

June 21, 1955

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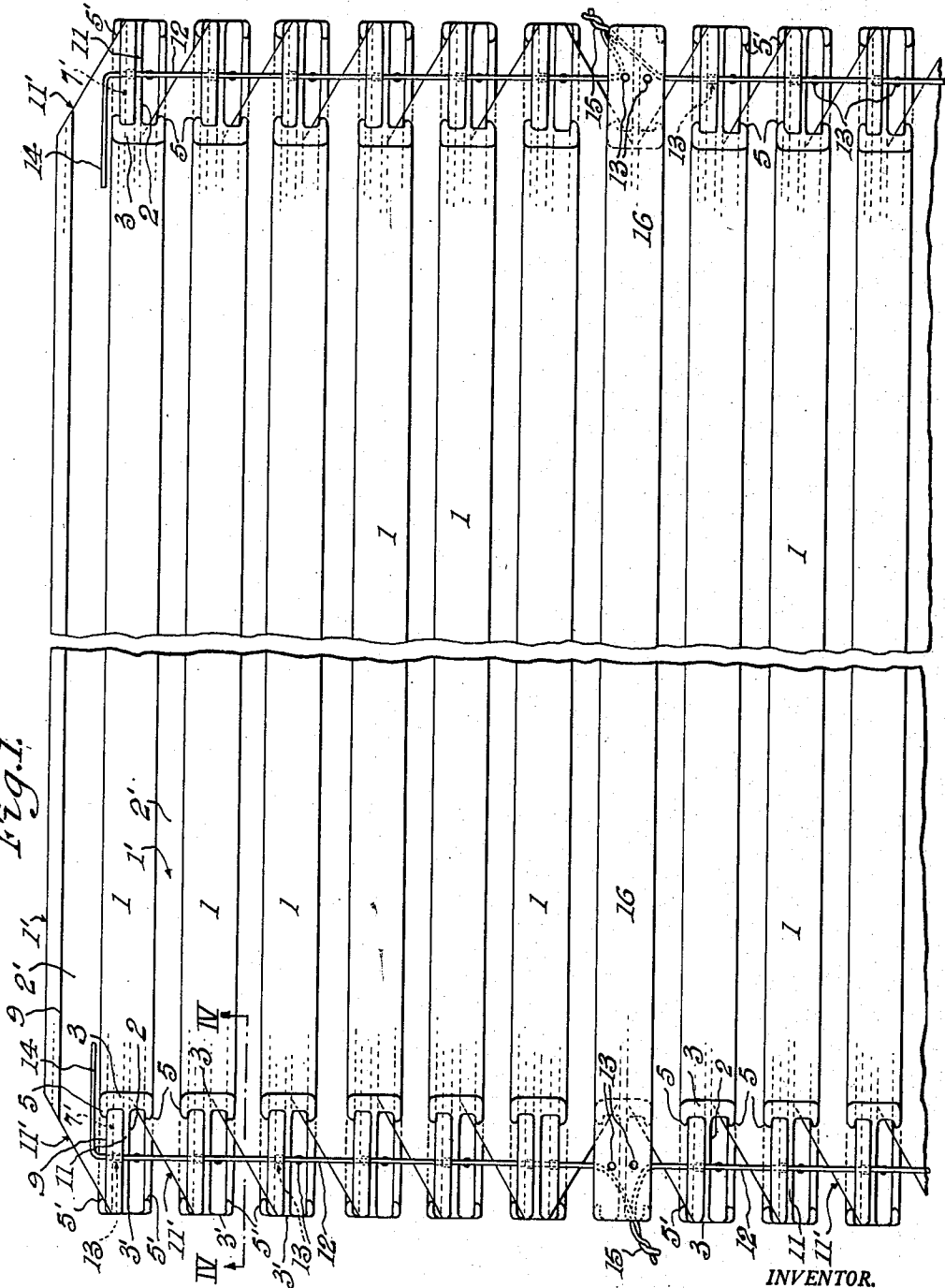
2,711,231

STRUCTURAL ASSEMBLIES COMPOSED OF ANTI-CREEPING
INTERCHANGEABLE INTERLOCKING STRUCTURAL UNITS

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3 Sheets-Sheet 1

Fig. 1.



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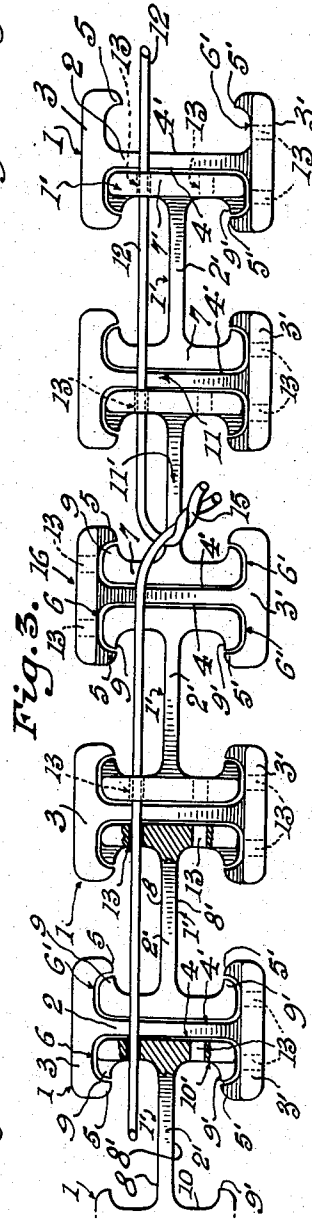
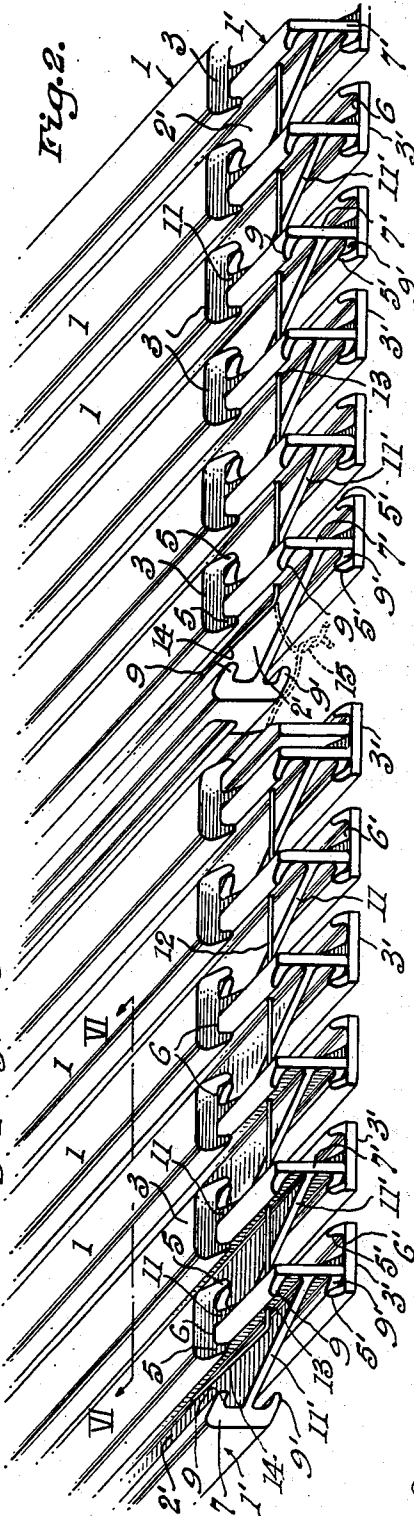
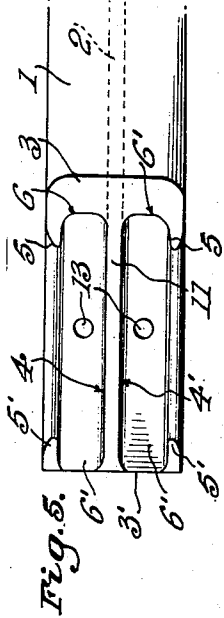
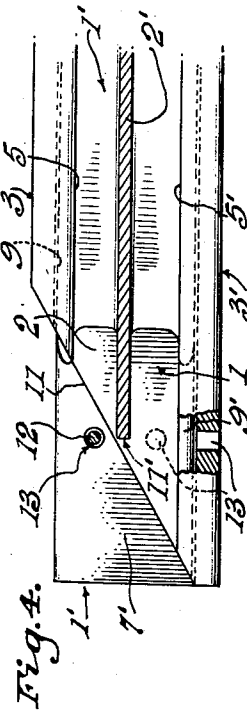
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3 Sheets-Sheet 2



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3 Sheets-Sheet 3

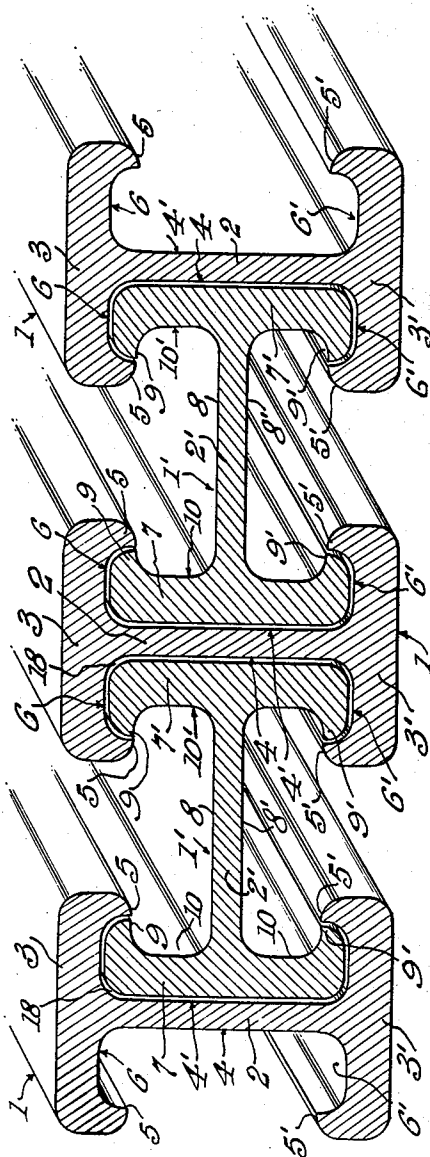


Fig. 6.

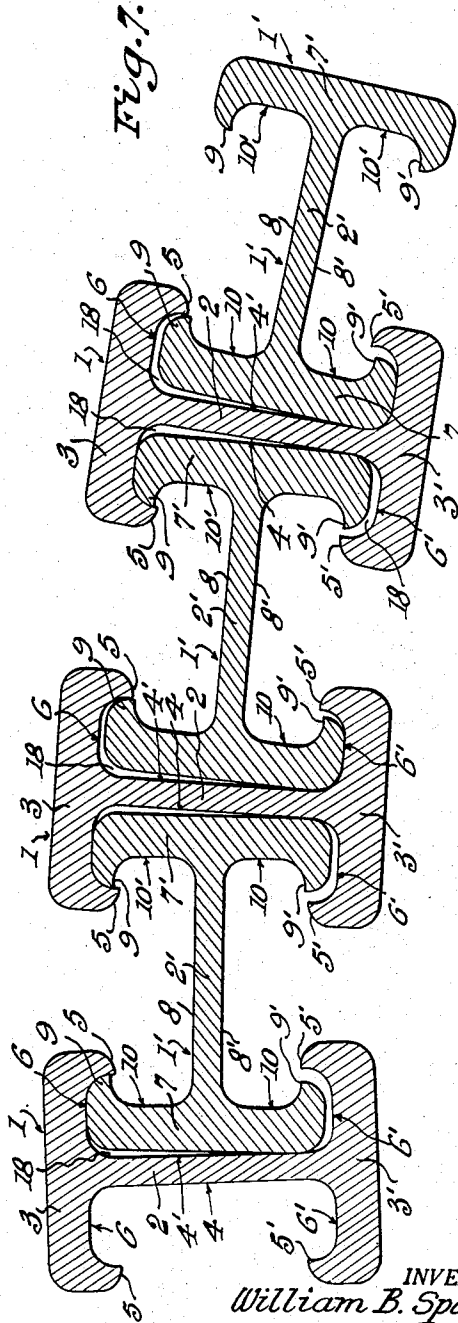


Fig. 7.

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2,711,231

STRUCTURAL ASSEMBLIES COMPOSED OF ANTI-CREEPING INTERCHANGEABLE INTERLOCKING STRUCTURAL UNITS

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Application September 20, 1954, Serial No. 457,318

6 Claims. (Cl. 189—34)

(Granted under Title 35, U. S. Code (1952), sec. 266)

The invention described in the foregoing specification and claims may be manufactured and used by or for the Government for governmental purposes without the payment to me of any royalty thereon.

The present invention provides certain modifications and improvements in structural assemblies composed of a plurality of separate interlocking units of the general type disclosed and claimed in United States Patent No. 2,589,304 issued March 18, 1952, to William B. Spangler, the present applicant; and while the individual units of the present invention present certain modifications which distinguish the present units from those of the aforesaid issued patent, in general they present a community of utility therewith in that they may be assembled to form similar types of structural entities disclosed in the said patent.

The utilization of the units of the patent has presented in actual service certain disadvantages which are desirable to remedy, which disadvantages are obviated by the present construction. Thus, among the specific utilities set forth in the patent for the cooperating interlocking units forming the subject matter of the patent, there are mentioned the construction of knock-down portable roadways and runways that are designed particularly for military service in temporary although strategic locations. In actual use of the patented units for the indicated purpose, it has been found that under heavy service conditions, there is a tendency of gradual longitudinal slippage between the individual units composing such roadways or runways, which slippage may be referred to as "creep," and which obviously is desirable to be obviated, since while such displacement or "creep" in any given period of time is very slight, nevertheless there is a tendency for it to become progressive in character and it may become sufficiently substantial to require relaying of the road or runway assembly before expiration of its intended period of service at the given location. Such necessity for reconstruction not only eliminates, for the time required for such reconstruction, the utility of the assembly regardless of its strategic importance, but it entails a high cost and loss of available manpower for accomplishing such reconstruction.

The desirability of obviating such creep between the patented units led to the modification of such units in accordance with the substance of the present invention, while at the same time preserving the advantages of knock-down portability which characterizes the assembled structures erected by the use of the units described and claimed in the aforesaid patent.

The present invention retains community of utility with the units of the above patent; that is, both the modified units of the present invention and the patented units are in the form of I-beams in cross section, defining top and bottom flanges which form recesses on opposite sides of the webs of the I-beams, which recesses are of similar size and shape so as to render the individual units interchangeable with other similar units by being receivable in such recesses at either end of similar structural units.

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However, in the present modified units, one of the flanges of each unit is provided with an opening on each side of the interconnecting web and adjacent to an end of the unit for reception of suitable retaining means which restrain creeping between individual units under any operational service conditions, each unit having its ends similarly beveled for clearing such retaining means while enabling the beveled web of each unit to abut against such retaining means before substantial slipping between the units can occur.

The construction represented by the present invention is illustrated by the accompanying drawings wherein—

Fig. 1 represents a plan view of a portable knock-down roadway or similar structural assembly, shown fragmentarily in the view and constructed of an interlocked assembly of the individual modified units or bars of the present invention;

Fig. 2 is an end perspective view of the assembly of Fig. 1;

Fig. 3 is a fragmentary end view, partly in section, of a plurality of sequentially interconnected assemblies such as the assembly shown in Fig. 1, the view illustrating the manner of interconnecting and interlocking a plurality of such assemblies for increasing operational area of the total structure in conformity with changes in operating conditions;

Fig. 4 is a detailed fragmentary longitudinal vertical section of a horizontally (flatly) disposed interlocking bar unit, taken on the line IV—IV of Fig. 1, looking in the direction of the arrows;

Fig. 5 is a fragmentary view of an end of an individual bar unit of the present invention, illustrated as being laterally (flatly) positioned;

Fig. 6 is an enlarged transverse sectional view of a part of an assembly such as shown in Figs. 1 and 2, taken on line VI—VI of Fig. 2, looking in the direction of the arrows, showing further structural details of the modified bar units of the present invention; and

Fig. 7 is a view similar to Fig. 6, but showing individual bar units relatively disposed and displaced for producing an assembly having a curved contour or configuration, instead of the substantially flat surface of the assemblies illustrated in Figs. 1, 2, and 3.

As has been indicated above, in common with the assemblies of the above-identified patent, the assemblies of the present invention consist of a plurality of interlocking and identically formed bars substantially in the form of I-beams including webs having transverse flanges on the opposite longitudinal edges thereof. The transverse flanges extend at right angles to, and equal distances from, opposite sides of the web, and are provided with curved lateral hook flanges which curve inwardly relative to the web from the outer extremities of the flanges substantially at right angles to the flanges and parallel to the webs, whereby recesses are formed on the individual bar units adjacent to opposite sides of, and along the longitudinal edges of, the webs. By providing such recesses on the individual units, the hook flanges on the transverse base flanges of similar sections may engage in the recesses of the other adjacent bar units, whereby a series of the I-beam bar units may be interconnected to form the roadway surface or mat, such as illustrated by Figs. 1, 2, and 3 of the accompanying drawings, by way of illustration.

In order to eliminate any tendency of the individual units of the assembly to become relatively displaced or "creep" through vibrations or other disturbances induced by service conditions, it has been found that such elimination may be effected by providing each beam unit with a similarly sloped bevel at both ends, a hole being provided in the bottom flange on both sides of the web near the center of the slope of the bevel. When

the units are interlocked, "anti-creep" means, such as a flexible wire or cable, or a pin, is threaded through the holes and past the beveled edges of alternate beam units on each end, thereby preventing the aforesaid endways creep or slippage between the individual units.

Referring more specifically to the drawings, the structural assembly as illustrated in Figs. 1, 2, and 3, for example, consists of a plurality of individual bar or beam units 1 held in spaced interlocking relation by means of laterally placed similar units 1'. The units 1 and 1' are structurally substantially identical, and each of the units 1 includes an upstanding web portion 2 having transverse flanges 3 and 3' provided on opposite, longitudinal edges thereof, which flanges 3 and 3' extend at right angles from the web 2 an equal distance from its opposite sides 4 and 4'. The transverse flanges 3 and 3' are formed adjacent to their longitudinal edges with curved lateral hook flanges 5 and 5', respectively, which depend inwardly from the outer extremities or edges thereof substantially at right angles to the transverse flanges 3 and 3', whereby recesses 6 and 6' are formed on the vertical (upright) units 1 adjacent to the opposite sides 4 and 4' of the web 2 and along the longitudinal edges thereof.

Each of the horizontally extending (flatly disposed) units 1', which units are duplicates of the vertically extending units 1, consists of a web 2' having transverse flanges 7 and 7' provided on opposite longitudinal edges of the web and extending at right angles to the web an equal distance from its opposite sides 8 and 8'. The transverse flanges 7 and 7' are provided with curved lateral hook flanges 9 and 9', respectively, which depend inwardly from the outer extremities or edges of the transverse flanges 7 and 7' substantially at right angles thereto and parallel with the web 2', whereby recesses 10 and 10' are formed on the horizontally extending units 1' adjacent to the opposite sides 8 and 8' of the web 2' and along the longitudinal edges thereof.

In forming the portable roadway or mat construction shown in Figs. 1, 2, and 3, a plurality of the units 1 are arranged and held in suitably spaced, interlocked relation by means of a series of the similar units 1' having the transverse flanges 7 and 7' of the horizontally disposed units abutting against the sides 4 and 4', respectively, of the webs 2 of the vertically extending units, with the lateral hook flanges 9 and 9' on the flanges 7 and 7' of the units 1' engaging in the recesses 6 and 6' of adjacent units 1 and abutting against the hook flanges 5 and 5' of these units.

As thus far described, the individual units of the present invention correspond to the interlocking structural units described and claimed in the aforesaid Spangler Patent No. 2,589,304. However, in the present instance, in order to obviate any tendency of the units of the said patent to become displaced longitudinally relative to each other during service, the ends of the present units are modified to avoid any such tendency of the units of the patent to creep with reference to each other.

As has been indicated above, in accordance with the present invention, the modifications of the present units comprise tapering the ends of the units at identically sloped angles and providing a hole in the flanges at corresponding locations in corresponding flanges in each unit and on both sides of the web, so that when the units are structurally assembled into a roadway or mat, the holes through the flanges will be in alignment in the horizontally disposed units 1' for receiving an interconnecting flexible wire or cable, while the slope of the tapered ends of the upright or vertically disposed units is sufficient to clear the said interconnecting cable, the presence of the said cable in corresponding holes in the corresponding flanges of the horizontal units preventing endways displacement or creep of such units, and by forming an abutment for the tapered ends of the webs of the upright or vertically disposed units, similar endways displacement of such upright units is prevented.

Thus, it will be seen from the drawings that each

unit 1 and 1' is provided with a substantially 27° one-way bevel 11 or 11' on both ends of each unit by removing the end on a line beginning at the end of the beam unit and top of the bottom flange 3' and tapering to a point on the top of the top flange 3. Such 27° angle of taper or slope of the end bevels is to be regarded only as illustrative and is mentioned only to the extent that it provides an adequate clearance for the flexible interconnecting wire or cable 12 which passes through corresponding holes 13 provided in a corresponding flange (bottom flange) 3' on both sides of the web 2 or 2' of each of the units. Such end bevels also facilitate the insertion and mutual interlocking of successive units. When a desired number of units has been assembled to form a complete section of the structural assembly, the end portions of the flexible interconnecting cables or wires 12 may be bent backwardly away from each end of the terminal lateral units of the section, as is indicated at 14; and when a series of such units is placed in contiguous side-by-side relation and has been connected and interlocked, the resulting contiguous end portions of the cables 12 may be united conveniently by twisting them together as is indicated at 15. The actual interlocking of such contiguous sections is accomplished by the use of an identically shaped connecting unit or beam 16 which is placed in interlocking relationship for the contiguous sections with its web 2 in upright or vertical position with the flanges 3 and 3' inverted so that the slopes of the beveled ends 11 and 11' are reversed with respect to the slope of the beveled ends of the remaining beam units of each section, as is illustrated in Fig. 1 of the drawings, so as to clear the tying cables or wires 12.

A further difference between the present units and those of the aforesaid patent is in making the horizontally-disposed units 1' with their end flanges 7 and 7' and webs 2' and the corresponding webs 2 and flanges 3 and 3' of the upright units, such that a space 18 will be defined between the outer sides of flanges 7 and 7' of the horizontal units 1' and adjacent sides 4' and 4 of the vertically disposed webs 2 of the upright units 1 so as to permit an angular displacement between the upright units 1 and horizontal units 1', as indicated by Fig. 7, thereby enabling the formation of a structural unit having a curved contour through angular displacement between successive units in amount corresponding to each space 18, this space 18 being insufficient in its extent, however, to cause an interruption of the interlock between flanges 5 and 5' of units 1 and corresponding flanges 9 and 9' of units 1'.

Having thus described my invention, what I claim as new and wish to secure by Letters Patent is:

1. A structural assembly comprising a plurality of interlocked, universally interchangeable, substantially identical, elongated units interlocked together with their major transverse axes at right angles to each other and being substantially in the form of I-beams and including web portions, elongated transverse flanges formed on opposite longitudinal edges of the web portions terminating in curved lateral hook flanges extending along outer longitudinal extremities of the transverse flanges, the curved hook flanges depending inwardly from the transverse flanges and providing oppositely curved, oppositely disposed recesses on opposite sides of the web portions at the longitudinal edges thereof, the interior surfaces of each pair of recesses with the surface of the web connecting the two recesses being substantially identical in configuration to the exterior surfaces of each of the transverse flanges including the curved lateral hook flanges thereon, the said units being substantially identical in size and shape and in interlocked relation with each other, with the curved hook flanges of certain of the units engaged in and interlocked with the said curved recesses in contiguous units of the assembly, each of the I-beam units of the assembly being similarly beveled at its extremities and having corresponding openings extending through

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similar transverse flanges of the units on each side of the web portions, so that when the units are assembled and interlocked with the web portions of alternate units in upright position and with the web portions of alternate intermediate locking units in horizontal position, corresponding openings of the horizontally disposed units are in alignment, and tie means extending continuously through the aligned openings, the beveled extremities of the webs of the upright units clearing the said tie means while being in substantially abutting relation therewith, the said tie means thereby preventing relative longitudinal displacement between the units of the assembly, the said tie means being provided with means preventing accidental displacement of the tie means from the said aligned openings.

2. A structural assembly as claimed in claim 1, wherein the elongated transverse flanges of each I-beam unit of the assembly constitute a top flange and a bottom flange, the said flanges being interconnected by the web portion, the beveled extremities of each unit being equally sloped, each bevel having a slope extending along a line beginning at each end of the unit and top of the bottom flange and extending to a corresponding point on the top of the top flange, the angle of slope affording clearance for the tie means relative to the web portions of upright units where the units are assembled in alternate upright and horizontal relation, the resulting beveled web portions of the upright units abutting against the tie means for preventing substantial relative longitudinal slippage between the units of the assembly.

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3. A structural assembly as claimed in claim 2, wherein the extremities of each unit are beveled at an angle of substantially 27°.

4. A structural assembly as claimed in claim 3 wherein the horizontal and upright interlocked units define limited intervening end spaces between the transverse flanges of each horizontally disposed unit and the web portions and corresponding recesses of adjacent upright units, thereby enabling angular displacement between successive units for enabling construction of a structural assembly of a curved configuration, the said spaces having magnitudes less than such required for producing a separation between the successive interlocked units.

5. A structural assembly as claimed in claim 2, wherein the tie means is a flexible cable passing continuously through the horizontal units interlocked by the upright units.

6. A structural assembly as claimed in claim 5 comprising a plurality of sections, and an interlocking I-beam unit interconnecting adjacent sections, the said unit having the same configuration as the remaining units of the sections but disposed in inverted position relative to the remaining units, contiguous ends of the flexible tie cable being interconnected for maintaining an uninterrupted continuity of the cable throughout the assembly.

No references cited