June 26, 1934. C. H. WETZEL 1,964,613

FOLDING GRANDSTAND

Filed April 18, 1933 3 Sheets-Sheet 1

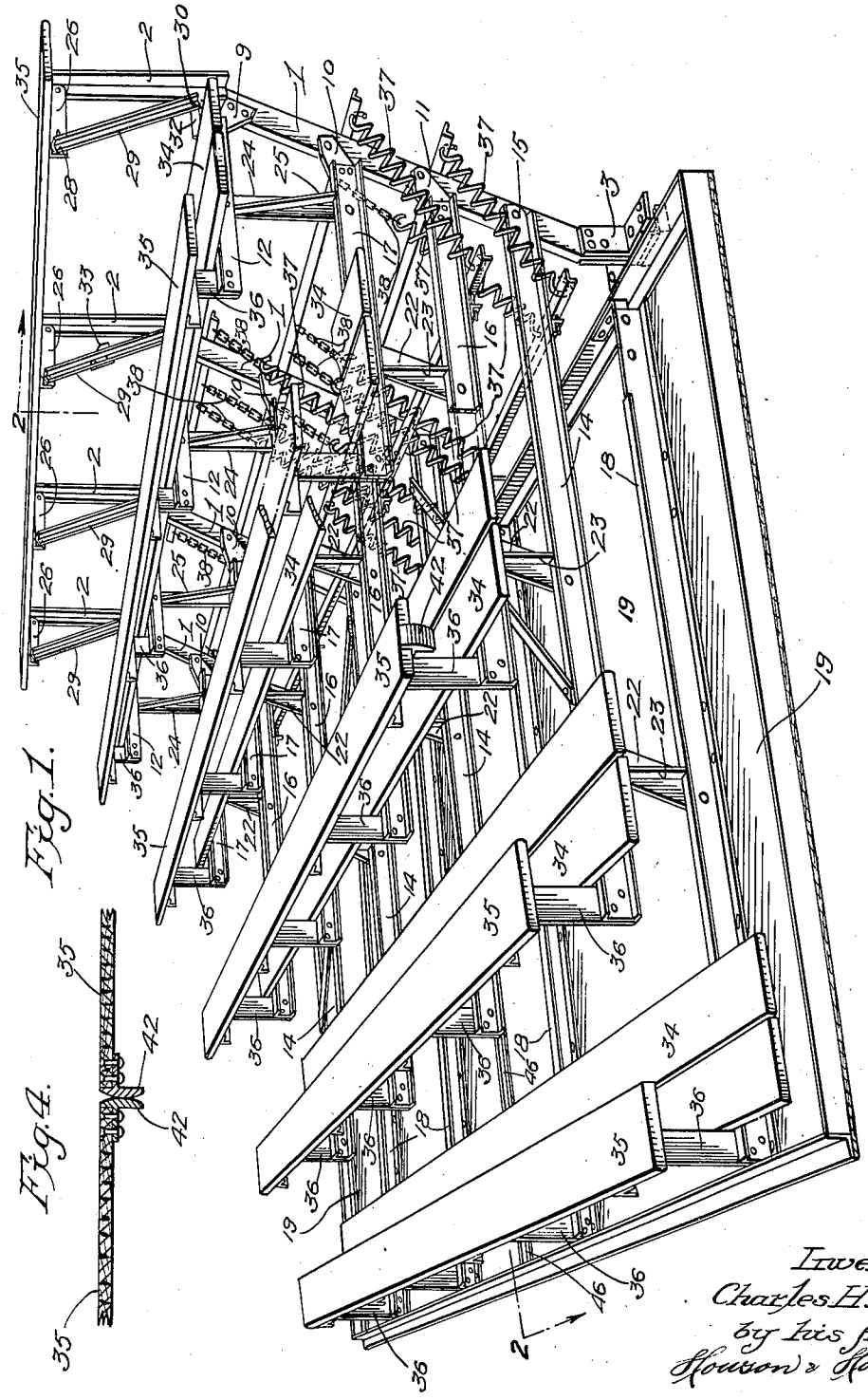


Fig. 1.

Fig. 4.

Inventor:—
Charles H. Wetzel
by his Attorneys
Howson & Howson

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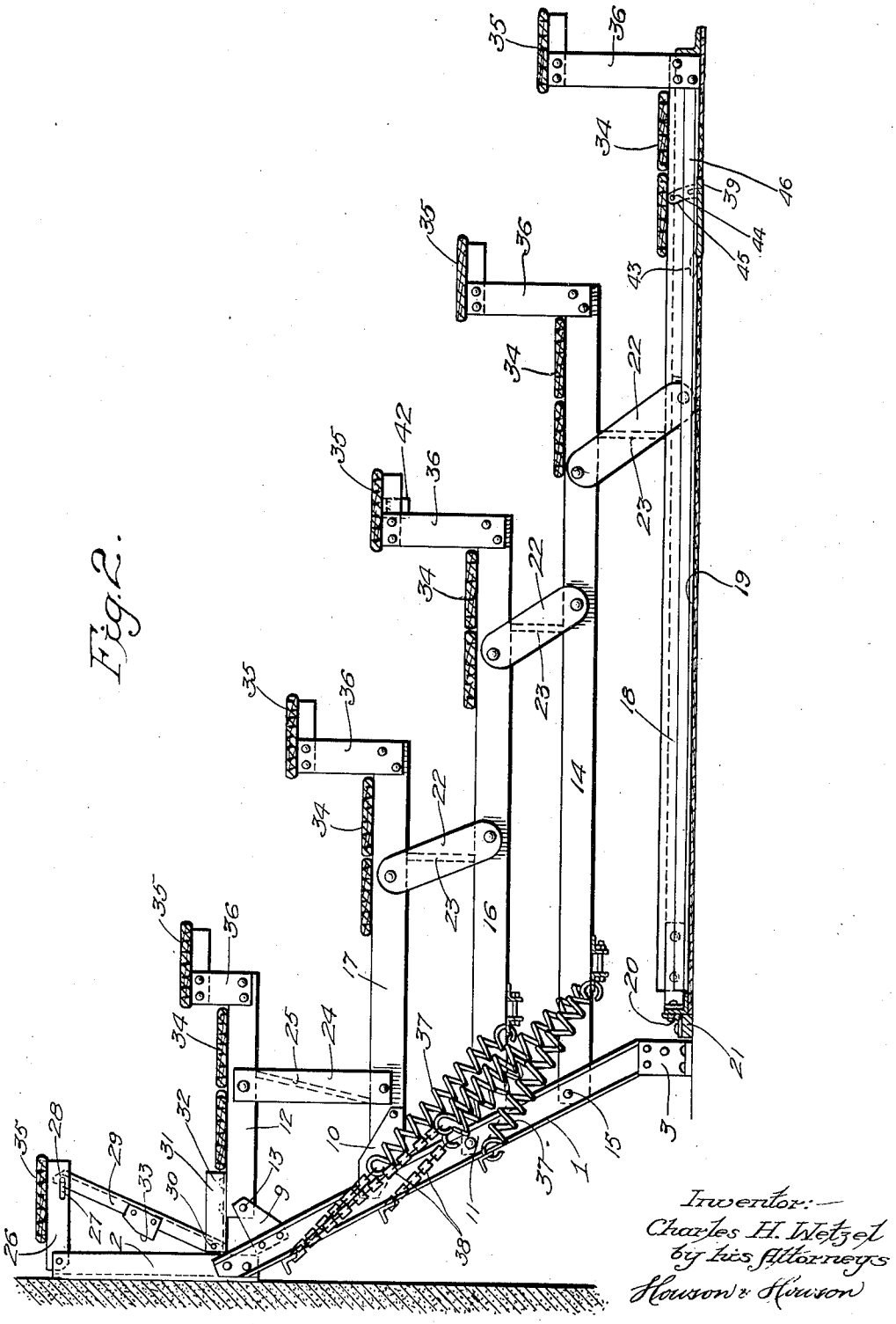


Fig. 2.

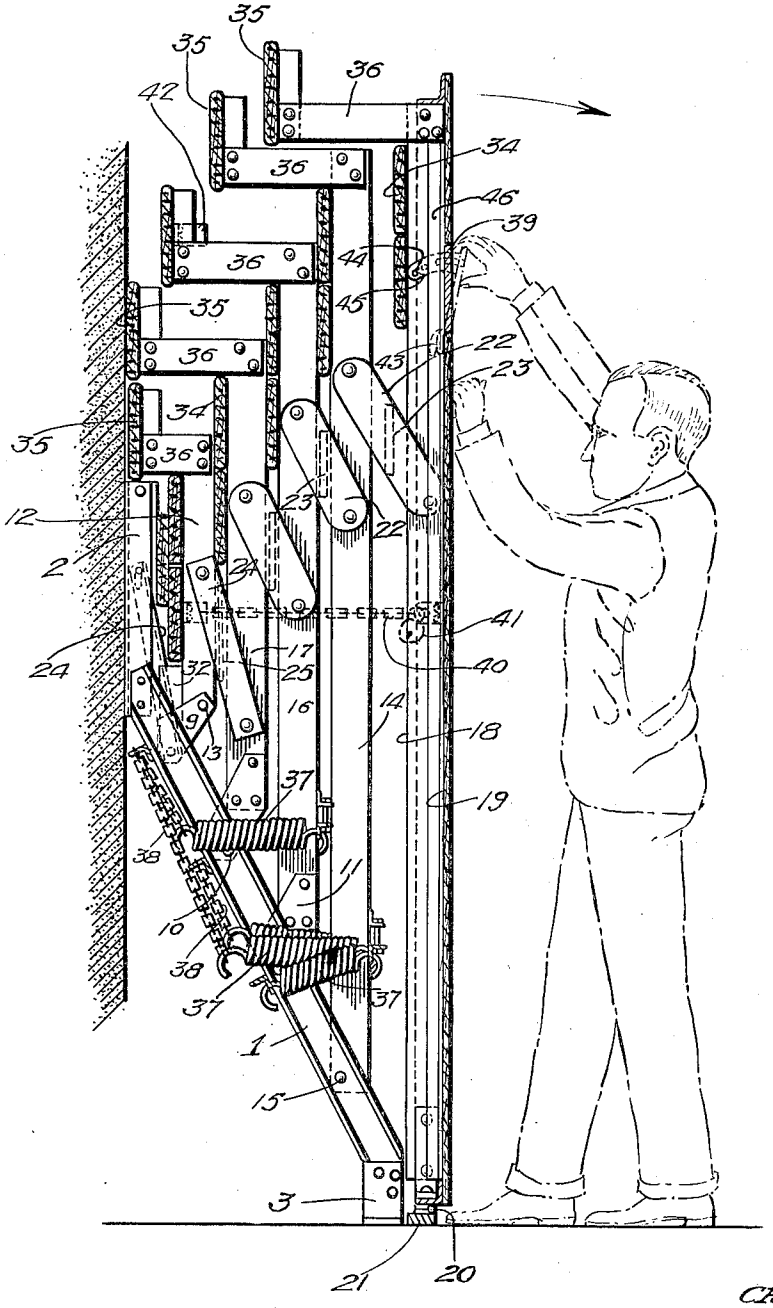
Inventor:—
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by his Attorneys
Howson & Howson

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Fig. 3.



Inventor:—
Charles H. Wetzel
by his Attorneys
Howson & Howson

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UNITED STATES PATENT OFFICE

1,964,613

FOLDING GRANDSTAND

Charles H. Wetzel, Wayne, Pa.

Application April 18, 1933, Serial No. 666,760

8 Claims. (Cl. 189—1)

This invention relates to new and useful improvements in folding structures and particularly to folding structures for grandstands and the like of the general character disclosed and described in my copending United States application, Ser. No. 640,709, filed November 1, 1932.

The principal object of the invention is to provide a structure of the general character set forth which may be folded or set up at will as a unit in its entirety and when in the former relation will occupy a relatively small, compact area.

A further object of the invention is to provide a structure of the general character described having a novel spring arrangement associated therewith to facilitate folding and setting up of said structure.

A more specific object of the invention is to provide a structure of the character set forth wherein the successive pivotal beam sections are pivotally connected to the adjacent beams by means of members which, when the structure is in the set up relation, function as spacing means to position said beams in respectively parallel relation and whereby the structure may be folded or set up in its entirety as a complete unit.

Other features and details of the invention are set forth hereinafter and disclosed in the accompanying drawings, in which:

Figure 1 is a view in perpsective of the structure constituting the present invention;

Fig. 2 is a view in section on line 2—2, Fig. 1;

Fig. 3 is a view in section through the structure, similar to that disclosed in Fig. 2 with said structure in folded or nested relation; and

Fig. 4 is a fragmentary view showing novel means for spacing adjacent unit structures disposed side by side in alignment.

The present invention contemplates a folding stand structure of the general character described in the previously identified copending United States application Ser. No. 640,709, filed November 1, 1932 having novel means to enable said structure to be set up in its entirety as a single unit to afford compact seating facilities for a large number of people and which, when not in use, may be folded as a single unit into a relatively small compact area, by a single person, eliminating the necessity for complete removal from the floor and rendering the portion of the floor occupied by it when set up, available for other desired uses. The present structure is of rugged, simple construction and embodies a substantially high factor of safety and renders it acceptable for use in such instances.

Referring now more particularly to the drawings, the particular structure constituting the present invention is adaptable to folding structures comprising a plurality of stringer members 1, secured to the lower extremity of each of a number of vertically positioned angle members 2, and at their lower ends secured intermediate the vertically disposed flanges of opposed L-members 3 secured to the floor or other foundation on which the structure is to be mounted.

A structural plate 9 is rigidly secured to each stringer 1 and similar plates 10 and 11 are pivotally mounted thereon as shown in Fig. 1 of the drawings. A beam 12 in the form of a channel or other structural shape is pivotally connected at the opposite end of the plate 9 as at 13 and a similar but somewhat longer beam 14 is pivotally connected directly to the stringer 1 adjacent its lower end as at 15. Intermediate beams 16 and 17 respectively of relative lengths are rigidly secured to the extended portions of the pivotally mounted plates 10 and 11, and a beam 18, the lowermost of the series, is permanently secured to a base structure or paneling 19 which is hinged as at 20 to a base strip 21 disposed just forward of the L-members 3 to which the lower ends of the stringers 1 are secured.

A particular feature of the invention is present in the structural members 22 one of which is pivotally connected at its extremities to the beams 18 and 14, 14 and 16, and 16 and 17 respectively in such manner that when the stand structure is in set up position as disclosed in Fig. 1, the longitudinal axis of each of said members 22 is disposed substantially parallel to the longitudinal axis of the stringers 1, that is, rearwardly inclined with respect to the base or paneling structure 19. Each of the structural members 22 is provided with a web 23 formed perpendicular to one face of said members 22 and positioned obliquely with respect to the longitudinal axis thereof so that they will assume a position vertical to the plane of the base paneling 19 when the stand is set up as disclosed in Fig. 1 of the drawings. When the stand structure is in the position just mentioned, the lower edges of the webs 23 rest upon the beams to which the lower ends of their constituent members 22 are secured and the beams to which the upper ends of said members 22 are connected rest upon the upper edge of said webs in the manner disclosed in Fig. 1 which function as spacing elements intermediate the beams to support the latter in superimposed parallel relation.

A structural member in the form of a plate 24 is pivotally connected at each of its ends to the

beams 12 and 17 respectively with its longitudinal axis substantially normal to the plane of the base structure 19 or any support upon which the stand rests. The plate 24 is similarly provided with an obliquely positioned web 25 which functions in the manner of the webs 23 on the structural members 22 to insure relative parallel spacing of said beams 12 and 17. It should be particularly noticed by referring to Figs. 1 and 2 that the web 25 on the structural member 24 is disposed at an acute angle with respect to a normal to the beam 17 and this is necessary to enable the structure to be folded or nested into a substantially small compact area as will be described hereinafter.

A member 26, preferably in the form of a structural angle, is pivotally connected to the upper end of each of the vertically disposed structural members 2 and the vertically disposed flange of said member 26 is provided with a longitudinal slot 27 arranged to receive a projecting pin 28 secured at the upper end and projecting outwardly from a structural member 29, the lower end of said member 29 being pivotally connected as at 30 to the upstanding flange or arm 31 of a structural member 32 rigidly secured on the upper face of the uppermost hinged beam 12 and extending rearwardly beyond the inner end thereof. A kick plate 33 is rigidly secured on the structural member 29 for the purpose of facilitating setting up of the stand and functions in the manner described in the above identified copending application.

Each of the beams 18, 14, 16, 17 and 12 are provided with board sections 34 constituting foot rests and a seat section 35 is mounted on the member 26 and at the forward end of each of the hinged beams 12, 17, 16, 14 and 18, by means of bracket structures 36.

A further feature of the invention is present in the novel arrangement of a number of substantially heavy coil springs 37 suspended between the stringer members 1 and certain of the pivotally mounted beam members for the purpose of enabling the grandstand structure to be readily set up or folded by a single person.

In the present instance coil springs 37 are distributed and connected between the stringers and certain of the hinged beam members in such manner as to substantially balance the entire structure during either setting up or folding operation at an angle of approximately 45° with the horizontal. It should be noticed by referring to the drawings that certain of the springs are connected directly to the stringers and others are connected by means of chains 38. When the stand structure is in the set up or unfolded position shown in Fig. 1 of the drawings, all of the springs 37 are exerting a maximum tension upon the hinged beam members, and as the structure is folded, the springs 37 connected by chains 38 to the stringers, contract more rapidly than do the others so that when the beams are at an angle of approximately 45° they are fully contracted and cease to exert further tension on the beams, the springs 37 connected directly to the stringer continuing to contract and pull the hinged beams to a substantially vertical position in nested or folded relation. When installing a structure of the present character, the number and positions of the springs is a matter of experiment and will vary from time to time, depending upon the weight of the structural members employed. The number of springs connected directly and the number of springs connected by chains 38 to the stringers are varied by the erector until a satisfactory balance is obtained.

A handle to facilitate folding and setting up of the stand structure, designated generally as at 39, is mounted in the base panel 19, and pivotable with respect thereto on lugs 43. Apertures are formed in the face of the handle member to enable the operator to insert his fingers therein and pivot the handle structure 39 outwardly with respect to the plane of the panel 19 so that he may subsequently insert his fingers back of the handle with a firm grip and pivot the hinged structures in the direction of the arrow in Fig. 3 of the drawings. Outward pivot of the handle 39 is limited by means of a cross bar 44 extending between two rearwardly positioned arcuate members 45 and engages a stiffener or rib 46 positioned with its axis substantially parallel to the axis of the hinged beam members.

Suitable means should be employed to lock the structure in folded position and in the present instance for the purpose of description, a chain 40 is shown connected between the innermost member and the base 19 or a beam member and secured by means of a padlock 41.

It will be obvious that by virtue of the permanent pivotal connection of each hinged beam to the next higher beam by means of the structural members 22 and 24 the stand structure can be set up or folded in its entirety as a complete unit by a single operation. When the structure is folded or nested as disclosed in Fig. 3 of the drawings, it will be noticed that the spacing webs 23 on the connecting members 22 are disposed vertically with respect to the disclosure and do not interfere in any manner with proper nesting of said structure. It should be noted also, that the web 25 of the structural member 24 is positioned oblique with respect to the disclosure in Fig. 1 as has been mentioned hereinbefore and this is necessary in order that said web 25 will assume a substantially vertical position when the structure is folded or nested as shown in Fig. 3 so as not to interfere with proper nesting of the structural elements of the stand.

In certain instances it may be desired to position several of the units constituting this invention side by side to form a substantially long grandstand structure, and in order to insure proper spacing of the abutting ends of the seat and foot sections or adjacent unit structures and prevent possibility of persons having fingers and hands and the like crushed in between as a result of small horizontal movement of the seat sections or units, a novel cam member 42 having a convex outer surface is mounted on the extremity of one or more of the seat sections 35 in the manner disclosed in Fig. 1 of the drawings and arranged to contact in the manner disclosed in Fig. 4 with a similar member on the adjacent abutting end of the seat section of the adjacent stand structure.

It should be particularly borne in mind that the panel or base structure 19 is not an essential element of the structure and the stand may be readily installed with the lowermost beam members 18 contacting directly with the floor, ground or other surface in the set-up position on which the stand is erected. In the absence of the base paneling 19, the handle 39 is obviously eliminated and the stand may be set up or folded by merely taking hold of any one of the numerous structural members of said stand.

The structure may comprise any desired number of stringer sections and rows or tiers of seats

to provide a stand to meet particular seating requirements, and a particular feature of the structure is present in the ease with which the stand may be set up or folded.

The particular structural detail involved has been set forth for the purpose of description, but it is not intended however, that the invention be limited thereto except as is without the scope of the appended claims.

What is claimed is:

1. In a folding structure, a plurality of pivotally mounted beams pivotable to a substantially horizontal or vertical position, means connected between each adjacent pair of said beams whereby all of the beams may be pivoted simultaneously as a unit, and means on each of said last mentioned means arranged to reside between said beams when in horizontal position and support same in substantially parallel spaced relation.

2. In a folding structure, a plurality of pivotally mounted beams pivotable to a substantially horizontal or vertical position, means pivotally connected between each adjacent pair of said beams whereby all of the beams may be pivoted simultaneously as a unit, and means on each of said last mentioned means arranged to reside between said beams when in horizontal position and support the same in substantially parallel spaced relation.

3. In a folding structure, a plurality of pivotally mounted beams pivotable to a substantially horizontal or vertical position, means connected between each adjacent pair of said beams whereby all of the beams may be pivoted simultaneously as a unit, and means on each of said last mentioned means arranged to reside between said beams when in horizontal position and support same in substantially parallel spaced relation and permit positioning thereof in compact nest-like relation in vertical position.

4. In a folding structure, a plurality of pivotally mounted beams pivotable to a substantially horizontal or vertical position, means pivotally connected between each adjacent pair of said beams whereby all of the beams may be pivoted simultaneously as a unit, and means on each of said last mentioned means arranged to reside between said beams when in horizontal position and support the same in substantially parallel spaced relation and permit positioning thereof in compact nest-like relation in vertical position.

5. In a folding structure, a plurality of pivotally mounted beams pivotable to a substantially horizontal or vertical position, means pivotally connected between each adjacent pair of said beams whereby all of the beams may be pivoted simultaneously as a unit, means on each of said last mentioned means arranged to reside between said beams when in horizontal position and support the same in substantially parallel spaced relation, and permit positioning thereof in compact nest-like relation in vertical position, and means for locking the beams in the latter relation.

6. In a folding structure, a plurality of stringers constituting supports for a plurality of pivotally mounted superimposed beams, rigid members pivotally connected between each of said beams and adjacent beams whereby the structure may be folded or set up as a unit, means on each of said rigid members for maintaining the beams in parallel spaced relation with respect to each other when in horizontal position and permitting positioning in compact nest-like relation in vertical position, and sets of springs disposed intermediate the stringers and the beams at predetermined locations to facilitate folding and setting-up of the structure.

7. In a folding structure, a plurality of pivotally mounted beams pivotable to a substantially horizontal or vertical position, means connected between said beams whereby all of the beams may be pivoted simultaneously as a unit, means on each of said last mentioned means arranged to reside between said beams when in horizontal position and support same in substantially parallel spaced relation, and sets of springs disposed intermediate the stringers and the beams at predetermined locations to facilitate folding and setting-up of the structure.

8. In a folding structure, a plurality of pivotally mounted beams pivotable to a substantially horizontal or vertical position, means pivotally connected between said beams whereby all of the beams may be pivoted simultaneously as a unit, means on each of said last mentioned means arranged to reside between said beams when in horizontal position and support the same in substantially parallel spaced relation and permit positioning thereof in compact nest-like relation in vertical position, and sets of springs disposed intermediate the stringers and beams at predetermined locations to facilitate folding and setting-up of the structure.

CHARLES H. WETZEL.