Oct. 25, 1932. H. F. SCHMIDT 1,884,282

MARINE SEA CHEST

Filed Aug. 29, 1931 2 Sheets-Sheet 1

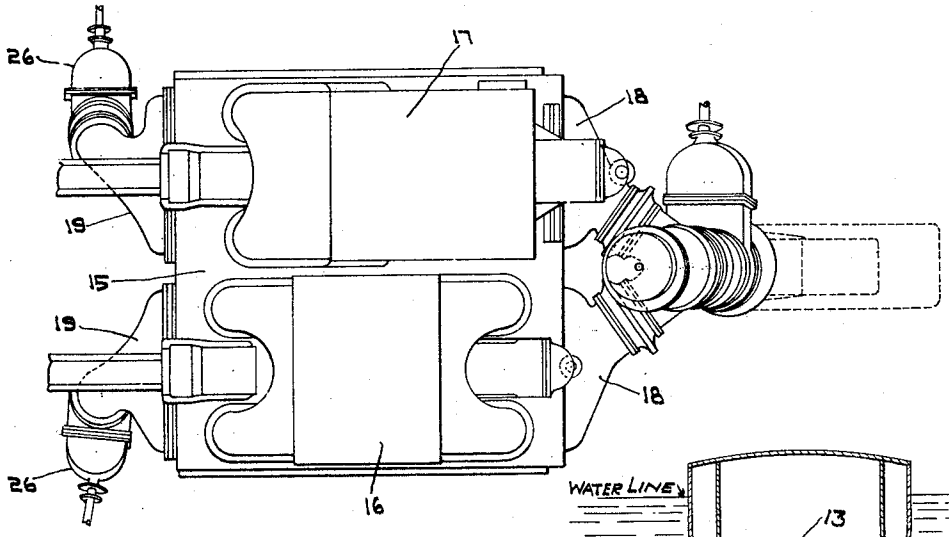


FIG. 2.

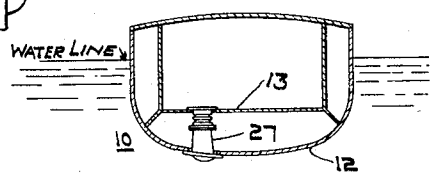


FIG. 3.

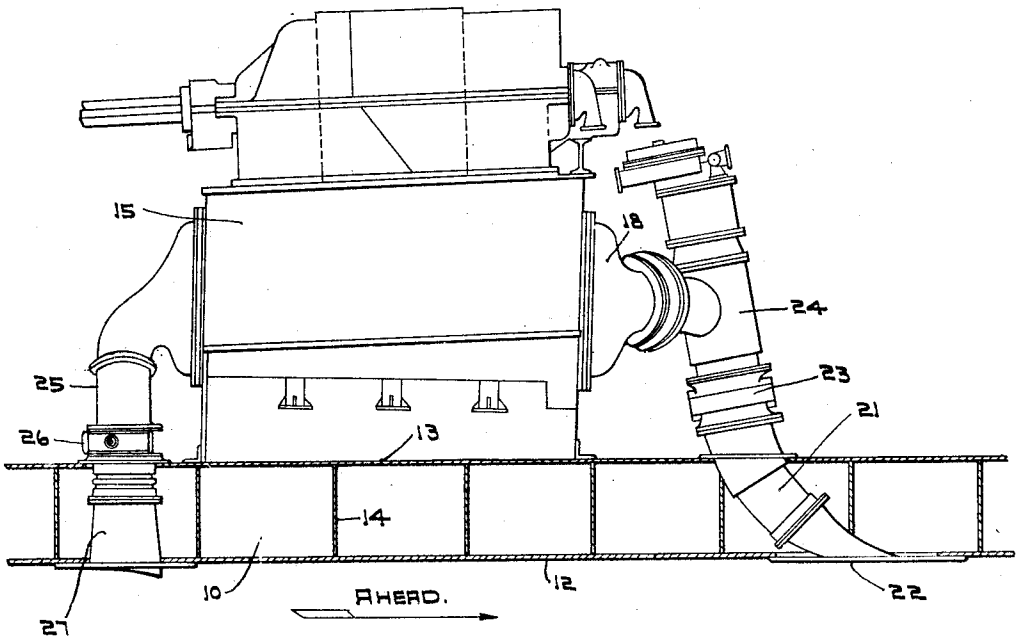


FIG. 1.

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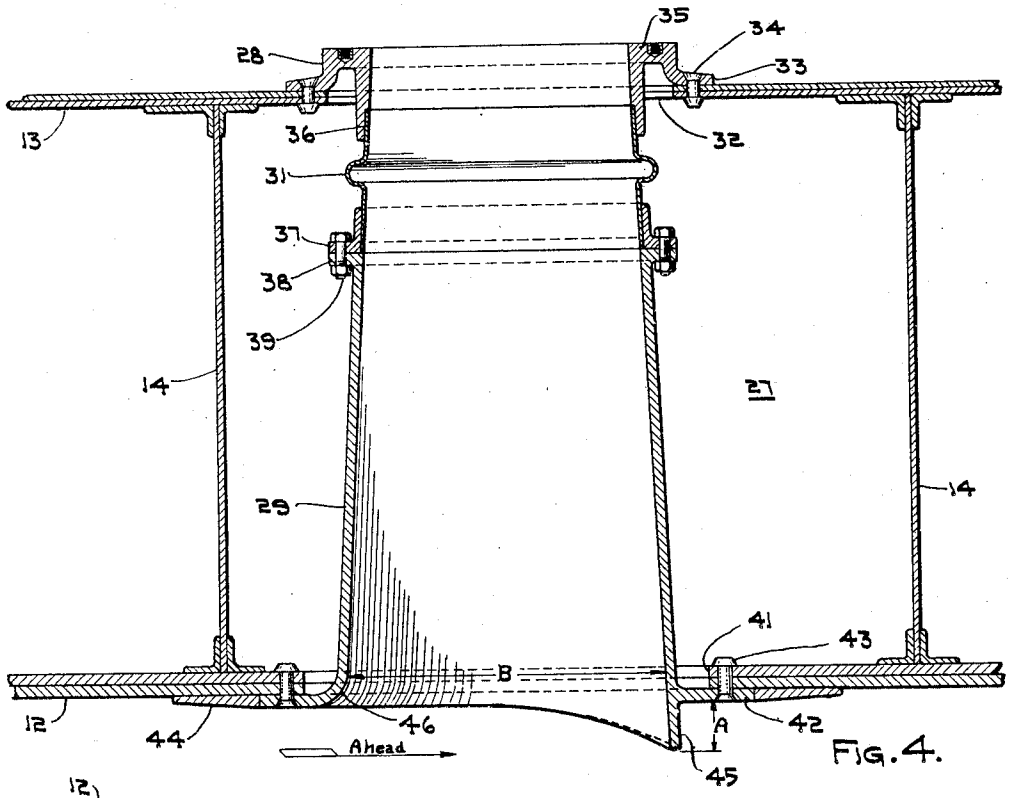


FIG. 4.

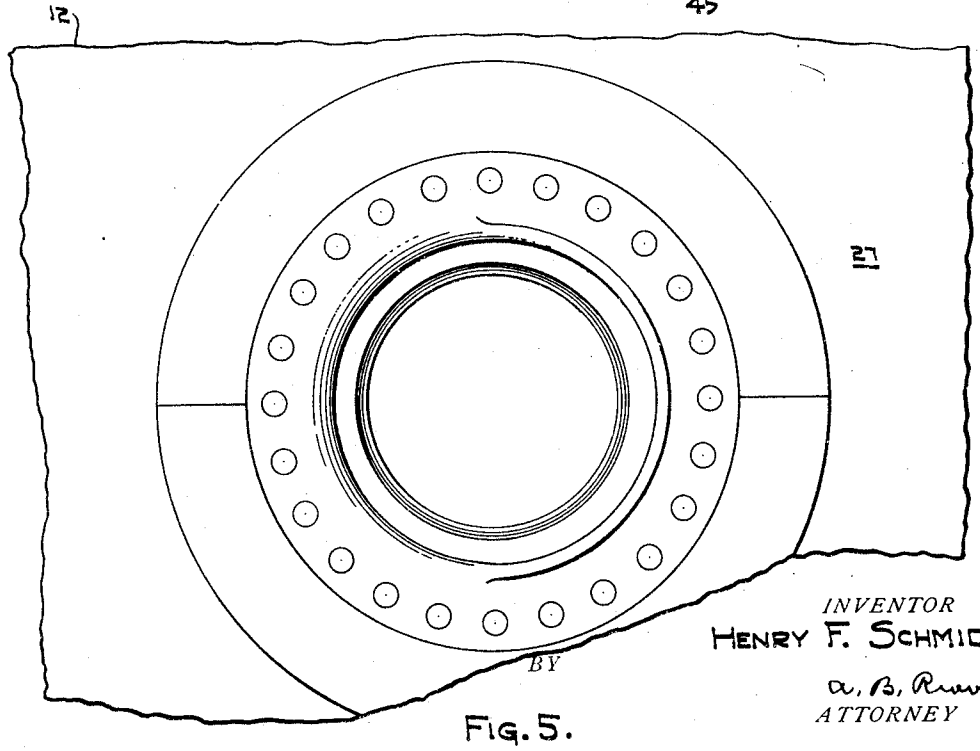


FIG. 5.

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MARINE SEA CHEST

Application filed August 29, 1931. Serial No. 560,193.

My invention relates to sea chests for marine piping systems and particularly to sea chests of the discharge type which are located below the water line and it has for an object to provide apparatus of the character designated which shall be capable of discharging the water beneath the surface of the sea with less resistance and consequently with greater efficiency than the sea chests of the prior art.

It has for still another object to provide apparatus of the foregoing character which, consistent with a given capacity, shall occupy less space, entail less weight and be less costly to manufacture than the sea chests of the prior art.

These and other objects are effected by my invention, as will be apparent from the following description and claims taken in connection with the accompanying drawings, forming a part of this application, in which:

Fig. 1 is a view, in sectional elevation, of a marine condenser circulating system which embodies one form of discharge sea chest arranged in accordance with my invention;

Fig. 2 is a plan view of the condenser circulating system shown in Fig. 1;

Fig. 3 is a transverse, sectional view taken through a ship, and showing the relation of the sea chest therein.

Fig. 4 is a detail view, in sectional elevation, of the discharge sea chest embodied in the circulating system illustrated in Figs. 1 and 2; and

Fig. 5 is a view, in elevation, looking at the under or discharge side of the sea chest shown in Fig. 4.

A sea chest may be defined as a conduit fitting open to the sea, secured to the skin of the ship and connected to some piping system of the ship for the purpose of admitting sea water to the piping system or for discharging water from the piping system. Sea chests may be divided into two types, the inlet type and the discharge type, the present invention relating to sea chests of the discharge type and more particularly to those located below the water line, which sea chests must discharge the water into the sea against the resistance offered by the sea water flowing past the hull of the ship.

In the greater majority of installations, the overboard discharge sea chests are so secured to the hull of the ship that their flow axes extend in the transverse plane of the ship, that is, a plane which is generally parallel to the ship's frames. In this way, the sea chest can be attached to the hull of the ship between an adjacent pair of frames, thereby involving very little alteration to the ship's normal hull structure. With sea chests so arranged, it has been the practice to make the discharge or exit end of the sea chest substantially flush with the hull of the ship. I have found, however, that with the latter arrangement, the sea water imposes considerable back pressure on the discharge end of the sea chest, thereby retarding the flow of water through the sea chest.

In order to reduce this back pressure, overboard discharge sea chests have sometimes been inclined toward the stern of the ship. This arrangement is objectionable because several of the ship's frames must be materially altered to accommodate the inclined position of the sea chest. Furthermore, the inclined position creates even a greater back pressure when the ship is moving astern.

I have, therefore, conceived of a form of discharge sea chest which may be installed with its axis in the transverse plane of the ship but which is so constructed and arranged that it is more efficient and adds more assistance to the flow of the water than even those sea chests which are installed at a very severe angle. In accordance with my invention, I provide a lip or wall projecting outboard from the hull structure on the forward side of the discharge end of the sea chest, the function of the lip being to deflect the sea water away from the outlet end of the sea chest, thereby tending to create a void space into which the water from the sea chest may flow. In addition, I prefer to round off the edge of the after side of the discharge end of the sea chest so as to afford a more ready flow passage for the water discharged through the sea chest into the void space created by the lip. While the protruding lip adds some resistance to the movement of the hull of the ship through the water, nevertheless, I have found

that the energy required to overcome this resistance is several times compensated for by the reduction in energy required to circulate the water through the discharge sea chest.

Referring now to the drawings for more detailed description of my invention, I show in Figs. 1 to 3 a ship's structure 10 which embodies a hull structure 12 and a water-tight, inner plating structure 13 spaced inwardly from the hull structure. Longitudinally spaced, transversely extending ship's frames are indicated at 14. While my discharge sea chest is applicable to any of numerous water circulating systems installed aboard a ship, in the present embodiment I show it applied to a system for circulating cooling water through a steam condenser, indicated at 15.

The condenser 15 is supported upon the inner plating structure 13 and, in turn, has supported thereon prime movers, such as, for example, steam turbines 16 and 17, for propelling the ship. The turbines 16 and 17 discharge exhaust steam into the condenser 15 in a manner well-understood in the art. The forward end of the ship is to the right of the illustration and the astern end of the ship is to the left of the illustration, the ahead motion of the ship being indicated by the arrow.

The condenser 15 is provided with a pair of inlet water boxes 18 located at its forward end and with a pair of discharge water boxes 19 located at its after end. Cooling water is supplied to the inlet water boxes 18 by a scoop or inlet fitting 21 which communicates at its lower or inlet end 22 with the sea and its upper or discharge end with a sea valve 23. The latter in turn connects through suitable piping 24 with the inlet water boxes 18. For a detailed description of the construction and operation of the inlet fitting 21, reference might be made to my copending application, Serial No. 547,923, filed June 30, 1931, entitled Marine condenser circulating system and assigned to the Westinghouse Electric & Manufacturing Company.

Each of the discharge water boxes 19 communicate through separate conduits 25 and sea valves 26 with overboard discharge sea chests 27 constructed and arranged in accordance with my invention.

Referring now to Figs. 4 and 5 for a detailed description of the sea chests 27, each sea chest embodies an inboard section 28, an outboard section 29, and an intermediate connecting section 31. The inboard section 28 is inserted through a suitable opening 32 provided in the inner plating structure 13, the direction of insertion being from the inner side of the inner plating structure. The section 28 is provided with a supporting flange 33 secured in a fluid-tight manner to the inner plating structure 13, as by rivets 34. The inboard end of the section 28 is provided with a suitable flange 35 for connecting the same to the sea valve 26.

The outboard end of the section 28 is counterbored, as at 36, to accommodate the intermediate section 31. The latter is fixedly secured to the inboard section 28 as by brazing while, at its outboard end, it is provided with a flange 37 secured to a similar flange 38 provided on the outboard section. The flanges 37 and 38 are preferably joined by some disconnectable means, such as, for example, bolts 39.

The outboard section 29 is inserted from outside the hull of the ship through a suitable opening 41 provided in the latter. It is provided with an outboard securing flange 42 which is flush or is nearly flush as practical with the hull structure. The flange 42 is secured to the hull structure in a water-tight manner by the rivets 43. A chamfered doubling plate 44 is preferably fitted about the flange 42 so as to decrease hull resistance.

The outboard end of the section 29 is provided with a protruding lip 45. The lip 45 is disposed on the forward side of the sea chest, the ahead motion of the ship being indicated by the arrow. Preferably, the lip 45 is of greatest extent at the forward side of the sea chest and tapers toward the hull in the direction of the after end of the sea chest. In the present embodiment, the lip 45 is located entirely in the forward half of the sea chest, the after half being flush with the flange 42. In addition, the discharge edge of the after half of the sea chest is provided with a substantial radius of curvature, such as 46, so as to facilitate the egress of the water into the sea. In the present embodiment, the radius 46 extends about the entire after half of the sea chest.

The sea chest 27 may be readily assembled in the ship's structure by inserting the section 28 with the section 31 assembled thereon through the opening 32, the direction of insertion being from the inner side of the inner plating structure. The section 29 may be readily inserted through the opening 41 from the outer side of the hull structure after which the bolts 39 may be installed.

As disclosed and claimed in my copending application, Serial No. 547,120 filed June 26, 1931, entitled Marine sea chest, and assigned to the Westinghouse Electric & Manufacturing Company, the intermediate section 31 may be composed of some material, such as annealed copper, which is relatively soft, so that, should there be any displacement of the hull structure 12 toward the inner plating structure 13, the intermediate section 31 may readily deform without impairing the water-tight integrity of the fitting.

In the embodiment illustrated, the flow-area of the sea chest 27 is of circular cross-section throughout. Preferably, the sea chest 27 diverges in flow-area in an outboard direction, the velocity of flow being higher at the inboard end and lower at the discharge

end. This permits a smaller valve 26 and a smaller conduit 25 to be used, thereby effecting a saving in weight and space occupied.

From the foregoing description, the operation of my invention will be apparent. Assuming that the ship is moving in an ahead direction, that is, the direction indicated by the arrow, there is a relative velocity between the hull of the ship and the sea water adjacent thereto. This causes a circulation of water through the inlet fitting 21 and the condenser 15, the water being finally discharged to the sea through conduits 25, valves 26 and sea chests 27. Because of the lip 45, the sea water is deflected away from the exit end of the sea chest 27 so that there is a tendency to create a void space in the area immediately adjacent to the exit end of the sea chest. This permits the water flowing through the sea chest to reach the sea with considerably less resistance to flow than would be the case if the lip 45 was omitted. The discharge of water into the sea is further facilitated by the substantial rounding of the after edge of the sea chest, whereby the water more readily enters the void space created by the lip.

From the foregoing, it will be apparent that I have provided a form of discharge sea chest wherein its axis may extend in the transverse plane of the ship. In other words, the axis of the sea chest may be substantially parallel with the ship's frames. However, by providing the lip 45, the back pressure normally acting against the outer end of such a sea chest is avoided and, hence, the resistance to the flow of the water through the sea chest and into the sea is very materially lessened. The height of the lip, that is, the distance "A" in Fig. 4, should be proportioned in accordance with the diameter of the sea chest, the diameter referred to being indicated at "B" in Fig. 4. I have found from tests that very effective results can be obtained with lips of various heights and that the foregoing proportions are merely given by way of example to facilitate the understanding of the invention.

While I have shown my invention in several forms, it will be obvious to those skilled in the art that it is not so limited, but is susceptible of various other changes and modifications, without departing from the spirit thereof, and I desire, therefore, that only such limitations shall be placed thereupon as are imposed by the prior art or as are specifically set forth in the appended claims.

What I claim is:

1. In a ship having an opening in its hull structure located below the water line for the discharge of water, a discharge sea chest embodying a conduit secured to the hull structure about the opening, and a lip projecting beyond the hull structure about the opening, said lip having its maximum projection disposed forward of the center of the opening and having its projecting portion terminating approximately athwartship of the center of the opening.

2. In a ship having an opening in its hull structure located below the water line for the discharge of water, a discharge sea chest embodying a conduit of circular flow-area secured to the hull structure about the opening therein, and a lip projecting beyond the hull structure about the forward side of the opening, the maximum projection of said lip beyond the hull structure being approximately one-fifth the diameter of the conduit.

3. In a ship having an opening in its hull structure located below the water line for the discharge of water, a discharge sea chest embodying a conduit having its axis extending in substantially a transverse plane of the ship, a flange provided on the conduit near its outboard and discharge end, means for securing the flange about the opening in the hull structure, and a lip extending about the forward side of the discharge opening, said lip projecting outboard beyond the hull structure and having its projecting distance greatest at the forward side of the discharge opening and having its projecting distance tapering inboard to approximately the athwartship center line of the discharge opening, the after side of the discharge opening being substantially flush with the hull structure of the ship and having its discharge edge provided with a substantial radius of curvature so as to facilitate egress of the water.

4. In a ship having a hull structure and a water tight inner plating structure spaced from the hull structure, a discharge sea chest located below the water-line of the ship and embodying an inner conduit member fixedly secured to the inner plating structure, an outer conduit member engaging the hull structure and being open to the sea at the hull structure, a flexible intermediate member connecting the inner and outer conduit members, a flange provided near the outboard end of the outer conduit member, means for fixedly securing said flange to the hull structure, and a lip protruding outboard of the hull structure and extending about the forward side of the outer conduit member for deflecting sea water away from the open end of the sea chest.

5. In a ship having an opening in its hull structure located below the water line for the discharge of water, a discharge sea chest embodying a conduit having its axis extending in the transverse plane of the ship, said conduit having a relatively small inboard inlet flow-area and a relatively larger outboard discharge flow-area and said conduit diverging in a direction from the inlet toward the discharge, means for fixedly securing the discharge portion of the conduit to the hull

structure, and a lip projecting beyond the hull structure about the forward side of the discharge end of the conduit.

6. In a ship having an opening in its hull structure located below the water line for the discharge of water, a discharge sea chest embodying a conduit connected to the hull structure about the opening, and a lip projecting beyond the hull structure and disposed entirely on the forward side of the opening, the after side of the conduit conforming with the contour of the hull structure and being substantially flush therewith and having a substantial radius of curvature on its discharge edge so as to facilitate egress of the water.

7. In a ship having a hull structure and a water-tight inner plating structure spaced from the hull structure, a discharge sea chest located below the water line of the ship and embodying an inner conduit member fixedly secured to the inner plating structure, an outer conduit member engaging the hull structure and being open to the sea at the hull structure, a flexible interconnecting member connecting the inner and outer conduit members, a flange provided near the outboard end of the outer conduit member, and means for fixedly securing said flange to the hull structure.

In testimony whereof, I have hereunto subscribed my name this 24th day of August, 1931.

HENRY F. SCHMIDT.