Oct. 27, 1959 E. M. GREER ET AL 2,910,031

HATCH COVER ASSEMBLY

Filed June 11, 1956 5 Sheets-Sheet 1

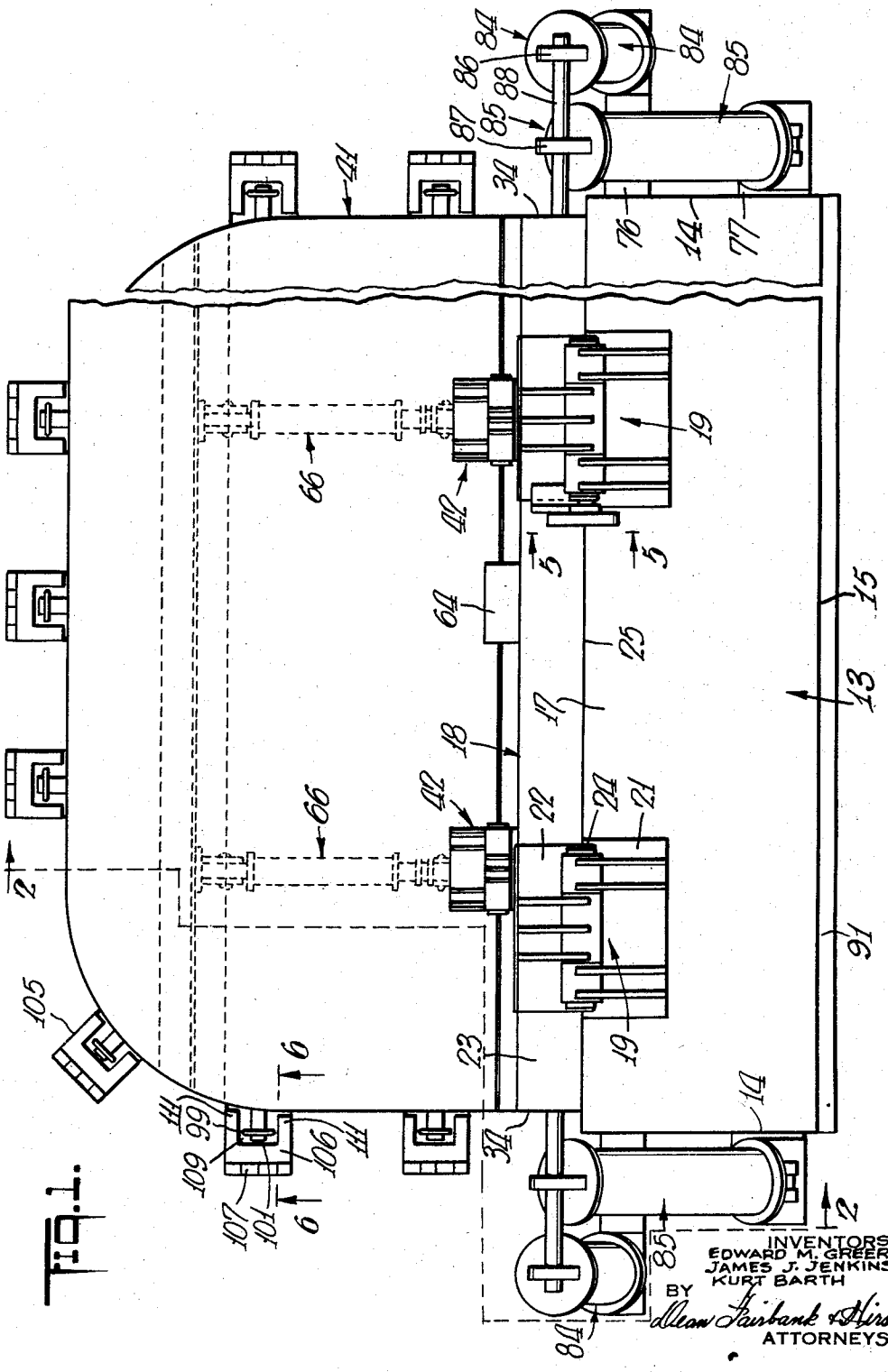


Fig. 1.

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Fig. 2.

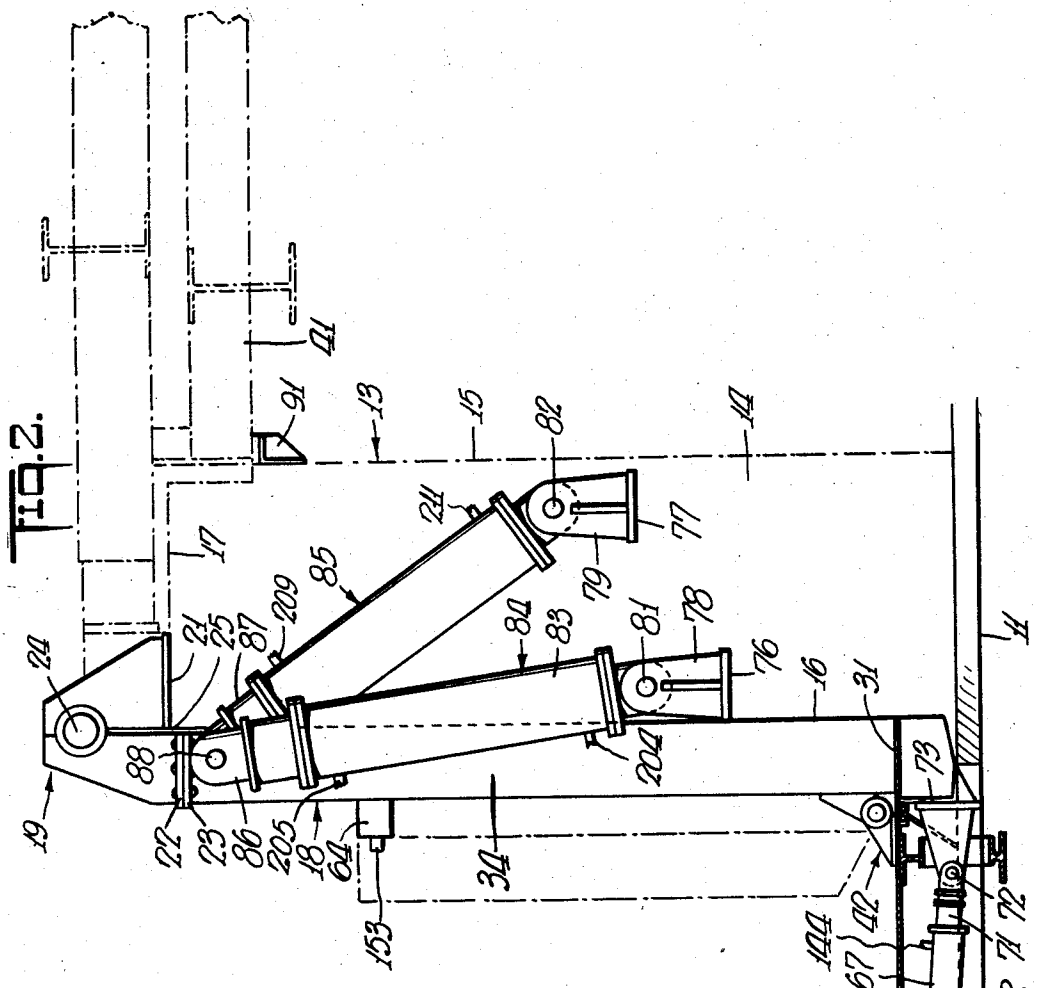
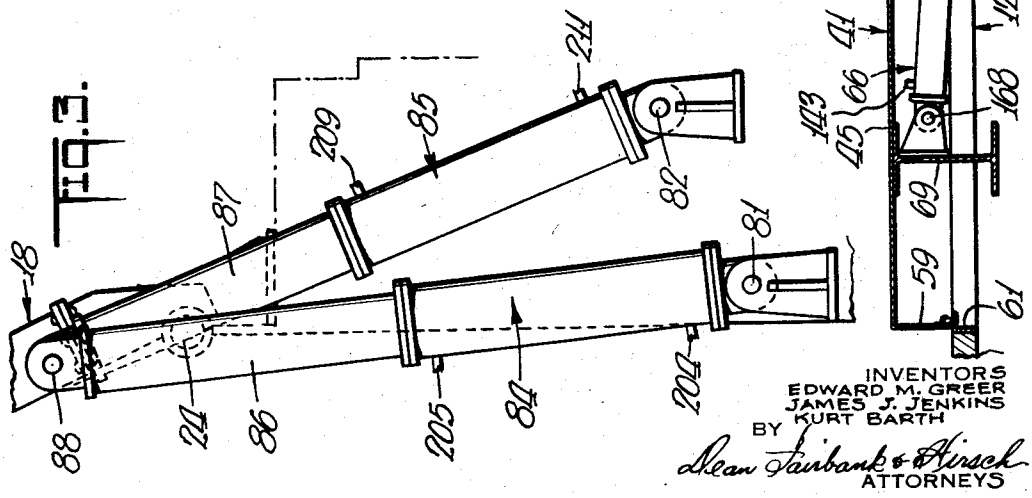


Fig. 3.



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HATCH COVER ASSEMBLY

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Fig. 4.

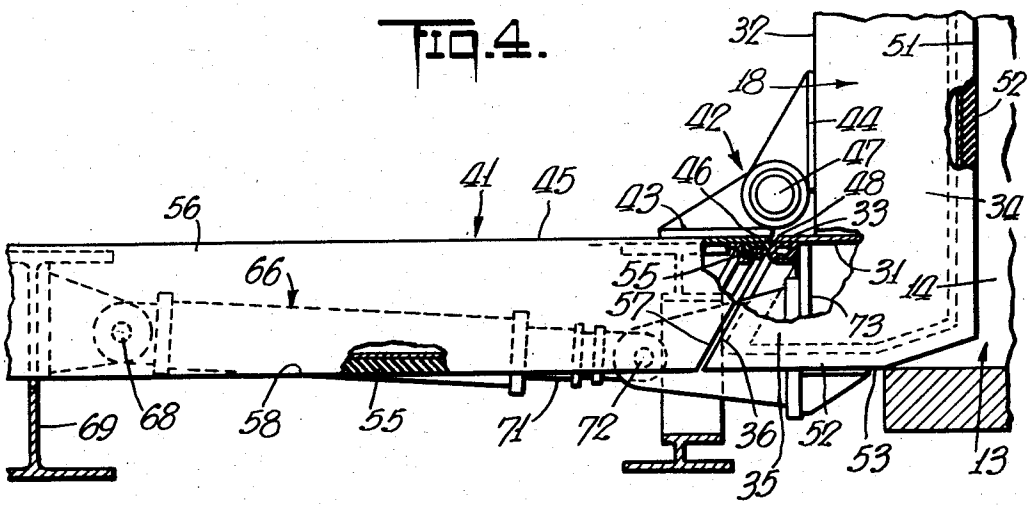


Fig. 5.

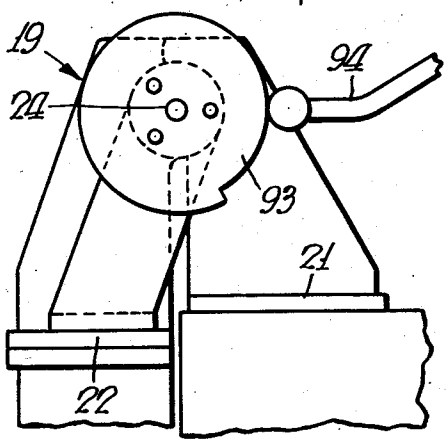


Fig. 6.

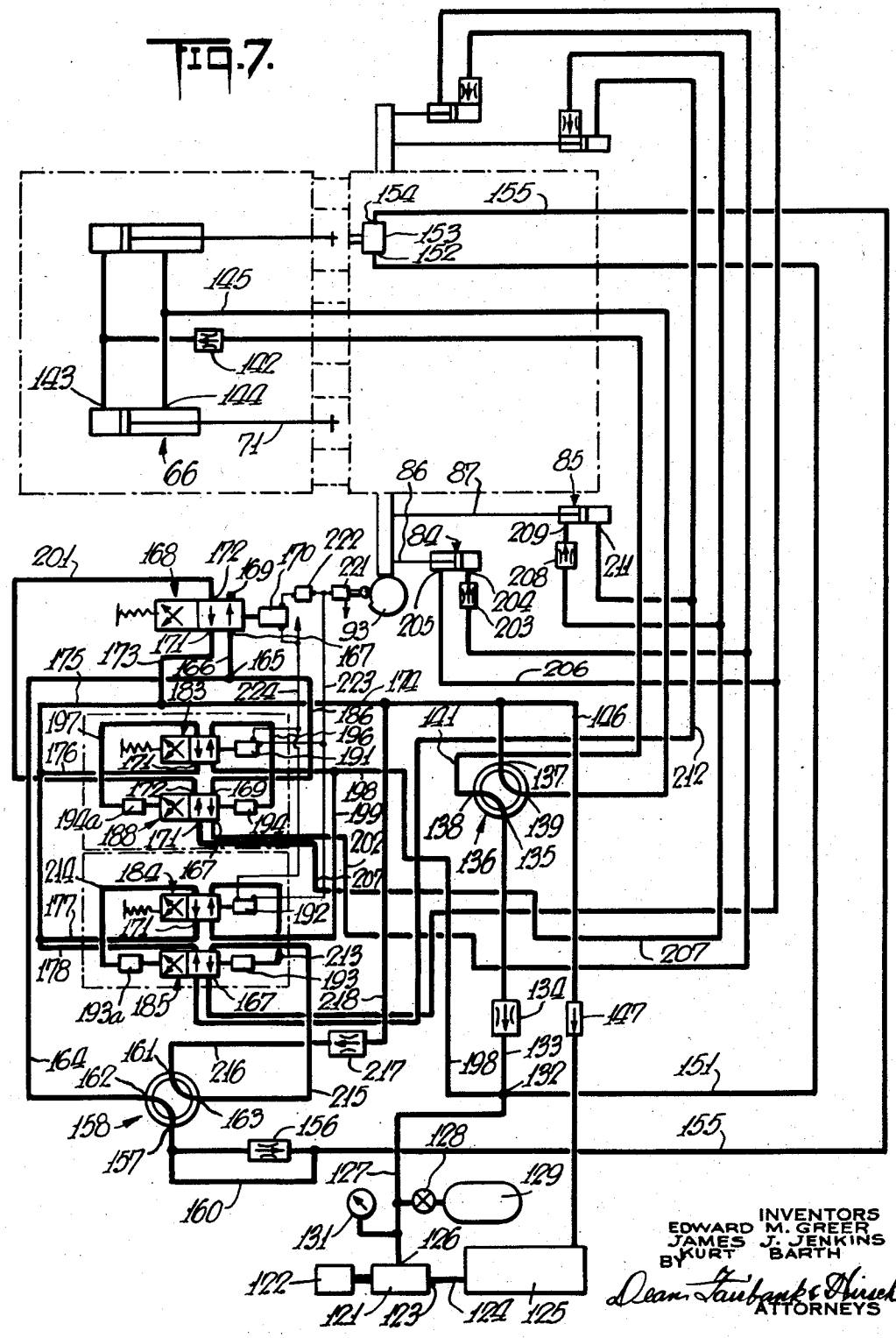
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FIG. 7.



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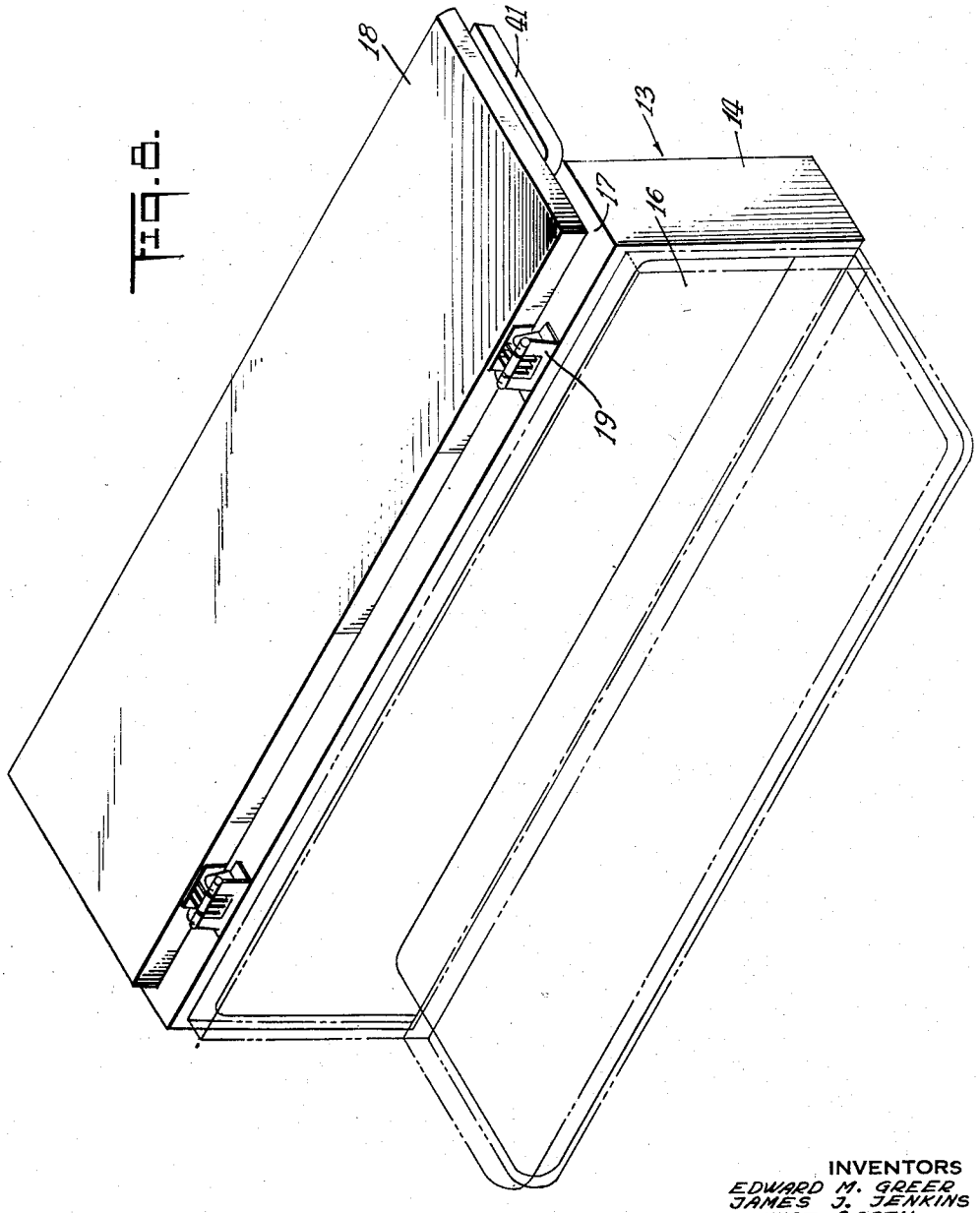
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Fig. 4.



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2,910,031

HATCH COVER ASSEMBLY

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Application June 11, 1956, Serial No. 590,689

17 Claims. (Cl. 114—201)

As conducive to an understanding of the invention, it is noted that in a ship of the type having a hatch opening with an elevator housing at one end having its entrance extending across the hatchway and more particularly an ammunition ship in which the elevator rising through the hatch opening is used to bring up containers of ammunition from the hold, it is essential in order to provide quick and ready access to the hold that the hatchway and entrance to the housing be readily opened and closed and when opened, that the panels closing the hatchway and entrance be completely clear thereof.

Where the ship's gear, including its boom or hoist, is used to move the relatively heavy panels, the operation is difficult, dangerous to personnel, time consuming and the need to store the panels after they are removed, in a position accessible to the ship's gear, may result in cluttering up the deck of the ship.

It is accordingly among the objects of the invention to provide a cover assembly of the above type that is relatively simple in construction, having but few parts that are not likely to become out of order, that provide water-tight security when in closed position, and may readily be operated by even unskilled personnel for rapid movement to open or closed position, and which, when in such open position, will be completely clear of the hatchway and entrance to the elevator housing.

According to the invention from its broader aspect, a panel is pivotally mounted to the top of the elevator housing and depends therefrom over the entrance to the housing to close the latter. A pair of actuators, desirably hydraulic units, are pivotally connected to the side of the housing and the panel in such manner that upon extension of the plunger of one of the hydraulic units the panel will be rotated away from the housing entrance a predetermined amount and dependably retained in such position by hydraulic means until subsequent retraction of the plunger of the other hydraulic unit causes the panel to be further rotated in the same direction so that it extends over the top of the housing having moved through an angle of approximately 270 degrees.

More particularly, the lower end of the housing panel has pivotally connected thereto a second panel which may extend at right angles therefrom over the hatchway through which the elevator rises to close such hatchway. The second panel, by means of a suitable actuator, which also may be a hydraulic unit, may be rotated ninety degrees so that it is parallel to the first panel which then is rotated through the angle of approximately 270 degrees to open position.

In the accompanying drawings in which are shown one or more of various possible embodiments of the several features of the invention,

Fig. 1 is a top plan view of the assembly,

Fig. 2 is a side elevational view partly in cross section taken along line 2—2 of Fig. 1,

Fig. 3 is a fragmentary side elevational view similar

to Fig. 2 illustrating the operation of the housing panel actuators,

Fig. 4 is a fragmentary side elevational view of the assembly with parts broken away,

Fig. 5 is a detail view taken along line 5—5 of Fig. 1,

Fig. 6 is a sectional view taken along line 6—6 of Fig. 1,

Fig. 7 is a view of the hydraulic control system, and

Fig. 8 is a perspective view of the assembly.

Referring now to the drawings, as shown in Figs. 1 and 2, the deck 11 of the ship has a hatch opening 12, at one end of which rises a substantially rectangular housing 13 having side walls 14, a back wall 15, an open front 16 and a top wall 17.

Positioned over the open front 16 of the housing 13 is a substantially rectangular box-like panel or cover 18 which is pivotally mounted so as to normally extend in vertical position by means of hinges 19, each having a pair of hinge plates 21 and 22. The plates 21 and 22 are affixed respectively to the top wall 17 of housing 13 and to the top wall 23 of the cover 18 in such manner that the pivotal axis 24 of the hinge will be longitudinally aligned with the front edge 25 of top wall 17 and positioned above the latter, so that the cover 18 may be rotated through an angle of approximately 270 degrees from closed position with respect to the housing shown in full lines to open position shown in broken lines in Fig. 2.

The bottom wall 31 of the cover 18 as shown in Fig. 4 extends slightly beyond the front wall 32 thereof to define a flange 33 and each of the side walls 34 of the cover extends beyond said bottom wall 31 and has a portion 35 thereof (Fig. 4) which also extends beyond the front wall 32 with the forward edge 36 of said portions 35 being beveled outwardly from the flange 33.

Pivotally connected to the cover 18 near its lower end is a panel or cover 41 which in the position shown in full lines in Fig. 2 extends over the hatch opening 12 to close the latter. The cover 41 is also substantially box-like and is pivoted to the cover 18 by means of hinges 42, each of which has a pair of hinge plates 43, 44 affixed to the top wall 45 of cover 41 adjacent its inner edge 46 and to the front wall 32 of cover 18 adjacent its bottom wall 31, the pivotal axis 47 of hinges 42 being longitudinally aligned with the junction 48 between the adjacent edges of flange 33 and top wall 45 of cover 41 as shown in Fig. 4.

In order to provide watertight security for the housing and the hatch opening, the inner edges 51 of the top and side walls 23, 34 of the cover (Fig. 4) are provided with gaskets 52 which engage suitable sealing rails (not shown) along the top and side walls 17, 14 of the housing 13. In addition, the gasket 52 extends along the lower edge 53 of the side walls 34 and the portions 35 thereof also to engage suitable sealing rails and then extends along the beveled edge 36 of each of the portions 35 and along the edge of the flange 33, protruding slightly beyond such edges.

The cover 41 also mounts a gasket 55 along its inner edge 46 and along the edges of side walls 56 thereof which are also beveled as at 57, said gasket 55 extending beyond such edges so that they may engage the adjacent portions of gasket 52 when the covers are in closed position.

The gasket 55 also extends along the lower edges 58 of side walls 56 and end wall 59 of cover 41 (Fig. 6) and is adapted to engage sealing rails 61, more particularly the horizontal legs 62 of L-shaped members affixed to the deck of the ship around the periphery of the hatch opening 12.

Means are provided to pivot the cover 41 from the

closed position shown in full lines in Fig. 2 through an angle of approximately 90 degrees to the open position shown in broken lines in which it extends substantially parallel to cover **18**, said cover **41** being spaced from cover **18** by means of a spacer block **64** mounted on said cover **18**.

To this end, as shown in Figs. 1, 3 and 4, a plurality of hydraulic units **66** are provided, the cylinders **67** of which are pivoted as at **68** to a brace **69** extending the length of the cover **41**. The plungers **71** of the units **66** are pivotally connected as at **72** to a brace **73** affixed to the cover **18** and extending between the members **35**, the pivotal axis **72** lying in a plane below that of pivotal axis **68**.

Means are provided to pivot the cover **18** through an angle of approximately 270 degrees from the closed position shown in Fig. 2 to the open position shown in broken lines.

To this end, a pair of brackets **76**, **77** are affixed to each of the side walls **14** of the housing adjacent the open front **16** and rear wall **15** thereof respectively. The brackets extend laterally outward from said side walls with the bracket **76** being longer than bracket **77**. Each of the brackets has an upstanding standard **78**, **79** to the upper end of each of which is pivotally mounted as at **81** and **82** one end of the cylinder **83** of a hydraulic unit **84**, **85**, the hydraulic unit **84** being positioned outwardly of hydraulic unit **85**. The pivotal axes **81**, **82** extends at right angles to the side walls **14** of the housing and the pivotal axis **82** is in a plane above the plane of pivotal axis **81**.

The plungers **86**, **87** of hydraulic units **84**, **85** are pivotally connected at their free end on a common axis **88** which desirably is a sturdy pin extending laterally outward from the side wall of cover **18** near its top wall **23**.

The hydraulic units **84**, **85** are so constructed and arranged that when the plunger **86** of the hydraulic unit **84** is first extended it will pivot the cover **18** so that the pin **88** will be moved to a position such that, as shown in Fig. 3, a line extending from pin **88** to pivotal axis **81** will be located on the left side of pivot **24** and a line extending from pin **88** to pivotal axis **82** will be located on the right side of pivot **24**. Thus, when the plunger **87** of hydraulic unit **85** is thereupon retracted, the movement of the cover **18** will be completed so that it lies in a substantially horizontal plane over the top wall **17** of housing **13**, having moved through an angle of approximately 270 degrees.

In order to support the covers in the fully open position shown in broken lines in Fig. 2, a ledge **91** is provided on the rear wall **15** of the housing **13** and extending outwardly therefrom on which the free end of cover **41** may rest.

Although the various hydraulic units **66**, **84** and **85** may be operated in sequence in any suitable manner, in the illustrative embodiment shown, the hydraulic system shown in Fig. 7 is preferred.

The hydraulic system comprises a power source which includes a pump **121** driven by a motor **122** and having its inlet **123** connected by line **124** to a reservoir **125**. The outlet **126** of pump **121** is connected by main pressure line **127** through a cutoff valve **128** to a pressure accumulator **129** of conventional type, a pressure gauge **131** desirably being connected to said line **127**.

The pressure line **127** is connected to a junction **132** and thence by line **133** through a flow restrictor **134** to the pressure port **135** of a manually operated valve **136** which has a neutral or cutoff position and two operating positions. The flow restrictor **134** as well as the other flow restrictor used are of the type that permits unrestricted flow in the direction of the arrow and restricted flow in the opposite direction.

The valve **136** has a return port **137** and two control ports **138**, **139**. In the neutral position of the valve all of the ports are closed. In one operating position, ports **135**, **138** and **137**, **139** are connected and in the other operating position ports **135**, **139** and **137**, **138** are connected.

The port **138** is connected by line **141** through flow restrictor **142** to the port **143** of hydraulic unit **66**. The port **144** of unit **66** is connected by line **145** to the port **139** of valve **136**, the return port **137** of which is connected by line **146** through one-way valve **147** to reservoir **125**.

The junction **132** is also connected by line **151** to the port **152** of a normally closed valve **153**, the port **154** of which is connected by line **155** through flow restrictor **156** to the pressure port **157** of a second manually operated valve **158**, said flow restrictor **156** being by-passed by a line **160**. The valve **153** is designed to open to connect ports **152**, **154** when the panel **41** (Fig. 2) has reached vertical position and this end may be mounted on the panel **18** so that its control rod will be actuated at such time.

The valve **158** also has a return port **161** and two control ports **162**, **163**. In the neutral position of the valve all the ports are closed. In one operating position ports **157**, **162** and **161**, **163** are connected and in the other operating position ports **157**, **163** and **161**, **162** are connected.

The port **162** is connected by line **164** to junction **165** and thence by line **166** to the port **167** of a solenoid operated valve **168**. The valve **168** has three additional ports **169**, **171**, **172** and when the solenoid **170** is deenergized, port **167** is connected to port **169** which is blocked and ports **171**, **172** are connected. When the solenoid **170** is energized, port **167** will be connected to port **172** and port **171** will be connected to blocked port **169**.

The port **171** is connected by line **173** to line **174** which is connected to return line **146**. Line **173** is also connected by line **175** and lines **176**, **177** and **178** to the ports **171** of valves **183** and **184** and port **172** of valve **185**. The junction **165** is connected by line **186** to the port **169** of a valve **188**, the valves **183**, **184**, **185** and **188** being similar to valve **168**. The valves **183** and **184** are actuated by solenoids **191**, **192** respectively and the valves **185** and **188** are actuated by hydraulic units **193**, **193***a* and **194**, **194***a* respectively.

In the normal position of valves **183**, **184**, **185** and **188**, when the solenoids **191** and **192** are not energized and pressure is applied to the system the ports **167**, **169** and **171**, **172** are connected, and when said valves are actuated, the ports **167**, **172** and **171**, **169** will be connected. The ports **169**, **172** of valve **183** are connected respectively by lines **196**, **197** to the hydraulic units **194**, **194***a* of valve **188**. The port **167** of valve **183** is connected by line **198** to junction **132** and by line **199** to port **167** of valve **184**. The port **172** of valve **188** is connected by line **201** to port **172** of valve **168**.

The port **167** of valve **188** is connected by line **202** through flow restrictor **203** to the port **204** of hydraulic unit **84**. The port **205** of unit **84** is connected by line **206** to port **167** of valve **185**. The port **171** of valve **188** is connected by line **207** through flow restrictor **208** to the port **209** of hydraulic unit **85**. The port **211** of unit **85** is connected by line **212** to port **171** of valve **185**.

The ports **169** and **172** of valve **184** are connected respectively by lines **213**, **214** to the hydraulic units **193**, **193***a* of valve **185**. The port **169** of valve **185** is connected by line **215** to port **163** of valve **158**, the return port **161** being connected by line **216** through flow restrictor **217** and line **218** to return line **146**.

The solenoid operated valves **168**, **183**, and **184** are controlled by means of a cam **93** (Fig. 5) secured to hinge member **22**, for example, of one of the hinges **19**. The cam **93** operates a control arm **94** to close a normally open switch **221**. One of the contacts of the

switch is connected to one side of a source of potential. The other side of the switch is connected to a time delay relay **222** and also by lead **223** to one side of solenoids **191** and **192** of valves **183** and **184**. The other side of the time delay relay **222** is connected to one side of solenoid **170** of valve **168** and the other sides of the solenoids **170, 191, 192** are connected by lead **224** to the other side of a source of potential.

In the operation of the covers, with the electrohydraulic circuit shown in Fig. 7, the motor **122** is energized so that the pump **121** will force fluid from reservoir **125** into the accumulator **129** to charge the latter. The pump circuit has a conventional pressure switch (not shown) to cut the motor **122** on and off as the pressure varies between predetermined limits.

The valve **136** is then manually operated to connect ports **135, 138** and **137, 139** as shown. As a result, fluid under pressure will flow through line **127**, junction **132**, line **133**, flow restrictor **134**, ports **135, 138** of valve **136**, line **141**, through flow restrictor **142** to port **143** of hydraulic unit **66**. As a result, the plunger **71** of unit **66** will be extended to cause the panel **41** to move through an angle of 90 degrees to vertical position as shown in broken lines in Fig. 2. As plunger **71** is extended, the fluid in unit **66** will flow from port **144** thereof, through line **145**, ports **139, 137** of valve **136**, line **146**, check valve **147** to the reservoir.

When the panel **41** reaches vertical position, it will actuate valve **153** to connect its ports **152, 154**. As a result, fluid under pressure will flow from junction **132**, line **151**, ports **152, 154** of valve **153**, line **155**, flow restrictor **156** to port **157** of valve **158**. At this time valve **158** which is normally closed may be actuated to connect its ports **157, 162** and **161, 163**.

If the valve **158** should be actuated prior to the movement of panel **41** to vertical position, as valve **153** is closed, no fluid will flow to valve **158** and hence the panel **18** controlled thereby will not move. Thus, by the provision of valve **153**, there is assurance that the panel **18** cannot be moved until panel **41** has attained vertical position thereby preventing damage to the ship's structure.

Upon actuation of valve **158** as previously described, fluid under pressure will flow through ports **157, 162**, line **164**, junction **165**, line **166** to port **167** of valve **168**. However, as the port **169** of this valve normally connected with port **167** is blocked, this will have no effect. Fluid will also flow from junction **165** through line **186** to the port **169** of valve **188** and thence through port **167**, line **202**, flow restrictor **203** to the port **204** of hydraulic unit **84** to extend its plunger **86** thereby pivoting the panel **18** in a clockwise direction.

As plunger **86** is extended, fluid will flow from port **205**, line **206** to port **167** of valve **185** and thence through port **169**, line **215**, through ports **163, 161** of valve **158**, line **216**, flow restrictor **217** which dampens the movement of the panel **18**, to line **174** and thence through return line **146** to the reservoir **125**.

When the panel **18** has pivoted an amount such as that shown in Fig. 3, the pin **88** will be moved to a position so that a line extending from pin **88** to pivotal axis **81** will be located on the left side of pivot **24** and a line extending from pin **88** to pivotal axis **82** will be located in the right side of pivot **24**, the cam **93** will actuate the switch **221** to close the circuits to solenoid **170** through time delay relay **222** and to solenoids **191** and **192**, thereby actuating valves **168, 183** and **184** to connect their ports **167, 172** and **171, 169**.

As a result of the actuation of valves **183, 184** fluid under pressure will flow from junction **132**, lines **198** and **199** to the ports **167** of valves **183, 184**, through ports **172** thereof, lines **197** and **214** respectively to the hydraulic units **194***a* and **193***a* of valves **188** and **185**, to actuate such valves to connect their ports **167, 172** and **171, 169**.

As a result of the actuation of hydraulic units **194***a*, **193***a*, fluid will flow from the associated units **194, 193**, lines **196, 213**, through the ports **169, 171** of valves **183, 184**, lines **176, 177, 175, 174** to return line **146** and thence through check valve **147** to reservoir **125**.

Fluid under pressure will also flow through line **164** from valve **158**, junction **165**, line **166**, ports **167, 172** of valve **168**, line **201**, ports **172, 167** of valve **188** which has been actuated as above described, line **202**, flow restrictor **203** to port **204** of hydraulic unit **84** to maintain the pressure in such port so that the panel **18** will be retained in position. Fluid under pressure will also flow from line **164**, junction **165**, line **186**, ports **169, 171** of valve **188** which also has been actuated, line **207** through restrictor **208**, to port **209** of hydraulic unit **85**.

Fluid under pressure is still applied to port **204** of hydraulic unit **84** to keep its plunger **86** extended even though it is also applied to port **209** of hydraulic unit **85** which will retract the plunger **87** thereof. This is done inasmuch as a short period of time is required for the pressure applied to port **209** to build up sufficiently to be able to overcome the force of gravity tending to move the panel **18** in a backward direction. If not for the maintenance of the pressure on port **204**, backward movement of panel **18** would cause switch **221** to open so that the solenoids **170, 191, 192** would be de-energized restoring the circuit to the position to again apply pressure to port **204** only. Thus, the panel **18** would oscillate back and forth and the pressure applied to port **209** of hydraulic unit **85** might not build up sufficiently to effect movement of the panel **18** through a complete 270 degree arc.

After a period of say five seconds, which will afford sufficient time for the pressure applied to port **209** to build up to the desired value, the time delay relay will break the circuit to solenoid **170** to de-energize the latter. Hence, the valve **168** will be actuated to connect its ports **167, 169** and **171, 172** and the fluid under pressure to port **204** of hydraulic unit **84** from port **172** of valve **168** will be cut off.

As a result, the plunger **87** of hydraulic unit **85** will be retracted by the application of fluid under pressure to port **209** thereof to effect movement of panel **18** through the remainder of the 270 degree arc. The fluid forced from port **211** of hydraulic unit **85** will flow through line **212**, ports **171, 169** of valve **185**, line **215**, ports **163, 161** of valve **158**, line **216**, flow restrictor **217**, which will restrain the movement of panel **18**, lines **218, 174, 146**, check valve **147** to reservoir **125**. In addition, the port **204** of hydraulic unit **84** will be connected to reservoir **125** through flow restrictor **203**, line **202**, ports **167, 172** of valve **188**, line **201**, ports **172, 171** of valve **168**, lines **173, 174** and **146**. Consequently, the plunger **86** of hydraulic unit **84** will readily retract upon retraction of the plunger **87** of hydraulic unit **85**.

When the panel **41** had reached vertical position, the valve **136** was restored to neutral position and the valve **158** is also restored to neutral position when the panel **18** has moved to its fully open position.

To move the panels to closed position, the valve **158** is first set to connect ports **157, 163**. As a result, fluid under pressure will be applied through line **215**, ports **169, 171** of energized valve **185**, line **212** to port **211** of hydraulic unit **85** to extend its plunger **87** to move panel **18** to the position shown in Fig. 3. At this time due to the action of cam **93**, the switch **221** will be opened to break the circuit to solenoids **91, 92**. As a result, valves **183** and **184** will be restored to the position shown to connect ports **167, 169** and **171, 172**.

This will cause fluid under pressure to flow from junction **132**, through lines **198, 199**, ports **167, 169** of valves **183, 184**, lines **186, 213**, to hydraulic units **194, 193** to restore valves **188, 185**, to the position shown to connect ports **167, 169** and **171, 172** thereof.

As a result, fluid under pressure will flow through line **215**, ports **169**, **167** of valve **185**, line **206** to port **205** of hydraulic unit **84** to retract its plunger **86**, to move the panel **18** to closed position.

The valve **158** may then be moved to neutral position and the valve **136** operated to connect its ports **135**, **139**, so that fluid under pressure will flow through line **145** to port **144** of hydraulic unit **66** to retract its plunger **71** to move the cover **41** to closed position.

Although the cover **41** may be secured in closed position solely by the action of the hydraulic fluid in the lines to the hydraulic units **66**, in the embodiment shown, suitable latches are provided to ensure that the covers will remain closed even in the event of a break in the hydraulic line.

To this end, as shown in Figs. 1 and 6, a plurality of latch plates **95** are pivotally mounted as at **96** to the vertical leg **97** of the sealing rail **61** around the periphery of hatch opening **12**. Extending through an opening **98** in plate **95** is a ring member **99** which may engage a hook **101** affixed as by welding to the wall **59** of cover **41**. The opening **98** is so positioned that with the ring member engaging the hook **101**, the plate **95** may be rotated in a counterclockwise direction to the position shown in Fig. 6 so that the opening **98** will be to the right of pivot **96** and below the latter to retain the cover in locked position. To release the cover **41** the plate **95** is pivoted in a clockwise direction from the position shown in Fig. 6 so that the opening **98** will move to the left of pivot **96** to move the ring **99** out of engagement with the hook **101**.

In the illustrative embodiment herein, as shown in Fig. 6, the deck of the ship desirably has a wooden sheathing **104** thereon and the horizontal leg **62** of the sealing rail is flush with the top surface of the sheathing **104**. In order that the latch plate **95** and ring member **99** will be concealed when the cover **41** is open, the sheathing **104** desirably has a rectangular recess **105** aligned with each of the latch plates **95** and of dimension sufficient to accommodate the ring member **99**. The recess **105** is covered by means of a plate **106** pivoted at one edge as at **107** to the edge **108** of the recess. The plate **106** has a cutout **109** at its free edge defining a pair of legs **111** which may straddle the ring **99** when it engages the hook **101**, the free ends **112** of legs **111** resting on a ledge **113** extending outwardly from sealing rail **61**.

When the cover **41** is to be opened, the plate **106** is pivoted to open the recess, and after the ring member is released from the hook, it may be pivoted downwardly into the recess and the plate moved to rest against the ledge to conceal the ring member so that there is no danger of a crew member tripping thereagainst.

With the assembly above described, the hatch opening and elevator housing entrance may be rapidly opened and closed by a crew member by mere operation of suitable control valves, and as the covers will be moved clear of the hatch opening and entrance, unimpeded access thereto is provided.

As many changes could be made in the above construction and circuit, and many apparently widely different embodiments of this invention could be made without departing from the scope of the claims, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

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

1. Equipment for effecting movement of a panel through an angle of substantially 270 degrees, said equipment comprising a panel, a fixed support for said panel, means pivotally mounting said panel to said fixed support, a pair of actuators each having a casing member and a reciprocable member, means pivotally mounting one of the members of each of said pair to said panel, means pivotally mounting the other of said members to said support, the pivotal connections of both of said actuators to said panel being on the same side and exteriorly of the angular region defined by lines extending from the pivotal mount for said panel, to the fixed pivotal mount for each actuator, said actuators and said pivotal mounts being constructed and arranged for one of said actuators to effect rotation of said panel about its pivotal mount on said fixed support to a predetermined position, to bring the pivotal panel mount of said actuator to a position such that a line extending from said pivotal panel mount of said actuator to its fixed pivotal mount will be located on one side of the pivotal mount for said panel and to bring the pivotal panel mount of said other actuator to a position such that a line extending from said pivotal panel mount of said other actuator, to its fixed pivotal mount will be located on the other side of the pivotal mount for said panel.

2. The combination set forth in claim 1 in which said actuators are hydraulic units, said casing members are the cylinders of said units and the reciprocable members are the plungers of the units.

3. The combination set forth in claim 1 in which the panel has parallel side walls, the pivotal mount for said panel is adjacent an edge thereof between said side walls, said actuators are hydraulic units having a cylinder and a plunger slidable therein, defining the casing member and reciprocable member respectively and the pivotal mount for said hydraulic units is on the side wall of said panel.

4. The combination set forth in claim 1 in which the panel has parallel side walls, the pivotal mount for said panel is adjacent an edge thereof between said side walls, said actuators are hydraulic units having a cylinder and a plunger slidable therein, defining the casing member and reciprocable member respectively, the pivotal mount for said hydraulic units to said panel being on the side wall of said panel and means are provided to extend the plunger of the first hydraulic unit to rotate said panel and after it has reached such predetermined position to retract the plunger of the second hydraulic unit.

5. A construction of the character described comprising a substantially rectangular housing having parallel side walls, an open front and a top wall, a substantially rectangular panel to cover said open front of said housing, said panel having a top wall and parallel side walls, means pivotally connecting the panel at its top wall to the top wall of said housing for rotation of said panel through an angle of substantially 270 degrees, a pair of hydraulic units each having a cylinder member and a plunger member slidable therein, means pivotally connecting the end of one of said members of each of said units to the side wall of the panel and means connecting the end of the other of said members of each of said units to the side wall of said housing, the pivotal connections of both of said hydraulic units to said panel being on the same side and exteriorly of the angular region defined by lines extending from the pivotal mount for said panel, to the fixed pivotal mount for each hydraulic unit, said hydraulic units and said pivotal connections being constructed and arranged for one of said hydraulic units to effect rotation of said panel to a predetermined position to bring the pivotal panel connection of said unit to a position such that a line extending from said pivotal panel connection of said unit to its pivotal connection to said housing is on one side of the pivotal connection of said panel and to bring the pivotal panel connection of said other hydraulic unit to a position such that a line extending from said pivotal panel connection of said other unit, to its pivotal connection to said housing will be located on the other side of the pivotal connection of said panel.

6. The combination set forth in claim 5 in which a source of fluid under pressure is provided, a valve connected in circuit between said source and said two hy-

draulic units, and normally providing communication between said source and the first hydraulic unit to effect movement of its plunger member, and cutting off communication between said source and said second hydraulic unit, a second valve connected in a circuit between said source and said first hydraulic unit and normally cutting off communication therebetween through said circuit, means when said panel has reached such predetermined position, to actuate said valves, whereby said first valve provides communication between said source and said second hydraulic unit, and said second valve provides communication between said source and said first hydraulic unit and means thereafter automatically to deactuate said second valve to cut off communication through said circuit between said source and said first hydraulic unit, for completion of the movement of said panel through such angle of 270 degrees by said second hydraulic unit.

7. The combination set forth in claim 5 in which means are provided to extend the plunger of the first hydraulic unit to rotate said panel and after it has reached such predetermined position to retract the plunger of the other hydraulic unit.

8. The combination set forth in claim 5 in which the pivotal connections of said hydraulic units to said panel are on a common axis.

9. A construction of the character described comprising a substantially rectangular housing rising from one end of a ship's hatchway, said housing having parallel side walls, an open front and a top wall, a substantially rectangular panel to cover said open front of said housing, said panel having a top wall and parallel side walls, means pivotally connecting the panel at its top wall to the top wall of said housing for rotation of said panel through an angle of substantially 270 degrees, a pair of hydraulic units each having a cylinder member and a plunger member slidable therein, means pivotally connecting the end of one of said members of each of said units to the side wall of the panel and means connecting the end of the other of said members of each of said units to the side wall of said housing, said hydraulic units and said pivotal connections being constructed and arranged for one of said hydraulic units to effect rotation of said panel to a predetermined position to bring the pivotal panel connection of said unit to a position such that a line extending from said pivotal panel connection of said unit to its pivotal connection to said housing is on one side of the pivotal connection of said panel and to bring the pivotal panel connection of said other hydraulic unit to a position such that a line extending from said pivotal panel connection of said other unit, to its pivotal connection to said housing will be located on the other side of the pivotal connection of said panel, a second panel pivotally connected to said first panel near the lower end of the latter and adapted to extend at substantially right angles to said first panel over such hatchway to close the latter, and means mounted on said panels to move said second panel about its pivotal mount into substantially parallel relationship with respect to said first panel.

10. The combination set forth in claim 9 in which the means to move said second panel comprises a hydraulic unit having a cylinder and a plunger slidable therein, and means pivotally to connect the free end of said plunger to the lower end of said first panel and means pivotally to connect one end of said cylinder to said second panel.

11. The combination set forth in claim 9 in which the adjacent edges of said panels each carries a resilient seal adapted to engage when said panels are in closed position.

12. The combination recited in claim 9 in which the housing has a rear wall with a support bracket extending outwardly therefrom and the free end of said second panel is adapted to rest on said bracket when said panels are in open position.

13. The combination set forth in claim 9 in which means are provided to latch said second panel in closed position over said hatchway.

14. The combination set forth in claim 9 in which a recess is provided in the deck of the ship adjacent the sealing rail, a latch member is mounted on said sealing rail in said recess, a complementary latch member is mounted on the periphery of the second panel and aligned with said first latch member and a plate is releasably mounted over said recess to close the latter.

15. A construction of the character described comprising a substantially rectangular housing having parallel side walls, an open front and a top wall, a substantially rectangular panel to cover said open front of said housing, said panel having a top wall and parallel side walls, means pivotally connecting the panel at its top wall to the top wall of said housing for rotation of said panel through an angle of substantially 270 degrees, a pair of hydraulic units each having a cylinder member and a plunger member slidable therein, means pivotally connecting the end of one of said members of each of said units to the side wall of the panel and means connecting the end of the other of said members of each of said units to the side wall of said housing, said hydraulic units extending parallel to the side walls of said panel and said housing, one of said hydraulic units being positioned outwardly of the other hydraulic unit, the pivotal connections of both of said hydraulic units to said panel being on a common axis, said hydraulic units and said pivotal connections being constructed and arranged for one of said hydraulic units to effect rotation of said panel to a predetermined position to bring the pivotal panel connection of said unit to a position such that a line extending from said pivotal panel connection of said unit to its pivotal connection to said housing is on one side of the pivotal connection of said panel and to bring the pivotal panel connection of said other hydraulic unit to a position such that a line extending from said pivotal panel connection of said other unit, to its pivotal connection to said housing will be located on the other side of the pivotal connection of said panel.

16. A construction of the character described comprising a substantially rectangular housing having parallel side walls, an open front and a top wall, a substantially rectangular panel to cover said open front of said housing, said panel having a top wall and parallel side walls, a hinge pivotally connecting the panel at its top wall to the top wall of said housing for rotation of said panel through an angle of substantially 270 degrees, a cam carried by said hinge to be rotated upon rotation of said panel, a pair of hydraulic units each having a cylinder member and a plunger member slidable therein, means pivotally connecting the end of one of said members of each of said units to the side wall of the panel and means connecting the end of the other of said members of each of said units to the side wall of said housing, said hydraulic units and said pivotal connections being constructed and arranged for one of said hydraulic units to effect rotation of said panel to a predetermined position to bring the pivotal panel connection of said unit to a position such that a line extending from said pivotal panel connection of said unit to its pivotal connection to said housing is on one side of the pivotal connection of said panel and to bring the pivotal panel connection of said other hydraulic unit to a position such that a line extending from said pivotal panel connection of said other unit, to its pivotal connection to said housing will be located on the other side of the pivotal connection of said panel, means to actuate said first hydraulic unit to rotate said panel to such predetermined position and means controlled by said cam after said panel has rotated to reach such predetermined position to effect actuation of said second hydraulic unit to retract the plunger thereof.

17. A construction of the character described compris-

ing a substantially rectangular housing having parallel side walls, an open front and a top wall, a substantially rectangular panel to cover said open front of said housing, said panel having a top wall and parallel side walls, means pivotally connecting the panel at its top wall to the top wall of said housing for rotation of said panel through an angle of substantially 270 degrees, a pair of hydraulic units each having a cylinder member and a plunger member slidable therein, the side wall of said housing having a pair of brackets extending laterally outward therefrom adjacent the edges of said side wall, the bracket adjacent the edge of said side wall adjacent the open front of said housing being on a level below the other bracket, the cylinders of said hydraulic units being pivotally connected to said brackets respectively and the plungers of said units being pivotally connected on a common axis adjacent the top wall of said panel and on a level above said brackets, said hydraulic units and said pivotal connections being constructed and arranged for

one of said hydraulic units to effect rotation of said panel to a predetermined position to bring the pivotal panel connection of said unit to a position such that a line extending from said pivotal panel connection of said unit to its pivotal connection to said housing is on one side of the pivotal connection of said panel and to bring the pivotal panel connection of said other hydraulic unit to a position such that a line extending from said pivotal panel connection of said other unit, to its pivotal connection to said housing will be located on the other side of the pivotal connection of said panel.

References Cited in the file of this patent

UNITED STATES PATENTS

2,277,640	Harrington	Mar. 24, 1942
2,283,577	Roby	May 19, 1942
2,353,655	Day	July 18, 1944
2,772,789	Hussong et al.	Dec. 4, 1956