figure 7*a*, and are adapted to receive the ends of the scissor braces **26** or other members which are secured thereto by means of wing nuts **19**. Attachment bolts **38** are provided on the inner surface of the rearmost vertical post **34**, on the vertical post **34** third from the front of the truss, and at the lower horizontal member **30** forward of the center thereof, a welded clip **37** being provided at this latter point to support the bolt **38** in horizontal position. Thus it will be seen that each of the risers **20** is adapted to receive two pairs of scissor braces, one secured at the rear and one secured just forward of the center as indicated in Figure 7.

Turning now to a discussion of the upright frame members **27**, reference should now be had to Figure 8. The frame **27** is comprised of two horizontal members **40**, two vertical posts **41**, and integral diagonal braces **42** terminating at the corners of the frame, all of said members

being welded together to form a box-like frame which is diagonally braced. The vertical dimension of the frame 27 is equal to that of the rear post 34 of the riser 20 whereby a riser 20 and frame 27 may combine to support a superimposed riser in horizontal position, as for example, in Figure 4. On the inner surfaces of the two vertical members 41 a pair of attachment bolts 38 are welded similarly to those in the riser 20. The vertical members 41 are open at the bottom to facilitate superposition thereof on another frame 27 and carry interconnecting pins 36 at their upper ends similarly to the riser 20. Thus the upright frames 27 are adapted as are the risers, to be superimposed and furthermore to be interconnected by scissor bracing 29 secured by wing nuts 19 as previously described.

The structure employing the box shaped supporting frames is particularly adapted to withstand the lateral thrust which is occasioned by the unusually large "live" load which a grandstand must carry. Such lateral rigidity is enhanced by the fact that the integral diagonal braces 42 in the frame 27 extend substantially into the corners of the frame and therefore when frames are superimposed in staggered relationship as illustrated in Figure 5, the diagonals 42 of the various frames are placed in continuous end-to-end relationship to provide rigid diagonal bracing for the entire structure.

The scissor bracing 26 employed to interconnect the risers, and 29 employed to interconnect the upright frame members 27 are of similar construction differing only in length. Each of the scissor braces 26 and 29 is comprised of a pair of pivotally interconnected tubular members 43 partially flattened to a semi-circular cross section at their centers and interconnected by a pivot 45, as indicated by the reference character 44 in Figure 8a. The ends of the members 43 are flattened and have apertures formed therein adapted to pass over the bolt 38.

The walkways 22 and the means employed to secure them to the floor supporting members 35 of the riser 20 are illustrated in Figures 9 through 11. Each of the walkways employed in the grandstand described herein is comprised of a pair of planks 22' secured together in side-by-side relationship by a number of transverse cleats 50 attached to the planks by means of countersunk carriage bolts 53 and nuts 52.

Cleats 50 are positioned at points along the planks 22' such as to fall immediately adjacent to the angular support members 35. At the cleat 50 illustrated at the right end of the walkway 22 in Figure 9, a pair of projecting lugs 51 are additionally secured by the bolts 53 and adapted and positioned to project under the upper horizontal flange of the angle member 35. It will be noted that all of the angle members 35 have the upper flange of the angle projecting to the left, and as a consequence, the lugs 51 must project to the right in order to hook under the flanges as just described. In the embodiment illustrated in Figure 1 a similar set of lugs 51 is provided at the left end of the floor planks 22', these lugs also projecting to the right whereby to hook under the angle member 35 adjacent thereto.

It will be noted from an examination of Figure 9 that the intermediate cleats 50 fall on the right-hand side of the angle members 35. Thus the floor planks in the embodiment illustrated in Figure 1 are installed by bowing the plank upwardly to the position indicated by the phantom lines in Figure 9, hooking the end lugs 51 under the upper flanges of the angles 35, moving the floor planks endwise to the right, and allowing the planks 22' to return to its original unbowed position whereby the cleats 50 fall behind the angles 35, prevent the walkway 22 from moving endwise, and thus secure it in place. The walkway is removed by bowing it upwardly again and moving it endwise to the left to unhook the lugs 51.



In the particular arrangement illustrated in Figure 9 the attachment means provided at the left end of the plank is such as to provide for a butt joint with a laterally adjacent walkway, thus providing for the arrangement previously described in which several sections of grandstand are joined end-to-end. The details of this butt joint are illustrated in Figure 10, wherein it will be seen that a flat plate 54 is secured to the under surface of the right-hand planks 22' and project to the left therefrom. This plate 54 is adapted and positioned to lie atop the supporting angle 35 with its left-hand end substantially in alignment with the edge of the upper flange thereof. Thus the planks 22' at the left in Figure 10 may be placed in end-to-end alignment with the planks to the right, resting atop the plate 54. A cleat 50a which is equal to the combined thickness of the flange of the angle 35 and the plate 54 is provided at this point in order to permit the lugs 51 to hook under the angle flange and the plate, thus to secure both the left-hand and the right-hand planks to the support angle 35. The plate 54 being relatively thin, the difference in planking elevation produced at the joint section is relatively small and immaterial.

Thus it will be seen that there are four types of floor plank assemblies which may be used in connection with the various combinations of elements in constructing grandstands embodying my invention.

The first type intended for use in the embodiment illustrated in Figure 1 provides attachment lugs 51 at both ends of the walkway and the planks are long enough to project somewhat beyond the support member 35 as illustrated in Figure 11, and also in Figure 1.

The second type of walkway is that illustrated in Figure 9, which projects beyond the support member 35 only at the right-hand end.

The third type of planking would be that which projects only at the left-hand end.

And the fourth type is that which projects at neither end, but is cut to a length to provide a butt joint at each end as illustrated in Figure 10.

The seat planks 21 employed in the various forms of my invention and the attachment means therefor are illustrated in Figures 12 through 14. In Figure 12 a plank projecting somewhat to the right beyond the end support member is illustrated being joined in end-to-end relationship with an additional section to the left as previously described in connection with the walkway. The seat planks 21 are supported on the upper ends of the vertical posts 34 which form part of the riser 20.

A plurality of socket members 60, 60a and 65 are bolted to the under surface of the plank 21 and positioned to be received over the upper ends of the tubular posts 34. Each of the sockets 60 and 60a is comprised of a cylindrical portion 61 of sufficient internal diameter to pass over the posts 34, a nut 63 being welded to the side

of the cylinder 61 to receive a set-screw 64 whereby the socket 60 may be secured to the post 34 to prevent rocking motion of the seat plank 21. A flat flange 62 is welded to the upper end of the cylindrical portion 61 and apertured to receive bolts 53 which secure it to the plank.

In seat planks of the type which provide a butt joint at one or both ends thereof, a special socket member 65 is provided at such adjoining end, such special socket 65 comprising a semi-cylindrical lower member 66 welded in alignment with the edge of an attachment flange 67. A semi-cylindrical stud 68 is also welded to the flange 67 being coaxial with the socket portion 66. Thus two of the special socket members 65 placed in adjacent relationship as illustrated in Figure 12, are adapted to be received in the same vertical posts 34, to hold the planks thereto in end-to-end relationship.

Similarly to the floor planks, four types of seat planks are provided, one projecting to the right as illustrated in Figure 12, one projecting to the left, one projecting at both ends, and one projecting at neither end.

As illustrated in Figure 12, the two intermediate socket members 60 are somewhat longer in vertical extent than the socket members 65 and 60*a* adjacent the ends of the seat planks 21. The purpose of this arrangement is to make possible the engagement of the two intermediatie sockets 60 prior to the engagement of the end sockets, thus facilitating the assembly of the grandstand.

For a description of the guard rails and support members therefor, reference should now be had to Figures 15 and 16. As has been previously described, the guard rail assembly comprises two horizontal and four slanting rails 23 which are secured by stanchions 24 and C-clamp-like members 24' to the ends of the planking as illustrated in Figure 9.

The horizontal rails 23 which are positioned along the back of the grandstand are secured by stanchions 25 which are comprised of a vertical member 70 to which the rails 23 are attached, a horizontal and slanting attachment strut 72 and 71 respectively, a vertical channel 73, and a vertical tubular section 74 welded within the channel 73 as illustrated in Figure 16. The tubular section 74 is of the same diameter as the upright posts 34 of the truss members, and thus it is adapted to be received over the pin 36 carried in the rear post 34 of the risers 20. When the stanchion 25 is so positioned over the rear post of one of the risers and interconnected by means of the pin 36, the channel 73 lies along the rear surface of the rear riser post to additionally brace and support the stanchion thereon.

It will be noted from an examination of Figure 7, that the rear and next-to-rear riser posts 34 are of substantially the same type and that it is necessary therefore to support the rearmost seat on any riser section on an additional section of vertical tubing in order to support said rear seat at the proper distance above the next-to-rear seat in the section. In the multiple tier grandstand illustrated in Figure 4 such additional height for the rear seat is provided by the front post of the superimposed and adjacent riser. The rearmost seat in the multiple tier grandstand is elevated to the proper height by reason of the additional tubular section 74 which forms part of the rear guard rail stanchion 25.

Thus it will be seen that I have provided a grandstand structure which may be easily and quickly erected or demounted. The size and



shape of the component elements are such that each element may be carried and lifted into place by one man. Furthermore the erection and demounting is facilitated by the fact that the only tool required is a wrench to tighten the set screws in the socket members 60, 60*a*, and 65.

As an additional securing means, transverse and aligned holes may be formed in the attachment pin 36 as illustrated in Figure 8, complementary holes being provided in the lower ends of the tubular members received on the pin 36 whereby transverse cotter key or other member can be inserted to prevent the accidental disengagement of the pin 36 from the tubular member carried thereon.

By making use of the construction described herein, a grandstand having many times the strength and rigidity of equivalent wooden structures can be erected and furthermore the overall weight of the structure will not greatly exceed that of the equivalent wooden structure.

While the structural elements shown and described herein are fully capable of achieving the objects and providing the advantages hereinbefore stated, it is to be understood that they are illustrative only and are capable of considerable modification without departing from the spirit of the invention. For this reason I do not mean to be limited to the forms shown and described herein, but rather to the scope of the appended claims.

I claim:

1. The combination with a tubular post included in a grandstand riser, of a pair of similar planks having abutting ends, a fitting mounted on the underside of each plank at its abutting end, said fittings each providing a semi-circular plug and a semi-circular socket concentric therewith and spaced therefrom to provide a semi-annular groove, said tubular post being snugly received in the grooves between co-acting plugs and socket members.

2. The combination with a tubular post included in a grandstand riser, of a pair of similar planks having abutting ends, a fitting mounted on the underside of each plank at its abutting end, said fittings each providing a semi-circular plug and a semi-circular socket concentric therewith and spaced therefrom to provide a semi-annular groove, said tubular post being snugly received in the grooves between co-acting plugs and socket members, and a set screw threaded into the socket member of each fitting to engage the post and hold the planks to the post.

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