

April 10, 1945.

J. C. TEMPLE

2,373,355

CARGO HATCH

Filed March 11, 1943

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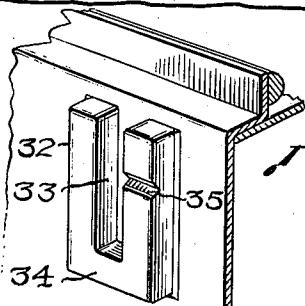
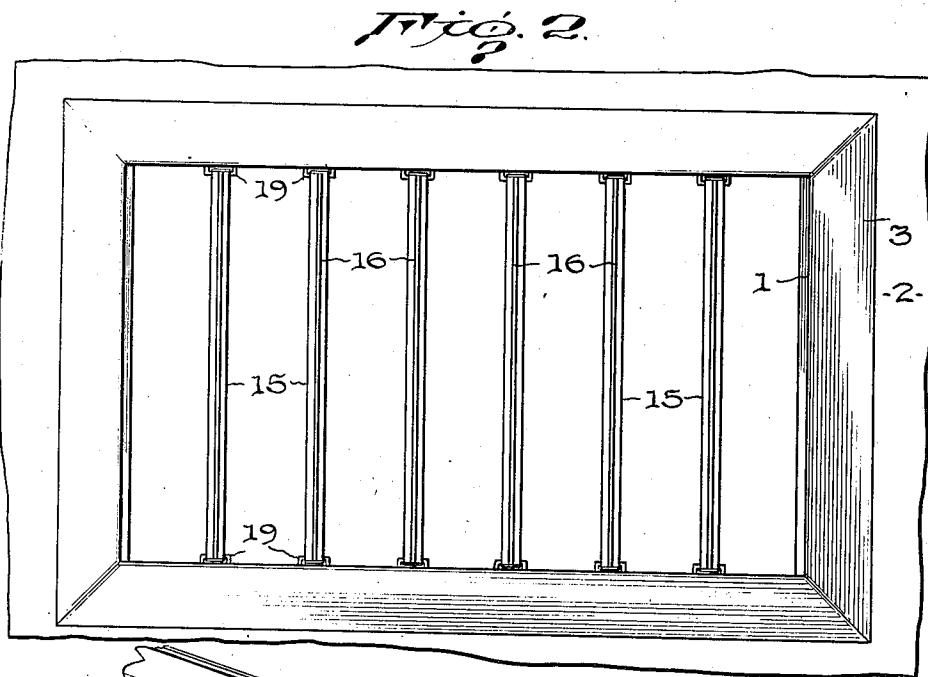
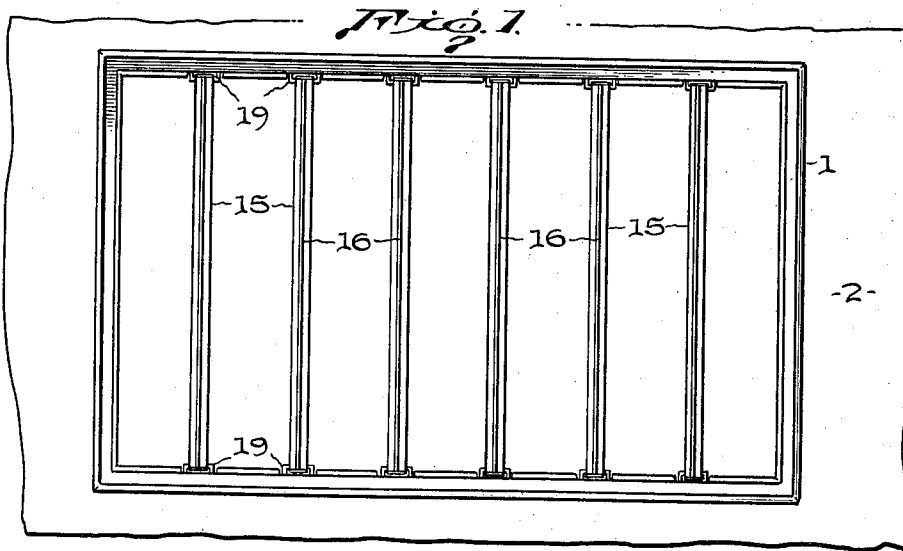


Fig. 13.

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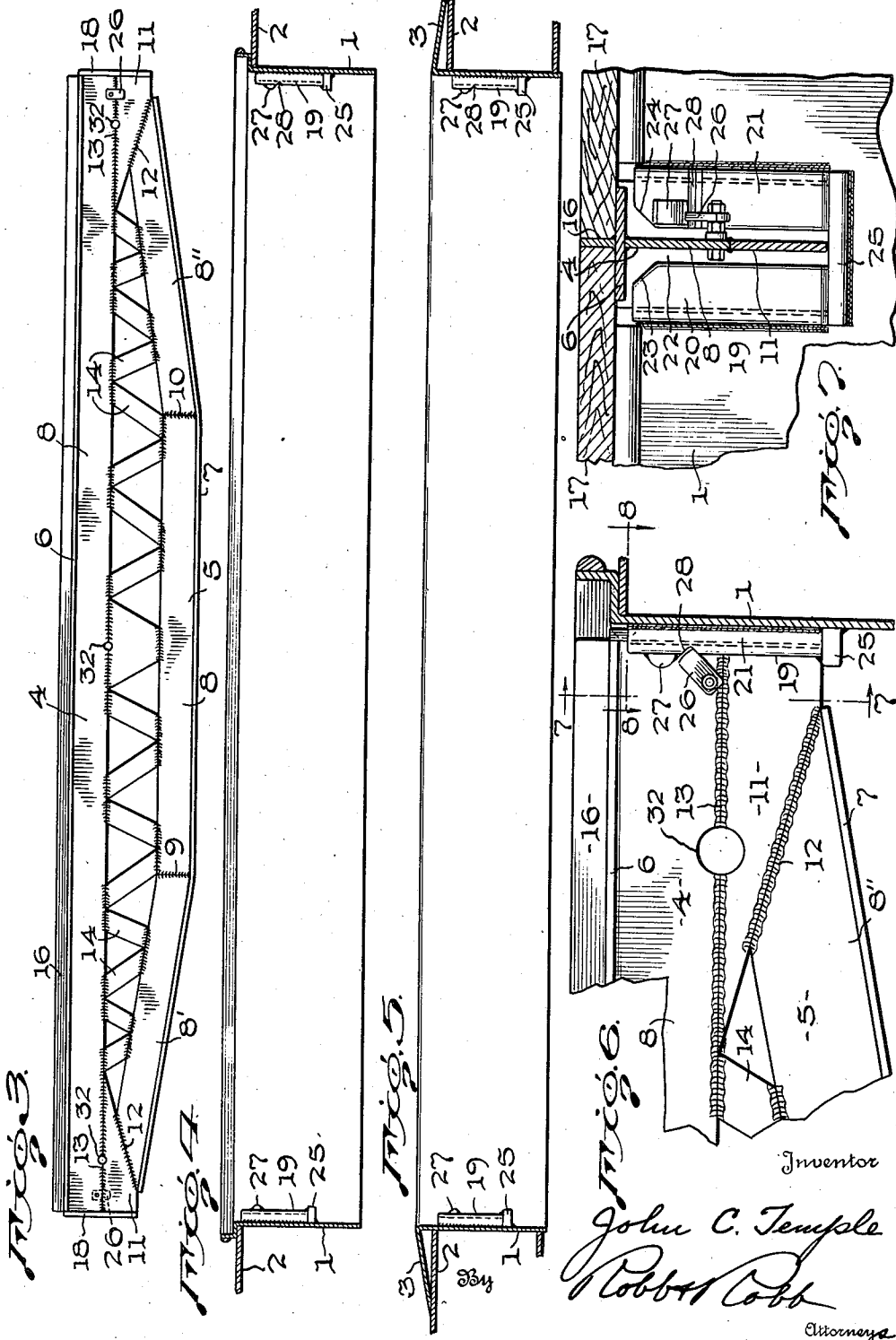
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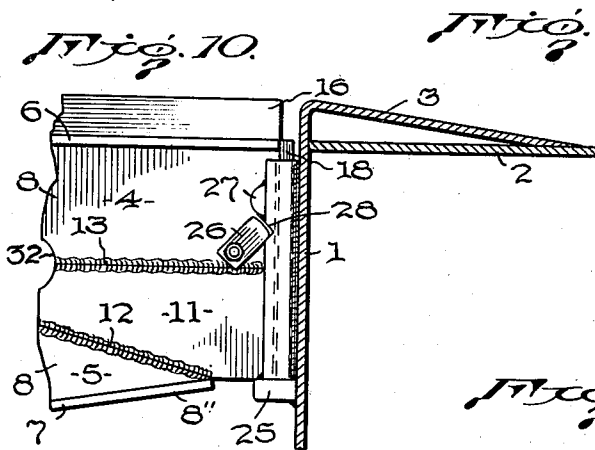
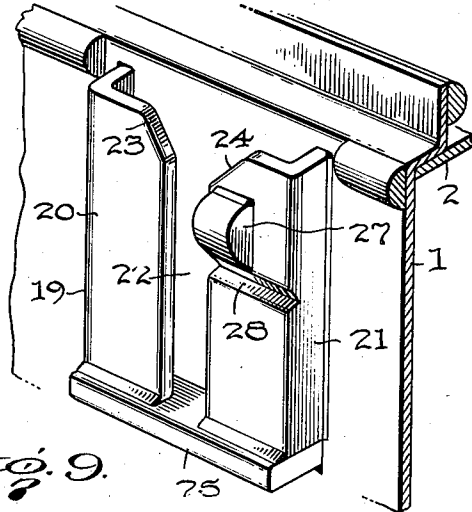
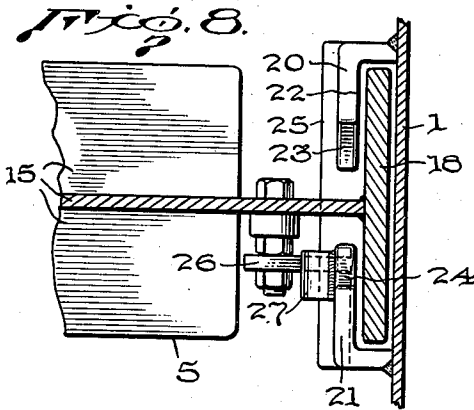


Fig. 9.

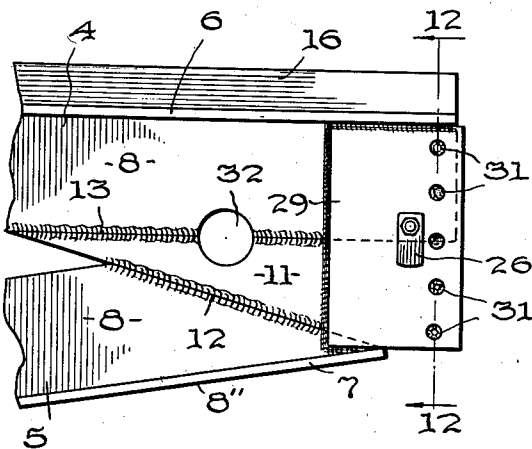
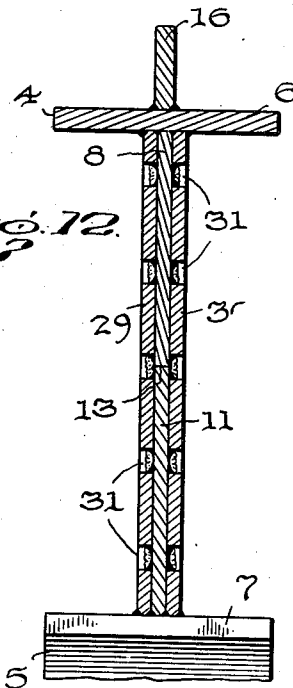


Fig. 11.

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UNITED STATES PATENT OFFICE

2,373,355

CARGO HATCH

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5 Claims. (Cl. 114-201)

This invention relates to fabricated truss beams, and more especially to cargo hatch beams, sometimes known as hatch shifting beams. While the following disclosure is primarily directed to such beams as applied to cargo hatches, it is to be understood that their use is not limited to this field, as they may be employed in practically any structure where beams or equivalent load supports are used.

The primary object of the invention is to provide a light weight beam of a strength equal to or greater than the strength of conventional solid I-beams which have considerably more weight per lineal foot. By virtue of the novel fabricated form of the beam, as will be hereinafter more fully described, I have found that savings of as much as, or more than, 25% of the weight of the usual beams can be effected, while possessing equal or greater strength when my invention is substituted for conventional I-beams. It will, accordingly, be seen that in the case of cargo hatch beams, as used in the C-2 type of Liberty ships which are being built in large numbers at the present time, the saving amounts to approximately ten tons per ship for the hatch beams alone. Applying this saving to the total number of Liberty ships scheduled to be built per annum, a gross saving of from 15,000 to 18,000 tons of steel per annum is conservatively estimated for this type of ship alone. Such a saving in steel is of great importance in these days when the demands on steel production are so great as to create a shortage of steel for ships.

As previously mentioned, the lighter weight and great strength of the beam of this invention is attained by a special form of fabrication of the beam, which is characterized by longitudinally splitting a standard solid I-beam of suitable length horizontally through the vertical web to provide an upper chord of T-shape and a lower chord of inverted T-shape. At the central portion of the beam, the upper and lower chords are arranged in vertically spaced, parallel relation, while the ends of the lower chord are bent upwardly and are joined to the respective ends of the upper chord by specially designed gusset plates which are preferably welded to the vertical webs of the upper and lower chords so as to lie in the same vertical plane. The gusset plates are preferably so shaped as to provide relatively long welds at the points of attachment to the chords, thereby offering maximum resistance to both vertical and horizontal shear.

By the use of the gusset plates above mentioned, the foreshortening of the lower chord incident to bending the ends of the latter upwardly, is compensated for without necessitating the splitting of a longer I-beam and then cutting off the ends of the upper chord to correspond to the length of the lower chord after the latter is bent.

In other words, the chords may be fabricated from an I-beam which is no greater in its original length than the length of the upper chord of the fabricated beam, or the span for which it is to be used.

In addition to the gusset plates, I also provide oppositely inclined lacings or trusses between the upper and lower chords, which are preferably welded to the lower and upper edges respectively of the vertical webs of the chords, and lie in the same vertical plane. For maximum strength to resist end shear, the leading edge of each lacing preferably contacts the edge of its succeeding lacing, and likewise, the gusset plates at the ends of the beam are preferably extended into contact with the edge of the first lacing.

By the fabrication of the beam as briefly described in the foregoing, it possesses the advantages of being easier to handle, particularly in and out of hatches on shipboard, because of its lighter weight and the numerous openings provided by the trusswork which permit the quick and easy application of lifting tackle thereto, and the minimized weight also lessens possible damage to deck plates, pipes, etc., on shipboard due to the weight of falling beams, or when the beams are roughly laid down and strike with great force, as would be the case with heavier beams.

As applied to hatch beams, my invention further contemplates a new and improved locking means to permit the beams to be locked in place, thereby preventing accidental displacement thereof as would otherwise happen in the handling or hoisting of cargo in and out of the hatches, said locking means being so constructed as to permit quick and convenient release thereof to allow removal of the beams from across the hatchway when occasion so requires.

Another object of my invention is to provide special trim means on the ends of the beam to permit convenient trimming of the beam to an accurate required length without modification or destruction of its prefabricated form, thereby allowing for the usual range of variation of actual dimensions of cargo hatches when the beams are installed in a shipyard.

Other objects and advantages of the invention will be hereinafter described and the novel features thereof defined in the appended claims.

In the drawings:

Figure 1 is a top plan view illustrating the application of my new beam to an upper deck cargo hatch, and showing a plurality of such beams arranged transversely of the hatchway to support the usual hatch covering (not shown) which is conventionally composed of battens, that is, short, stout planks or boards disposed to span the space between the adjacent pairs of beams, with the ends of the battens resting upon the upper surfaces of the respective beams;

Figure 2 is a view similar to Figure 1, showing the beams applied to a second or lower deck hatch;

Figure 3 is a view in side elevation of my fabricated beam per se, with the beam shown in correlated position above an upper deck hatch illustrated in transverse section in Figure 4, or above a second or lower deck hatch likewise illustrated in transverse section in Figure 5, as in lifting the beam out of or lowering the beam into either of such hatches;

Figure 6 is an enlarged, fragmentary detail view, partly in side elevation and partly in section, showing the manner of supporting the end of the hatch beam in a socket for the same on the inner face of the hatch coaming plate, together with the locking means for releasably locking the end of the beam in said socket;

Figure 7 is a vertical sectional view taken on the line 7—7 of Figure 6, looking in the direction of the arrows;

Figure 8 is a horizontal sectional view taken on the line 8—8 of Figure 6, looking in the direction of the arrows;

Figure 9 is an enlarged, fragmentary, perspective view, showing the details of one of the beam sockets as mounted on the coaming plate of an upper deck hatch;

Figure 10 is a fragmentary view generally similar to Figure 6, showing the end of a beam supported in a socket mounted on the coaming plate of a second or lower deck hatch, the coaming plate being provided with a brow plate;

Figure 11 is a fragmentary view in side elevation of a hatch beam generally corresponding to that of Figure 3, the beam having special trim plates applied to the ends thereof as illustrated at one end of the beam in this figure;

Figure 12 is a vertical sectional view taken on the line 12—12 of Figure 11, particularly illustrating the attachment of the trim plates to the end of the beam by special welds which dispense with rewelding after trimming the ends of the plates to conform to the required over-all length of the beam; and

Figure 13 is a view generally similar to Figure 9, illustrating a modified form of beam socket for use with beams omitting the transversely disposed end plates, as for example, with beams as shown in Figure 11.

Like reference characters designate corresponding parts in the several figures of the drawings.

It will be understood from reference to Figures 1 and 2 that the hatches shown in these figures respectively correspond to the conventional upper and lower deck hatch constructions at present employed in ship building, and in which 1 generally denotes the coaming plate which usually extends vertically upward for a distance above the deck plate 2 in the case of an upper deck cargo hatch. On the other hand, in the case of a second or lower deck hatch, as shown in Figure 2, the coaming plate terminates to its upper extremity in an inclined brow plate 3 above the deck plate 2. The shapes of the coaming plates are further illustrated in Figures 4, 5, 9 and 10, but since the details thereof are not material to the present invention, they will not be further described herein. Suffice it to say that the coaming plates are extended vertically downwardly below the deck plates to define the margins of the different hatchways which may vary in number and size according to the design of the ship.

It has been the custom in the past to provide

removable coverings for the hatches which afford access to the cargo holds of ships, and where the hatches are of relatively large size, the coverings have been made in the form of wooden battens consisting of relatively short, stout planks or boards which span the space between supporting beams arranged in parallel spaced relation to each other transversely across the hatch. This construction permits convenient handling or shifting of the battens and the beams, as required in the removal and reapplication of the hatch covers, in whole or in part, as the circumstances require in loading and unloading cargo. Heretofore the supporting beams have been employed in the form of standard solid I-beams which are relatively heavy and which utilize more steel than the circumstances permit at the present time.

My invention primarily resides in the provision of a specially fabricated beam of relatively lighter weight, but of great strength, as compared with solid I-beams, and which also attains a substantial saving in the amount of steel required per beam. My new beam is best shown in Figure 3, wherein the same includes an upper chord 4 which is T-shape in cross section and straight from end to end, and a lower chord 5 which has an inverted T-shape in cross section. The two chords 4 and 5 may be conveniently obtained by splitting longitudinally a standard solid I-beam of suitable length, the split occurring preferably midway between the upper horizontal flange 6 and the lower horizontal flange 7 of the I-beam, and extending horizontally through the vertical web 8. After splitting the I-beam as just described, the vertical web of the lower inverted T half thereof is preferably notched at points substantially spaced from the opposite ends thereof, and the ends of this half of the split beam are bent upwardly, as shown at 8' and 8'' in Figure 3, after which the edges formed by notching the web, and which have been brought together by bending the ends of the beam section in an upward direction, are welded together, as at 9 and 10 respectively. The lower inverted T section of the split beam is now ready to be joined to the upper T section to provide the lower and upper chords respectively of the fabricated beam.

Owing to the fact that in bending the ends of the lower chord, the over-all length thereof has become foreshortened as compared with the over-all length of the straight upper chord, I preferably cut the ends of the vertical web at the respective ends of the lower chord on an acute angle, and attach thereto, as by welding, gusset plates 11, 11, said gusset plates having the form shown best in Figures 3 and 6. The upper edges of the gusset plates 11, 11 are respectively welded to the lower edge of the vertical web 8 of the upper chord 4, and their longer inclined edges are welded to the inclined edges of the vertical web at the extreme ends of the inclined parts 8', 8'', of the lower chord 5, the gusset plates being extended outwardly beyond the ends of the lower chord and terminating in the vertical line of the squared ends of the upper chord. As will be understood from the drawings, the gusset plates 11, 11 lie in the same vertical plane as the vertical webs 8, 8 of the upper and lower chords 4 and 5 respectively, and are secured to the abutting edges of said vertical webs in such manner as to provide relatively long welds as at 12 and 13 respectively, thereby offering the maximum resistance to both vertical and horizontal shear.

Disposed between the upper and lower chords 4 and 5, there is provided a series of lacings or

trusses 14, consisting of inclined plates lying in the same vertical plane as the webs 8, 8 of the upper and lower chords. These lacings are preferably secured at their upper and lower ends respectively to the chord webs by welding, with the lacings so arranged that the leading edge of each lacing abuts against the edge of its succeeding lacing, from end to end of the trusswork. It will also be seen from reference to the drawings that the gusset plates 11, 11 are extended into contact at their inboard ends with the first lacing at the corresponding ends of the beam. This arrangement of the gusset plates and lacings provides maximum resistance to end shear.

Having described the fabricated construction of the truss beam, it is to be understood that the same can be used in precisely the same manner as solid I-beams have formerly been used in connection with cargo hatches. Because of the great strength of my fabricated beam, I am able to fabricate the same in the manner described from I-beams of considerably lighter weight as compared with solid I-beams formerly used, as indicated in the following table which is given solely for illustrative purposes:

Fabricated beam	Solid I-beam
36 lb. I-beam in lieu of.....	59 lb. I-beam
45 lb. I-beam in lieu of.....	68 lb. I-beam
58 lb. I-beam in lieu of.....	82 lb. I-beam

That is to say, in the application of my new fabricated beam to hatches, I employ a plurality of such beams which are supported in parallel spaced relation to each other across the hatch as shown in Figures 1 and 2, the fabricated beams being generally denoted by the reference character 15, and serving to support the battens or planking which span the spaces between adjacent pairs of beams and form the horizontal cover which is not shown in Figures 1 and 2. Each beam is preferably provided at its upper side with a longitudinally extended bar or strip 16 which serves not only to stiffen the beam, but which also serves as a parting strip lying between the contiguous ends of the battens or planks designated 17, as shown in Figure 7. Thus, each beam serves to support the adjacent ends of the battens or planks resting thereon at opposite sides of the parting strip 16.

To support the opposite ends of the respective fabricated beams in their arrangement transversely across the hatchways, I preferably attach to each end of the beam, as by welding, a transversely disposed end plate 18, which end plates are adapted to seat in sockets 19 mounted on the inner face of the coaming plate at opposite sides of the hatch. The details of the sockets 19 will be best understood from reference to Figures 6 to 10 inclusive of the drawings, wherein I have shown a socket composed of a pair of opposed, horizontally spaced angular plates 20, 21 welded to the inner face of the coaming plate 1 to form an upwardly and inwardly open socket 22 of such shape and size as to receive the end plate 18 on the end of the fabricated beam, the opposing edges of the angular plates 20, 21 being sufficiently spaced apart to receive therebetween the vertical web 8 and gusset plate 11 at the extreme end of the beam. The upper corners of the angular plates 20, 21 are preferably cut away, as at 23, 24, to facilitate the guiding of the beam into the socket as it is lowered into the hatchway. The weight of the beam is preferably sup-

ported at each end by a short bar 25 welded to the inner face of the coaming plate and to the lower ends of the angular plates 20, 21, so that the bar 25 closes the lower end of the socket.

In order to prevent accidental displacement of the hatch beams when disposed across the hatchway, or when less than all of the beams are removed for the purposes of handling cargo through the hatch, I also provide suitable locking means as shown in Figures 6 to 10 inclusive. Said locking means preferably comprises a locking pawl 26 pivotally attached to the beam adjacent to each end thereof so as to swing about a horizontal axis normal to the plane of the vertical web of the beam. The locking pawls at the respective ends of the beam are preferably mounted on opposite sides of the longitudinal axis of the beam, and according to the arrangement illustrated in the drawings herein, the locking pawl lies on the righthand side of said longitudinal axis of the beam when viewed in a direction looking towards the socket. Coacting with the locking pawl, I provide a half-round abutment 27 welded to one of the angle plates forming the socket for the end of the beam, said abutment being carried by the angle plate 21, as shown in the drawings. Immediately below the abutment 27, the angle plate 21 is recessed or grooved horizontally, as at 28, so that when the locking pawl is swung in a clockwise direction as viewed in Figures 6 to 10 inclusive, it will pass beyond the vertical center of its axis of rotation so that its free extremity will lie partly in the recess or groove 28, and partly beneath the abutment 27, thus assuring against inadvertent displacement of the locking pawl by vibration of the ship. When the locking pawl is in the locking position shown in Figures 6 and 10, the beam is positively locked against movement in an upward direction, it being understood that the locking pawls and coacting abutments and recesses are duplicated at the opposite ends of each beam. To permit removal of the beam, this can be quickly accomplished by swinging the locking pawls in a counterclockwise direction to free the same from engagement with their recesses 28 and abutments 27, and when the pawls pass over the vertical center of their axis of rotation, they will drop to their vertical positions as shown in Figure 3, in which positions they will remain until they are again swung back to their locking positions. After unlocking the pawls as just described, the beams may be readily lifted out of the hatch, after removal of the hatch covers or battens, as by the use of suitable tackle or other hoisting means which may be readily engaged with the beams at the various openings provided between the trusswork thereof. Since the lower chord 5 of the fabricated beam is arranged parallel to the upper chord 4 at its central portion, and the beam flange of the lower chord as formed by the inverted T section of an I-beam is flat, the beams may be conveniently placed on deck by resting the same on the bottom of the lower chord, without teetering or endangering the deck plating by denting thereof.

It will be understood that while I prefer to employ a split I-beam to form the upper and lower chords 4 and 5 of my fabricated beam, to gain the advantage of saving in weight and material by the utilization of the lower half of the split I-beam for the tension member of the fabricated beam, this type of fabrication is not absolutely essential to the invention inasmuch as

standard beams of T cross section may be employed and built up into the same fabricated form as disclosed herein, where the material is readily available or circumstances otherwise permit.

Passing now to Figures 11 and 12 of the drawings, I have there shown an end detail of a fabricated beam of the same construction as illustrated in the other figures of the drawings, but otherwise modified through the provision of trim plates 29 and 30 respectively disposed on opposite sides of the vertical web formed by the coextensive webs 8, 8 of the upper and lower chords 4, 5, and the intermediate gusset plate 11. As seen in Figure 11, the trim plates 29 and 30 are extended beyond the extreme ends of the beam proper, at each end of the beam, so that the trim plates may be cut off along a vertical line according to the required over-all length of the beam, which may vary plus or minus one inch from the standard width of the hatch opening in the shipyard construction. The advantage of the trim plates particularly resides in the manner of welding the same to the ends of the fabricated beam, and in this connection, it will be observed that each of the plates 29 and 30 is welded to the beam along their upper and lower edges and their inboard edges. The outboard edges of the trim plates are not, however, welded together, since such weld would be cut away in trimming the ends to accurately correspond with the required over-all length of the beam. In lieu of welding the outboard edges of the trim plates together, the trim plates are provided with a series of vertically spaced holes 31, approximately one-inch in diameter and the edges of these holes are welded to the vertical web of the beam by making the weld interiorly of the holes and extending the same around the holes, as shown in Figure 12. In employing the trim plates as just described, the end plates 18 may be welded to the outer edges of the trim plates after the latter have been trimmed to the required over-all length of the beam, although it is to be understood that these end plates may be omitted entirely from either type of beam construction shown herein, if preferred, in which event, the sockets for the ends of the beam could be modified to dispense with the space which normally receives the end plates 18. Such a modified socket is shown in Figure 13, wherein the same is shown in the form of a one-piece U-shaped member 32 having a space 33 to receive the beam therein. By making the member 32 somewhat thicker than the depth of the angular plates 20, 21 of Figure 9, the beam may be supported by the horizontal part 34 at the bottom of the member 32. The member 32 is also provided with a deep groove or recess 35 to receive the locking pawl 26 on the beam. Thus, by making the groove or recess 35 of greater depth than the depth of the corresponding groove or recess 28 shown in Figure 9, the abutment 27 may be dispensed with.

In addition to the openings afforded by the trusswork which can be conveniently engaged by suitable lifting tackle in handling the hatch beams into and out of the hatchways, separate large circular openings 32 may be provided through the vertical web of the beam adjacent to the opposite ends thereof and at the center, as shown in Figures 3 and 11, said openings likewise serving to facilitate handling of the beam. These openings 32 are thus provided at points of the

beam where there is a solid web or plate affording ample strength to sustain the stresses set up on lifting the beam, without damage to the beam. This is especially important where the beams are relatively long and heavy, in which case, it may not be advisable to engage the lifting tackle in the openings in the trusswork because of the likelihood of tearing out or otherwise damaging the lacing.

While the specific details have been herein shown and described, the invention is not confined thereto, as changes and alterations may be made without departing from the spirit thereof as defined by the appended claims.

I claim:

1. In a deck hatch construction, a hatchway formed in the deck and including a vertically downwardly extended coaming about the margin of the hatchway, a plurality of hatch beam sockets mounted at spaced intervals on the inner face of the coaming at opposite sides of the hatchway, with the sockets at one side of the hatchway arranged in opposed relation to the respective sockets at the opposite side, each of said sockets comprising a pair of vertically extended horizontally spaced arms joined at their lower ends by a horizontally-disposed abutment, one arm of each socket being provided with a recess formed in its inner face and facing the opposite socket, a plurality of hatch beams removably mounted across the hatchway, each with its opposite ends positioned between the arms of an opposed pair of sockets and resting upon the abutments at the lower ends thereof, and a latch member pivotally mounted on each hatch beam adjacent to each end thereof, with each latch pivot arranged below and spaced inwardly of the hatchway with relation to the recess in the socket arm at the corresponding end of the hatch beam, said latch members being respectively shiftable from a normally pendant released position to a gravity-biased beam locking position inclining upwardly and towards the socket, with its free extremity received in the recess aforesaid.

2. A hatch construction as defined in claim 1, wherein the latches and latch-engaging socket recesses at the respective ends of each hatch beam lie on opposite sides of the beam.

3. A hatch construction as defined in claim 1, wherein each socket arm having a latch-engaging recess is further provided with an abutment located immediately above the recess and projecting inwardly of the hatchway so as to overlie the free extremity of the latch when the latch assumes its recess-engaged position.

4. A hatch construction as defined in claim 1, wherein each latch is of generally rectangular outline and the latch-engaging socket recesses each are substantially V-shape in cross section, forming intersecting upwardly and downwardly inclined faces respectively lying above and below the outermost corner of the latch when the latter assumes its upwardly inclined recess-engaged position.

5. A hatch construction as defined in claim 1, wherein the arms of the respective sockets are spaced from the coaming at their horizontally-spaced edges, and the hatch beams are each provided with transversely extended end plates seating in the space between the arms and the coaming as the beams are vertically lowered into their respective sockets.

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