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UNLOADING APPARATUS

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Fig-1.

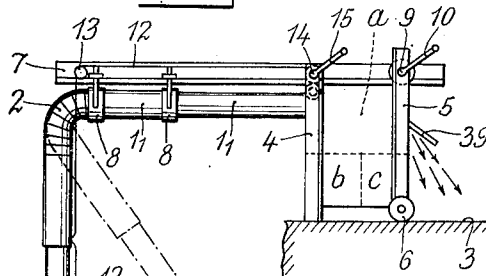


Fig. 5.

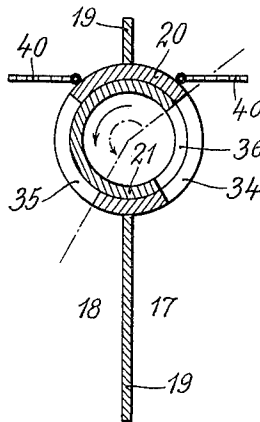


Fig. 2.

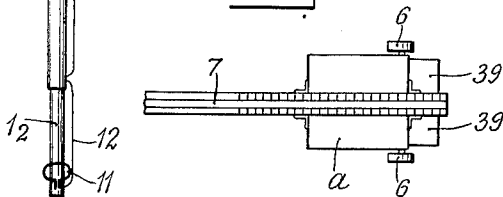


Fig. 3.

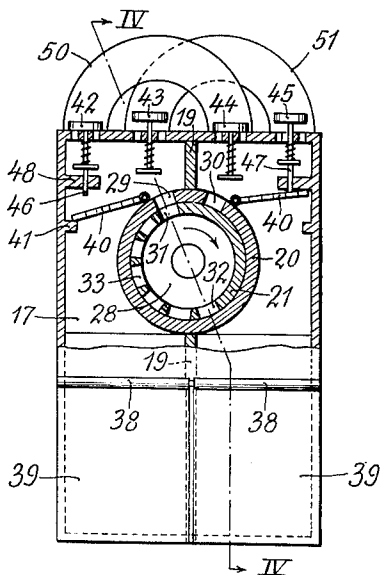
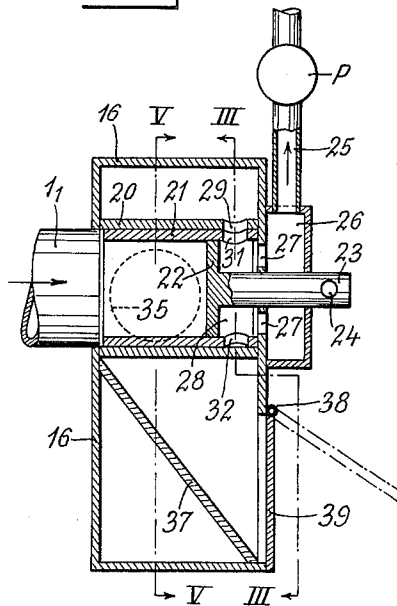


Fig 4.



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UNLOADING APPARATUS

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This invention relates to an unloading device for unloading loose cargo such as herring, fish, fishguano, mud, nuts, salt, cereals, or the like, from ships and has for an object to provide an unloading device by means of which such unloading may take place rapidly and with a comparatively small number of laborers.

The device includes a suction pump to suck up the material through an adjustable suction pipe, and one or more chambers which communicate with the suction pipe through valve mechanism so arranged that the chambers are subjected to suction for filling and are disconnected from the suction for emptying.

In a suitable embodiment two chambers are provided which are connected to the suction pipe by a common valve mechanism in such a manner that alternately one chamber is subjected to suction and is filled while the other chamber is disconnected from the suction and is emptied. By this device the fish or the like may be sucked from the loading hold without being mixed with water and passed directly up and delivered into boxes or other packing in predetermined quantities corresponding to the capacity of the said chamber.

Other characteristic features of the invention will be apparent from the following description taken in connection with the accompanying drawings in which a specific embodiment has been shown for purposes of illustration.

In the drawings:

Fig. 1 is a side elevation of the unloading apparatus placed on the edge of a quay, at which the ship (not shown) which is to be unloaded is lying;

Fig. 2 is a top plan view of a portion of the unloading apparatus;

Fig. 3 is a section, drawn to a larger scale, taken on the vertical section on the line III—III of Fig. 4 through the valve mechanism;

Fig. 4 is an axial section taken on the line IV—IV of Fig. 3 with the smaller valves omitted; and

Fig. 5 is a section through the valve device taken on the line V—V of Fig. 4.

As shown diagrammatically in Fig. 1 the unloading apparatus consists of a container which is divided by horizontal and vertical partitions into an upper compartment and two lower compartments *b* and *c*. Compartment *c* contains a motor (not shown) which drives a suction pump located in compartment *b*, and in compartment *a* there are two chambers in communication with the suction pump and adapted to receive the sucked-up material. A rotary valve described

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more in detail hereinafter has an inlet opening in connection with a suction pipe serving to suck up the material to be unloaded and consisting of a horizontal portion 1₁ and a downwardly directed portion 1₂, whose lower end may be passed down into the hold. The pipe portions 1₁ and 1₂ are so connected with each other by means of a flexible knee joint 2 that the pipe portion 1₂ may be swung in all directions.

The pipe portions 1₁ and 1₂ are indicated in the drawing as composed of a plurality of shorter pipe sections inserted telescopically into each other, so that the horizontal as well as the vertical portions may be shortened and prolonged as desired. By this arrangement the lower opening of pipe portion 1₂ may be shifted to any place in the hold.

The apparatus, which during the unloading of a boat is arranged on the edge of a quay 3, is provided with supports 4 and 5, the supports 5 being provided with wheels 6 so that the whole unloading apparatus may be easily moved when it is lifted slightly so that the supports 4 are raised a little from the base. Above the said container there is arranged a horizontal beam 7, preferably of inverted T section, which projects out from the container nearly to the downwardly directed pipe portion 1₂ and from which one of the horizontal pipe portions 1₁ is suspended by means of straps 8. The beam 7 is displaceable longitudinally and is journaled in guides in the upper ends of the supports 4 and 5 and may be displaced by turning a cog wheel 9 meshing with teeth on the upper sides of the horizontal beam flanges. A hand crank 10 is attached to the cog wheel for this purpose, and it will be seen that the displacement causes a prolongation or a shortening of the horizontal pipe portion 1₁, so that the pipe portion 1₂ may be adjusted to a suitable distance from the container according to the width of the ship to be unloaded. The pipe portion 1₂ may be swung in all directions by means of a handle 11 attached to the lower end of the lowermost pipe section.

Further, this pipe portion 1₂ may be lengthened and shortened as desired by means of a line 12 which is attached to the lower ends of all pipe elements and which runs over a roller 13 journaled in the beam 7 and then passes on along the beam to another roller or barrel 14 journaled in the beam and to which the line is attached. By turning a hand crank 15 attached to the shaft of the roller 14 the line will be wound upon or unwound from the roller 14, whereby the pipe portion 1₂ will be shortened or lengthened respectively.

The unloading apparatus must be so arranged that the material sucked up through the suction pipe 12, 11 does not pass through the suction pump. Further the material should be sucked up and passed directly to transport boxes or the like in definite quantities without interrupting the suction. In order to accomplish this a special valve is used which is placed in the upper compartment *a* of the container shown in Fig. 1. This valve which is shown in a larger scale in Figs. 3 to 5 consists of a housing 16 containing two chambers 17 and 18 arranged side by side and separated from each other by a tight partition 19. The partition carries a cylinder 20 the ends of which are tightly connected with the front and rear walls (Fig. 4) of the housing and the axis of which lies in the plane of the partition 19 so that the halves of the cylinder 20 are located on opposite sides of a vertical axial plane passing through the partition between the chambers 17 and 18 (Fig. 3).

In the front wall of the housing 16, outside of the cylinder 20, is a circular opening to which the outlet end of the horizontal pipe portion 11 is connected.

In the stationary cylinder 20 is journaled a cylindrical rotary valve body 21 which according to its angular position distributes the sucked-up material to the two chambers 17 and 18 in the desired manner. The valve body 21 is open at the end facing towards the pipe 11, but is closed at a distance from its other end by a disc 22 which is attached to the inside of the valve body. The disc 22 is provided with a shaft pin 23 which projects through an opening in the rear wall of the valve housing 16. The exterior end of the shaft pin is shown as provided with a hole 24 for receiving a transverse arm by which the shaft pin and the disc and thereby also the valve body 21 may be turned to different angular positions. This turning may also be effected automatically as mentioned below.

The suction pump which is indicated at P in Fig. 4 is connected through a pipe 25 with a suction chamber 26 surrounding the shaft pin 23 outside of the end wall of housing 16. This suction chamber communicates through ports 27 in the said rear wall with a chamber 28 in the valve body 21 between disc 22 and the rear wall of housing 16. The chamber 28 may be connected with one or the other of the chambers 17 and 18 through holes so arranged in the cylinder 20 and the valve body 21 that, according to the angular position of the valve body suction may be applied to either of the chambers 17, 18.

All of these ports are arranged in the portion of the cylinder 20 and valve body 21 which is located between disc 22 and the rear wall of the valve housing. As shown in Fig. 3 the cylinder 20 is provided with two ports 29 and 30 arranged uppermost in the cylinder wall symmetrically on both sides of the partition 19, so that they are each connected to one of the chambers 17 and 18. The valve body 21 is provided with two diametrically arranged ports 31 and 32 and with a plurality of corresponding ports 33 along one-half of the valve body periphery. In the position of the valve body shown in the drawing the valve body port 31 is directly opposite the port 29 of the cylinder 20, so that suction is applied to chamber 17, but not to chamber 18. If the valve body is turned to the right (clockwise), Fig. 3, what corresponds to turning to the left in Fig. 5, through an angle somewhat more than 180°, so that the valve body port 32 coincides with port

30 in cylinder 20, suction will be applied to chamber 18, but not to chamber 17. The ports 33 prevent the port 30 from being closed during the turning motion. The port 29 is not closed before port 32 has moved past the port 29, hence both chambers 17 and 18 are subjected to suction for a short time during the turning of the valve.

The portion of cylinder 20 which is located between disc 22 and the front wall of the valve housing 16 is provided at each side with a large port 34 and 35 respectively, as shown in Fig. 5, and the sucked-up material passes through these ports in order to enter one or the other of the chambers 17 and 18. The valve body 21 is provided on one side with a port 36 corresponding to the ports 34, 35.

When the valve body is set in such an angular position that port 36 coincides with one or the other of the ports 34, 35, a free passage for the material will be provided to the chamber 17 or 18 in question. In the position shown in Fig. 5 port 36 coincides with port 34, hence the interior of the valve body is in connection with chamber 17. In order that the material may not have any tendency to remain in the bottom of valve body 21, the ports 34, 35 are so arranged that their lower edge has a greater distance from the horizontal plane through the valve body axis than the upper edge of the port. For this reason the ports 31, 32 and 33 in the valve body are so arranged that the valve body must be turned somewhat more than 180° from one extreme position to the other. In Fig. 5 the legs of this angle are indicated by dot and dash lines.

Each chamber 17 and 18 is provided with an inclined bottom 37 and the front wall of each chamber is provided with an emptying door 39 which may be closed by a suitable closing device. When one chamber has been filled it is emptied by the door 39 being swung to the position shown by dot and dash lines in Fig. 4 and the contents then moves along the inclined bottom down into a box or the like placed under the emptying opening.

In each chamber 17 and 18 a perforated plate 40 is hinged to the upper side of cylinder 20 adjacent the partition 19, said plate being normally maintained in downwardly swung position by gravity as shown at the left in Fig. 3, the free edge of the plate engaging and being supported by a lug 41 in the valve housing 16. In the upper wall of each chamber two outlet valves 42, 43 and 44, 45 respectively are arranged which normally are maintained in closed position by spring action. The valves 42 and 44 are provided with valve stems 46 and 47 respectively which are guided by and project down through brackets 48 and 49 respectively, attached in the wall of the chamber. The valve 42 in chamber 17 connects through a pipe 50 with valve 44 in chamber 18, and valve 45 in chamber 18 connects with valve 43 in chamber 17 through a pipe 51. In Fig. 3 the said valves as well as the perforated plates 40 are shown in arbitrary positions.

The operation of these arrangements and of the complete apparatus will appear from the following:

It is assumed that valve body 21 is in the angular position shown in Figs. 3 to 5, the chamber 17 being subjected to suction, whereas the other chamber 18 is emptying. The material is then sucked-up through the suction pipe into the valve body 21 and then through the coinciding ports 36 and 34 into chamber 17. The mate-

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rial therefore will increase in the chamber and when this is nearly filled, the mass presses against the perforated plate 40 and swings same upwards, whereby the plate will press against valve stem 46 so as to open valve 42. Thereby the suction in chamber 17 will propagate through pipe 50, so as to open valve 44 in chamber 18 which is presumed to be empty and closed. Now preliminarily a suction action prevails in both chambers so that the sucking-up of the mass in chamber 18 commences. The two other valves 43 and 45 are closed during this operation, the right plate 40 being in downwardly swung position.

Now the valve body 21 is turned to the right (Fig. 3) so much that port 32 coincides with port 30. In this new position of the valve body the port 29 is closed, whereas within chamber 18 a suction action arises through the coinciding ports 30 and 32. In chamber 17 there is a definite quantity of material which is emptied by opening the door 39 in the manner described above. As plate 40 during the emptying is no longer held up by the material it will swing down, whereby valve 42 and thereby also valve 44 are closed. When emptying is finished, the door is closed, and as soon as chamber 18 is filled the plate 40 of this chamber is swung upwards, thereby opening valves 45 and 43. The valve body is now again turned into the position shown whereby a suction arises again in chamber 17 so that this is filled and at the same time chamber 18 is emptied.

The described unloading apparatus may be used for sucking up a dry or comparatively dry mass, because, owing to the construction of the valve mechanism the portion of the apparatus subjected to suction is always so tight that the high suction is obtained. An essential advantage of the apparatus is that the sucked-up material is delivered in definite quantities without interruption of the suction.

If only one chamber is used this is subjected alternately to suction for filling and disconnected from suction for emptying.

In the arrangement shown in the drawing it is presumed that the turning of the valve body 21 takes place by hand. But obviously the turning may be effected automatically by having the plates 40, when they are swung upwardly act upon the valve body by means of suitable transferring members so that the body is turned in one direction or the other.

What is claimed is:

1. Apparatus for unloading loose material from a ship's hold or the like, comprising a casing having outer walls and a vertical partition forming a pair of closed compartments, discharge doors in the outer wall of each compartment, a valve housing in said partition having a pair of chambers therein, a pipe connected to one chamber and adapted to be positioned to receive material from said hold, a suction pump, a connection from said pump to the other of said chambers, a shiftable valve member in said valve housing having means connecting both of said chambers selectively to said compartments according to the position thereof whereby suction is applied to a selected compartment and said pipe is also connected to discharge sucked-up material thereto.

2. Apparatus for unloading loose material from a ship's hold or the like, comprising a casing having outer walls and a vertical partition forming a pair of closed compartments, discharge

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doors in the outer wall of each compartment, a valve in said partition comprising a cylindrical wall forming a part of said partition and extending between said outer walls with its axis in the plane of said partition, said cylindrical wall having an open end and a closed end, and having a pair of large discharge openings in the lower side thereof near its end opening downwardly into the respective compartments and having a pair of smaller ports in its upper side near said closed end opening upwardly into the respective compartments, a rotary cylindrical valve member journaled in said cylindrical wall having large and small openings adapted to register with the opening and port in said cylindrical wall communicating with the respective compartments according to the position of said rotary member, a disc in said rotary member between said openings therein to divide the same into suction and discharge chambers, a suction pump, a conduit connecting said pump to said suction chamber, and a pipe adapted to be extended into said ship's hold and connected to said open end of said cylindrical wall for discharging said loose material through said large openings into a selected compartment.

3. Unloading apparatus according to claim 2, wherein the large opening of the cylindrical wall and the large opening of the rotary cylinder are so arranged that the rotary cylinder must be turned through more than 180° from one extreme position to the other one in order to have the first mentioned opening coincide with one of the last mentioned openings for the purpose of preventing sucked-up material from remaining in the lower portion of the cylindrical wall.

4. In an unloading apparatus according to claim 1, a valve system in each compartment and at the upper end of each compartment a pivoted perforated plate adapted, when the compartment is filled, to be swung upwardly thereby, said plate acting upon the valve system in such a manner that both compartments are placed under suction for a short time while the valve system is being shifted into such a position that the suction pipe as well as the suction pump are disconnected from the filled compartment.

5. In an unloading apparatus according to claim 1 wherein the suction pipe consists of a horizontal portion and a downwardly projecting portion flexibly connected therewith, both portions consisting of pipe sections movable telescopically in each other, an arm extending from said casing, the horizontal portion of said pipe being suspended from said arm, said arm being shiftable to extend or retract said pipe sections, said downwardly projecting portion being connected together by lines which are passed over rollers to a reel mounted on said arm by means of which the vertical portion of the suction pipe may be shortened or lengthened.

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