Feb. 1, 1938. H. F. SCHMIDT 2,106,961

CONDENSER SCOOP APPARATUS

Filed Oct. 5, 1935 4 Sheets-Sheet 1

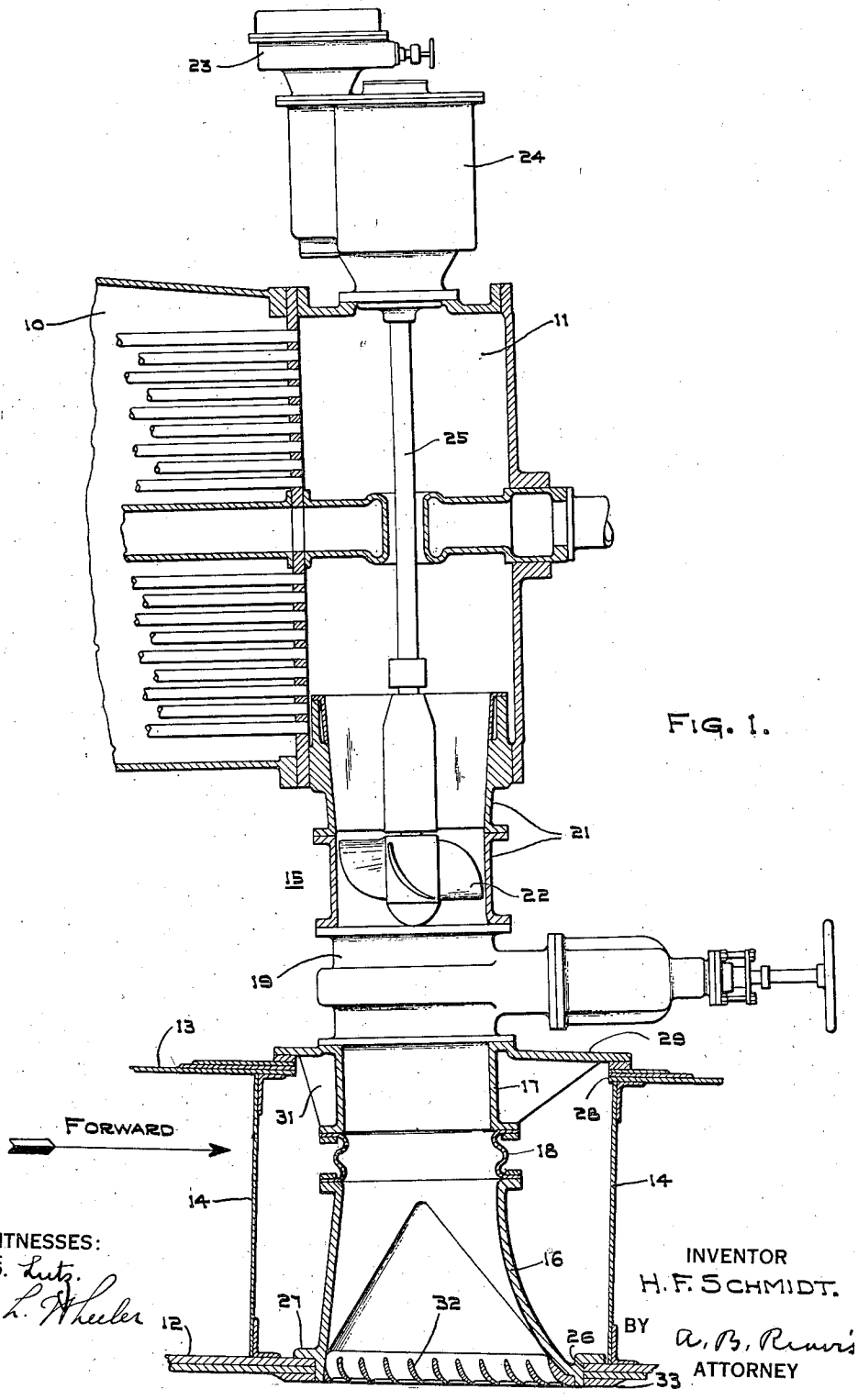


FIG. 1.

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CONDENSER SCOOP APPARATUS

Filed Oct. 5, 1935 4 Sheets-Sheet 2

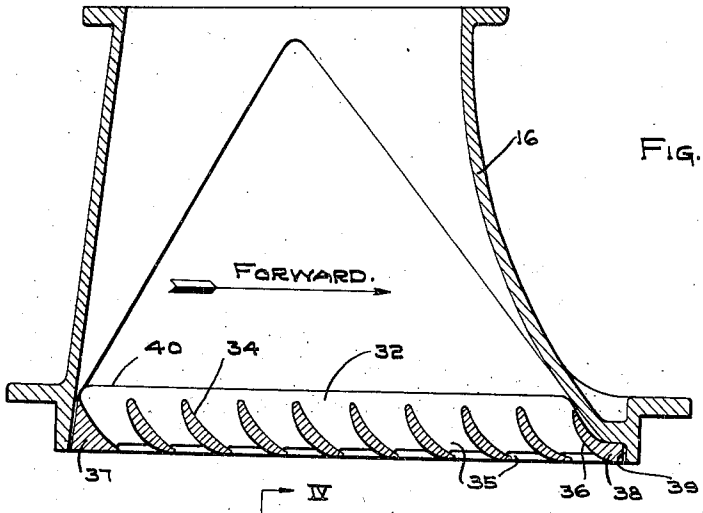


FIG. 3.

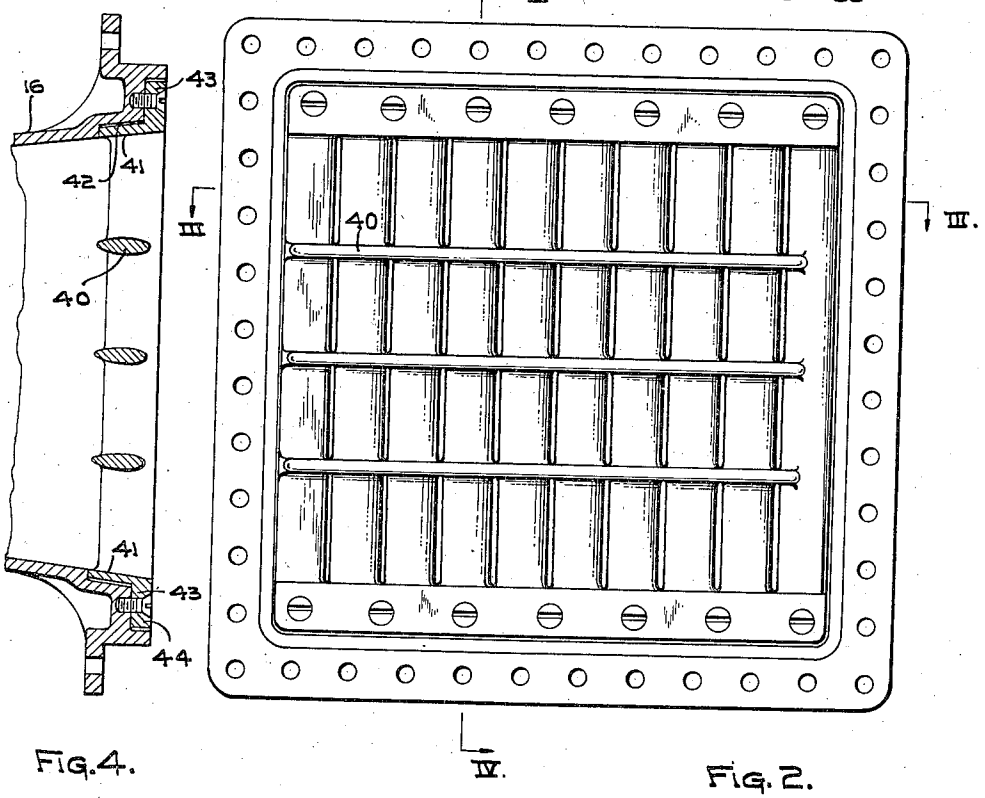


FIG. 4.

FIG. 2.

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CONDENSER SCOOP APPARATUS

Filed Oct. 5, 1935 4 Sheets-Sheet 3

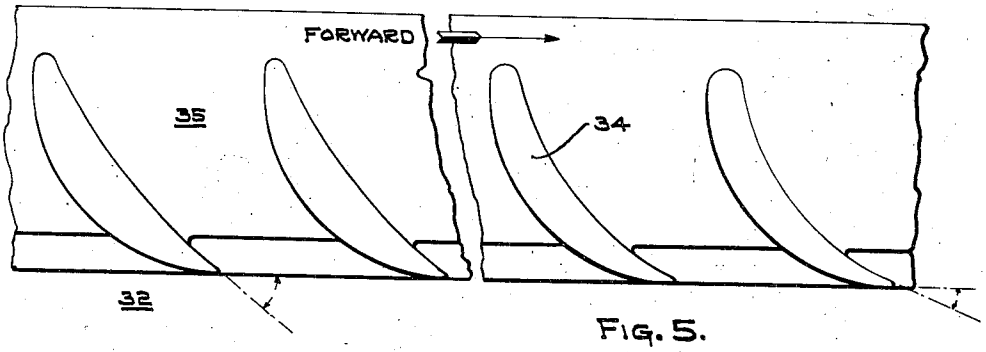


FIG. 5.

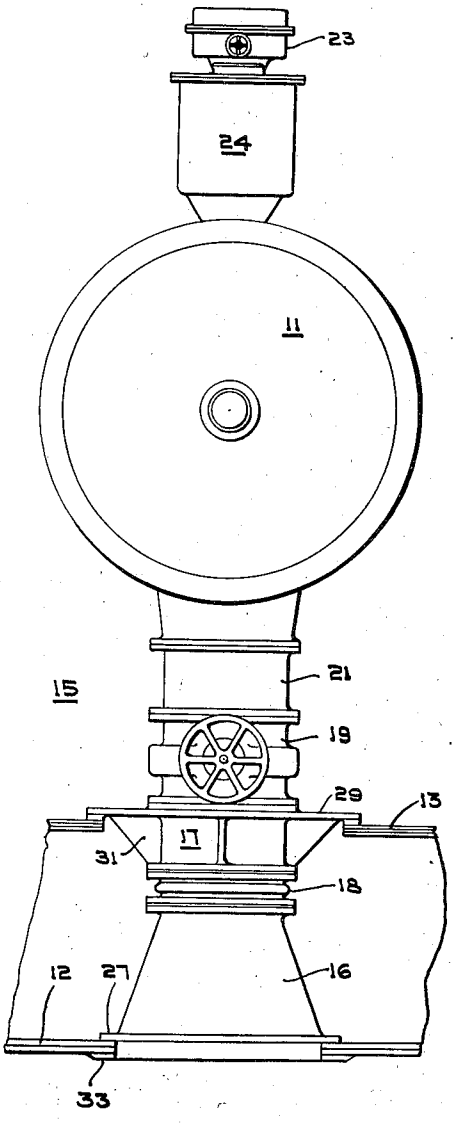


FIG. 6.

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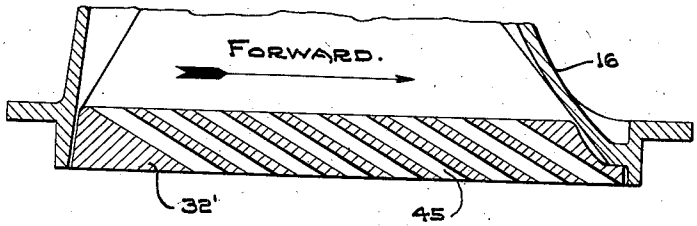
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CONDENSER SCOOP APPARATUS

Filed Oct. 5, 1935 4 Sheets-Sheet 4

FIG. 7.



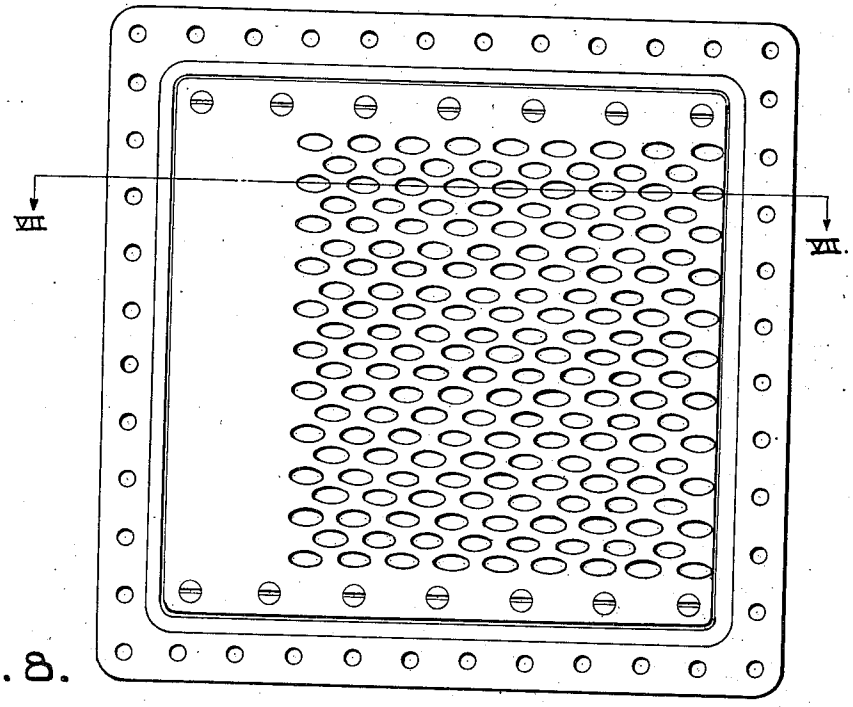


FIG. 8.

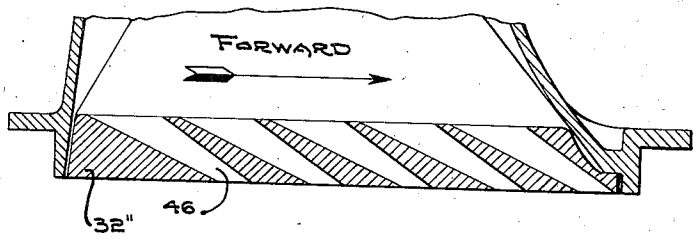


FIG. 9.

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Patented Feb. 1, 1938 2,106,961

UNITED STATES PATENT OFFICE

2,106,961

CONDENSER SCOOP APPARATUS

Henry F. Schmidt, Lansdowne, Pa., assignor to Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., a corporation of Pennsylvania

Application October 5, 1935, Serial No. 43,668

10 Claims. (Cl. 257—26)

My invention relates to condenser scoop apparatus for a ship, that is, apparatus, utilizing the velocity energy of approach of sea water relative to the ship for effecting circulation of sea water through the condenser or other apparatus of the ship. Such scoop apparatus comprises conduit or guide vane structure for guiding and turning the flow of water from a direction rearward with respect to the ship to a direction inwardly of the ship for use therein.

The object of the present invention is to provide improved condenser scoop apparatus.

Another object is to provide condenser scoop apparatus of reduced space requirements, reduced weight, and reduced cost.

A particular object is to provide condenser scoop apparatus which does not protrude substantially beyond the hull of the ship and which may be disposed entirely between adjacent frames of the ship, thereby eliminating the necessity of altering any of the ship's frames.

A further object is to provide condenser scoop apparatus which is substantially flush with the hull of the ship, which may be disposed entirely between adjacent ship's frames, and which converts velocity energy of approach of the water into pressure for partially or wholly effecting the flow of the water through the condenser or other apparatus.

In my patents, Nos. 1,862,282 and 1,893,039, I have disclosed condenser scoop apparatus which converts the velocity energy of approach of the water into static head or pressure for effecting flow of water through the condenser. One object of the present invention is to improve upon the apparatus shown in Figs. 12 and 13 of Patent 1,862,282, which apparatus is disposed wholly between adjacent ship's frames, by providing apparatus which does not project beyond the hull of the ship but is substantially flush therewith. Another object is to improve upon the form shown in Fig. 19 of said patent and in Patent 1,893,039, which apparatus is substantially flush with the hull of the ship, by providing apparatus which may be disposed entirely between adjacent ship's frames.

In accordance with the present invention, I provide an inlet conduit extending from the hull of the ship to the condenser, or other apparatus to which it may be desired to supply sea water, which conduit may be disposed, in connection with the present invention, wholly between adjacent ship's frames. I provide a strainer plate at the outboard or inlet end of said inlet conduit, the outer side thereof being substantially flush with the hull of the ship. The strainer plate constitutes the scoop of the present apparatus. It is formed with passages therein which open into the outer side thereof in a substantially forward direction, thereby providing, upon forward movement of the ship, flow of sea water rearwardly into said passages and through the same into the conduit.

The strainer plate preferably comprises a series of vanes extending athwartships and curved from rearward to upward direction to change the direction of water flow accordingly. The vanes are preferably formed so that the passages therebetween diverge, thereby effecting velocity pressure conversion of the sea water as it passes therethrough.

The static head or pressure of the sea water provided by such velocity pressure conversion may be sufficient alone to effect the required flow of sea water through the condenser, or it may be used to reduce the head required to be developed by the circulating water pump, in which case it is referred to as an "assistant scoop".

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

Fig. 1 is a vertical section taken in the fore and aft direction of the ship, showing the preferred embodiment of the condenser scoop apparatus and the adjacent end of the condenser;

Fig. 2 is a bottom plan view of the strainer plate which constitutes the scoop;

Fig. 3 is a vertical section taken on the line III—III of Fig. 2;

Fig. 4 is a vertical section taken on the line IV—IV of Fig. 2;

Fig. 5 is an enlarged view showing the cross-section of the guide vanes in the strainer plate;

Fig. 6 is an elevation of the condenser scoop apparatus looking to the left as seen in Fig. 1;

Fig. 7 is a vertical section, taken on the line VII—VII of Fig. 8, showing a second embodiment of the strainer plate;

Fig. 8 is a bottom plan view of the strainer plate shown in Fig. 7; and,

Fig. 9 is a vertical section, showing a third embodiment of the strainer plate.

Referring to the drawings in detail, I show a condenser at 10 having an inlet water box 11. The hull or outer plating of the ship is shown at 12, the inner plating at 13, and adjacent ship's frames at 14. An inlet conduit 15 for supplying sea water to the condenser comprises an outboard or inlet end section 16, an intermediate section 17 connected to the section 16 by a flexible connection 18, a stop valve 19, and a propeller housing 21 which is connected to the inlet water box 11 and which houses a propeller 22. The propeller 22 is driven by a turbine 23 through reduction gearing 24 and a shaft 25 extending through the water box. The gearing 24 may be mounted upon the inlet water box 11 and in turn support the turbine 23.

The outboard end of the section 16 extends into an opening 26 in the outer plating 12 and is substantially flush with said outer plating or hull of the ship. It is formed with a flange 27 bearing against the inner surface of the outer plating 12, and by which it may be secured to said outer plating. The conformation of the section 16 is rectangular at the outboard end and is gradually transformed into a circular conformation at the connection 18. The fitting 16 may be inserted from the interior of the ship through an opening 28 in the inner plating 13, which opening is greater than the opening 26. The section 17 is formed with a flange 29 adapted to bear against the inner surface of the inner plating 13 and to be secured thereto. Ribs 31 extending between the section 17 and its flange 29 are preferably provided for reenforcing this piece.

The scoop of the present apparatus is embodied in a strainer plate 32 disposed in the outboard end of the section 16, the outboard surface thereof being substantially flush with the outboard edge of said section and being as nearly flush with the hull or outer plating 12 of the ship as possible. It projects beyond the hull of the ship only by the thickness of a doubler plate 33 provided around the opening 26.

The strainer plate 32 comprises a series of curved vanes 34 extending transversely of the ship. The lower edges of the vanes extend in a direction, the major component of which is forwardly of the ship. From the forward edges, the vanes 34 are curved from a direction, the major component of which is rearwardly, to a direction upwardly or inwardly of the ship. The passages 35 formed between adjacent vanes thus open in a direction substantially forwardly of the ship and are curved from rearward to upward or inward direction. The vanes 34 are preferably of such cross-section that the passages 35 gradually diverge from the inlet end to the outlet end, to effect conversion of the velocity energy of approach of the sea water into static head or pressure as fully explained and claimed in my aforesaid patents. The degree of divergence of the passage 35 is preferably such as corresponds to the divergence between straight sides disposed at an angle of approximately 8° to each other, but such degree of divergence may vary, as explained in my aforesaid patents.

The strainer plate is also formed with an element 36 providing the convex side for the foremost passage 35 and with an element 37 forming a concave surface for the rearmost passage 35. The elements 36 and 37 are disposed against the forward and the rearward side of the section 16, the element 36 also comprising a flange 38 received in a recess 39 in the section 16. The strainer plate is further formed with a plurality of strainer bars 40 extending in fore and aft direction. It is further formed with a pair of side plates 41 disposed in recesses 42 in the section 16, and with flanges 43 disposed in recesses 44 in the section 16. The various parts of the strainer plate may be secured to each other in any suitable manner, as by welding the same in one piece. It is secured to the section 16 by means of screws extending through the flanges 43.

Operation

The movement of the ship is from left to right as is indicated by the arrow. The velocity of the sea water relative to the ship causes the water in the passages 35 to flow to the left therein. Due to the conformation and arrangement of the passages 35, the water is caused to turn from rearward to inward direction. At the same time, due to the divergence of the passages 35, a portion of the velocity energy of the sea water entering the passages is converted into pressure, which pressure is utilized to effect flow of water through the inlet conduit 15 to the water box 11 and through the remainder of the condenser apparatus, as described in my aforesaid Patent 1,862,282. When the apparatus is designed fully in accordance with the present invention, such velocity pressure conversion is sufficient to effect the required flow of condenser water when the ship is moving at full speed.

During the operation just described, the propeller 22 is rotated idly by the flow of water. The propeller may well be of a design providing minimum resistance when idling. The purpose of the propeller is to effect flow of water when the ship is not moving or moving at low speed. When moving at low speed, the pressure provided by the velocity pressure conversion reduces the work required of the pump. In cases where the scoop apparatus provides only a portion of the pressure required to effect the necessary flow, the remainder of the pressure is provided by the pump.

The strainer plate 32, in addition to serving as the condenser scoop, performs the usual function of a strainer plate in preventing the entrance of large foreign articles.

It will be seen from the above description that the turning and the velocity-pressure conversion of the water are effected substantially at the inlet end of the inlet conduit. They may be considered as being effected, roughly, in the plane of the hull of the ship. There are thus no limitations placed on the form of the inlet conduit and it may, therefore, be disposed entirely between adjacent ship's frames. Also, there are no parts protruding substantially beyond the hull of this ship.

While I prefer to provide diverging passages to effect velocity pressure conversion as described in connection with the first embodiment shown in Figs. 1 to 6, the present invention may be embodied in a condenser scoop having straight, parallel-sided passages. For example, in Figs. 7 and 8, I show a strainer plate 32' secured in the outboard end of a fitting 16, said fitting 16 and the remainder of the inlet conduit being the same as in the first embodiment. Cylindrical passages 15 are drilled in the strainer plate 32. These passages are inclined rearwardly as shown in Fig. 7, the inner ends communicating with the inlet conduit and the outer ends opening forwardly to the sea water.

Referring to the operation of the embodiment shown in Figs. 7 and 8, the forward movement of the ship is to the right, as indicated by the arrow. Upon such movement, the water in the inlet ends of the passages 45 is caused to flow rearwardly in such passages and into the inlet conduit. In this embodiment, the condenser scoop utilizes only the impact pressure of the water at the forward or inlet ends, to effect the flow through the condenser apparatus. A circulating pump may be used to augment the flow of the sea water as in the first embodiment.

In Fig. 9, I show a third embodiment in which divergent passages 46 are formed in the strainer plate 32'. The passages are also formed about a straight line axis, as in Fig. 7, but in this case diverge at a suitable angle, such as 10°, to effect

velocity-pressure conversion. The passages are again inclined rearwardly, and may be formed in any suitable manner, as by reaming or casting.

The operation of the embodiment of Fig. 9 is substantially the same as that of the first embodiment. Upon forward movement to the right as indicated by the arrow, the water in the outboard ends of the passages is caused to flow rearwardly by reason of the forward motion of the ship. As the water flows through the passage 46, the velocity thereof relative to the ship is converted into pressure and such pressure utilized to effect flow through the condenser apparatus as in the first embodiment.

While I have shown and described my novel scoop apparatus as applied to a condenser, it is to be understood that the invention is not so limited, but that said scoop apparatus may be used for supplying sea water to any other apparatus in the ship. It is also to be understood that the term "scoop apparatus" is used herein to refer to apparatus which utilizes the velocity of approach of the sea water relative to the ship to turn the water from rearward flow to flow inwardly of the ship, and it is not to be taken as limited to the prior conventional scoop which projects beyond the hull of the ship and effects flow by impact.

While I have shown my invention in three 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. An intake conduit for a ship comprising an intake fitting whose outboard end is disposed substantially flush with the hull of the ship, and a strainer plate disposed in said outboard end, said strainer plate comprising vanes curved and formed to change the direction of flow of water from rearwardly to inwardly relative to the ship.

2. An intake conduit for a ship comprising an intake fitting whose outboard end is disposed substantially flush with the hull of the ship, and a strainer plate disposed in said outboard end, said strainer plate comprising vanes curved and formed to change the direction of the flow of water from rearwardly to inwardly relative to the ship, the passages between adjacent vanes being of divergent form to effect velocity-pressure conversion of the sea water flowing therethrough.

3. The combination with a sea water inlet conduit on a ship, of a strainer plate disposed at the outboard end thereof, said strainer plate including vanes extending transversely of the ship, said vanes having their lower edges disposed forwardly and being curved so as to change direction of water flow from rearwardly to inwardly relative to the ship.

4. The combination with a sea water inlet conduit on a ship, of a strainer plate disposed at the outboard end thereof, said strainer plate including vanes extending transversely of the ship, said vanes having their lower edges disposed forwardly and being curved so as to change direction of water flow from rearwardly to inwardly relative to the ship, the passages between adjacent vanes being of divergent form to effect velocity-pressure conversion of the water.

5. In a ship, the combination of a strainer plate disposed substantially flush with the hull of the ship and a conduit extending inwardly from the strainer plate, said strainer plate having passages extending transversely therethrough, the outer ends of said passages opening in a forward direction to cause flow of sea water rearwardly and inwardly through said passages into said conduit in consequence of forward movement of the ship, and said passages being disposed substantially within the fore and aft extent of said conduit.

6. In a ship, the combination of a strainer plate disposed substantially flush with the hull of the ship and a conduit extending inwardly from the strainer plate, said strainer plate having passages extending transversely therethrough, the outer ends of said passages opening in a forward direction to cause flow of sea water rearwardly and inwardly through said passages into said conduit in consequence of forward movement of the ship, and said passages being disposed substantially within the fore and aft extent of said conduit, said passages being divergent to convert velocity energy of approach of the sea water into pressure thereof.

7. The combination with a sea water inlet conduit on a ship, of a strainer plate disposed at the outboard end thereof substantially flush with the hull of the ship, said strainer plate including vanes extending transversely of the ship, each vane having one edge extending in an upward direction and the other in a forward direction and being curved between said edges to turn sea water from rearward to inward flow relative to the ship.

8. The combination with a sea water inlet conduit on a ship, of a strainer plate disposed at the outboard end thereof substantially flush with the hull of the ship, said strainer plate including vanes extending transversely of the ship, each vane having one edge extending in an upward direction and the other in a forward direction and being curved between said edges to turn sea water from rearward to inward flow relative to the ship, the passages between adjacent vanes being divergent to convert the velocity of approach of the sea water into pressure thereof.

9. The combination with a ship and an inlet conduit extending from the hull thereof, of a strainer plate disposed at the outboard end of said conduit with its outer surface substantially flush with the hull of the ship, said strainer plate having passages therein opening forwardly and inclined rearwardly so as to utilize the impact pressure of the approaching stream of sea water.

10. In a ship, a substantially straight intake conduit extending to the outer plating or skin of the ship and having its outboard or entrance end substantially flush with said outer plating, and a multiplicity of turning vanes whose width approximates the thickness of the outer plating and which are disposed substantially in line therewith, said turning vanes being curved so that sea-water enters the passages therebetween by reason of movement of the ship and is discharged into the intake conduit in the direction of extent thereof.

HENRY F. SCHMIDT.