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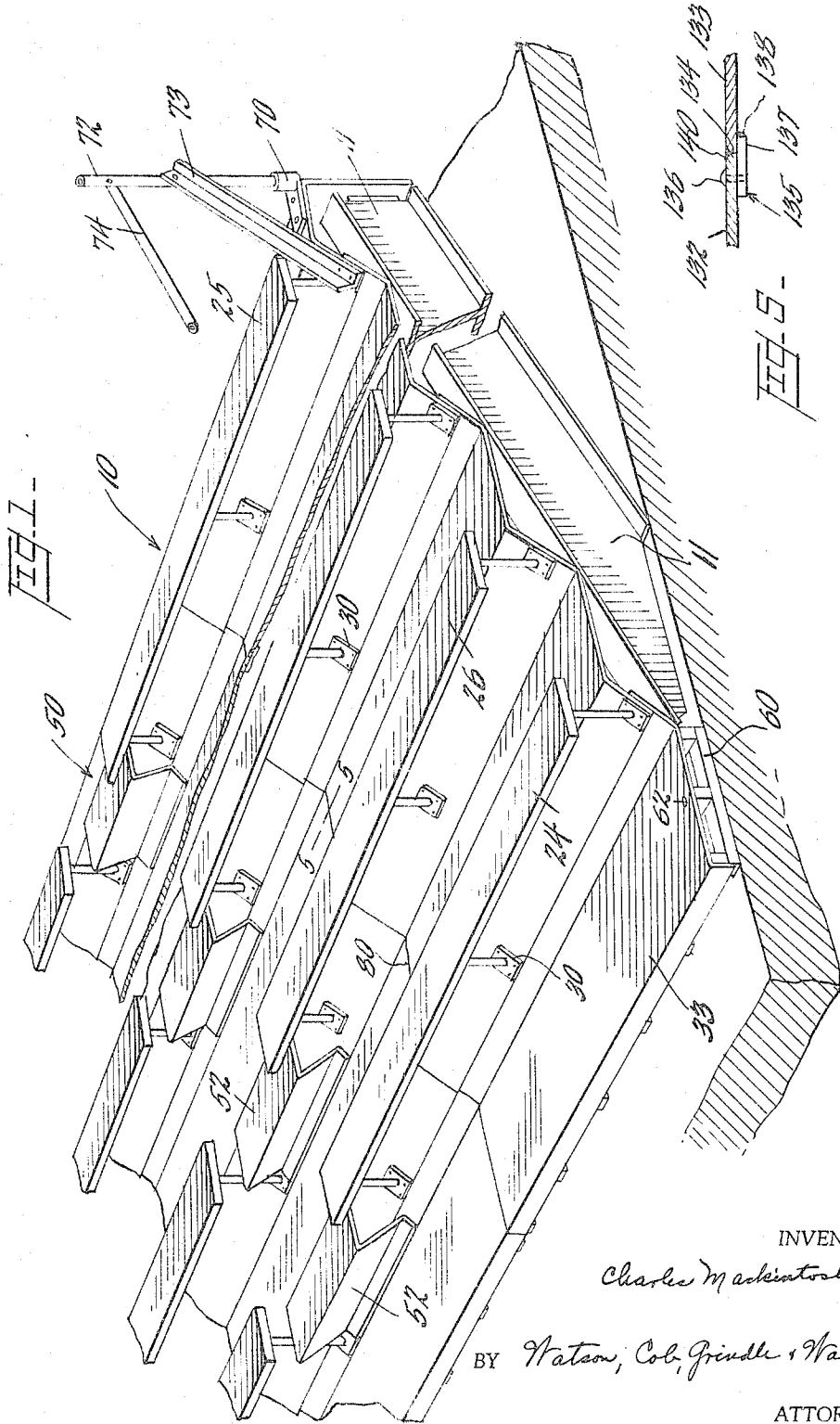
C. MACKINTOSH

3,289,367

GRANDSTANDS

Filed March 30, 1964

2 Sheets-Sheet 1



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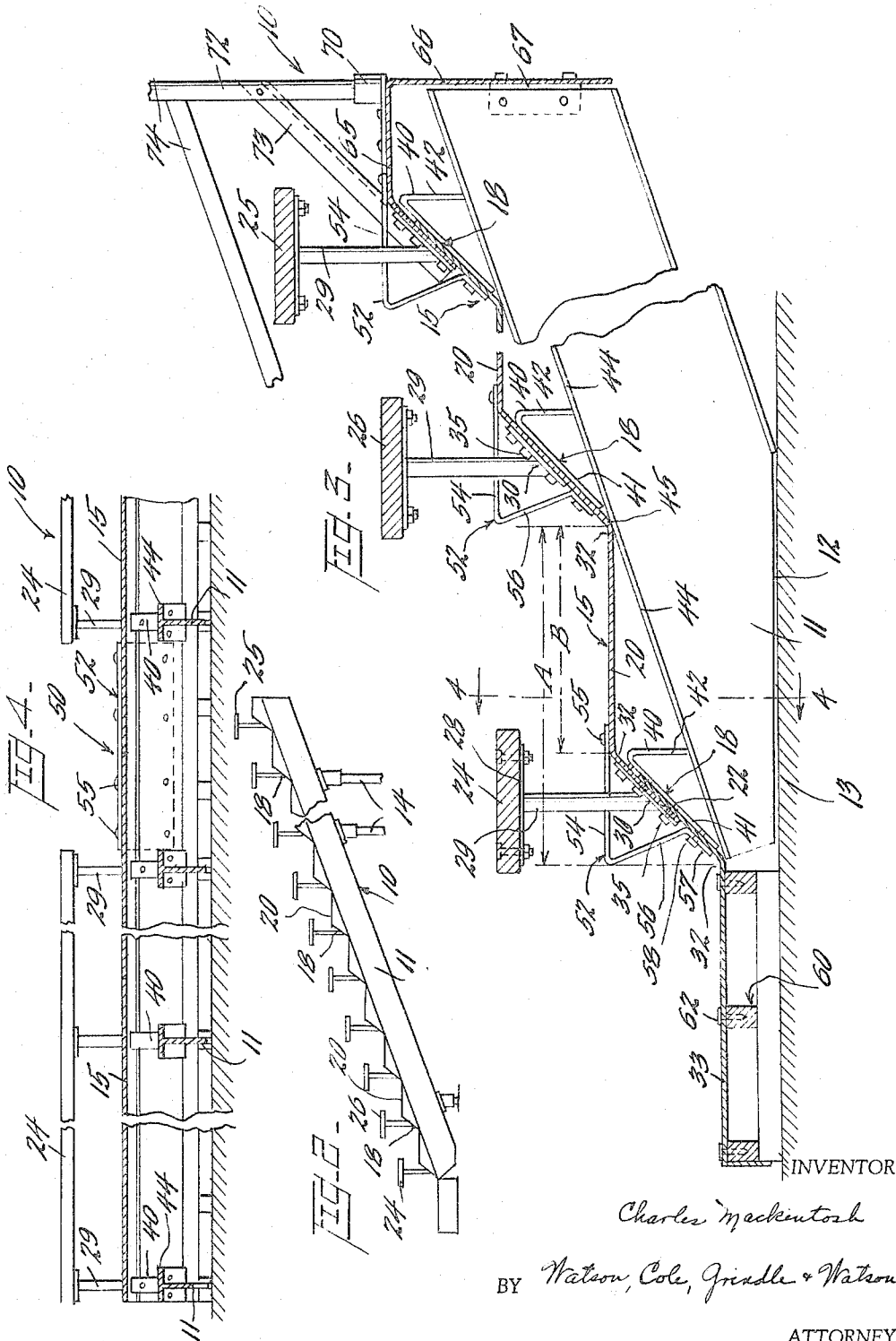
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GRANDSTANDS  
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This invention relates to grandstands, bleachers, or other raised viewing stands, and more particularly to those of which the basic seat supporting deck structure is made of steel sheeting.

The principal object of the invention is the provision of a novel and improved structure of the type described in which, by an ingenious structural modification of the sheet steel base, a saving is effected of from about 20% to 33 1/3% in metal costs, while at the same time there is maintained the structural strength and dimensional adequacy of the seating arrangement.

Furthermore, the novel arrangement provides an improved appearance and more convenience in welding and painting the structure.

The construction permits a more convenient location of the seat posts or brackets, provides a better footrest, and reduces the amount of space required in storage and trucking.

In its preferred embodiments the invention contemplates the provision of a stepped grandstand structure, which instead of a conventional rectilinear "tread and riser" arrangement, the actual horizontal "tread" portions are narrowed to a minimum width necessary for providing adequate transverse walking decks, and the "riser" portions of the deck structure are correspondingly widened and disposed in inclined or sloping positions.

The seat posts are very conveniently attached to the inclined deck portions, and the sloping metal surfaces are convenient for footrests for the occupants of the seats.

In conventional structures, the usual bleacher seats without back are disposed about twenty-four inches apart on centers, and thus the walking deck portions were correspondingly twenty-four inches wide. In one example of my novel structure, by sloping the metal sheets under the seats, this walking deck is reduced to approximately sixteen inches which is entirely adequate for the purposes. Since the elastic deflection of a span varies as the span cubed ( $d=L^3$ ) the narrower walkway having two-thirds the width is much stiffer, having only 8/27 or less than one-third the deflection. The usual thickness of metal on the old twenty-four inch decks was 3/16 inch. There can now be saved 33% of the metal by using 1/8 inch thick metal deck sheeting which has two-thirds the thickness and still has the same stiffness as the 3/16 inch sheeting has on twenty-four inches (the deflection varies inversely as the cube of the thickness,  $T^3$ ).

Other objects and features of novelty including the provision of novel details of construction and arrangement of walkways and aisles will be apparent from the following specification when read in connection with the accompanying drawings in which one embodiment of the invention is illustrated by way of example.

In the drawings:

FIGURE 1 is a partial view in perspective of a grandstand structure embodying the principles of the invention;

FIGURE 2 is a somewhat more diagrammatic view in side elevation of a stand similar to the one shown in FIGURE 1;

FIGURE 3 is a fragmentary view on an enlarged scale and partly in vertical section of the grandstand;

FIGURE 4 is a transverse vertical sectional view taken substantially on line 4-4 of FIGURE 3; and

FIGURE 5 is a fragmentary detail view taken on line 5-5 of FIGURE 1.

The novel grandstand is given the general designation 10 in the drawings and comprises a basic framing structure which includes stringers preferably in the form of I-beams 11 disposed in inclined positions and spaced along the width of the grandstand 10 as clearly shown in FIGURE 4.

In some cases the front end of the stand may be at a slight elevation above the ground, in which situations the I-beams 11 need not be bevelled or truncated at their forward ends. However, in the suggested embodiment illustrated herein the first row of seating occurs at substantially ground level and therefore the forward ends of the beams 11 are cut away as at 12 to align with the level of the ground surface 13, which surface may of course be reinforced by a concrete or other paving layer to aid in supporting the stand upon the soil. The rear and intermediate portions of the stand 10 may be supported by any suitable structure as typically represented by the posts 14 in FIGURE 2. Disposed upon the spaced I-beams or stringers 11 is the sheet steel decking structure 15 which would, in the conventional structures, be bent or angled to provide alternate risers and treads standing at right angles to each other as in an ordinary stairway. However, in the present novel arrangement, the deck structure 15 is serially bent at wider obtuse angles to provide alternate inclined riser portions 18 and tread or cross walkway portions 20.

The decking may be made in sheets of sufficient rearward extent to bridge two or more rows of seats or the width may be determined by the spacing center-to-center between adjacent rows of seats. Thus, an overlap joint structure between adjacent transverse deck sheets is shown at 22 beneath the first seat 24 and also a junction is shown adjacent the last row beneath the seat 25; however, beneath the second seat 26 the deck sheet is continuous. Also, for some purposes, the joints between adjacent transversely extending deck sheets might occur intermediate the walkway portion 20, but in the present illustrated example, the joints are arranged beneath certain of the seats, and in such a structure common fastening means such as self-tapping screws may be employed to secure the overlapping edges of the deck sheets together and to secure the base brackets of the seat posts in place.

This arrangement is clearly shown in FIGURE 3 of the drawings where the seat 24 is bolted to a plate 28 carried by the vertical post 29 which is provided with an angled bracket plate 30 at its lower end, the angularity of the plate corresponding to that of the inclined "riser" portion 18 of the decking. The edges of the adjacent plates 32 and 33 are overlapped as clearly shown and the same self-tapping screws 35 may be employed to join the plates and also to secure the bracket 30.

Similar posts 29 and brackets 30 are used to secure the seat 26, but in this case the self-tapping screws 35 merely pass through the bracket 30 and the intended riser portion of the plate 32.

Beneath the riser areas of the decking above each of the I-beams 11 are secured the angle plates 40. An inclined portion 41 of each of these plates is secured upon the underside of the lapped junction areas of the plate edges; and conveniently when a seat post 29 occurs above one of the I-beams 11, the same screws 35 could be used to secure the angle bracket 40. The vertical arm 42 of each angle bracket is directed downwardly and abuts the top flange 44 of the I-beam 11 as clearly indicated in FIGURE 3. Thus, an extra bracing measure is afforded for those portions of the decking 15 which do not come into contact directly with the flange 44 as in the case of the bends 45.

Where aisles occur as at 50 in FIGURES 1 and 4 ascent of the stairs at these aisle locations is greatly facilitated by the provision of the sheet metal extensions 52, the horizontal portions 54 of which extend from the forward edge of the cross walk or tread portion 20 of the decking 15, their rearward edges being secured thereto as by means of the screw or other fastenings 55. A forward depending portion of the step members 52 is designated 56 and is inclined slightly rearwardly and provided with a flange 57 which is secured by means of the screw 58 to the lower portion of the inclined riser area 18 of the decking. Thus, a very convenient step arrangement is provided for ascending and descending the aisles 50.

At the forward edge of the grandstand the plate 33 is extended horizontally and mounted upon a framework 60 which may conveniently comprise wooden strips such as two-by-fours and the sheeting may be secured thereto as by means of the screws 62.

At the rear end of the stand, beyond the last bracing element 40, a further sheet element 65 may have its forward inclined edge secured to the last inclined riser portion 18 and this sheet 65 may be bent downwardly as at 66 and suitably secured to the end of the I-beams 11 as by means of the plate 67.

A bracket 70 may be secured to the horizontal portion of the final sheet 65 to receive a railing post 72 which also may be braced by means of the strut 73 bolted to the final riser area 18, and the railing may be completed in suitable fashion as suggested by the elements 74.

Of course, the deck sheeting may be made in any convenient obtainable areal dimensions and if adjacent strips are to be joined along rearwardly extending lines such as suggested at 80 in FIGURE 1, such junctions may be conveniently effected as suggested in the fragmentary detail view of FIGURE 5 where a sheet 132 has its edge abutted to the edge of a seat 133 as at 134. A series of small cleats 135 may be secured to the lower portion of the edge of sheet 132 as by means of the screw 136 and the projecting portion 137 of the cleat 135 will underlie the edge of the deck sheet 133. The sheeting may be further secured as by means of a welded joint suggested at 138 or at 140.

As already mentioned, due to the novel structural modification of the deck by reducing the "tread" width from "A" to "B" (see FIGURE 3) the gauge of the metal sheeting may be reduced with an attendant saving in costs.

It is understood that various changes and modifications may be made in the embodiments illustrated and described herein without departing from the scope of the invention as determined by the subjoined claims.

Having thus described the invention, what is claimed as new and desired to be secured by Letters Patent is:

1. A grandstand structure comprising a supporting framework, a stepped sheet metal deck structure, and seating means supported thereby, said deck structure comprising alternating tread and modified riser portions, said tread portions being somewhat narrowed to provide only the transverse walkway width needed for comfortable passage therealong, said riser portions being inclined to provide forwardly and downwardly sloping areas, and means securing said seating means to said sloping riser portions only of the deck.

2. The grandstand structure as set forth in claim 1 in

which said framework includes stringers inclined from the front of said grandstand structure upwardly toward the rear thereof, the angled junctions of the forward edges of the riser portions and the rearward edges of the tread portions resting upon said inclined stringers, and supplemental supporting brackets for said deck structure comprising strips each secured along the underside of a riser portion and having a rear end portion bent downwardly into abutting contact with said stringer.

3. The grandstand structure as set forth in claim 1 in which the seating means comprises seats secured to the upper ends of vertical supporting posts, and bracket plates secured to the lower ends of said posts and inclined at the same angle as the riser portion of the deck and secured thereto.

4. The grandstand structure as set forth in claim 1 in which the deck structure is made of a plurality of sheets, the adjoining edges of which are overlapped and secured together within the confines of the sloping riser portions of the deck structure.

5. The grandstand structure as set forth in claim 4 in which the seating means comprises seats secured to the upper ends of vertical supporting posts, and common means for securing the deck sheets together within the sloping riser areas and for securing the lower ends of the posts to the riser portions of the deck.

6. The grandstand structure as set forth in claim 2 in which the deck structure is made of a plurality of sheets, the adjoining edges of which are overlapped and secured together within the confines of the riser portions of the deck structure, and in which the seating means comprises seats secured to the upper ends of vertical supporting posts, and common means are provided for securing the deck sheets together at the riser areas, for securing the lower ends of the posts and the supplemental supporting brackets to the riser portions of the deck.

7. The grandstand structure as set forth in claim 1 in which the inclined stringers are I-beams, the forward ends of which rest upon the ground, and the foremost margin of the deck structure is extended forwardly and supported upon the ground surface to provide a forward transverse walkway in front of the first row of seating.

8. The grandstand structure as set forth in claim 1 in which the rearmost margin of the deck structure sheeting is bent over the rear ends of the stringers and secured rearwardly to the ends thereof, and a rear railing structure is secured thereto.

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