

(No Model.)

H. F. SWAN.

CONSTRUCTION OF NAVIGABLE VESSELS FOR CARRYING LIQUIDS IN BULK.

No. 339,344.

Patented Apr. 6, 1886.

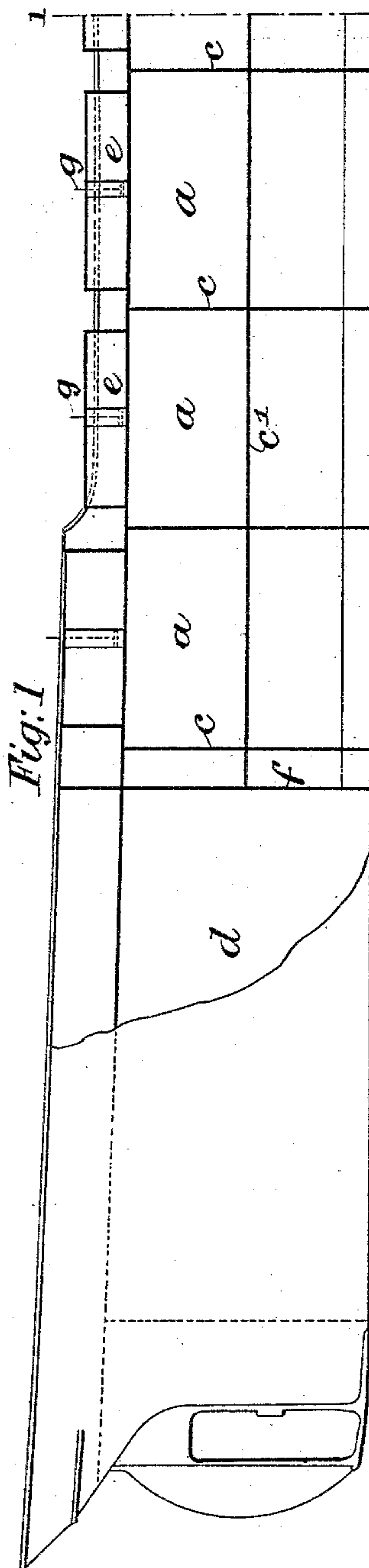


Fig: 1

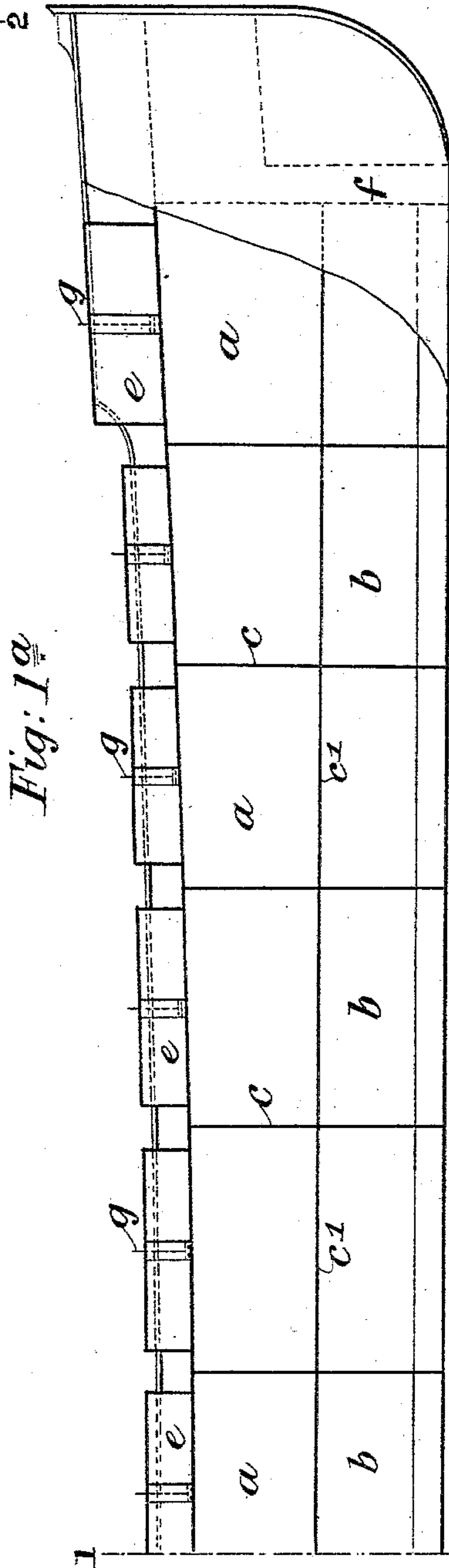


Fig: 1a

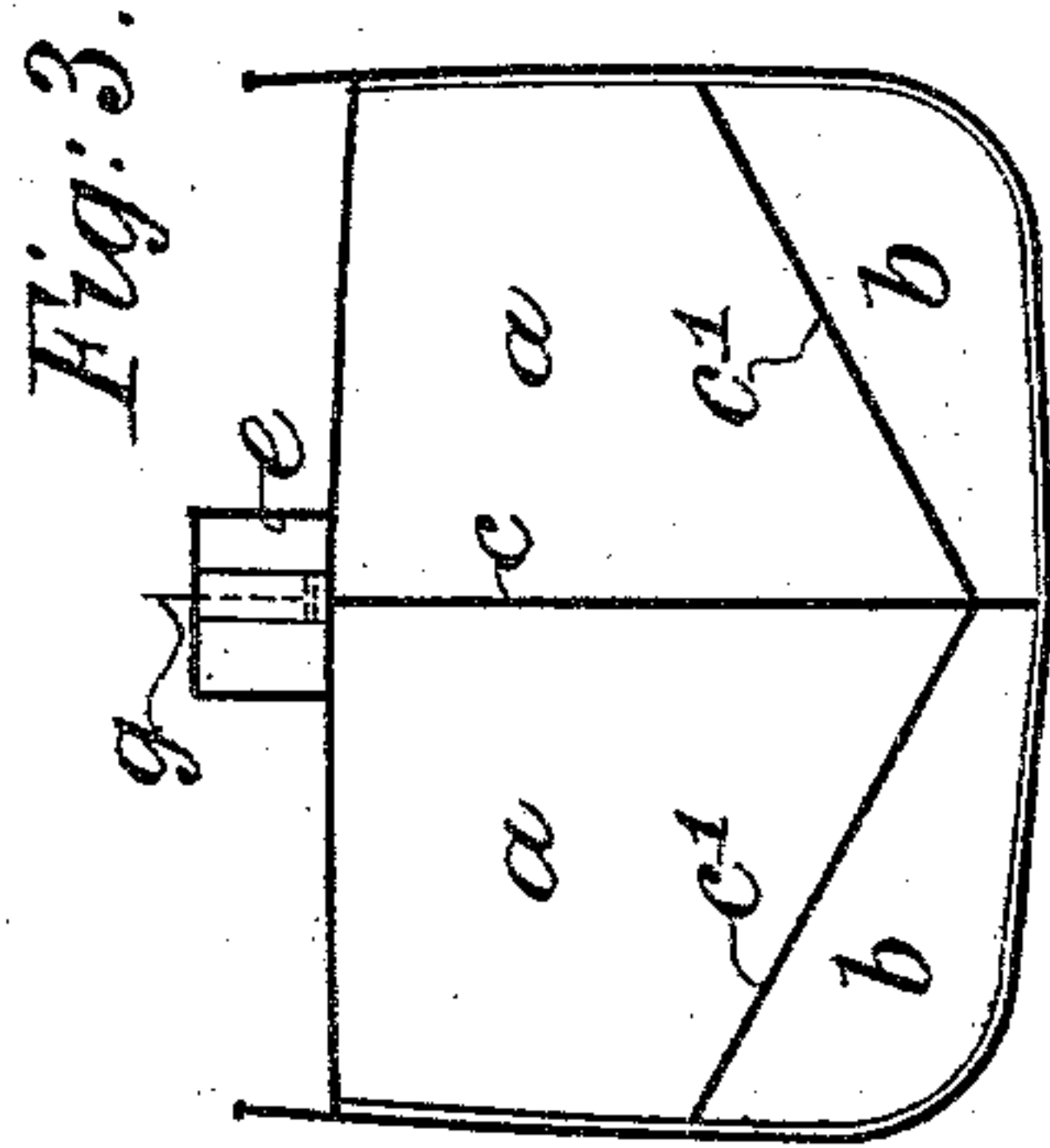
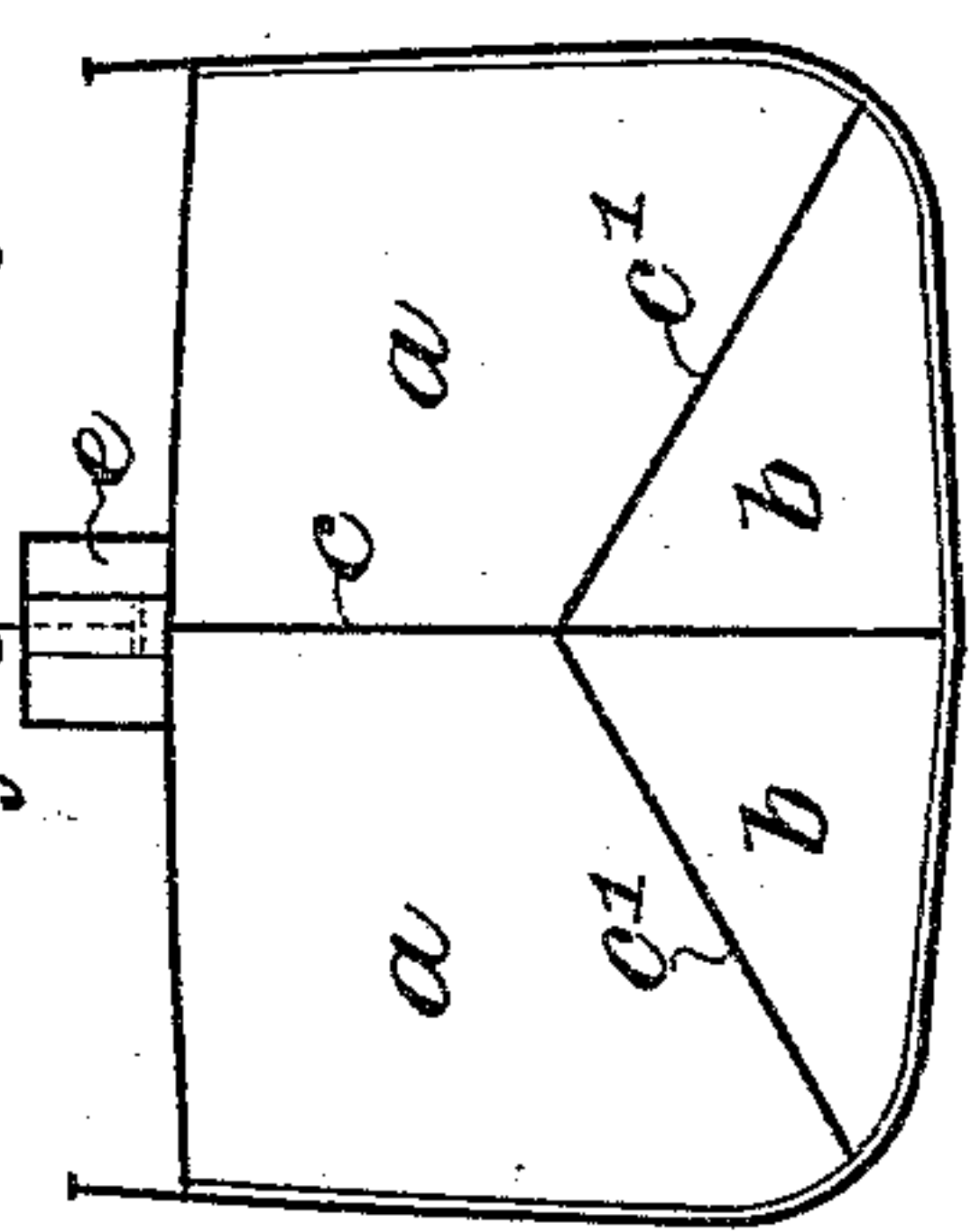


Fig: 2

Fig: 3



Witnesses:
O. Sundgren
Emil Herter

Inventor.
Henry Frederick Swan
By his attorneys
Brown & Hall

UNITED STATES PATENT OFFICE.

HENRY FREDERICK SWAN, OF NORTH JESMOND, NEWCASTLE-UPON-TYNE,
COUNTY OF NORTHUMBERLAND, ENGLAND.

CONSTRUCTION OF NAVIGABLE VESSELS FOR CARRYING LIQUIDS IN BULK.

SPECIFICATION forming part of Letters Patent No. 339,344, dated April 6, 1886.

Application filed February 9, 1886. Serial No. 191,293. (No model.)

To all whom it may concern:

Be it known that I, HENRY FREDERICK SWAN, of North Jesmond, Newcastle-upon-Tyne, in the county of Northumberland, England, have invented certain new and useful Improvements in the Construction of Navigable Vessels for Carrying Liquids in Bulk, of which the following is a specification.

The object of my invention is to effect improvements in the construction of navigable vessels for carrying liquids in bulk, including cargoes of a volatile character—such as petroleum, turpentine, and the like—the special construction of the vessel permitting a sufficient amount of water ballast being carried to enable the vessels to make long voyages without it being necessary to put the water ballast into the chambers or compartments in which cargo is carried, and at the same time raising the center of gravity of the cargo and ballast, respectively, to give the vessel proper sea-going qualities.

My invention relates more particularly to the construction of vessels for carrying liquid cargoes, for which I have already applied for Letters Patent. According to that invention provision is made to meet the expansion or contraction of the liquid cargo, due to variations in the temperature of the atmosphere or otherwise, without affecting the seaworthiness of the vessel, and at the same time allowing for the escape of the volatile gases which may be evolved from the cargo.

In carrying out the present invention I construct vessels of the usual ship-building materials, or alter existing vessels, in either case subdividing them by one or more longitudinal bulk-heads and several transverse bulk-heads into numerous cells or compartments for the reception of the liquid cargo, the aggregate capacity of the cells or compartments approaching more or less closely to the full cargo-carrying capacity of the vessel. Below these compartments I construct cells or compartments for the reception of water ballast, giving them such a form as will insure the raising of the center of gravity of the ballast. The top of the liquid-cargo cells or compartments may be formed by the main or upper deck of the vessel, or a special deck might be constructed at any suitable height.

In the accompanying drawings, Figures 1 and 1^a represent in longitudinal section a liquid-cargo vessel constructed according to this invention, and Fig. 2 is a transverse section of the same, taken in the dividing-line 1 2 of Figs. 1 and 1^a.

In these figures, *a a* are the compartments for cargo, and *b b* the compartments for ballast. These compartments are formed by dividing up the space in the hull by longitudinal and transverse bulk-heads *c*, and by inclined longitudinal division-plates *c' c'*, which extend from the sides of the hull to the central bulk-head, and constitute the floor of the compartments *a*. By this arrangement the height of the center of gravity of the water ballast is raised to an extent which is very satisfactory in relation to the vessel's immersion when in ballast-trim, and the center of gravity of the cargo is proportionately raised.

d is the engine-room.

e e are trunks or boxes, which provide for the expansion or contraction of the liquid cargo and insure the compartments *a* remaining fully charged, although exposed to varying temperatures, and also serve to receive the volatile gases evolved from the cargo.

f f are wells for the reception of leakages from the cargo-tanks.

g g are indicators or floats fitted to the trunks or boxes *e*, for the purpose of showing the height of the contents in those trunks.

In Fig. 1 the propelling machinery is shown placed aft, so as to give greater safety from fire when the vessel is carrying volatile or inflammable cargoes. The machinery may, however, be placed in any other convenient position, and the arrangement and distribution of the cargo cells or compartments may be varied accordingly. It will be seen by reference to Fig. 2 that the sides of these cells or compartments are formed by the sides of the vessel from the deck to the point where the inclined floor *c'* of the cells or compartments intersects the vessel's skin.

The number and size of the cells or compartments *a* are to be determined with reference to the relative proportions of the vessel herself, so that the filling or emptying of any one compartment would not dangerously affect the vessel's stability, whether she be in a light or

laden condition, and also to give the necessary amount of metacentric height. As, however, the present invention contemplates the liquid cargo and ballast being carried in compartments that are entirely distinct, the possibility is thereby given of keeping the water-ballast cells filled until almost the whole of the cargo is loaded, thereby tending to keep the vessel in an upright position.

10 It is a necessary condition of this mode of transporting liquid cargo that the cells or compartments *a* must be kept absolutely full, and for this purpose each bulk-head, as also the top and bottom of the cells or compartments, 15 must be constructed in a sufficiently-strong manner to insure that each individual cell or compartment shall stand the maximum head-pressure that can be brought upon it through any portion of the ship's structure or fixed 20 fittings.

The wells which receive leakage from the cargo-cells *a* are fitted with pumping arrangements for returning the same to those cells or compartments.

25 To control the liquid with which the cells or compartments may be filled, and to permit of expansion or contraction by self-acting means in such cargoes as are of an expansive character, I fit to each cell or compartment 30 one or more of the trunks or boxes *e*, the capacity and height of which are regulated by the nature of the liquid likely to be carried, it being necessary to have each trunk or box always partially filled, to insure that the corresponding cells or compartments with which 35 it is in connection are also full. Sometimes I construct a trunk or box common to two or more compartments, as shown in the drawings; but in every case apertures are made in

the top of the cells or compartments, (on which 40 the trunks or boxes stand,) to provide for the free passage to and fro of the petroleum or other liquid contained in the cells *a* and in the trunks *e*. In every case the trunks or boxes 45 form receptacles for the escaping gases, and have vapor-pipes fitted for carrying off the same to convenient places.

A modification of the form of the ballast cells or compartments is shown in the cross-section, Fig. 3, where, instead of the water- 50 ballast rising to its highest level at the center of the vessel, the highest level is attained at the sides of the ship, the floor *c'* being inclined in the opposite direction to that shown at Fig. 2. The principle of construction, however, so 55 far as the use of the water ballast is concerned, is the same in both arrangements.

Having now explained the nature of my invention, I will have it understood that I claim—

In a ship or vessel designed to carry liquid 60 cargo in bulk, a series of cells or compartments (for receiving the liquid cargo) formed by longitudinal and transverse bulk-heads, and divided from an underlying series of cells or 65 compartments (for the reception of water ballast in sufficient quantity to avoid the necessity of putting sea-water into the cargo-compartments) by means of inclined longitudinal division plates or floors, as described, such 70 floors, by their disposition, serving to insure to the vessel a proper degree of metacentric height both in a laden and ballast condition.

HENRY FREDERICK SWAN.

Witnesses:

J. STORMONT HAYS,

CHAS. C. L. ASTROP,

*Clerks to Messrs. Ingledew & Daggett, No. 3
Dean Street, Newcastle-upon-Tyne.*