United States Patent [19]

Devine

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[54] **TANK VESSEL AIR LOCK**

[75] Inventor: **Walter B. Devine,** Houston, Tex.

[73] Assignee: **Esso Research and Engineering Company,** Linden, N.J.

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[52] **U.S. Cl.**..... **114/0.5 R,** 49/68, 114/16.6

[51] **Int. Cl.**..... **B63g 8/24,** B63b 35/00

[58] **Field of Search**..... 114/78, 116, 117–120, 114/16.4–16.6, .5 R; 61/69 R, 69 A, 70, 71; 49/68

[56] **References Cited**

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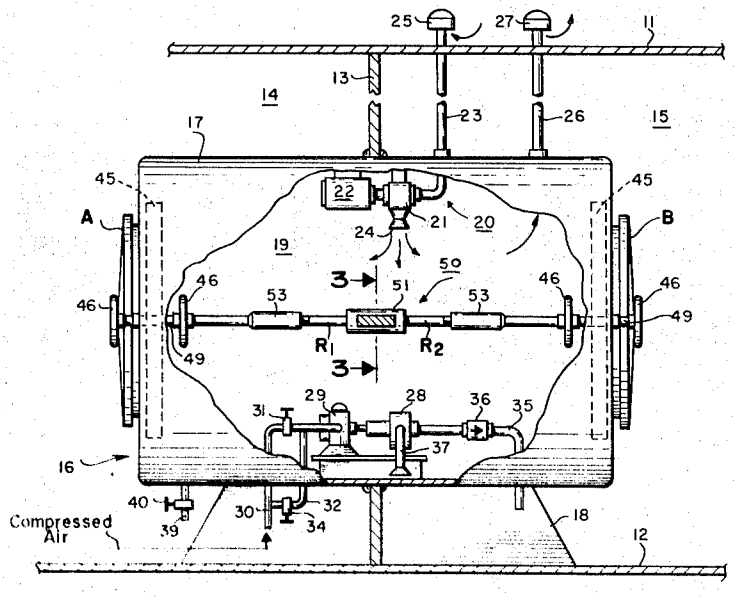
Primary Examiner—Milton Buchler
Assistant Examiner—Jesus D. Sotelo
Attorney—Thomas B. McCulloch et al.

[57] **ABSTRACT**

An air lock on a tank ship is arranged in the bulkhead between the engine and pump rooms to provide access to and from the pump room, the air lock being provided with doors on each end. Each door is openable only when the other door is closed there being an interconnection between the doors which prevents one being opened while the other is open, respectively and both doors being openable sequentially from within the air lock which forms a ventilated chamber.

10 Claims, 7 Drawing Figures



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SHEET 1 OF 2

FIG. 1.

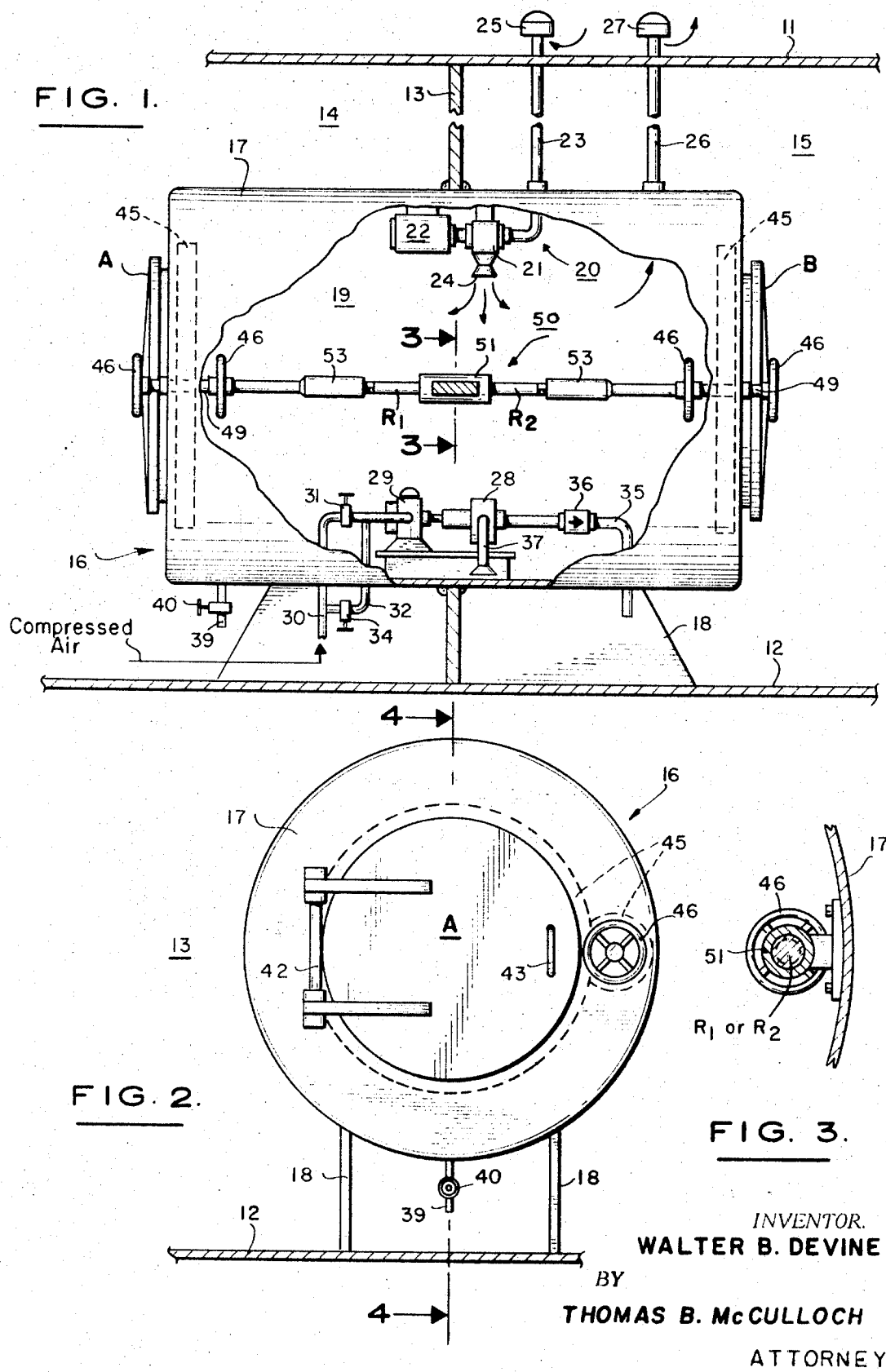

FIG. 2.

FIG. 3.

INVENTOR.
WALTER B. DEVINE,
BY
THOMAS B. McCULLOCH
ATTORNEY.

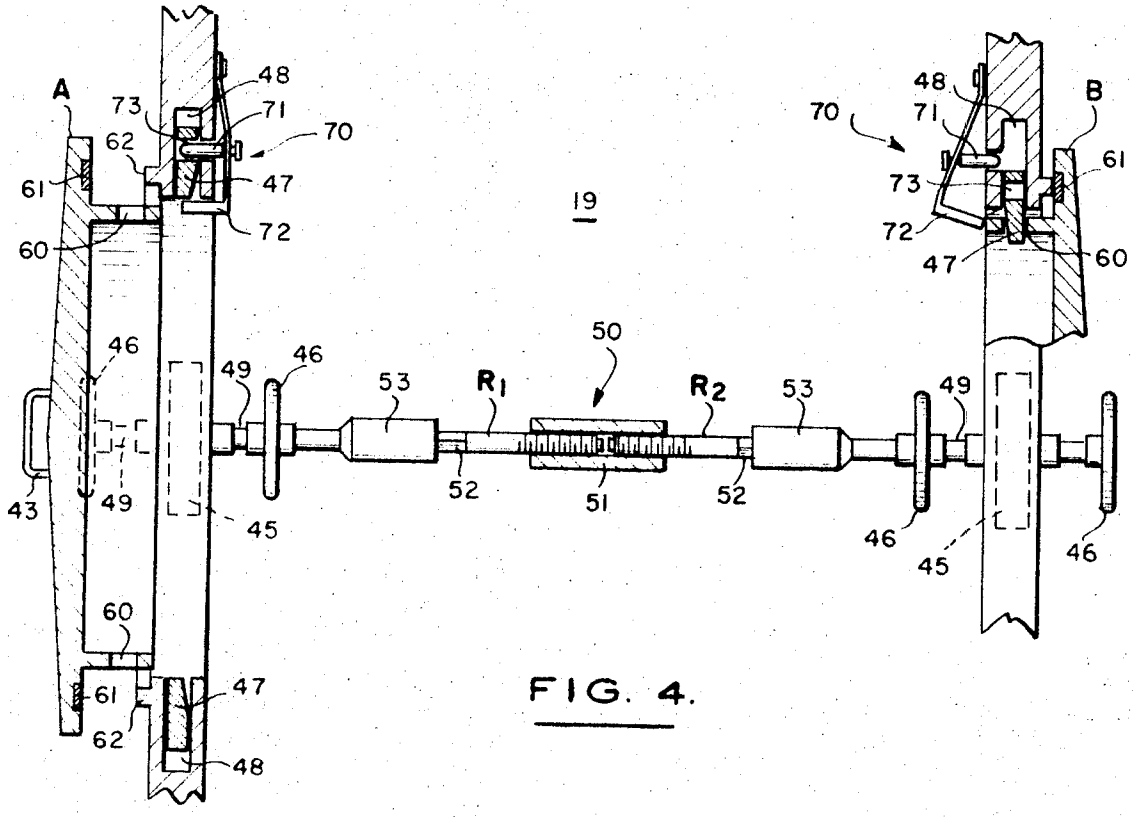

FIG. 4.

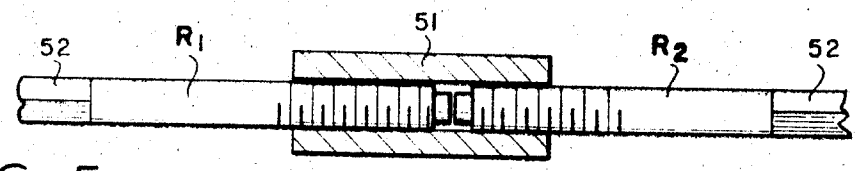

FIG. 5.

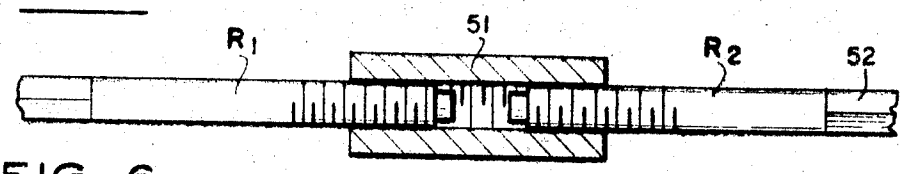

FIG. 6.

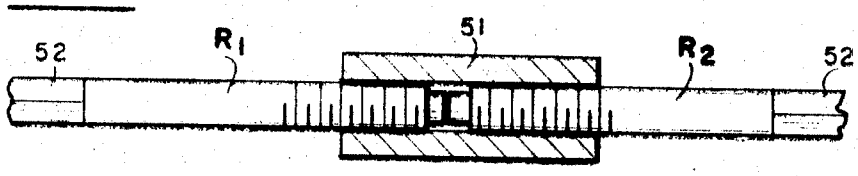

FIG. 7

INVENTOR.
WALTER B. DEVINE,
BY
THOMAS B. McCULLOCH
ATTORNEY

TANK VESSEL AIR LOCK

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention is directed to an air lock on a tank ship. More particularly, the invention is directed to a lock providing access between the engine room and pump room and vice versa where the door to each may not be opened until the other is closed. In its more particular aspects, the invention is concerned with a means of access from the engine room to the pump room on a tank ship and vice versa which prevents passage of combustible vapors or gases from the pump room to the engine room.

2. The Prior Art

It has been known heretofore to provide underwater capsules and the like with hatches which are locked in place. It has also been known to provide underdeck tunnels for transport of personnel and utilities on tank ships. Air locks and man ways for submerged vessels and the like have been provided. Further the construction of tank vessels with cylindrical tanks has been taught. In the mining art, there is a teaching of control of doors or gates so that a group of cars may enter one gate while another gate is closed and to mutually interlock them for safety purposes. However, it has not been known or taught heretofore to provide air locks to provide access from deep engine rooms of tank ships to pump rooms to allow passage of personnel while preventing combustible vapors or gases from entering the engine room. The present invention provides such a lock means and provides a new, useful and unobvious way of entering a pump room on a deep tank ship in safety.

The following listed U.S. patents were considered in connection with this invention: U.S. Pat. Nos. 1,252,357; 1,589,357; 2,335,450; 3,113,544; and 3,299,645.

SUMMARY OF THE INVENTION

Access to pump rooms on very large crude oil tank ship carriers has been by ladders from the main deck. These vessels today are now greater than 100 feet deep, a round trip inspection tour requiring a significant physical effort on the part of personnel. Equipment mounted in the pump room or access trunk must be explosion proof thereby making an elevator installation not only difficult but very costly. Elevators are located in these deep vessels in the engine room which is adjacent to but separated from the pump room by a gas tight and oil tight bulkhead. The air lock pump room access described herein maintains the proper level of isolation between engine room and pump room but permits easier access to the pump room.

Briefly described and summarized the air lock is comprised of a chamber located in the lower end of the bulkhead separating the pump room from the engine room. At either end of the chamber are tight doors that swing out, one to the pump room and one to the engine room. These doors are constructed to be both gas tight and oil tight when closed to prevent leakage of vapors as well as liquids should the pump room become flooded with oil. The dogging arrangement on the two doors are mechanically interlocked so that one door must be closed and dogged before the other can be undogged and opened.

The air lock chamber is fitted with an explosion proof ventilation system that changes the air to prevent an explosive mixture from entering the engine room. The supply and exhaust systems are through gas and oil tight ducts leading outside of both engine room and pump room.

An explosion proof oil discharge system is fitted in the air lock to discharge any oil that may enter the chamber from a partially flooded pump room, the pump discharge having a check valve to prevent oil in the pump room from entering the air lock through the pump discharge line. A test cock on the engine room side of the air lock permits checking the chamber for flooding.

BRIEF DESCRIPTION OF THE DRAWING

The present invention will be further described by reference to the drawing in which,

FIG. 1 is a partial sectional view of the air lock of the present invention;

FIG. 2 is a front view of one end of the air lock;

FIG. 3 is a view taken along the lines 3—3 of FIG. 1;

FIG. 4 is a partial sectional view of the doors and interconnecting means taken along lines 4—4 of FIG. 2;

FIG. 5 is a partial sectional view of the interconnecting means of FIG. 1 in one position with one door open;

FIG. 6 is a partial sectional view of the interconnecting means of FIG. 1 in another position with the door of FIG. 5 closed; and

FIG. 7 is a partial sectional view of the interconnecting means of FIG. 1 with the other door in position to be opened.

DESCRIPTION OF THE PREFERRED EMBODIMENTS RELATIVE TO THE DRAWING

Referring now to the drawing and particularly to FIG. 1, numeral 11 designates the main deck of an oil tank vessel and numeral 12 designates the bottom of the tank vessel which are interconnected by a bulk-head 13 which forms an engine room 14 and a pump room 15 which are vapor tight. That is, any vapors from pump room 15 cannot migrate to engine room 14 which contains the propulsion means of the vessel which may be a steam driven tank ship, a motor vessel or a nuclear powered vessel, and the like.

Since tank vessels are now built in such large capacities, the distance between the main deck 11 and the bottom of the shell 12 may be as much as 100 feet or more, and it is necessary to provide access to the engine room 14 and the pump room 15. It is undesirable that the pump room 15 be open because of the possibilities of leaking vapors and gases. Therefore, usually the pump room 15 is sealed but has access thereto from the main deck 11. However, when someone is in the engine room 14 and wishes to gain access to the pump room 15, it is possible to do so by providing an air lock means designated by the arrow 16 and formed by a chamber or tank 17 arranged in the bulkhead 13 and supported by support means 18.

The air lock means 16 formed by vessel 17 defines a chamber 19 in which is arranged a ventilation means 20 comprised of a blower 21, an explosion proof motor 22 which may be driven by compressed air or electricity but preferably by compressed air and an air intake 23 and an air discharge 24. The air intake 23 terminates on the outside of the chamber 19 and preferably above

the deck 11 and is covered by cover means 25 which allows clean air to be drawn in to the chamber 19. Exhaust air is exhausted by exhaust means such as conduit 26 which terminates on the exterior of the chamber 19 and is covered by cover means such as 27 above the deck 11.

Arranged in the bottom of air lock 16 is a pump 28, driven by compressed air supplied through a conduit from a source not shown in engine room 14. Conduit 30 is controlled by a valve 31 located within chamber 19. A bypass conduit 32, controlled by a valve 34, connects into conduit 30 down stream of valve 31. This allows operation of pump 28 to be controlled from within engine room 14. A discharge conduit 35 provided with a check valve 36 is connected into the outlet of pump 28 and extends through the bottom of air lock 16 into pump room 15. The suction line 37 of the pump extends to adjacent the bottom of air lock 16 whereby any oil which may enter the chamber 19 may be pumped out. Conduit 35 may discharge into a sump or the like (not shown).

A conduit 39, provided with a test cock 40 extends from the interior of chamber 19 for determining the presence of liquids within chamber 19. A test cock and conduit may also be provided in chamber 19 on the pump room end. Also a bypass conduit with control valve may be provided for controlling the pump 28 from within the pump room 15.

The air lock 16 is provided in one end thereof with a door A which opens into engine room 14 and at the other end with a door B which opens into the pump room 15. Each door swings on hinges 42 (FIG. 2) and each door is provided with a handle 43. The doors are opened and closed manually but are locked in the closed position by a dogging mechanism generally designated by the numeral 45 and schematically shown in dotted lines (FIGS. 1 and 2). The mechanism 45 is conventional to the art and, for reasons of clarity, is not shown in detail. The mechanism 45 is arranged in the framing of each door and consists of a plurality of locking dogs 47 (FIG. 4) arranged for movement in recesses 48 whereby they may be openably extended into the opening of each door. Each set of dogs 47 are interconnected by a conventional gear train or the like and work in unison. Operation of the gear train and dogs 47 is had by control wheels 46 mounted on shafts 49 which sealingly extend through the wall of the air lock and mechanically connect to the gear trains. Operation of locking dogs 47 is performed by rotation of the wheels 46.

The shafts 49 in each end of air lock 16 are horizontally aligned and are interconnected by a interlocking mechanism generally designated as 50 and which is coaxially aligned with the shafts 49. Mechanism 50 consists of two rods R_1 and R_2, each of which are threadedly mounted in a fixed sleeve 51 which is mounted to the wall of air lock 16 as shown in FIG. 3. The ends of rods R_1 and R_2 extending from sleeve 51 are splined as at 52 and are slidably arranged in splined sleeves 53 which are rigidly connected to shafts 49. Rotation of wheels 46 causes the rods $_1$ and R_2 to move back and forth in sleeve 51.

It will be noted that the extendable end of locking dogs 47 are tapered such that when extended into holes 60 of each door A and B the annular seals 61 are forced tightly against the raised annular shoulder 62 formed on the outer end of air lock 16 about the door opening. The more the pressure is applied by rotation of wheels 46 the tighter the sealing contact.

A locking dog retainer 70 is positioned on the inner wall of each end of air lock 16 for the purpose of preventing the extension of locking dogs 47 until the holes 60 are aligned with the dogs 47. In other words the dogs cannot be extended into the door opening until the door is properly closed by personnel. Retainer 70 consists of a retainer pin 71 adapted to extend into a hole 73 of one of the dogs 47 and is mounted on a leaf spring 72 one end of which is fixed to the air lock wall and the other end thereof extending L shaped into the door opening. Closing of the door A or B causes the door to contact spring 72, moving it inwardly of the air lock and retracting the retainer pin 71 as shown in regard to door B.

Referring now to FIGS. 5, 6 and 7 and as previously explained rods R_1 and R_2 are moved horizontally within the threaded sleeve 51 by rotation of wheels 46 and shafts 49. When both doors are closed and dogged either door A or B may be opened by personnel. With regards to FIGS. 4 and 5 door A is opened by rotation of one of the wheels 46 adjacent that door. When door A is undogged or unlocked rod R_1 is moved to the right in sleeve 51 (FIG. 5). Rod R_2 is in its right position as door B is now closed and dogged. With R_1 and R_2 now abutting, door B cannot be undogged until door A is closed and dogged which moves rod R_1 to the left as shown in FIG. 6. In this figure rod R_2 can now be rotated so as to move it to the left hand position as shown in FIG. 7. Now door B can be opened by personnel but door A cannot be opened as the two rods R_1 and R_2 are again abutting. In other words door A now cannot open until door B is closed and dogged which moves rod R_2 back to its right hand position again. The rods R_1 and R_2 are always abutting each other in sleeve 51 when either of the doors A or B are open.

Such an interlocking mechanism as described allows the engine room and the pump room to be completely isolated one from the other in a completely sealed off manner. Personnel entering chamber 19, for example, from engine room to inspect the pump room can open door A only if the door B is closed and dogged. Entrance into pump room 15 from chamber 19 can only be accomplished after personnel has closed door A and the dogging mechanism operated. With the retainer mechanism 70 in operation position it is not possible to open both doors at the same time.

By virtue of the pump room handling volatile liquids and the like it may be desirable for personnel leaving the chamber 19 to enter the pump room to wear a gas mask. Also it will be desirable to have other access to the pump room 15 besides the air lock 16. This can be in the form of a vapor type hatch on the main deck 11 with a ladder extending down into the pump room 15. In most cases, however, it will be desirable to use the air lock 16 because of the depth of the vessel and the effort required to enter or leave the engine room and then enter the pump room from the main deck. However, the engine room may be provided with an elevator since it does not have to be sealed, but the pump room probably would not be provided with an elevator because of the problems of sealing.

While the invention has been described by mechanical means to actuate the dogs and the interlocking safety mechanism, other means such as pneumatic and

the like may be employed in lieu of the mechanical means described.

It will be seen from the foregoing description taken with the drawing that new and unobvious results are obtainable with simple equipment heretofore not available or provided. The invention is therefore new, useful and unobvious.

The nature and objects of the present invention having been completely described and illustrated and the best modes and embodiments contemplated set forth what I wish to claim as new and useful and to secure by Letters Patent is:

I claim:

1. In a tank ship having an engine room and a pump room separated by an oil and gas tight bulkhead, the combination which comprises:

air lock means forming a chamber located in said bulkhead having a door at one end providing access to one room and a door at the other end providing access to the other room;

dogging means mounted with each door to hold each said door in oil and gas tight sealing relationship with respect to said air lock means;

means interconnecting said dogging means so that either door may not be opened unless the other door is closed; and

said means interconnecting said dogging means comprising first and second coaxially aligned rods, each rod having external threads formed on an end extending into said chamber and each rod having external splines on an end extending toward a door at one end of said chamber, internally threaded sleeve means connecting said rods, first and second internally splined sleeves, the first splined sleeve being rigidly connected to the door at one end and the second splined sleeve being rigidly connected to the door at the other end, the splined end of each of said aligned rods being slidably arranged in one of said splined sleeves, and separate means connected to each of said splined sleeves for separately rotating said splined sleeves.

2. A tank ship in accordance with claim 1 in which the air lock means is provided with ventilating means extending from said chamber to the atmosphere.

3. A tank ship in accordance with claim 1 in which the air lock means is provided with pump means in said chamber for removing any liquid from said air lock means.

4. A tank ship in accordance with claim 2 in which the ventilating means comprises air intake and exhaust means and power means in said chamber for drawing air into said air lock means.

5. A tank ship in accordance with claim 3 in which the pump means is provided with power means from the engine room and is also provided with discharge means extending into the pump room.

6. A tank ship in accordance with claim 1 in which the dogging means is provided with means for operating same from the engine room, the pump room and from within said chamber.

7. A tank ship in accordance with claim 1 in which the chamber is provided with test cock means extending from the interior bottom of the chamber into the engine room for determining the presence of liquid in said chamber.

8. A tank ship in accordance with claim 1 in which the means interconnecting the dogging means includes means for locking the door opposite the one that is opened.

9. A tank ship in accordance with claim 1 in which:

a. the chamber is provided with ventilating means;

b. the chamber is provided with pump means for removing any liquid therefrom;

c. the dogging means is provided with means for operating same from the engine room, the pump room, and from within said chamber.

10. A tank ship in accordance with claim 9 in which the interconnecting means is provided with means for locking the door opposite the one that is opened.

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