June 12, 1951 L. D. SMITH 2,557,016

DUAL PURPOSE SELF-UNLOADER SHIP

Filed Aug. 10, 1945 2 Sheets-Sheet 1

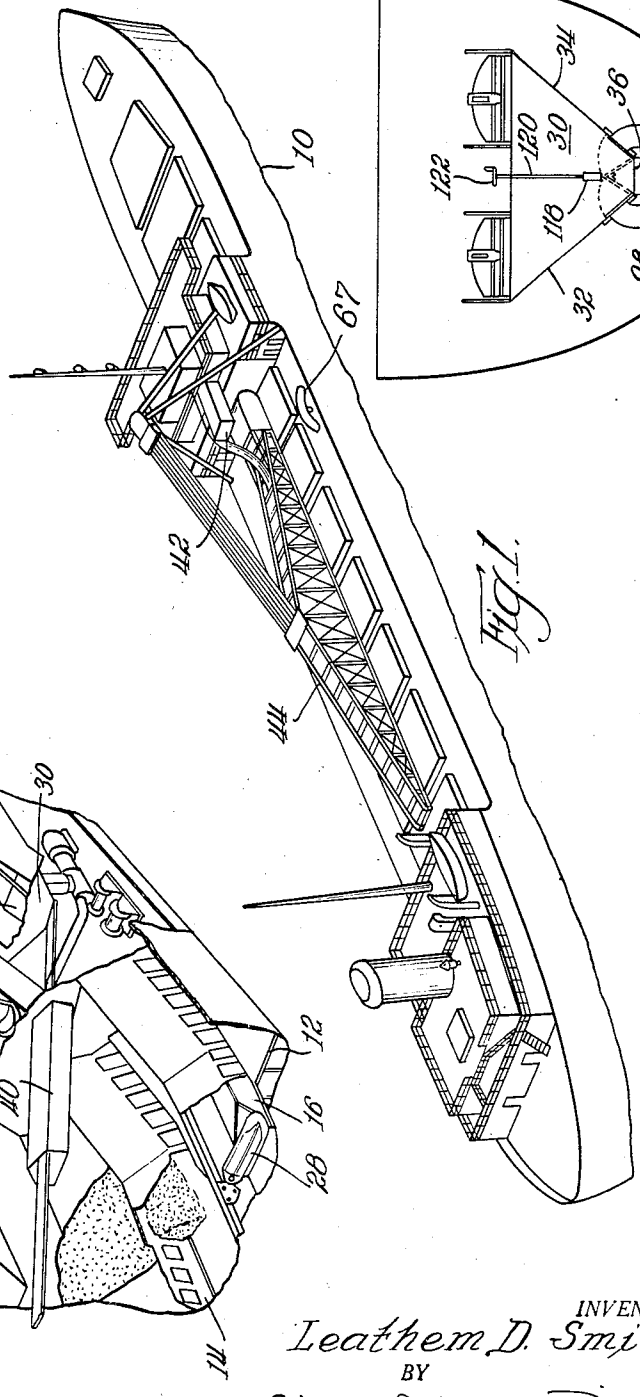


Fig. 1.

Fig. 3.

Fig. 2.

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Fig. 4.

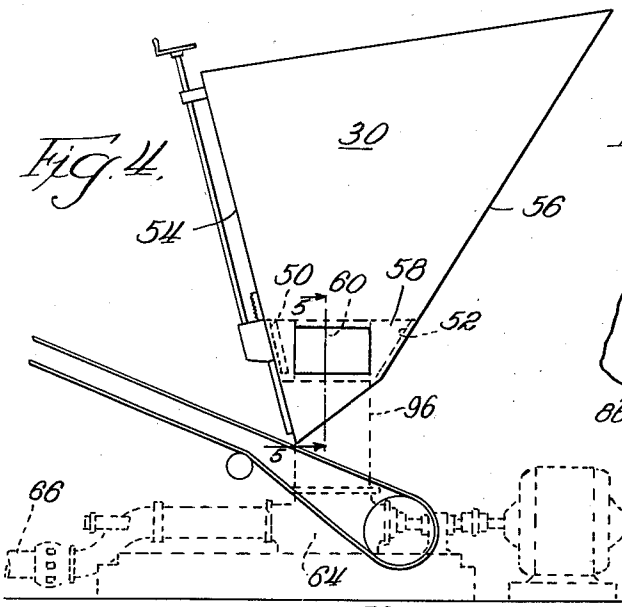


Fig. 6

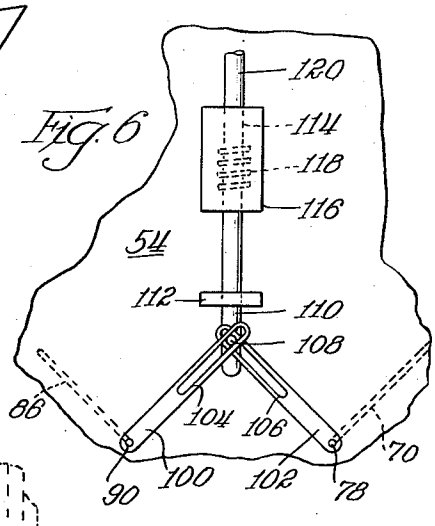


Fig. 5

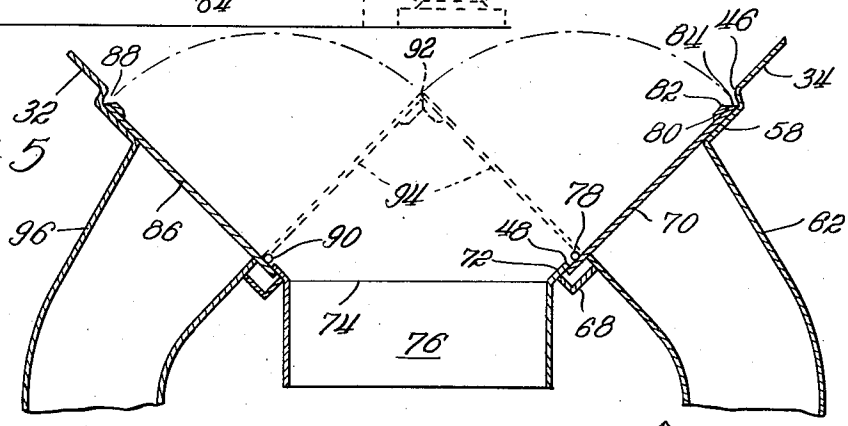
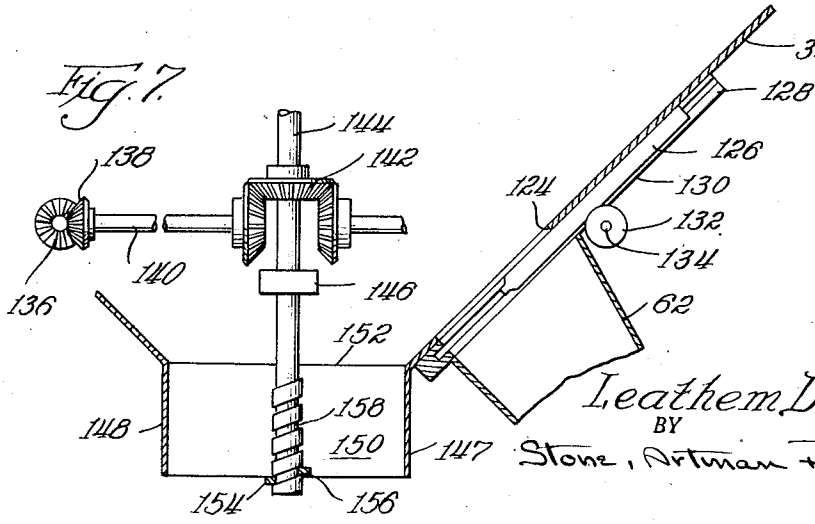


Fig. 7.



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DUAL-PURPOSE SELF-UNLOADER SHIP

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Application August 10, 1945, Serial No. 610,073

4 Claims. (Cl. 214—15)

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This invention relates to a self-unloading ship and may be described as a dual purpose, self-unloading, bulk material ship.

Some two decades ago applicant invented a self-unloading ship for handling bulk material wherein tunnels positioned longitudinally of the ship were constructed so as to receive by gravity a flow of material thereinto. The scrapers operating longitudinally of these tunnels drew the material to one end of the ship from which it was lifted by suitable means onto the weather deck and thence to the wharf. The ships have been useful in handling coal and sand, which are materials generally piled out in the weather and on the ground so that a long boom conveyor on the deck of one of applicant's ships can pile such material for a storage period. The unloading system of applicant's ships has not been economical in handling grains, cement and such other materials as are stored in elevators. In the case of grain, receiving elevators are usually equipped with blowers or belt equipment which may lift the grain directly out of the hold up to the top of the elevator, rendering unnecessary unloading equipment on the ships and therefore favoring ships having larger capacity due to an absence of unloading equipment.

In the case of cement, handling is usually by air-tight blower systems because wind blows cement easily—off of a pile, or a conveyor, etc.—and blown cement deposits itself on ship and shore superstructures so as to create expensive cleaning problems. For several years on the Great Lakes, bulk cement has been handled principally by expensive pump equipment installed on ships intended solely to handle bulk cement and in connection with storage elevators.

The object of this invention is to provide an improvement for applicant's self-unloading system which will render it useful in handling cement and grain as well as coal, sand and iron ore. The feature that attains this end is the mounting of cement pumps fed by diversionary ducts from the accumulator hopper adjacent the delivery end of the tunnels. Such a dual purpose unloader more than doubles the usefulness of the ship as a cement carrier, for not only can it serve elevators equipped with cement pumps, but can serve those elevators having only conveyor equipment, in which latter case, the cement will be hauled by applicant's conveyors including boom conveyor.

The invention is disclosed in the accompanying drawings comprising two sheets, and there are two embodiments of the means for controlling the delivery from the accumulator hopper.

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Figure 1 is a perspective view of applicant's ship;

Figure 2 is a perspective view partly cut-away of the forward holds of applicant's ship in which are mounted the bulk material unloading equipment;

Figure 3 is a view looking forward showing the control arrangement of the hopper;

Figure 4 is a side view of the hopper;

Figure 5 is a view taken on the line 5—5 of Figure 4;

Figure 6 is an enlargement of the control mechanism in Figure 3; and

Figure 7 is an alternative construction for the control mechanism.

Continuing to refer to the drawings, in Figure 1, the numeral 10 identifies a bulk material cargo ship, in which are disposed on the hold floor 12, referring to Figure 2, two tunnels 14 and 16 which are positioned in side-by-side relationship and extend longitudinally of the holds of the ship. At the forward end of the tunnels are ramps 18 and 20 which terminate at platforms 22 and 24 which contain openings 23 and 25. The scrapers 26 and 28 may be drawn up onto the platforms 22 and 24 so as to discharge material through these openings into the accumulator hopper 30, which, referring to Figure 3, has sloping side walls 32 and 34 terminating in a delivery chute 36. This delivery chute feeds a belt conveyor 38 which, referring to Figure 2, moves upwardly in a housing 40, and terminates, referring to Figure 1, in a chamber 42 which is disposed above the pivotal axis of a boom conveyor 44. The foregoing equipment is used to remove bulk cargo such as ore, coal and sand.

Examining the accumulator hopper 30, and referring to Figures 3 to 5, the walls 32 and 34 are sloped at an angle of 45 degrees so that they are at substantially right angles to each other. Openings having parallel upper and lower edges such as 46 and 48 and side edges such as 50 and 52, parallel respectively front and back walls 54 and 56, so as to have a trapezoidal configuration are cut in the lower portion of the side walls 32 and 34. A U-shaped plate 58 having a rectangular opening 60 is mounted over each opening in recessed arrangement thereto. To the inside edges of this opening 60 is affixed the peripheral edges of a duct 62 which opens into the feed side of a cement pump 64 having a delivery line 66. An angle iron 68 is butt welded to the lower edge of the wall 34 and the adjacent side of the duct 62. A trap door 70 engages the outer side 72 of the lower part of the wall 34 and the inside of the adapter plate 58 so as to

provide a comparatively smooth downward flow of bulk material to an opening 74 from which depends a delivery chute 76. This trap door 70 is pivoted on a shaft 78 which is journalled in the front and back walls 54 and 56 of the hopper 30. The trap door 70 carries along its free edge a reinforcing strip 80 which has its outer edge 82 in beveled alignment with the beveled edge 84 of the trap door 70, the angle being 45 degrees. A trap door 86 in a similar opening 88 is mounted on a shaft 90 which is in the horizontal plane with the shaft 78.

It is evident that by rotating the two trap doors 70 and 86 inwardly by 90 degrees they will engage each other at the point 92 and that in such engagement, the side edges of each of these trap doors will closely engage the inside surfaces of the back and front walls 54 and 56 of the hopper 30. When the two trap doors are the position indicated by the dotted lines 94 of Figure 5, all the bulk material will flow into the two ducts 62 and 96 which lead to two cement pumps, 64 and 98. On the other hand, when the two trap doors 70 and 86 are in the solid line position indicated in Figure 5, the flow into the ducts 62 and 96 will be blocked and will be directed downwardly through the opening 74 onto the chute 76.

The mechanical equipment necessary to throw the trap doors 70 and 86 may assume various forms. In Figure 6, two lever arms 100 and 102 are keyed respectively to the forwardly projecting ends of the shafts 90 and 78. At their inner ends, each contains elongated slots 104 and 106 which are engaged by a pin 108 mounted on the lower end of a rod 110. This rod is guided by a block 112 mounted on the outer face of the wall 54 of the hopper 30 and at its upper end carries a rack 114. This rack is held in position in a housing 116 where it is engaged by a worm 118 mounted on the lower end of a shaft 120 which carries at its upper end an operating wheel 122, see Figure 3. As illustrated in Figure 6, the arms 100 and 102 are holding the gates 86 and 70 in the solid line position shown in Figure 5.

An alternative construction is illustrated in Figure 7 where an opening 124 in the side wall 34 is covered by a slidable door or gate valve 126 riding in suitable guides such as 128. The door carries a pair of racks 130 which engage pinion gears such as 132 mounted on a shaft 134. This shaft carries at its forward end a gear such as 136 which is driven by a meshing gear 138 mounted on a shaft 140. The shaft 140 in turn is operated by a meshing gear 142 mounted on a vertical shaft 144 held in position on blocks such as 146 and having at its upper end, not shown, a hand wheel similar to 122 in Figure 3. In this embodiment, the side walls of the chute at the bottom of the main hopper, namely 147 and 148, are fixed but the chute itself, 150 is pivoted along its rear edge 152 so that it may be raised and lowered to close the opening. At the forward end of this chute 150 projects the fingers 154 and 156 of a yoke which ride in the threads 158 of a worm disposed on the lower end of the shaft 144. No attempt is here made to relate the exact size of the gears to the worm, as this will depend upon the slope desired for the chute 150 and the size of the opening 124. However, turning the shaft 144 in one direction will cause the gate valve such as 126 to open as the chute 150 is closed and conversely, turning the shaft 144 in the other direction will close the gate

valve such as 126 and open the chute 150. The gearing will be related to the worm so that the closed positions of the gate valves will coincide with the open position of the chute 150 and conversely, the open positions of the gate valves will coincide with the closed position of the chute 150.

Referring now to Figures 1 and 2, the delivery lines such as 66 of the cement pumps communicate to deck connections such as 67.

By the construction thus described, applicant has provided a self-unloading ship that can handle finely powdered material such as cement as well as coarser material such as ore, coal and sand. It will be noted that by this construction, applicant can convert one of his present self-unloading ships quite easily to a dual purpose self-unloading ship.

Having thus described my invention, what I claim as new and wish to secure by United States Letters Patent is:

1. A self-unloading ship comprising a hull, a tunnel disposed longitudinally of the inside of the hull, means for admitting into the tunnel material in the hull, a hopper disposed at one end of the tunnel, means for moving material longitudinally of the tunnel into said hopper, an opening centrally of the bottom of said hopper, a belt conveyor having its lower end positioned beneath said opening and its upper end positioned above the weather deck of the ship, a second opening in the lower part of the hopper with a conduit leading to the intake of a pump, and swinging door means adapted in one position to close the opening leading to the pump and in a second position, to close the opening leading to the belt.

2. A self-unloading ship comprising a hull, a tunnel disposed longitudinally of the inside of the hull, means for admitting into the tunnel material in the hull, a hopper disposed at one end of the tunnel, means for moving material longitudinally of the tunnel into said hopper, an opening centrally of the bottom of said hopper, a belt conveyor having its lower end disposed beneath said opening and its upper end disposed above the weather deck of the ship, a pair of laterally aligned openings in the lower part of said hopper, one on each side of said central opening, ducts connecting said last named openings to forced air pumping means, and two complemental doors so hinged to the hopper that in one position they cover the openings into the pumps and in the other position they cooperate to close the opening to the belt conveyor.

3. A self-unloading ship comprising a hull, a tunnel disposed longitudinally of the inside of the hull, means for admitting into the tunnel material from the hull, a hopper at one end of the tunnel, a belt conveyor and pumping means mounted adjacent the hopper, and means in the tunnel for moving material longitudinally thereof into said hopper, said hopper comprising side walls, a pair of parallel shafts each mounted substantially in the plane of one of the side walls, the front and back walls of said hopper lying in upright planes intersecting said shafts at right angles thereto, a door mounted on each shaft and having a configuration identical to a front-to-back cross section of the lower part of said hopper, an opening in the bottom of said hopper between said shafts, and opening onto the belt conveyor, an opening in the lower portion of each of said side walls and opening into the pumping means, and means for concurrently

swinging the two doors on the shafts from a position where each lies over the opening in its associated side wall to a position where the two doors cooperatively close the opening between the shafts.

4. A self-unloading ship comprising a hull, a tunnel disposed longitudinally of the inside of the hull, means for admitting into the tunnel material from the hull, a hopper at one end of the tunnel, a belt conveyor and pumping means mounted adjacent the hopper, and means in the tunnel for moving material longitudinally thereof into said hopper, said hopper comprising side walls, a pair of parallel shafts, each mounted substantially in the plane of one of the side walls, the front and back walls of said hopper lying in upright planes intersecting said shafts at right angles thereto, a door mounted on each shaft and having a configuration identical to a front to back cross section of the lower part of said hopper, an opening in the bottom of said hopper between said shafts and opening onto the belt conveyor, an opening in the lower portion of each of said side walls and opening into the pumping means, means for concurrently swinging the two doors on the shafts from a position where each lies over the opening in its associated side wall to a position where the two doors cooperatively close the opening between the shafts, and a single control means positively connected by lever trains to each shaft for simultaneously operating both doors.

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