J. F. METTEN.

UNDER WATER ASH EJECTOR.

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990,369.

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Fig. 2

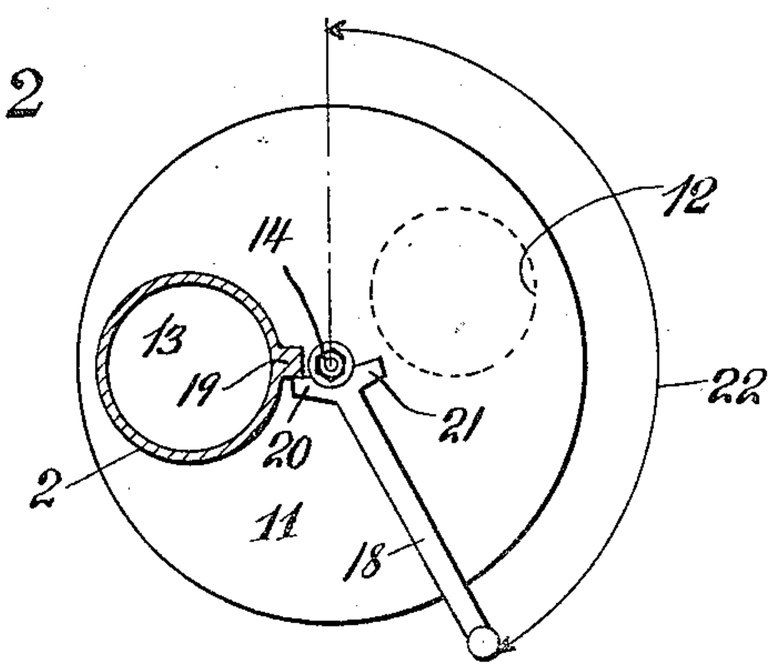


Fig. 3

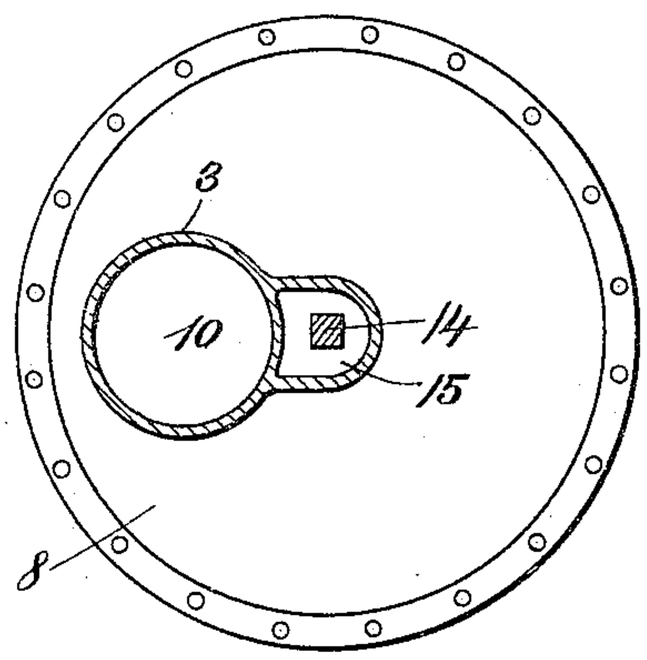


Fig. 1

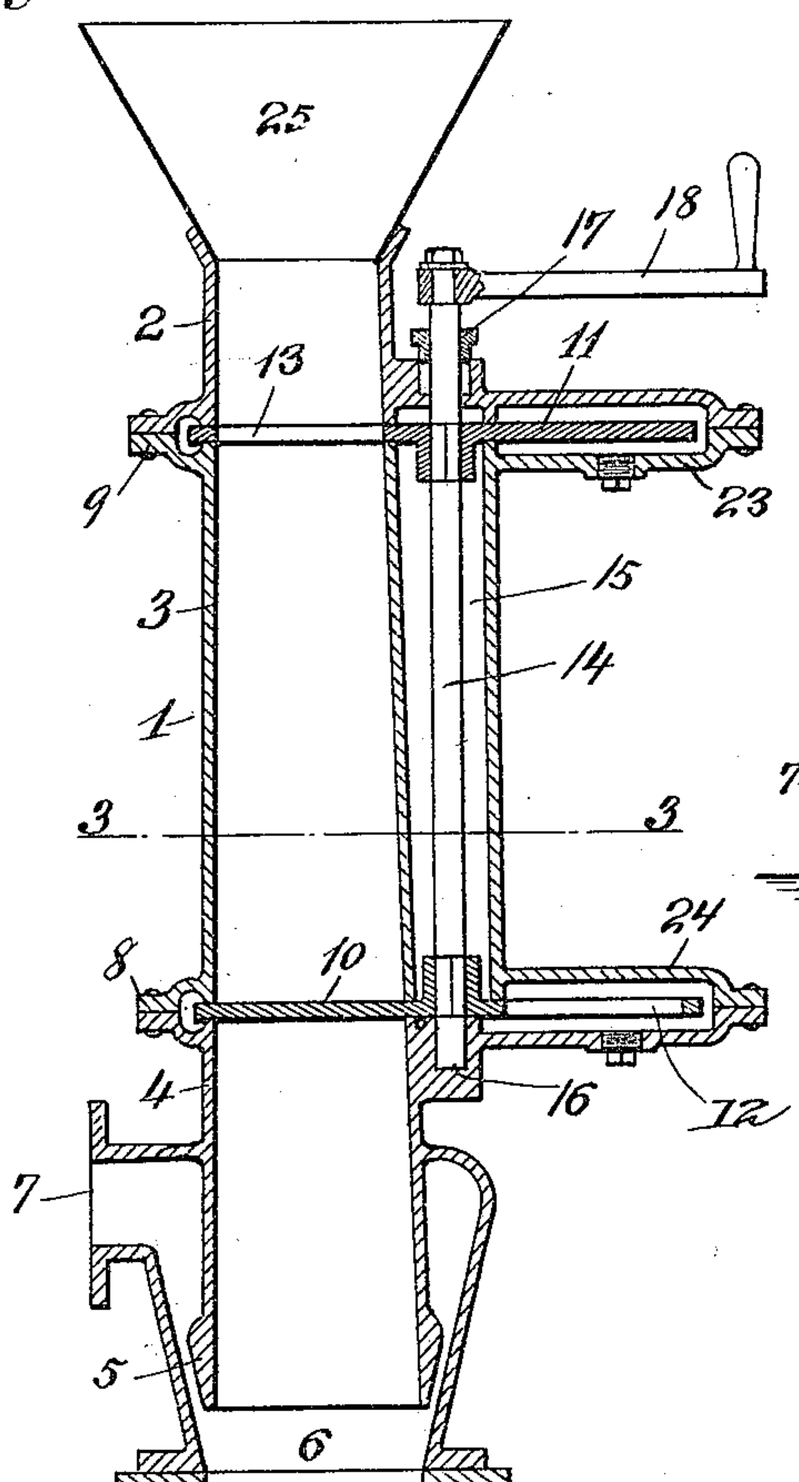


Fig. 4

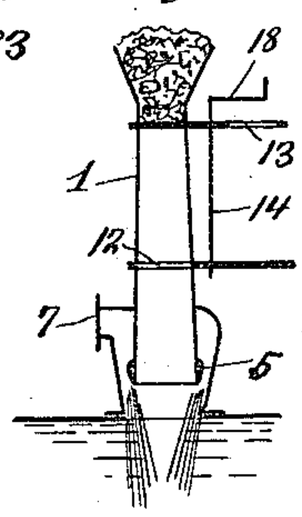


Fig. 5

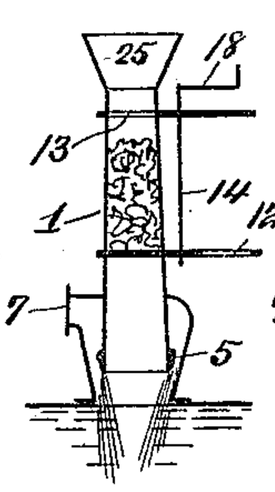
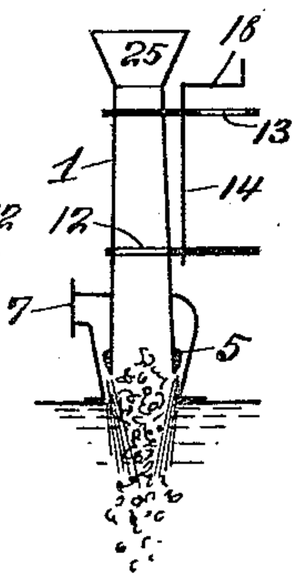


Fig. 6



Witnesses:

A. K. Schneider

Geo. Uker

John F. Metten Inventor

By his Attorneys

Edwards, Sayer & Wooster

UNITED STATES PATENT OFFICE.

JOHN F. METTEN, OF PHILADELPHIA, PENNSYLVANIA.

UNDER-WATER ASH-EJECTOR.

990,369. Specification of Letters Patent. Patented Apr. 25, 1911.

Application filed April 15, 1910. Serial No. 555,702.

To all whom it may concern:

Be it known that I, JOHN F. METTEN, a citizen of the United States, residing at Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Under-Water Ash-Ejectors, of which the following is a full, clear, and exact specification.

This invention relates to ash or refuse ejectors such as are used on ships for discharging ashes or refuse directly into the sea through the skin of the vessel.

Devices for this purpose heretofore proposed first crush the ashes before discharging into a tube leading though the skin of the ship, and then apply compressed air or hydraulic means for pushing the material out through the tube. Such devices are objectionable because the ashes when impelled through the tube under applied pressure have a severe scoring and abrading effect upon the tube, causing wear, and eventually perforation, allowing the water to leak into the ship. Also the ashes issue in a loose condition and are not thrown entirely clear of the ship, unless a high and uneconomical ejecting pressure is used, which thereby increases the scoring and abrading effect on the tube. Moreover, where crushers are used, considerable fine powder is produced which retains the air after being discharged and consequently floats into other openings in the ship, such as those for pumps or condensers, and also into the stern tube stuffing boxes and bearings.

According to this invention, I propose to construct an apparatus wherein the use of crushers will be avoided and the material will pass through the ejector tube principally by gravity, without scoring or abrading the sides of the tube, and be discharged from the end of the tube through the skin of the ship in a wet compact mass at such a velocity that it will not again come near the ship's surface so as to enter other openings or bearings.

In carrying out the invention, I provide an ejector tube opening through the skin of the ship and having at its inner end a receiving portion or hopper, and intermediately, transversely movable gates which open alternately to allow the material to pass by gravity from the receiving portion through the gates in succession. The ejector tube is tapered or flared outwardly from the outer gate to the skin of the ship, and just beyond the outer end of the flared ejector tube is provided an annular hydraulic nozzle surrounding the tube and connected with a suitable pump arranged to supply water under pressure to the nozzle which will flow outwardly in a solid stream completely inclosing the flared end of the ejector tube, creating a suction in the ejector tube, and also relieving the static pressure of the sea therein. The result will be that the ashes will pass through the flared ejector tube principally by gravity without rubbing against the tube, and at the nozzle will be completely surrounded by the hydraulic discharge jet and compacted thereby into a practically solid mass, which will be carried a considerable distance from the ship before the force is spent, depending upon the force of the hydraulic jet.

In the preferred construction shown in the accompanying drawings, the parts are so arranged that the discharge of material is practically continuous while material is supplied and the gates operated, as will be hereinafter fully pointed out.

In the accompanying drawings Figure 1 is a central vertical section of an apparatus embodying the invention; Fig. 2 is a plan view, the hopper being omitted; Fig. 3 is a section on line 3, 3, of Fig. 1, and Figs. 4, 5 and 6 are views showing diagrammatically the operation of an apparatus embodying the invention.

The ejector tube consists of a lower flared section 4, intermediate section 1, which may be flared as shown for the purpose of preventing the material from binding therein, and an upper section 2, which is also preferably flared. Attached to the upper receiving section 2 is a hopper 25. At each end of the intermediate section 3 are flat circular gates 10, 11, mounted on a shaft 14, journaled outside the ejector tube in a housing 15, the gates being within the housings 24, 23, respectively, and being fitted to be water tight where in contact with the ejector tube. As will be seen, the joints 8 and 9 between the tube sections are recessed in order to receive the peripheries of the gates 10, 11, and form seating surfaces for the gates on the lower ends of the sections 2, 3 and 4 when subjected to the static pressure of the sea, sufficient clearance being provided to permit rotation of the disks. The gates 10, 11 are both rotated at the same time when

the shaft 14 is turned, as by the crank 18, and in gate 10 is provided a passage 12 and in gate 11 a passage 13, which passages are angularly displaced as shown in Fig. 2, so that both passages will not be open at the same time. The lever 18 is provided with lugs 20 and 21, which engage a stationary lug 19 formed on the upper tube section 2, as shown in Fig. 2, so as to limit the movement of the lever to such an arc that one or the other of passages 12, 13 will be opened at the extreme positions of the lever.

The parts as thus far described operate to alternately close the ejector tube at gates 10 and 11, and by alternately operating the lever 18 material will be charged into the hopper as shown in Fig. 4, then discharged into the intermediate section 3 as in Fig. 5 by opening gate 13, and then into the lower section 4 by opening gate 12 and closing gate 13, as shown in Fig. 6. The material falls by gravity through the sections 2, 3, 4, and has little tendency to score or abrade the tube sections,—even though not crushed into powder,—because of the flaring of the ejector tube, and also because the material is wet as soon as it passes into the intermediate section 3, and is not violently pushed by an extraneous force applied from behind upon the opening of the lower gate. Thus while the intermediate section is discharged through the lower gate the hopper is being filled again and vice versa, so that there is practically a continuous discharge. By suitably proportioning the distance between the gates and the size of the ejector tube the desired quantities of material can be handled without delay, if the gates be operated as above described.

An important advantage of the gate construction herein described is that they are self clearing and the material does not get into the seats or joints and prevent them from being opened or closed, as has happened in some of the prior constructions.

In order to cause the material in the lower section 4 to be discharged in a solid compacted mass to a considerable distance from the ship, there is provided in line with and slightly beyond the outer end of the ejector tube a preferably conical nozzle 6, which flares inwardly from the skin of the ship so as to form a narrow annular passage around the end of the lower ejector tube section 4, as shown in Fig. 1. This nozzle and annular passage are connected to a pipe 7, to which will be connected a suitable pump for supplying water under pressure, not herein shown, so as to produce an annular discharge around the outer end of the ejector tube.

The effect of the annular stream of water discharged under pressure around the end of the ejector tube is to create a degree of suction in the ejector tube, which not only overcomes the static pressure of the sea, normally opposing fall of the material through the tube, but causing the material to be compacted into a mass as it issues from the tube. At the same time the velocity of the mass is accelerated so that it will be carried a considerable distance from the ship before it breaks up. Consequently, the mass will not be likely to rise and enter other openings in the ship or the stern bearings, which has happened with ejectors heretofore proposed, wherein the material is ejected in loose or scattered condition through the tube by extraneous force admitted to the ejector tube in the rear of the material.

It will therefore be seen that the invention comprehends broadly the provision of means at the end of the ejector tube adjacent the skin of the ship for creating a suction which overcomes the static pressure of the sea within the lower portion of the ejector tube and against the gates, thereby allowing the material to fall freely through the ejector tube without scoring or abrading action, and then accelerating and compacting the mass by hydraulic pressure as it issues from the ship and projecting it to a considerable distance therefrom before it can break up. Preferably, the hydraulic nozzle will be narrowed toward the end as herein shown in order to project a conical stream, and also the annular passage will be continuous so that the stream will be solid, but the annular stream might be varied by changing the form of the nozzle, or be an annular series of jets surrounding the end of the ejector tube, and still be within the scope of the invention. Also, various modifications and changes in the details of construction may be made without departing from the scope of the invention.

Having thus described my invention, I declare that what I claim as new and desire to secure by Letters Patent, is—

1. In an ash ejector adapted to discharge below water level the combination of a tube opening below the water level, a plurality of gates at separated points in said tube, said gates having discharge openings displaced relatively to each other, and means disposed at the extreme end of said tube and below the lower gate for discharging a fluid under pressure beyond the end of said tube.

2. In an ash ejector adapted to discharge below water level, the combination of a tube, a plurality of gates in said tube, said gates having discharge openings displaced relatively to each other, and an annular nozzle disposed at the lowermost portion of said tube permitting a fluid to be discharged under pressure.

3. In an ash ejector adapted to discharge below water level, a tube, a plurality of disks mounted eccentrically with respect to said tube, said disks having discharge openings

out of register with each other, means for moving said disks, and means for discharging a liquid at the end of said tube.

4. In an ash ejector adapted to discharge below water level, a tube, a plurality of disks mounted eccentrically with respect to said tube, said disks having discharge openings out of register with each other, means for moving said disks, and means for discharging a liquid under pressure at the end of said tube.

5. In combination with a ship having a hole therein, a tube having a discharge opening registering with the hole in the ship bottom, a plurality of disks mounted in said tube, said disks having openings out of alinement with each other, means for moving said disks so that when one opening in a disk communicates with said tube, the opening of another disk is out of communication with said tube, and hydraulic means disposed proximate the end of said tube for effecting a fluid discharge under pressure.

6. In combination with a ship having a hole in its bottom, of an ejector adapted to discharge ashes and the like, comprising a tube, gates disposed in said tube, the discharge openings of said gates being so disposed that when any one discharge opening communicates with said tube the discharge opening of the other gate is out of communication with said tube, means for operating said gates, and means for discharging outwardly at the end of said tube an annular body of fluid.

7. In combination with a ship, an ejector tube having a discharge end opening through the shell of the ship below the water line, hydraulic means at said discharge end and surrounding the tube for overcoming external static pressure and accelerating the discharge, a hopper disposed to discharge material by gravity into said tube, and means between said hydraulic means and said hopper permitting continuous passage of material by gravity through said tube and at all times preventing inflow of water independently of said hydraulic means.

8. In an ash ejector adapted to be disposed below the water level, the combination of a straight, outwardly flaring tube, means for producing an annular discharge of fluid surrounding the end of said tube, and means between said fluid discharge end and the other end of said tube permitting material charged into said tube to fall by gravity through the same, said means at all positions substantially precluding passage of water through said tube independently of said fluid discharge.

9. The combination in a device for discharging materials against an external pressure, of a discharge tube having an end portion normally exposed to the external pressure, means surrounding the discharge end of the tube for relieving said pressure in said end portion, and a plurality of alternately operating gates for permitting passage of material toward the end portion of said tube and at all times preventing inflow of external pressure.

10. The combination in a device for discharging material against a static water pressure, of a discharge tube having its discharge end normally exposed to said water pressure, gate mechanism in said end portion permitting material to pass substantially continuously through said end portion by gravity without admitting external pressure, and means outside said gate and at the end of said discharge tube for creating in said end portion an eduction pressure tending to draw material out of said tube and project it outwardly in a compact mass beyond the end of the tube.

11. The combination in a device for discharging material against a static water pressure, of a discharge tube having its discharge end normally exposed to said water pressure, a gate in said end portion, and hydraulic means outside said gate and at the end of said discharge tube for creating in said end portion an eduction pressure tending to draw material out of said tube and project it outwardly in a compact mass beyond the end of the tube.

12. The combination in an ash ejector adapted to discharge below water level, with an ejector tube opening through the skin of a ship, and means for controlling the passage of material therethrough by gravity while preventing inflow of water to the ship, of fluid pressure means for compacting the material as it issues from the tube and projecting it outward at an increased velocity away from the surface of the ship.

13. The combination in an ash ejector adapted to discharge below water level, with an ejector tube opening through the skin of the ship below water level, and means controlling the passage of material therethrough by gravity while preventing inflow of water to the ship, of a nozzle opening through the skin of the ship for surrounding the material with an annular hydraulic discharge as it leaves the tube.

14. The combination in a ship with a vertically disposed tube opening through the ship below the water line and having a seat intermediate its ends, of a flat rotatable disk having an aperture arranged to cooperate with said seat to open and close the tube, a water-tight casing inclosing said disk, and means for operating said disk to discharge material from the ship while preventing admission of water.

15. The combination in a ship with a vertically disposed tube having a seat at its lower end, and a flat rotatable gate having

an aperture, mounted to coöperate with said seat to open and close said tube, and means closing another portion of said tube when said aperture opens the tube, of an outwardly tapering discharge tube leading from said first named tube and opening through the skin of the ship below the water line, and an annular nozzle opening through the skin of the ship and surrounding the wide end of said tapered tube for discharging an annular hydraulic stream outwardly to carry material discharged from the tube in a compact mass away from the ship.

In testimony whereof I affix my signature, in presence of two witnesses.

JOHN F. METTEN.

Witnesses:
I. ARROTT,
ROLAND L. HOWE.

193,434 Wilkinson
583,349 Wendet K
735,582 Pape