United States Patent [19]

Papanicolaou et al.

[11] **3,709,181**

[45] **Jan. 9, 1973**

[54] **CARGO VESSELS**

[75] Inventors: **John Paul Papanicolaou,** Athens, Greece; **Telemachus Nicolas Galati,** London, England

[73] Assignee: **Marine and Industrial Developments Limited,** Piraeus, Greece

[22] Filed: **Dec. 10, 1970**

[21] Appl. No.: **97,042**

[30] **Foreign Application Priority Data**

Dec. 10, 1969 Great Britain.....60,295/69

[52] **U.S. Cl.**.....**114/72**

[51] **Int. Cl.**.....**B63b 25/00**

[58] **Field of Search**.....114/72, 73, 76, 78, 65 R; 214/12, 74, 15 R

[56] **References Cited**

UNITED STATES PATENTS

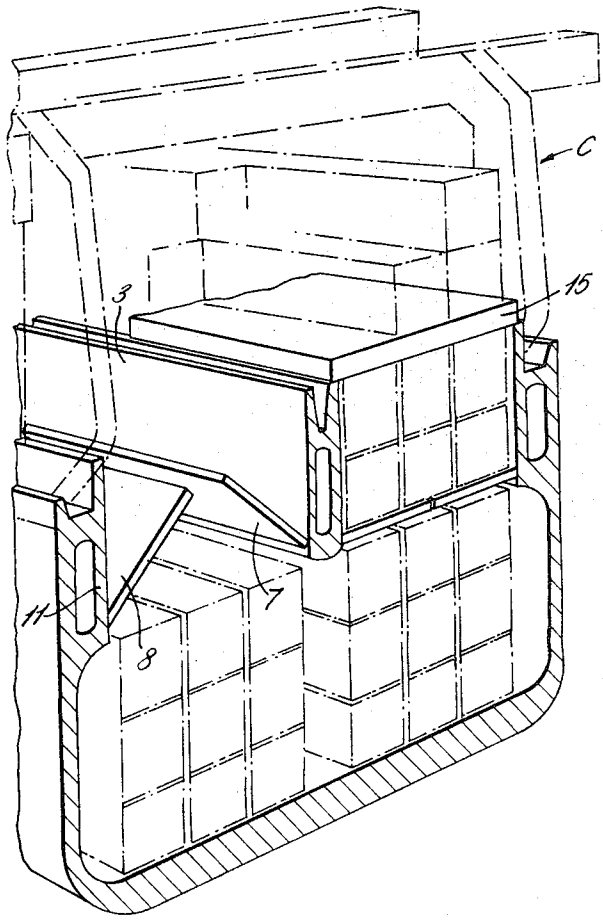
2,985,131	5/1961	Knight et al.	114/72
3,038,432	6/1962	Goldman	114/72
3,162,169	12/1964	Ferris	114/72
2,736,287	2/1956	Kummerman	114/72
3,109,402	11/1963	Blomberg et al.	114/72 X
3,087,453	4/1963	Friedman	114/72
3,291,324	12/1966	Fulcher et al.	114/72 X

Primary Examiner—Milton Buchler
Assistant Examiner—F. K. Yee
Attorney—Cushman, Darby & Cushman

[57] **ABSTRACT**

The specification discloses a multi-purpose cargo ship which has cargo-carrying holds with between decks which are fully collapsable. The between decks are composed of panels which are hinged for folding into vertical planes against the boundary walls of the hatchways. When the between decks are in use they separate the holds into upper and lower compartments for carrying different types of cargo. When the between decks are collapsed the vessel can be used as a full bulk cargo carrier and is self-trimming. The upper hold compartments lie abreast of a longitudinal strength member which is preferably a hollow structure providing a tunnel or passageway for personnel.

4 Claims, 8 Drawing Figures



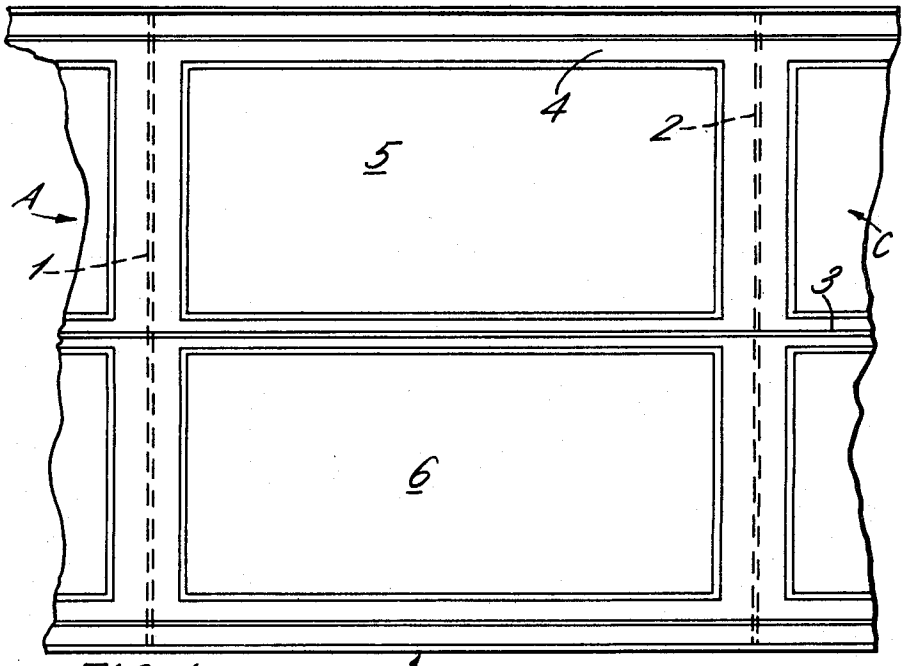


FIG. 1.

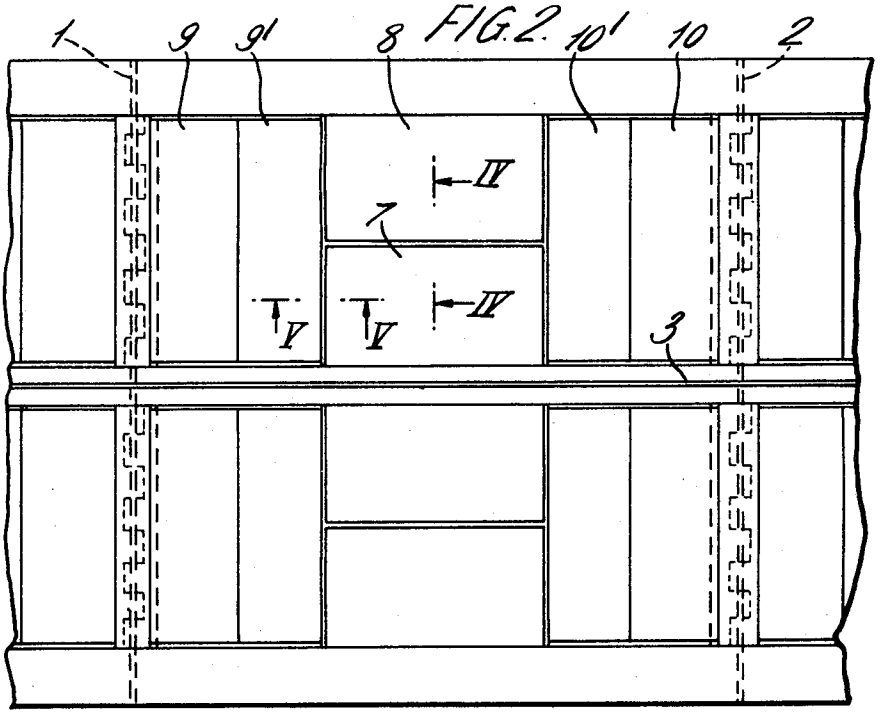


FIG. 2.

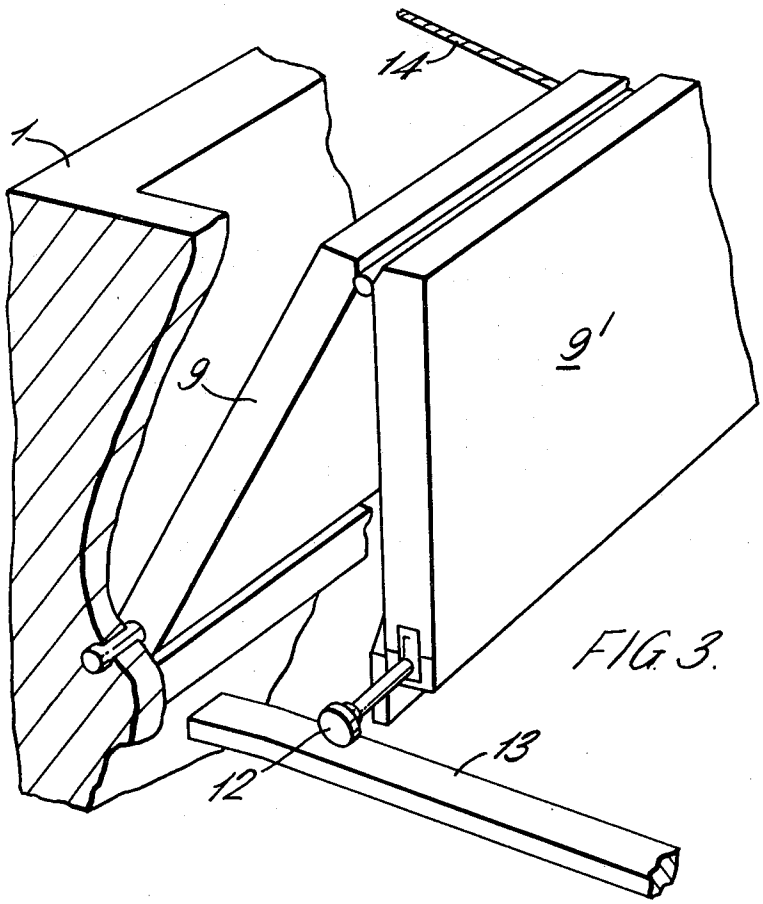


FIG. 3.

FIG. 4.

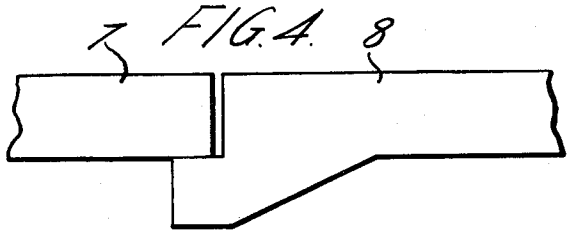


FIG. 5.

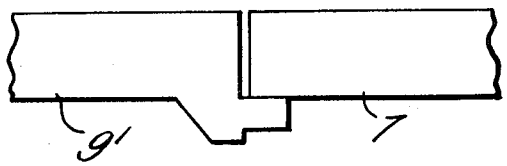


FIG. 6

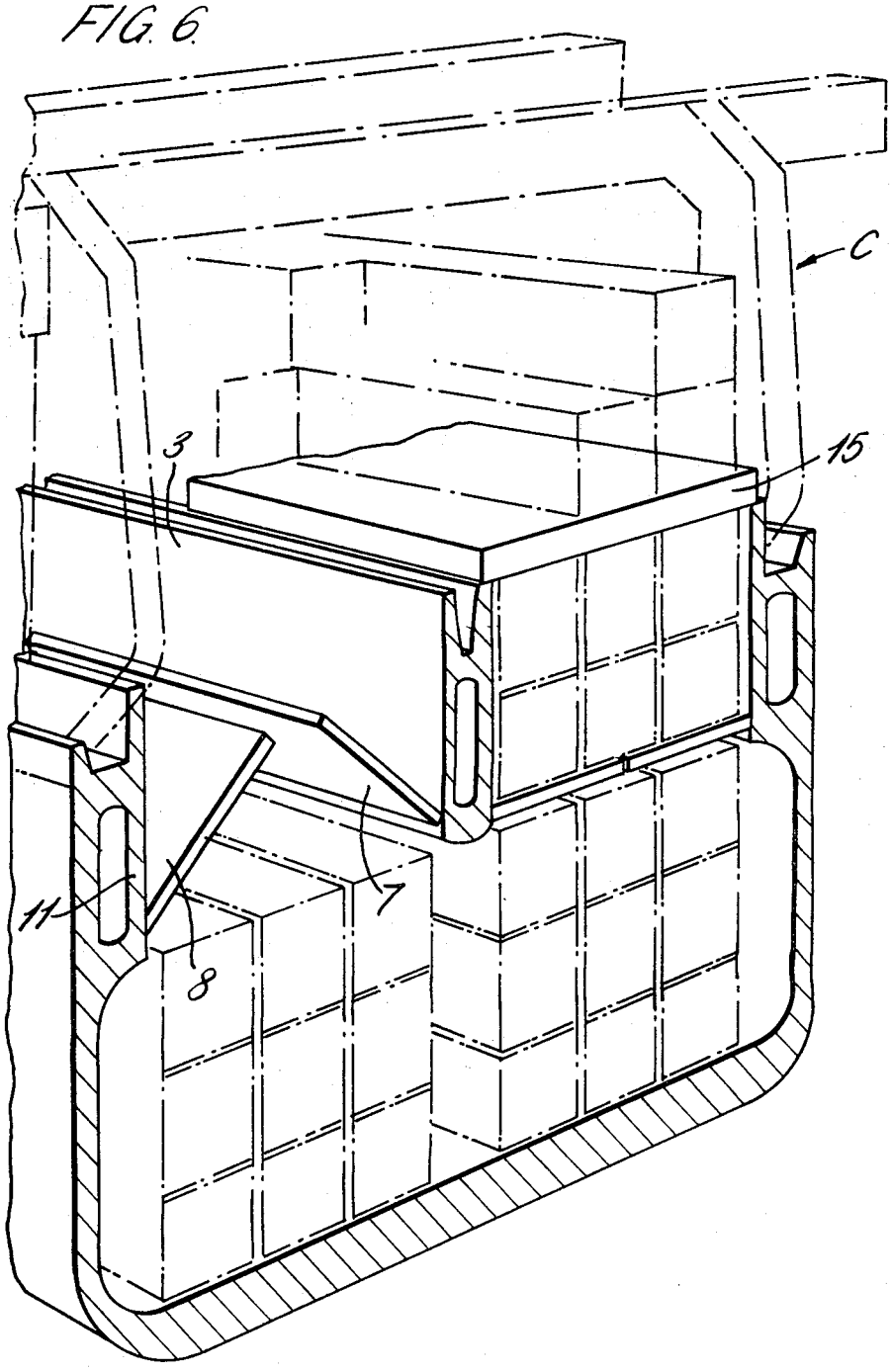


FIG. 7.

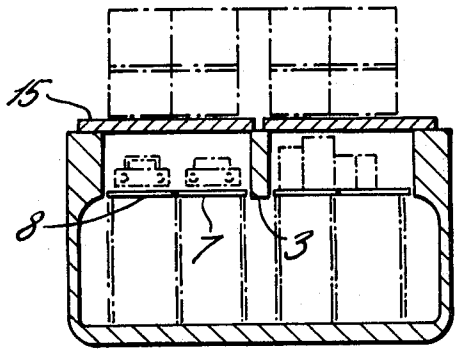
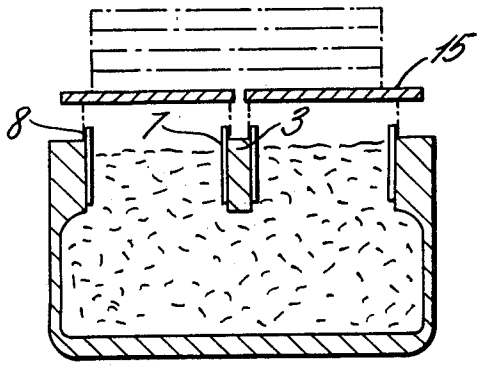


FIG. 8.



CARGO VESSELS

This invention relates to cargo ships.

So-called "open" cargo ships are very suitable for carrying bulk cargo. Such ships comprise holds extending over nearly the full depth and width of the hull, the holds being separated from each other by transverse bulkheads.

For certain cargoes it is an advantage to use a cargo vessel comprising one or more between-decks so that different categories of cargo can be carried at different levels in the holds. Such between-decks are customarily constructed with hatches and displaceable hatch covers. In some vessels, when the between-deck hatch covers are open the vessel can be loaded as a full bulk cargo carrier. However, vessels of known design, when so used, are not self-trimming. Places immediately beneath the between-decks remain void unless the cargo is manually levelled into those places during loading of the vessel. Moreover an appreciable amount of bulk cargo is supported by the between-decks around the between-deck hatches and this cargo has to be cleared away manually when the vessel is unloaded. These trimming operations take up much valuable time and labor.

According to the present invention, a cargo vessel having a plurality of holds separated by transverse bulkheads, each hold extending over the full internal width of the vessel, is characterized in that there is a central strength member which runs longitudinally of the vessel and divides the upper portion of the holds into two side by side parts and at least one of such holds is served by two upper decks hatches which are located on opposite sides of said longitudinal member and are together substantially co-extensive with the horizontal area of such hold, there being in each upper part of such holds a fully collapsable between-deck composed of panels which are hingeable into substantially vertical planes adjacent boundaries of said upper hold part so that when the said between-decks in such hold are collapsed, substantially the entire hold is accessable to bulk cargo released through said hatches.

The present invention involves a departure from the basic traditional concept of a deck as necessarily being a permanently horizontal floor, usually comprising strength members of the structural framework of the vessel. This concept has been a determining influence even in the design of between-decks in cargo vessels. In such vessels the need for free access of cargo to the deeper parts of the hold has hitherto been met by the provision of large hatches in the between-decks. In such cases the between-decks may be but narrow perimetral floors but they are nevertheless a disadvantage when handling bulk cargo. A cargo vessel according to the present invention comprises between-decks which are not permanent horizontal floors with hatches; rather the whole projected area of each between-deck is collapsable. A hold having these fully collapsable between-decks, when used for carrying bulk-cargo, is self-trimming. Moreover the formation of the between-decks from hinged panels which are foldable into vertical planes next to the boundaries of the upper hold parts avoids the presence behind the folded panels of spaces which are inaccessable to bulk cargo released through the upper deck hatches and the wastage of cargo space is minimal.

The invention is primarily intended to be applied so that in the cargo vessel there are fully collapsable between-decks on opposite sides of the central longitudinal strength member in each of a plurality of holds so that the vessel can be used as a full bulk cargo carrier.

The central longitudinal strength member is preferably a hollow structure serving as a tunnel or passageway for personnel. This feature materially contributes to the efficient manning of the vessel. The passageway may have lateral doors giving access to the between-decks. Said passageway can also serve as a housing for electrical conduction and other services.

Preferably the longitudinal strength member is of elongated rectangular or substantially rectangular section with its longer sectional dimension vertical. The lesser the width of the strength member the wider may be the upper deck hatches.

The depth of the longitudinal strength member is preferably less than half the total depth of the holds. When the between-decks are collapsed the vessel is fully "open" save for the presence of this longitudinal member. For attaining maximum bulk cargo capacity and ease of bulk cargo handling the depth of the longitudinal member should not be greater than is necessitated by its contribution to the integral strength of the hull structure and by the depth of space required between the upper deck and the between-decks when these are in use.

Each between-deck, i.e., the between-deck in each upper hold part, comprises panels which are hinged for folding into vertical planes. Preferably each between-deck at least comprises two opposed meeting panels, one of which is hinged to the outer vertical boundary wall of the upper hold part in which that between-deck is provided and the other of which is hinged to the central longitudinal strength member forming the inner boundary wall of such upper hold part. Such panels take up very little space when folded up against such inner and outer boundary walls.

According to a particularly advantageous design of the between-decks, each such deck comprises opposed meeting panels as aforesaid, hingeable about longitudinal axes parallel with the longitudinal axis of the vessel, and at least one end panel which is hinged to a bulkhead for folding against such bulkhead about an axis parallel therewith. By adopting such a combination of panels, a between-deck of large area can be formed from panels which are comparatively small and which fold very comparctly so as to cause very little obstruction of the hatchway.

A particularly advantageous between-deck construction is one comprising opposed meeting panels hingeable about longitudinal axes against the inner and outer boundary walls of the upper hold part, and pairs of transverse accordian panels which are hinged to the opposed transverse bulkheads. Accordian panels are panels which are hinged together so that they can fold from a horizontal plane in which they are mutually flush, into vertical planes in which the panels lie face to face. Between-decks having the said four-way folding panel construction can be collapsed into stowage spaces which are very small in relation to the between-deck areas.

In the case of a between-deck of the said four-way folding construction, the accordian panels can ad-

vantageously be supported by marginal guide rails which guide the panels during their opening and closing movements and the opposed meeting panels can be supported by the accordian panels when the panels are unfolded to form the between-deck. There is then no need to provide any temporary cross-beams to support the panels under load. This avoidance of temporary beams is important for reducing the loading and unloading times.

The between-deck panels can be remotely operated by hydraulic or other automatic control mechanism. It is preferable to employ hauling cables or wires in the interest of simplicity and cost reduction. Such cables or wires may be pulled by winches or lifting gear on the vessel.

Ballast boxes are preferably disposed along the sides of the hull at the upper portion thereof so as to form the outer boundary walls of the upper hold parts.

A cargo vessel according to the invention preferably incorporates a bridge-type crane or other lifting appliance which travels on tracks located along the side margins of the upper deck so that the appliance can load and unload cargo from any of the holds.

A particular cargo-vessel constructed according to the invention will now be described by way of example with reference to the accompanying drawings in which:

FIG. 1 is a plan view of part of the vessel;

FIG. 2 is a plan view of the between-decks at the corresponding part of the vessel;

FIG. 3 is a perspective cross-sectional view of part of one between-deck, showing a pair of accordian panels in partly folded position;

FIG. 4. is a cross-sectional view on line IV—IV of FIG. 2; showing the joint between the edges of the two longitudinal panels of the between-deck;

FIG. 5 is a cross-sectional view on line V—V of FIG. 2, showing the joint between a longitudinal panel and an accordian panel in the between-deck;

FIG. 6 is a perspective cross-sectional view of one of the holds;

FIGS. 7 and 8 are transverse sections of the vessel, through one of the holds, and showing the appertaining between-decks in operative and inoperative position respectively.

The illustrated vessel comprises a plurality of holds partitioned from each other by transverse bulkheads. FIG. 1 shows a part of the ship including two bulkheads 1,2 which form end boundaries of holds A,B and C. A central spar 3 (strength member) runs longitudinally of the vessel and divides the upper part of each hold into two parts as can be clearly seen in FIGS. 6 to 8.

In the upper deck 4 there are two hatches such as 5,6, serving each hold. The hatches lie on opposite sides of the- spar 3 and extend over nearly the entire length of the hold and over nearly the full transverse distance between the ship sides and the central spar 3.

The central spar 3 extends depthwise of the vessel over approximately one third of the total depth of the holds, i.e., over approximately one third of the vertical distance from the bottom of the holds to the upper deck.

In each hold, the vessel is provided with fully collapsable port and starboard between-decks located one on each side of the central spar 3. When these between-decks are in unfolded operative position they are at the level of the bottom of the central spar 3 and thus convert the upper third of the hold into two separate compartments located between the main part of the hold and the upper deck. Each between deck is formed by four panels as can be seen in FIG. 2. There are two longitudinal panels 7,8 and two pairs of end panels 9,9' and 10,10'. When the between-decks are not required their component panels are folded against vertical boundary walls of the upper parts of the holds. For this purpose, the panel 7 is hinged to the central spar 3 so that it can hinge upwardly against one face thereof, and the panel 8 is hinged to the inner vertical wall of a ballast box 11 running along the inside of the appertaining side wall of the vessel, so that that panel can hinge upwardly against such wall. The panels 9,9' are accordian panels hinged together at their meeting margins and panel 9 is hingewise mounted at its other margin so that the two sections can be folded face to face and substantially against the bulkhead 1. The other transverse panels 10,10' are accordian panels which fold in a similar way against the bulkhead 2.

The vessel can be designed so that when the between-deck panels are in folded, inoperative, position, they underlie marginal portions of the upper deck 4 bordering the hatches 5,6.

The manner in which the accordian panels 9,9' fold is shown in FIG. 3. The other accordian panels fold in the same way. At one of its free corners, the panel 9' carries a roller 12 which runs on a marginal rail 13 secured to the structural framework of the vessel. A similar roller is provided at the opposite free corner of the panel 9' and engages a similar track adjacent the other side of the between-deck.

A cable 14 is attached to the panel 9 adjacent its hinged connected to panel 9'. This cable is guided by guide pulleys (not shown) so that when a hauling force is applied to the cable it raises panel 9 about its hinge connection to the bulkhead 1 and causes the panel 9' to fold inwardly towards panel 9 as shown in the figure. During the folding of the accordian panels the rollers on panel 9' travel along the marginal tracks. The cable 14 may be connected to a powered winch or to a lifting boom (not shown) as conventionally provided on cargo vessels for load-lifting purposes.

The marginal rails such as 13 can be shaped so that the accordian panels unfold from the vertical planes under gravity as soon as the tension in the operating cable 14 is relaxed. Alternatively, a further cable may be provided which is attached to the panel 9' adjacent its free longer margin and is guided around pulleys positioned so that a haulage force exerted on the further cable when the accordian panels are in folded condition serves to draw the said free margin of panel 9' horizontally in a direction away from the bulkhead 1 so as to start the unfolding of the panels, this unfolding then continuing under gravity, controlled by cable 14.

The hinged longitudinal panels 7,8 can be operated by cables attached thereto in like manner to the operation of panel 9 by cable 14.

When the panels are unfolded to form the between-deck, there is edge-overlap between the longitudinal panels 7,8 and between those panels and the transverse panels 9' and 10' as is clearly shown by FIGS. 4 and 5. The unfolding sequence is first the accordian panels and then the longitudinal panels. The latter panels are

supported by the adjacent margins of the panels 9' and 10' which are themselves supported by the marginal rails such as 13.

When the panels are unfolded, the hauling cables used for raising the panels can be detached therefrom so that the cables cause no obstruction in the upper hold compartments.

Along the side margins of the upper deck there are tracks for a travelling gantry-type crane C as suggested in broken line in FIG. 6.

The illustrated vessel is a general purpose vessel which can be used for carrying general cargo, container cargo, bulk cargo or mixed cargo. The vessel is fully cellularizable and when used for carrying gain or other bulk cargo is self-trimming. FIG. 7 shows one of the holds with the between-decks in operative position and cellularized for the carriage of containers. FIG. 8 shows one of the holds with the between-decks folded into inoperative position so that the entire hold can be filled with grain. It will be apparent from this view of the vessel that in contrast to vessels having a permanent between-deck with removable hatch covers, the volume of any pockets or voids which will not become occupied by grain when it is poured into the hold is negligible and the expenditure of time and labor on trimming is very considerably reduced or even obviated. The vessel is provided with upper deck hatch covers 15. When these hatch covers are in place, they can support additional cargo as is also represented in FIGS. 6 to 8.

What is claimed is:

1. A cargo vessel having a plurality of holds separated by transverse bulkheads, each hold extending over the full internal width of the vessel, characterized in that there is a central strength member which runs longitudinally of the vessel and which divides only the upper portion of the holds into two side by side parts, at least one of such holds being served by two upper deck hatches which are located on opposite sides of said central strength member, said upper deck hatches together being substantially co-extensive with the horizontal area of such hold, and there being in each upper part of such hold a fully collapsible between-deck composed of panels which are hingeable into substantially vertical planes adjacent boundaries of said upper hold part so that when the said between-decks in such hold are collapsed, substantially the entire hold is accessible to bulk cargo released through said upper deck hatches.

2. A cargo vessel according to claim 1, characterized in that said central strength member is a hollow structure serving as a tunnel or passageway for personnel.

3. In a cargo vessel having a plurality of holds separated by transverse bulkheads, and each hold extending over the full internal width of the vessel, the improvements comprising;

a central strength member which runs longitudinally of the vessel and which divides only upper portions of the holds into two side by side parts, said central strength member being a hollow structure serving as a tunnel or passageway for personnel;

at least one of said holds being served by two upper deck hatches which are located on opposite sides of said central strength member and which are together substantially co-extensive with the horizontal area of such hold, and

a fully collapsible between-deck contained in the upper parts of said at least one hold, said between-deck having (a) two side panels which meet when in an operative position to form a part of a closed deck, one of such side panels being hinged to an outer vertical boundary wall of an upper part of the hold so as to be hingeable into a substantially vertical plane against such outer boundary wall, and the other of said side panels being hinged to said central longitudinal strength member so as to be hingeable into a substantially vertical plane against the central strength member, and (b) two accordion panels which are located at opposite ends of said side panels and which are hinged to opposed transverse bulkheads so as to be movable into substantially vertical planes against said opposed transverse bulkheads and which can be moved into a horizontal plane to complete a closed deck with said side panels.

4. A cargo vessel according to claim 3, wherein said accordion panels are supported by marginal rails when in their operative positions and wherein said side panels hinge into operative positions in which their end margins are supported by adjacent free margins of the accordion panels.

* * * * *