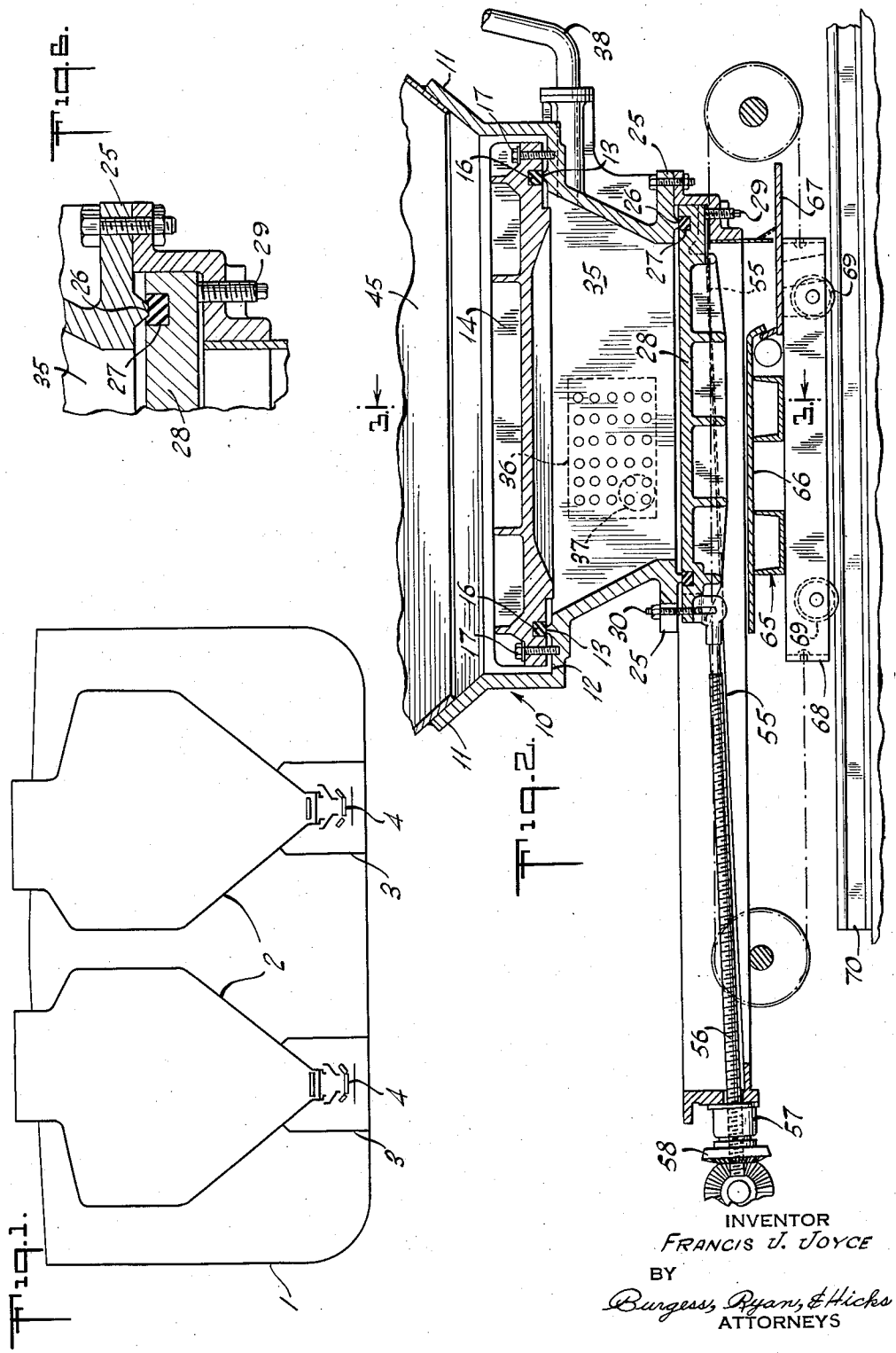
Jan. 24, 1961 F. J. JOYCE 2,969,083

VESSEL FOR CARRYING LIQUID OR BULK CARGOES

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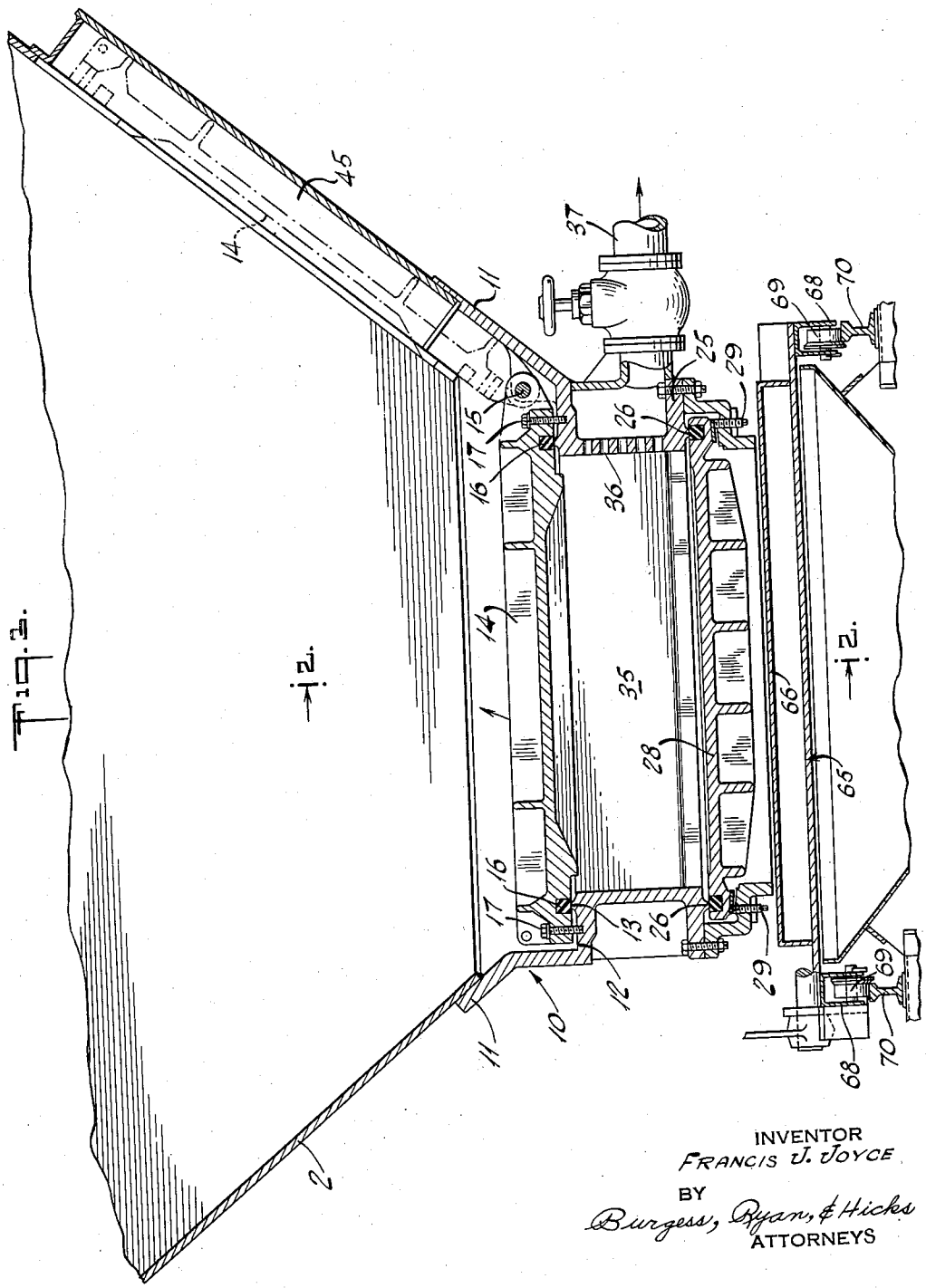


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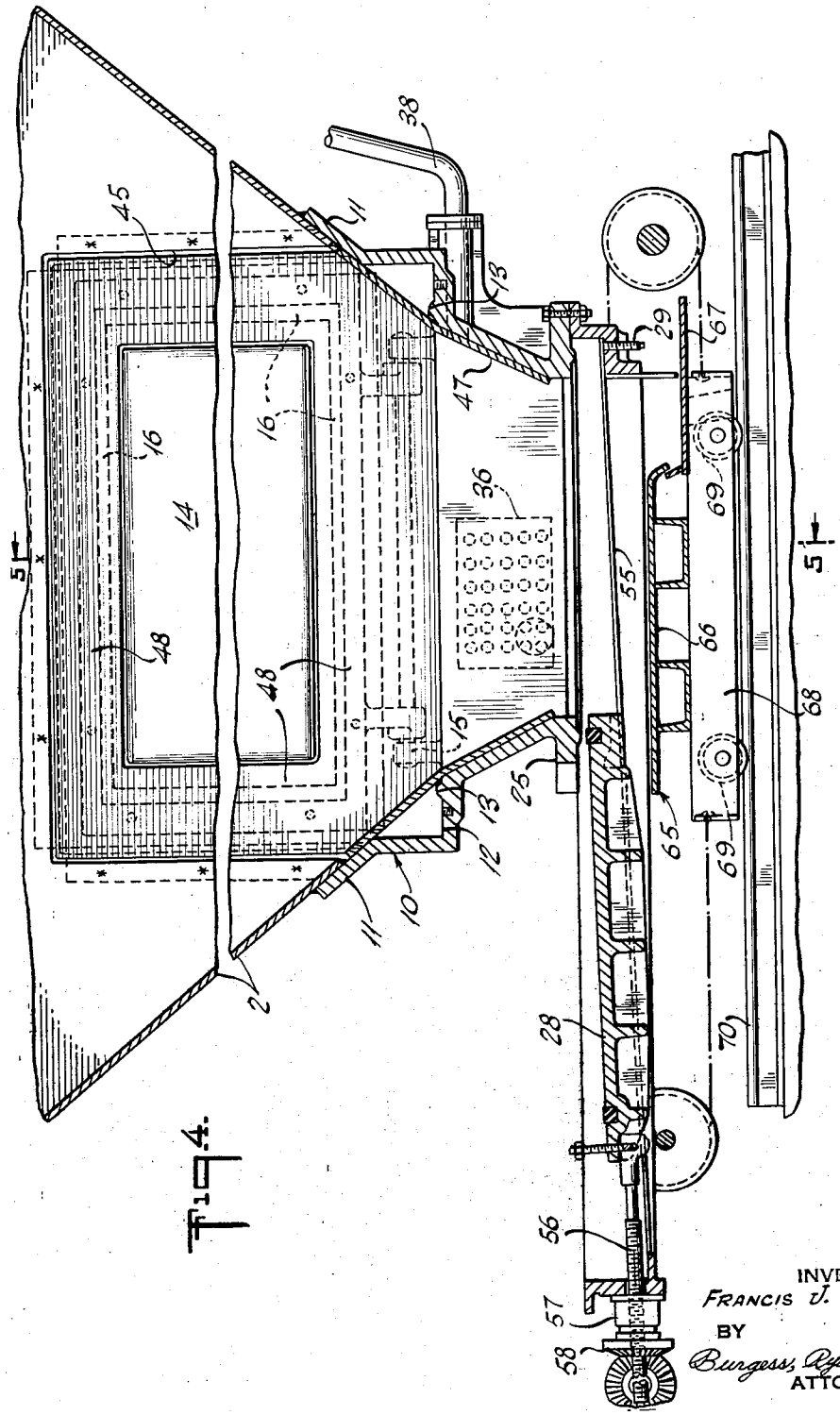


Fig. 4.

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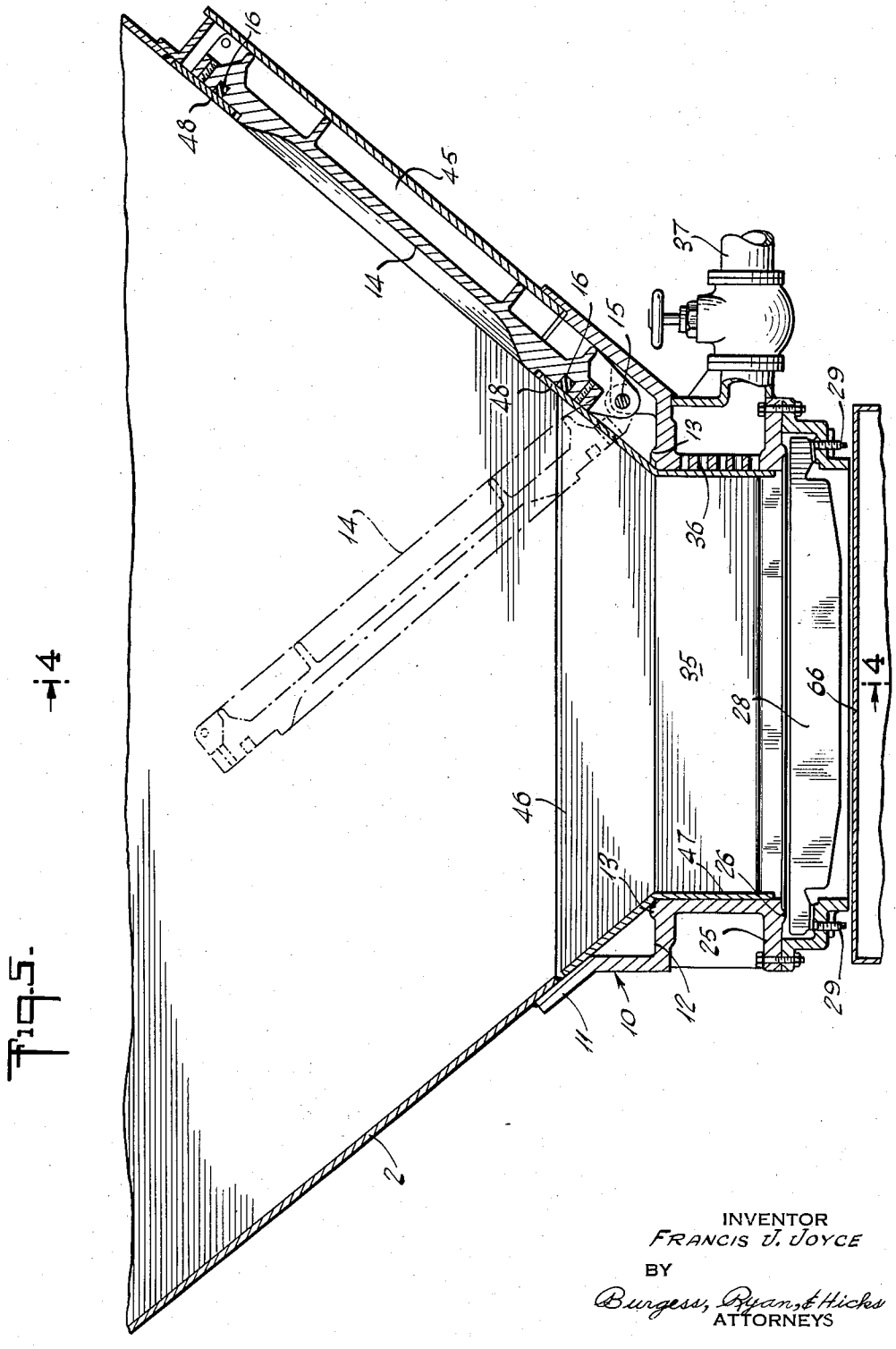


Fig. 5.

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4 Claims. (Cl. 137—269)

As is well known, the common practice is to transport liquids, such as oil, by sea, in what are commonly termed tankers and bulk cargo, such as ore, in carrier vessels. Each type of vessel is of a construction adapting it for the one particular use and neither is capable, ordinarily, of carrying the other type of cargo. This practice is inefficient in that both types of vessel, shuttling back and forth between their loading and discharge ports, spend each return trip or half their time traveling in ballast, that is, not carrying any pay load.

The object of the present invention is to provide a vessel construction such that either type of cargo can be carried, such as oil or ore, with a minimum of change required to convert from the one type of load to the other.

The invention will be readily understood from the following description of the accompanying drawings which illustrate the preferred construction. In the drawings:

Fig. 1 is a diagrammatic cross section of a ship's hull showing the general arrangement of hoppers to which the invention is applied;

Fig. 2 is a broken-out, enlarged vertical sectional, longitudinally of the hull and on the line 2—2 of Fig. 3, showing the lower part of one of the hoppers with the components as arranged for transporting liquid;

Fig. 3 is a similar section but taken transversely of the hull on the line 3—3 of Fig. 2;

Fig. 4 is a section similar to Fig. 2 but with the hopper gates open;

Fig. 5 is a section on the line 5—5 of Fig. 4; and

Fig. 6 is an enlarged broken-out section of a detail.

The hull 1 of the vessel incorporates a plurality of cargo hoppers and in this instance it can be assumed that there are port and starboard rows of such hoppers extending throughout the length of the cargo space. In Fig. 1 the reference 2 is applied to one hopper of each row. Beneath each row of hoppers is a tunnel or space 3 in which is located a conveyor, generally designated 4, which receives the bulk material which is gravity discharged from the hoppers. This conveyor, per se, forms no part of the present invention and it will not be described. The hoppers are identical and the following description of one of them will serve for all.

The lower wall portion of hopper 2 merges into a restricted bottom section generally designated 10. This section is shown as a casting having upper diverging flanges 11 to which the lower end portions of the hopper walls are welded or otherwise secured. The section also includes a shoulder 12 arranged to form or provide an upwardly directed seat for a closure gate. In this preferred form the seat itself is formed by an upstanding rib or ridge 13 which extends around the inner periphery of the shoulder. A gate 14 designed to engage this seat is located in the bottom of the hopper and, in this instance, is hinged mounted, as at 15, to the bottom section 10. The underside of this gate is shown provided with a gasket 16 (Figs. 2 and 3) adapted to close down against rib 13. The gasket is of neoprene or other suitable material to

form an oil tight seal. As shown, the gate is drawn down tight and held closed by studs 17.

The lower end of the bottom section 10 has a flange 25 arranged to provide a downwardly directed seat for another closure gate. A rib or ridge 26, like the rib 13, is shown engaged with the similar gasket 27 (see Fig. 6) of an upwardly closing gate 28. This gate is drawn up tight and held closed by studs 29 and bolts 30.

In the closed and sealed position of the two gates, the hopper is designed to carry oil or the like. The upper gate is held closed not only by the locking studs but also by the pressure of the head of oil in the hopper. The lower gate, whenever closed, serves (as one of its purposes) to resist (and close tighter in response to) any pressure from below, as in the event of an accident involving a rupture of the hull and flooding of the space 3 which, it will be understood, runs beneath the entire length of the row of hoppers and cannot be compartmented or bulkheaded. In other words, both gates close in the direction in which they are or might be subjected to liquid pressure and hence each serves to protect the other.

By locating and separating the two gates as indicated, a chamber or space 35 between the two seats is formed (Figs. 2 and 3) and any leakage of oil from the tank will be trapped in this chamber. One wall of the chamber is provided with a lateral outlet, preferably in the form of a screen or grid 36, leading to a valved line 37 by which the chamber may be drained and the oil so removed pumped back into the hopper. The chamber 35 is also shown provided with a vent pipe 38 (Figs. 2 and 4) which may extend to the deck level. It will thus be seen that the chamber 35 also constitutes a test chamber into which liquid may be pumped to test the gate seals prior to loading. It will be recognized also that the double gate arrangement guards against any escape of oil on to the belt of the conveyor 4.

When the hopper is empty and it is desired to convert for ore carrying, the upper gate is opened. In this preferred arrangement the lower wall portion of the hopper is stepped or recessed to provide a cavity 45 to receive the open gate, as shown in Fig. 5 and a liner 46 is inserted in the bottom of the hopper. This liner consists of a metal shell adapted to fit the lower end of the hopper so as to overlie the upwardly directed gate seat 13, thereby protecting it against damage from the ore dumped into the hopper. The depending neck portion 47 of the liner substantially fits the chamber between the gates and overlies the grid outlet, thereby protecting it and guarding against clogging. The right hand wall of the liner as viewed in Fig. 5 is extended upwardly in the form of a frame 48 which surrounds the marginal portion of the opened gate (see also Fig. 4) so as to close the gate cavity or recess around its edges against the entry of ore and protect the gasket 16. Before the liner is inserted, the hopper is thoroughly flushed, of course, to render it gas-free (as with any tanker) and in this connection it will be noted that the chamber or space 35 serves as a useful flushing sump.

In this illustrative embodiment of the invention, the lower gate 28 is arranged to be withdrawn more or less horizontally. As shown, it is mounted (in its closed position) slightly above tracks 55 (Fig. 4) which are designed to receive the door when its locking studs and bolts are released and to support and guide it as it is withdrawn (to the left in Figs. 2 and 4). The means shown for withdrawing this gate consists of a draw bar 56 loosely coupled at its forward end to the gate and threaded throughout the major part of its length. The outer or left hand end of the bar extends through a nut member 57 and a bevel gear 58 secured to the nut member. The bevel gear may be driven by a motor (not shown) and, as will be understood, rotation of the gear

and nut member draws the gate 28 along the tracks to its Fig. 4 or open position.

Directly below the bottom section of the hopper, beneath the lower gate 28, is an ore gate, generally designated 65 (Figs. 2 and 4). This gate is itself of known construction and will not be described in detail. It includes top plates 66, 67 mounted on a truck 68 the wheels 69 of which are supported on tracks 70. When this gate is opened by moving the truck to the left (as viewed in Figs. 2 and 4) ore in the hopper is free to discharge on to the upper run of the conveyor 4.

As will be understood, the belts of the conveyors discharge their load on to some sort of elevating apparatus (not shown) which takes it up to deck level whence it may be discharged by another conveyor to a receiving dock. This general arrangement of conveyors for unloading ore or the like is well known and, since the details of it form no part of the present invention, it needs no description.

It will thus be seen that an efficient oil-ore carrier is provided, having hoppers which can readily be converted to receive either type of cargo.

In the light of the foregoing description exemplifying the principles of the invention in a preferred embodiment, the following is claimed:

1. In a carrier of the kind described, the combination with a hopper having lower wall portions merging into a restricted bottom section, of an upwardly facing seat disposed around the upper end of said section, a downwardly facing seat disposed around the lower end of said section, an upper, hinged gate within the hopper adapted to close downwardly and seal against the upwardly facing seat, a cavity formed in one of said lower wall portions of the hopper to receive said gate in its open position, a lower gate adapted to close upwardly and seal against the downwardly facing seat, said bottom section between the two seats having a lateral outlet, and a removable liner member adapted, in the open position of the upper, hinged gate, to overlie the said lateral outlet, the said upwardly facing seat and to cooperate with the upper gate to close the said cavity.

2. In a carrier of the kind described, the combination of a hopper having lower wall portions slanting downward and inward to partially define a funnel-shaped passage for solid granular matter placed in the hopper, said passage leading to a restricted bottom section having a lateral outlet; an upwardly facing seat disposed around the upper end of said section; a downwardly facing seat disposed around the lower end of said section; an upper, hinged gate within the hopper adapted to close downwardly and seal against the upwardly facing seat and to assume an open position clear of the funnel-shaped passage; a lower gate adapted to close and seal against the downwardly facing seat; and a removable liner member adapted, in the open position of the upper hinged gate, to overlie the said lateral outlet and upwardly facing seat and to cooperate with the lower wall portions to at least partially define the funnel-shaped passage.

3. The combination of claim 2 wherein that side of the upper hinged gate which faces downward when said gate is sealed against the upwardly facing seat is adapted to cooperate with the lower wall portions and the removable liner member to define the funnel-shaped passage when the upper hinged gate is in the open position and the removable liner is in place.

4. The combination of claim 2 wherein the upper hinged gate is equipped with a gasket designed to cooperate with the upwardly facing seat and in which the removable liner member overlies and protects the gasket when the upper gate is in the open position.

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