Jan. 23, 1951 L. D. SMITH ET AL 2,539,168

CONTAINER SHIP

Filed April 4, 1945 4 Sheets-Sheet 1

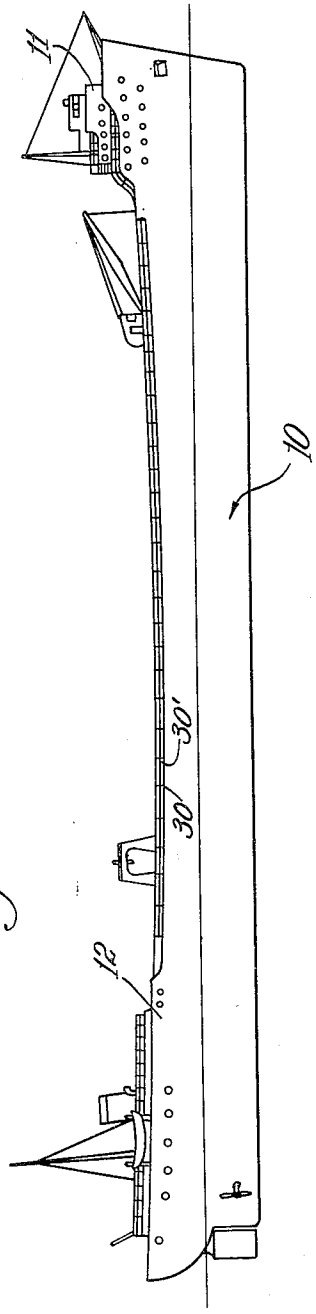

Fig. 1.

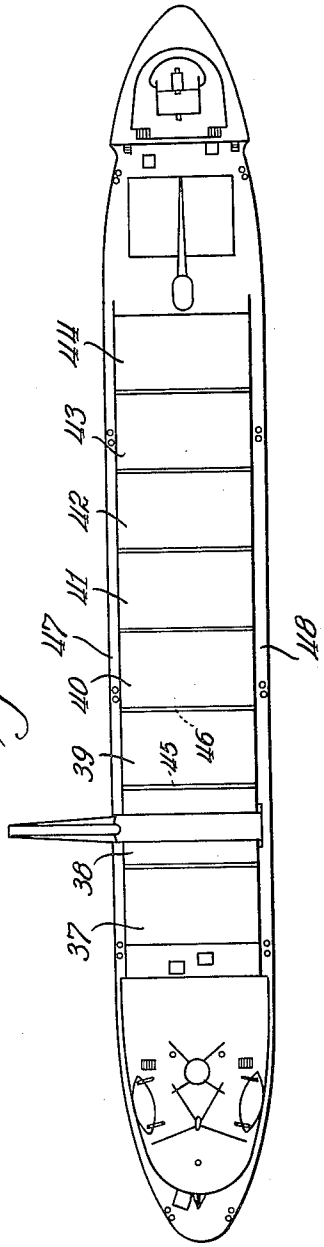

Fig. 2.

INVENTORS
Leathem D. Smith
BY Richard A. Stearn
Stone, Artman & Bisson
Att'ys.

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CONTAINER SHIP

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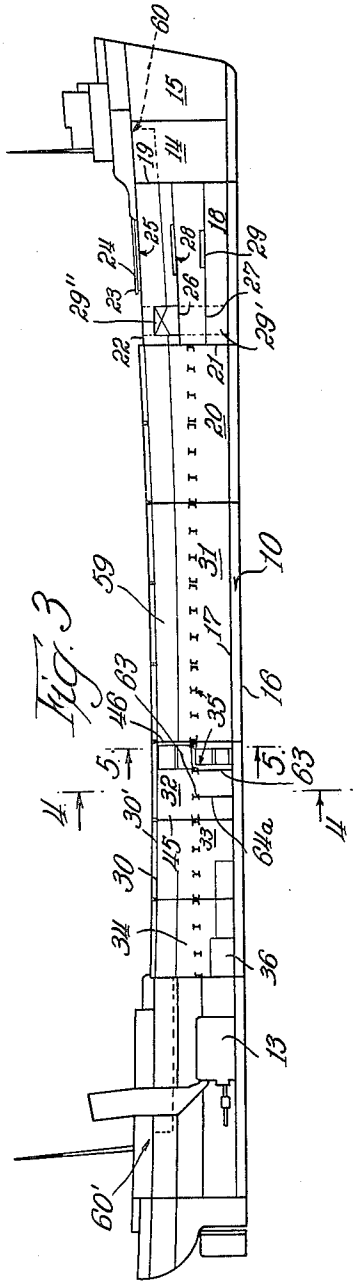

Fig. 3

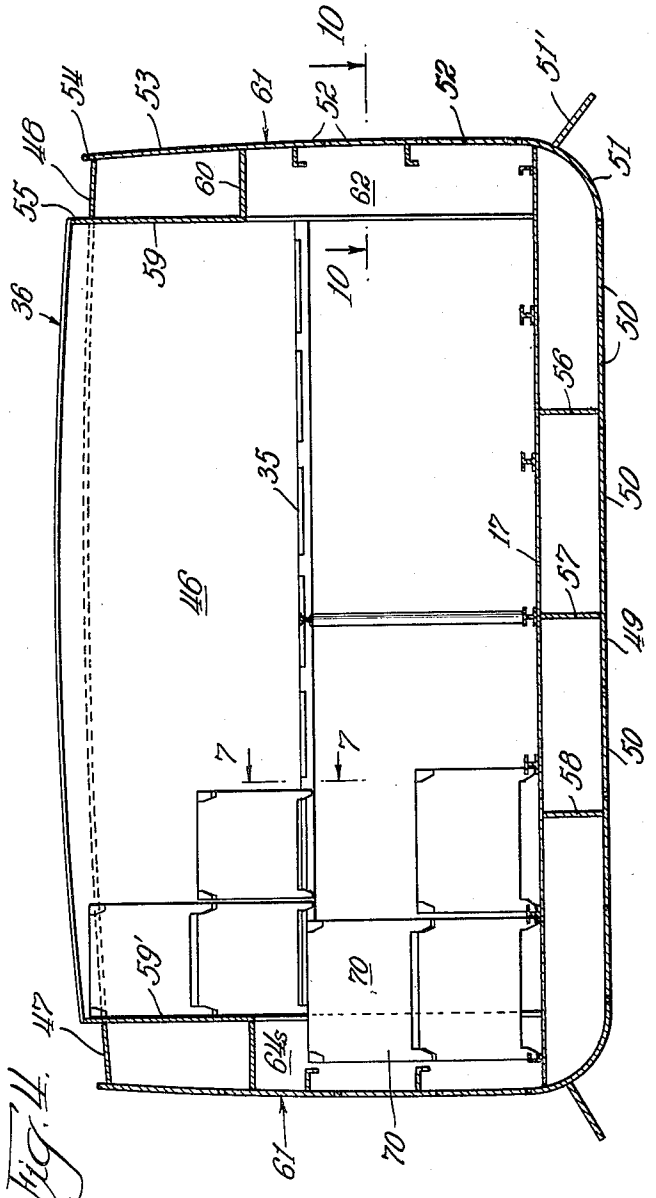

Fig. 4

INVENTORS
Leathem D. Smith
BY Richard A. Stearn
Stone, Artmant Bisson
Attys.

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CONTAINER SHIP

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Fig. 5.

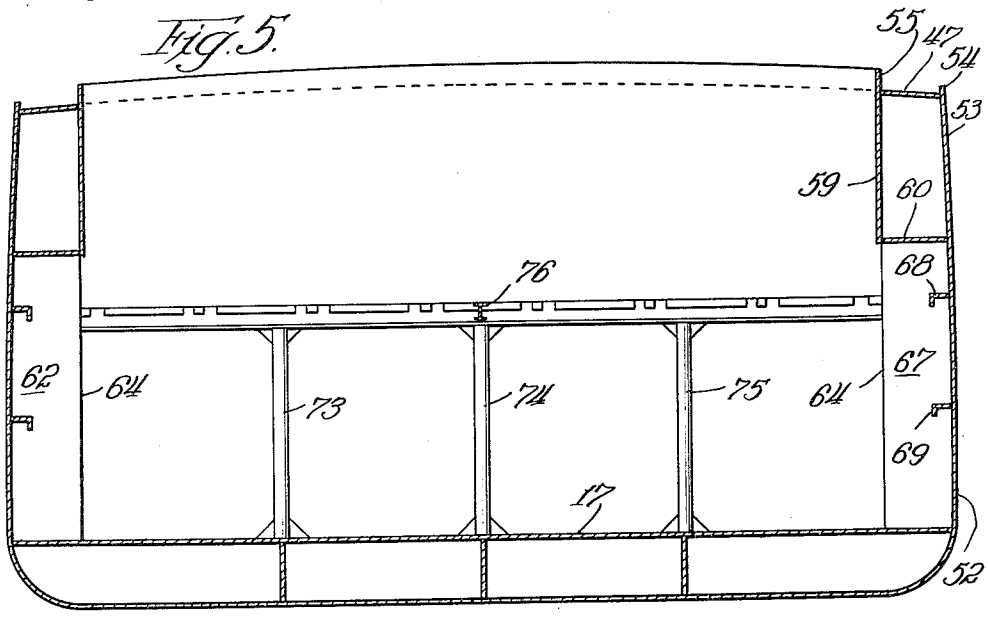
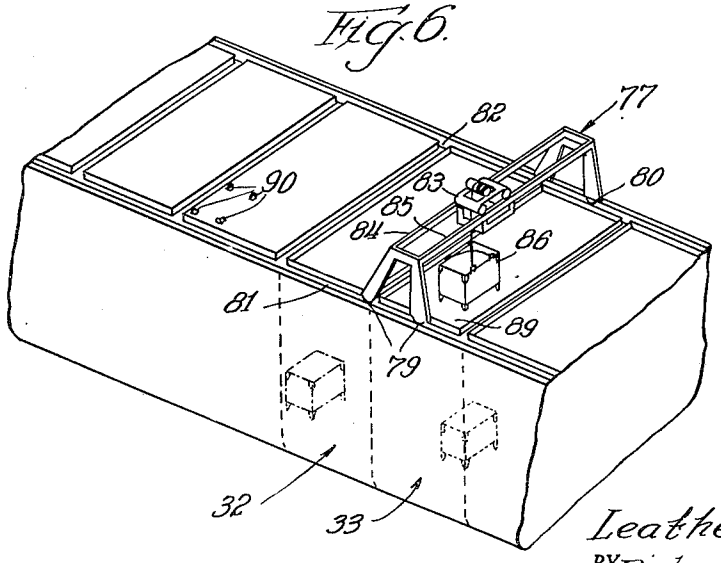


Fig. 6.



INVENTORS
Leathem D. Smith
BY Richard A Stearn
Stone, Artman + Bacon
Att'ys.

Jan. 23, 1951 L. D. SMITH ET AL 2,539,168

CONTAINER SHIP

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Fig. 7.

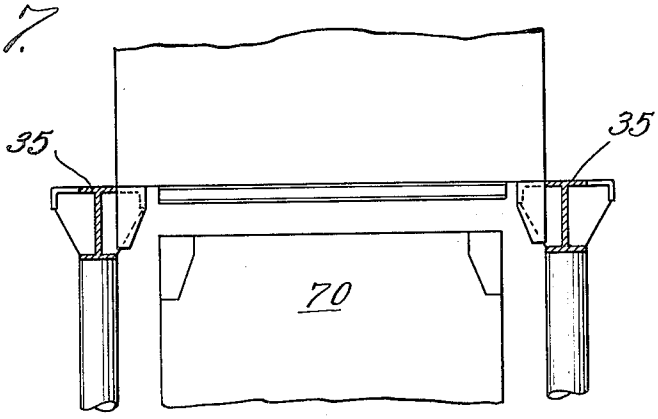


Fig. 8.

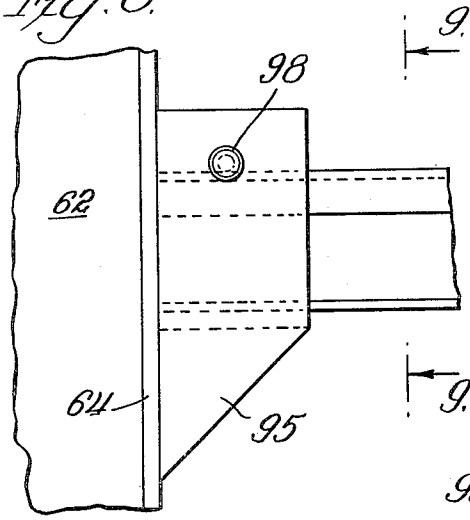


Fig. 9.

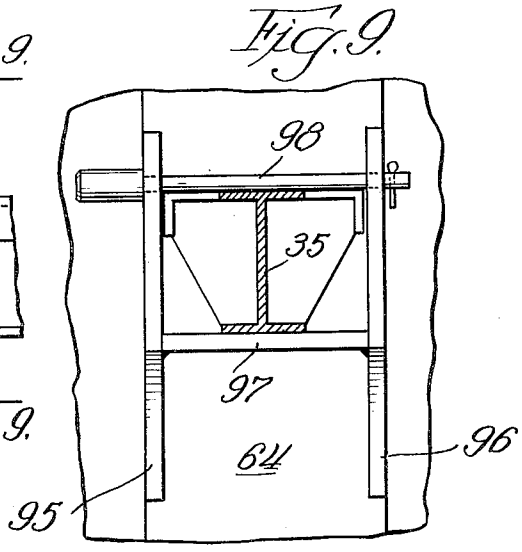
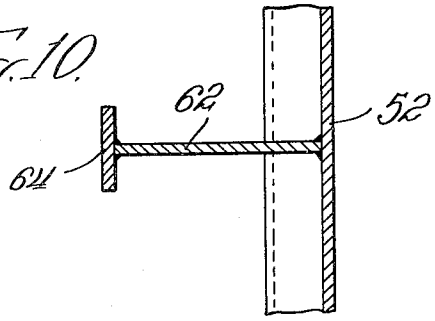


Fig. 10.



INVENTORS
Leathem D. Smith
BY Richard A. Stearn
Stone, Artman + Bisson
Atty's

Patented Jan. 23, 1951 2,539,168

UNITED STATES PATENT OFFICE

2,539,168

CONTAINER SHIP

Leathem D. Smith and Richard A. Stearn, Sturgeon Bay, Wis.; said Stearn assignor to said Smith; Alva Smith administratrix of the estate of said Leathem D. Smith, deceased

Application April 4, 1945, Serial No. 586,522

6 Claims. (Cl. 114—72)

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This application relates to a container ship having large hatches over holds, and more particularly to a reinforced side wall and sheer construction which makes possible the use of large hatches in a ship's weather deck. This application is one of several inventions jointly contributing to render practical a container ship. See copending application Serial No. 596,124, and United States Letters Patent No. 2,440,307, dated April 27, 1948, and No. 2,457,841, dated January 4, 1949, and No. 2,457,842, dated January 4, 1949.

The principal object of this invention is to provide a container ship which will utilize the hold construction disclosed in United States Letters Patent No. 2,440,307, dated April 27, 1948. This hold construction requires a hatch (or hatches) in the weather deck which is almost coextensive in area with the area of the hold. While barges and other vessels not intended to withstand heavy weather such as occurs on the Great Lakes or on the oceans have been built with large hatches or without any weather deck at all, such construction has not been deemed feasible for oceangoing and Great Lakes ships.

The principal feature of the present invention is a reinforced construction at each of the ship sheers extending from a point near the bow to a point near the stern—the ship sheers being the two areas adjacent the lines along which the port and starboard sheer strake of the hull intercept the weather deck. In addition to this ship sheer construction, there is provided a furthere side wall reinforcement consisting of transverse, equally spaced vertical stiffener plates extending from the bottom of the ship sheer reinforcement to the tank top above the ship bottom.

A further object of this invention is to provide open holds of varying sizes in which can be mounted applicants' deck beam construction. Much cargo does not lend itself to container shipments. Bulk merchandise that can be poured and merchandise which is larger than the containers require holds unbroken by deck beams, stanchions or between decks. A feature of the present invention is the provision of wall holding means for applicants' beams. These holding means are in regular fixed spaced relationship along the side walls of the vessel. When the beams with their regularly spaced container holding means upon them are positioned in these wall holding means, a beam deck is provided for containers, but where the beams have been removed, it is possible to insert lumber, telegraph poles and other long objects directly on the tank top or the hold floor.

A further object of this invention is to support

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one or more ship cranes on the reinforced ship sheer. Heretofore unloading means on seagoing vessels have quite commonly been located along the center line of the hatch deck. Applicants desire to use the reinforced sheer construction as a supporting means and toward that end mount on the port and starboard stringers rails to support a bridge mounted travel crane. While such bridge mounted travel cranes have been mounted along the sides of loading barges, here again the problem of designing a hull that would withstand high seas was not encountered.

These and such other objects as may hereinafter appear are obtained in an embodiment of the invention shown in the accompanying drawings comprising four sheets wherein:

Figure 1 is a side elevation of applicants' container ship;

Figure 2 is a plan view thereof;

Figure 3 is a longitudinal, sectional view of applicants' container ship;

Figure 4 is a view taken on the line 4—4 of Figure 3;

Figure 5 is a view taken on the line 5—5 of Figure 3;

Figure 6 is a perspective view of hold 33 in Figure 3 illustrating movement of cargo at sea;

Figure 7 illustrates how the top of the containers in the lower portion of the hold are positioned between the deck beams;

Figure 8 is a side elevation of a fixed side wall holding means for supporting a removable cross beam;

Figure 9 is a view taken on the line 9—9 of Figure 8; and

Figure 10 is a view taken on the line 10—10 of Figure 4.

Continuing to refer to the drawings, in Figure 1 the numeral 10 generally identifies a ship hull wherein the pilot quarters 11 are located in the bow of the ship and the crew quarters 12 and propulsion equipment 13 (see Figure 3) are located in the stern. Beneath the pilot's cabin in the fore part of the hull are positioned two ballast holds 14 and 15 which partly balance the disposition of the propulsion equipment at the stern of the vessel. Continuing to refer to Figure 3, the vessel has a double bottom comprising bottom strakes 16 and tank top or cargo bottom 17. The cargo bottom 17 is frequently referred to as the "tank top" because the space between it and the bottom strakes 16 is filled with tanks for carrying fuel oil or ballast.

A forward hold 18 separated from the forward ballast hold 14 by a bulkhead 19 and from a rearwardly positioned hold 20 by a bulkhead 21,

is covered from above by a weather deck 22 and a hatch cover 23 seated on a hatch coaming 24 which defines a hatch generally identified by the numeral 25. The hold 18 is divided into three horizontal spaces by between decks 26 and 27 which respectively have relatively smaller hatch openings 28 and 29 in vertical alignment with the hatch 25. An elevator shaft 29' with car 29'' is mounted in the rear part of the hold 18. This hold is intended for miscellaneous package merchandise.

Attention is drawn at this point to the relationship of the edges of the decks 26 and 27 to the plates forming the side strakes of the vessel. Referring to Figure 1, the sheer 30 and gunwhale 30' are not at a constant height above the ship bottom 16 or above the keel but rise slightly as the bow of the vessel is reached. The steel plates forming the side strakes of the vessel are welded or riveted together along lengthwise extending edges that tend to follow in substantially parallel relationship with the curvature of this sheer 30. However although the weather deck 22, referring to Figure 3, follows the lines of the rising sheer it is not necessary for the between decks 26 and 27 to follow these same lines but they are customarily substantially parallel thereto and not parallel to the bottom of the vessel 16 and the tank top 17. The tank top 17 constitutes the bottom of the holds in the vessel and is substantially flat.

Aft of hold 18 are holds 20, 31, 32, 33 and 34. These holds embody in a general way the hold construction disclosed in United States Letters Patent No. 2,440,307, dated April 27, 1948, and it should be noted that the deck of beams generally identified by the numeral 35 bears no relationship to the slight curvature of the sheer or gunwhale of the ship, but is in a plane throughout the entire length of all holds employing these beams, which plane is uniformly spaced from the tank top 17. Contrast the horizontal straight level of this deck of beam structures with the upwardly sloping between decks 26 and 27 of hold 18. Holds 20 and 31 are multiples of the smaller holds such as 32, hold 31 being three times as large as hold 32 and hold 20 twice as large.

Holds 32, 33 and 34 are refrigerated and the space 36 contains the refrigerating equipment. The space 36 is shaped so that a maximum space will be provided for uniform sized containers in holds 33 and 34.

Referring now to both Figures 2 and 3, applicants' ship has practically no hatch deck, for a series of uniformly sized hatches 37, 38, 39, 40, 41, 42, 43 and 44 have a length longitudinally of the vessel of substantially the distance between bulkheads 45 and 46 and have a width transversely of the vessel of the distance between the port stringer 47 and the starboard stringer 48. A ship construction having such hatches without additional structure cannot meet strength specifications for a seagoing ship, particularly where the holds are open holds. In many cases certain accepted types of ship construction located the main cabin, fuel and propulsion equipment centrally of the vessel, and in so doing provided that portion of the ship with a plurality of between decks with small openings therethrough for doors and the like in order to attain that longitudinal, horizontal and vertical strength which is necessary to a ship that may roll 30 degrees in a high sea with the bow and the stern occasionally completely out of water. Most modern ships having a fore cabin and stern cabin construction similar to that illustrated in applicants' present ship, rely upon hold bulkheads, small hatches and a plurality of between decks to provide the requisite transverse strength.

Applicants provide a ship that will meet the specifications for an oceangoing ship as laid down by certain classification society authorities by providing a reinforced sheer construction to go with web frames connecting the reinforced sheer to the double bottom of the vessel. Reinforcement extends the entire heights of the two sides of the vessel. Referring to Figure 4, the flat keel 49 is joined on each side to garboard strakes 50. The garboard strakes on their outer edges are connected to the bilge strake 51 which in turn is joined to the side strakes 52, to the upper edge of which is fastened the sheer strake 53. The bilge keel is 51'. The numeral 54 identifies the gunwhale and 48, the heretofore mentioned starboard stringer. The numeral 55 identifies the hatch coaming. The numeral 17 is the tank top spacedly held to the bottom by solid upright partitions 56, 57 and 58. The construction thus described is conventional.

Referring now to Figure 5, extending downwardly from the stringer 48 in the plane of the hatch coaming 55 is what applicants call a reinforcing sheer strake 59. This strake consists of a series of heavy plates spaced inwardly from the sheer strake 53 and it extends almost the entire length of the vessel from approximately point 60 in the bow to point 60' in the stern, see Figure 3. The plates forming the reinforcing sheer strake 59 may have their upper edges cut so that they form the portion marked 55 of the hatch coaming. The lower edge of the reinforcing sheer strake 59 is connected by an auxiliary depressed stringer 60 to the side wall of the vessel and this auxiliary depressed stringer likewise extends substantially the entire length of the vessel, that is, between points 60 and 60' in Figure 3. From the stringer 48 to the auxiliary stringer 60, therefore, the ship hull is a double hull and the plates used in the strakes 53 and 59 and in the stringers 48 and 60 are of such a heavy gauge as to supply a substantial portion of the longitudinal strength at the upper sides of the hull which in conventional ships is obtained by means of a hatch deck and between decks. These two sheer strakes 53 and 59 and stringers 48 and 60 constitute a hollow rectangle beam, herein called the rectangular sheer beam, which extends substantially the entire length of the vessel. Its height extends from the ship sheer almost to the water line 61, see Figure 4, constituting a double hull from ship sheer to waterline. The inside of these beams may be used as a covered walk connecting the forward cabin to the stern cabin.

A substantial equivalent of this double hull construction on down to the double bottom is desired, without, however, the loss of hold space which results from use of the sheer beams. This additional strength is obtained by transverse stiffener or web plates 62 and 64, see Figure 5, which are positioned in the same vertical plane as each transverse beam, see for example 63 and 64a, in hold 32 of Figure 3. The inside vertical edges of the web plates 62 are in vertical alignment with the reinforced sheer strake 59 and may have mounted thereon by any suitable means a flat plate 64. Additionally, plates such

as 62 may be used to reinforce the bulkhead, see numeral 67 in Figure 5. To provide additional rigidity longitudinally of the vessel between these web plates 62, angle irons 68 and 69 are utilized. Further rigidity to the hull as a whole is provided by welding the edges of the bulkheads, as 46, which abut the reinforcing sheer strake and the auxiliary depressed stringer, to these last named members.

The two sheer beams extending longitudinally of the vessel together with the vertical web plates 62 provide the equivalent of a double side hull for applicants' vessel and provide the requisite strength necessary to permit the use of large hatches.

The spacing of the sheer reinforcing plate 59 from the sheer strake bears a relationship to the size of the containers to be stowed. Applicants' hatch and hold construction requires that the center point of a container in position in the hatch hold be beneath the hatch opening, and referring to Figure 4, it follows that the reinforcing sheer strake 59' must be to the outside of the center point above the container 70. The vertical stiffener plate 62 being an essential element of this reinforced sheer construction, applicants space these vertical stiffener plates so that the width dimension of the container may be inserted between them. This results in a more complete use of hold space.

Attention is further invited to the relationship of the transverse beams 35 to the top edges of the upper level of containers in the lower hold, namely containers number 70 of Figure 4. The beam 35 is illustrated in Figure 4 and Figure 7 is an enlarged view taken on the line 7—7 of Figure 4. The upper edge of the container 70 is above the bottom edge of the beams 35 so that in case of forward and backward rocking, the beams 35 would tend to hold the containers in their proper vertical position.

The upper two levels of containers bear no relationship to the lower two levels, excepting that they are positioned very close to one another and their lengths are at right angles to each other.

Referring now to Figure 5, the beams 35 in holds such as 32 are permanently fastened to the web frames 62 and are supported by stanchions 73, 74 and 75 and may be centrally spaced from each other by I beams such as 76. These stanchions are rigidly fastened to the beam 35 and are intended to maintain that beam in rigid parallel relationship to the tank top 17. It will be appreciated, referring to Figure 4, that if the supporting beams 35 sag appreciably, where the containers are mounted close together their upper edges will contact one another and this is not wanted. While a container ship will completely cure the problem of shifting cargo at sea, it is still somewhat subject to the problem of "cargo working." The term "cargo working" identifies a movement of the cargo with each roll of the ship. The more exactly coordinated a movement of this sort is, the more strain is placed on the ship. Where a ship is filled with containers of standard size, if any movement is permitted, a very serious cargo working may be set up. If the containers can move a half inch in a given direction in the holding means, the chance of a movement occurring all at one moment in a given hold is very great. Applicants therefore seek first to keep the containers from contacting each other during rocking at sea and secondly, to keep the containers from setting up a coordinated, momentary, unidirectional movement in a hold.

Referring now to Figure 6, the numeral 77 generally identifies a bridge mounted travel crane comprising a bridge supported on wheels 79 and 80 which run along tracks 81 and 82. A travel crane 83 supported on rails 84 and 85 is illustrated lifting a container 86 from hold 33. It is about to move the container over to hold 32. The use of the bridge mounted travel crane and the fixed position holding means for the containers results in two important advantages in the performance of this operation at sea. Firstly, at no time are the containers in the hold unsecured. The only container that is loose so that movement of the ship might cause it to move laterally is the container which is being lifted by the travel crane. An ordinary bridge mounted travel crane is shown in Figure 6 and such travel cranes are superior to a boom type or whirler crane because when a container is drawn closely up to the travel carriage, there will be much less swaying and thrashing about. This is primarily due to the fact that the holding point of the cable in the bridge mounted travel crane need not be raised and lowered with respect to the hatch deck in order to reach various points of a hold, whereas in the case of the whirler crane or any boom type crane, the boom is raised or lowered and in so doing is raised or lowered with respect to the rolling or rocking center of the ship. This is explained in copending application Serial No. 596,124.

Provision is made in the top of hatch covers to provide holding means for containers so that in a transfer operation, a few containers may be stacked on the deck safely as for example, 90 in Figure 6.

As applicants' type of container ship becomes more generally used and a great volume of cargo is loaded in containers, it is contemplated that the deck beams in many of the holds be permanently fastened to the vertical web stiffener plates. Beams so fixed to the web plates provide additional strength for the ship hull. Until such time arrives, however, it will probably be wise to removably mount the beams in at least several of the holds. Regularly spaced holding means may be mounted on the facing plate 64 attached to the inside edge of each vertical stiffener plate as 62. To this facing plate 64, referring to Figure 18, are attached two plates 95 and 96 joined by a horizontal plate 97. The end of one of applicants' beams 35 may be dropped into the resulting rest and tied thereby means of pin 98.

Having thus described our invention, what we claim as new and wish to secure by United States Letters Patent is:

1. A seaworthy ship comprising a hull having a bottom, a reinforcing beam positioned in each ship sheer and extending throughout the greater length thereof, a plurality of transverse, weather deck hatches, each spanning the distance between the two beams, and spaced, stiffener plates, each having a width approximating the width of a beam and vertically positioned beneath each beam with its flat surfaces transverse to the length of the ship, with one vertical edge fastened to the side of the ship and with its top and bottom edges fastened respectively to the beam and ship bottom.

2. A seaworthy ship comprising a hull, having

a bottom, a hollow rectangular beam positioned at each ship sheer and extending throughout the greater length thereof, a plurality of transverse, weather deck hatches, each spanning the distance between the two beams, and spaced, stiffener plates, each having a width approximating the width of a beam and vertically positioned beneath each beam with its flat surfaces transverse to the length of the ship, with one vertical edge fastened to the side of the ship and with its top and bottom edges fastened respectively to the beam and ship bottom.

3. A seaworthy ship for handling uniformly sized containers comprising a hull having a bottom, a rectangular beam positioned at each ship sheer and extending throughout the greater length thereof, said sheer beam extending inwardly of the side of the hull by a distance less than one-half of one of the horizontal dimensions of the container, a plurality of transverse weather deck hatches, each spanning the distance between the two beams, and stiffener plates having a width approximating the width of a beam positioned transversely to the length of the ship and extending downwardly from each rectangular beam to the hull bottom, said plates being spaced by a distance greater than the width dimension of said containers and being fastened along its top, hull side and bottom edges to the beam, hull side and ship bottom respectively.

4. A sub-deckless ship for handling uniformly sized containers having a length greater than their width comprising a hull having a bottom and side walls, a hollow beam mounted in each of the hull sheers, a plurality of weather deck hatches, each spanning the distance between the two beams, a plurality of elongated stiffener plates having a width approximating the width of a sheer beam and height approximating the distance between the bottom of a sheer beam and the hull bottom mounted transversely along the ship side and fastened to the beam, ship side and bottom, said stiffener plates being spaced by a distance greater than the width of the uniformly sized containers, and a deck of beams intermediate the hold bottom and the weather deck, each beam being mounted at its ends on transversely aligned stiffener plates, whereby containers may be lowered between the beams and seated between adjacent stiffener plates and beneath the sheer beam, while other containers may be rested on the beams with their length parallel to the length of the ship.

5. The ship described in claim 4 wherein a bracket is mounted on the inside edge of each stiffener plate and the transverse beams are removably seated in said bracket.

6. The ship of claim 4 wherein a bracket consisting of an inwardly directed channel having a transverse shelf is mounted on the inside edge of each stiffener plate so that the ends of the beams may drop into the channel and rest on the shelf.

LEATHEM D. SMITH.
RICHARD A. STEARN.

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