Oct. 13, 1925. 1,556,697

R. L. LEACH

STANDARD UNIT MARINE CONDENSER

Filed Aug. 19, 1922 4 Sheets-Sheet 1

Fig. 1.

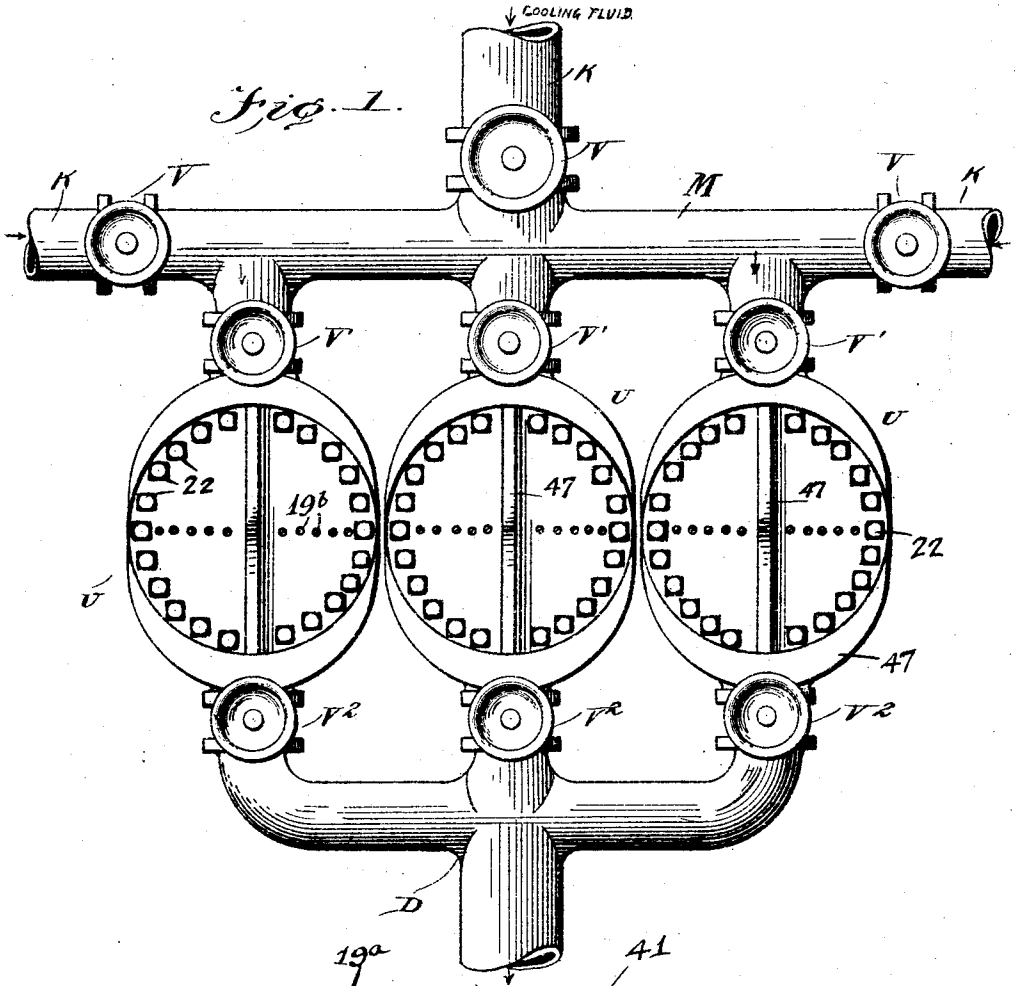
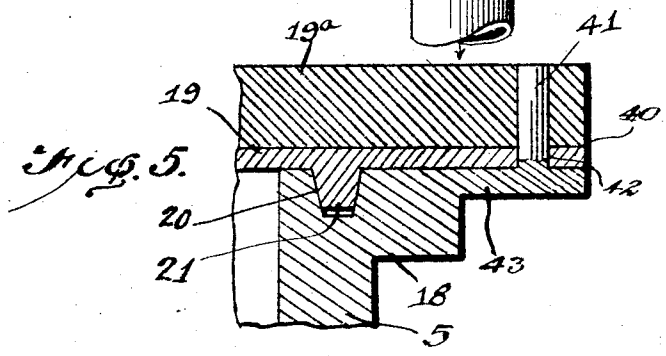


Fig. 5.



WITNESSES

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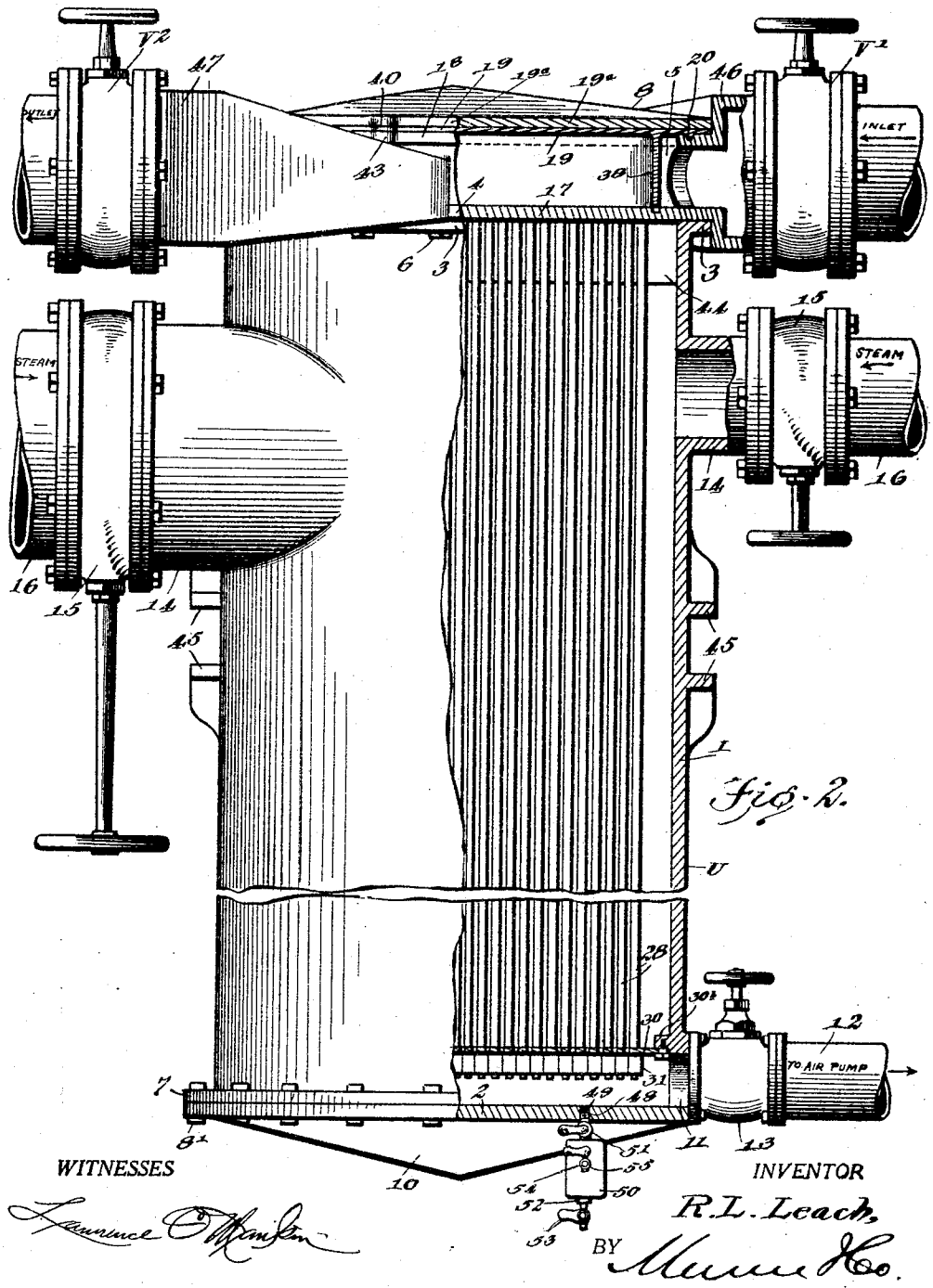


Fig. 2.

WITNESSES

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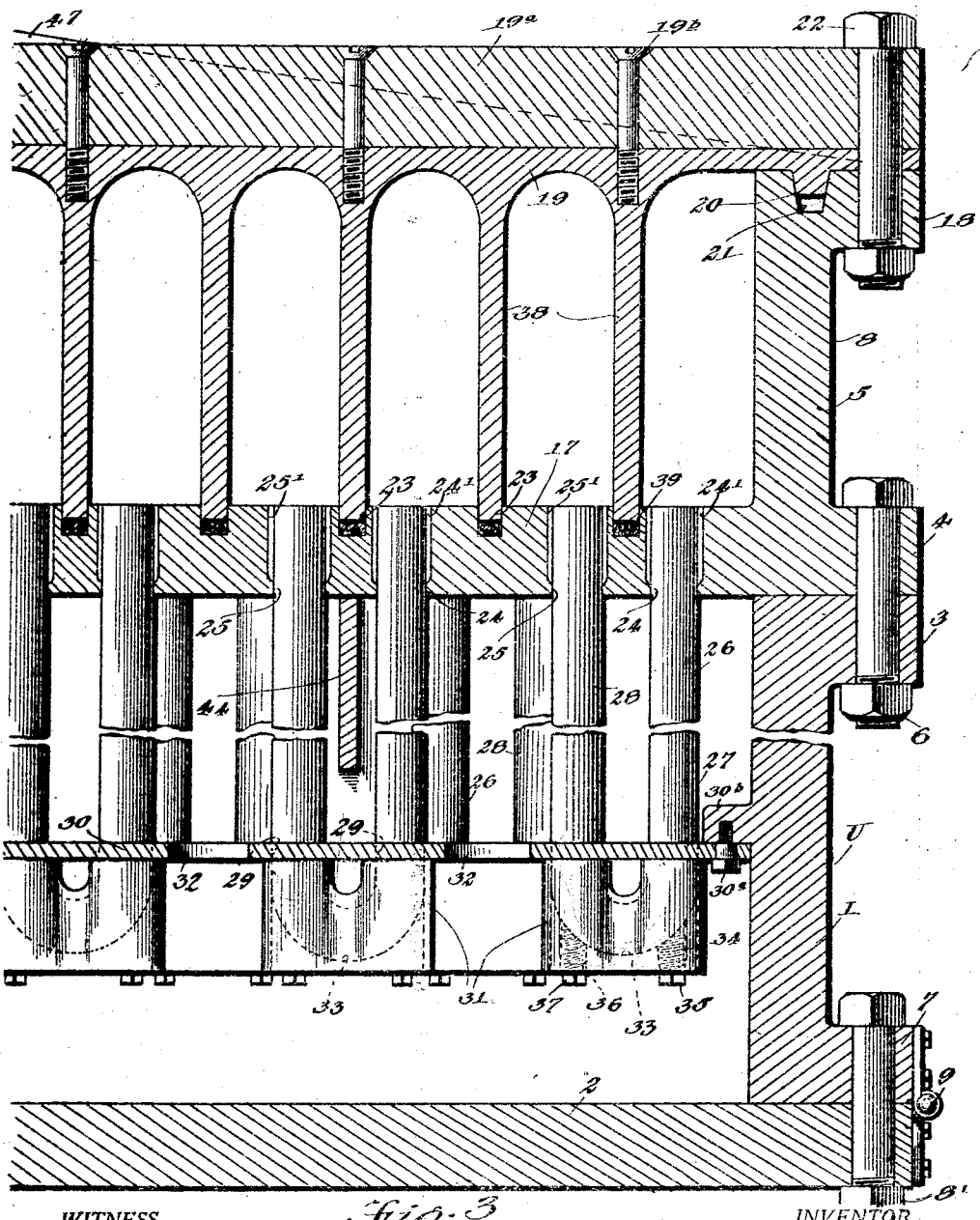
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Oct. 13, 1925. 1,556,697

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STANDARD UNIT MARINE CONDENSER

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WITNESS

Fig. 3

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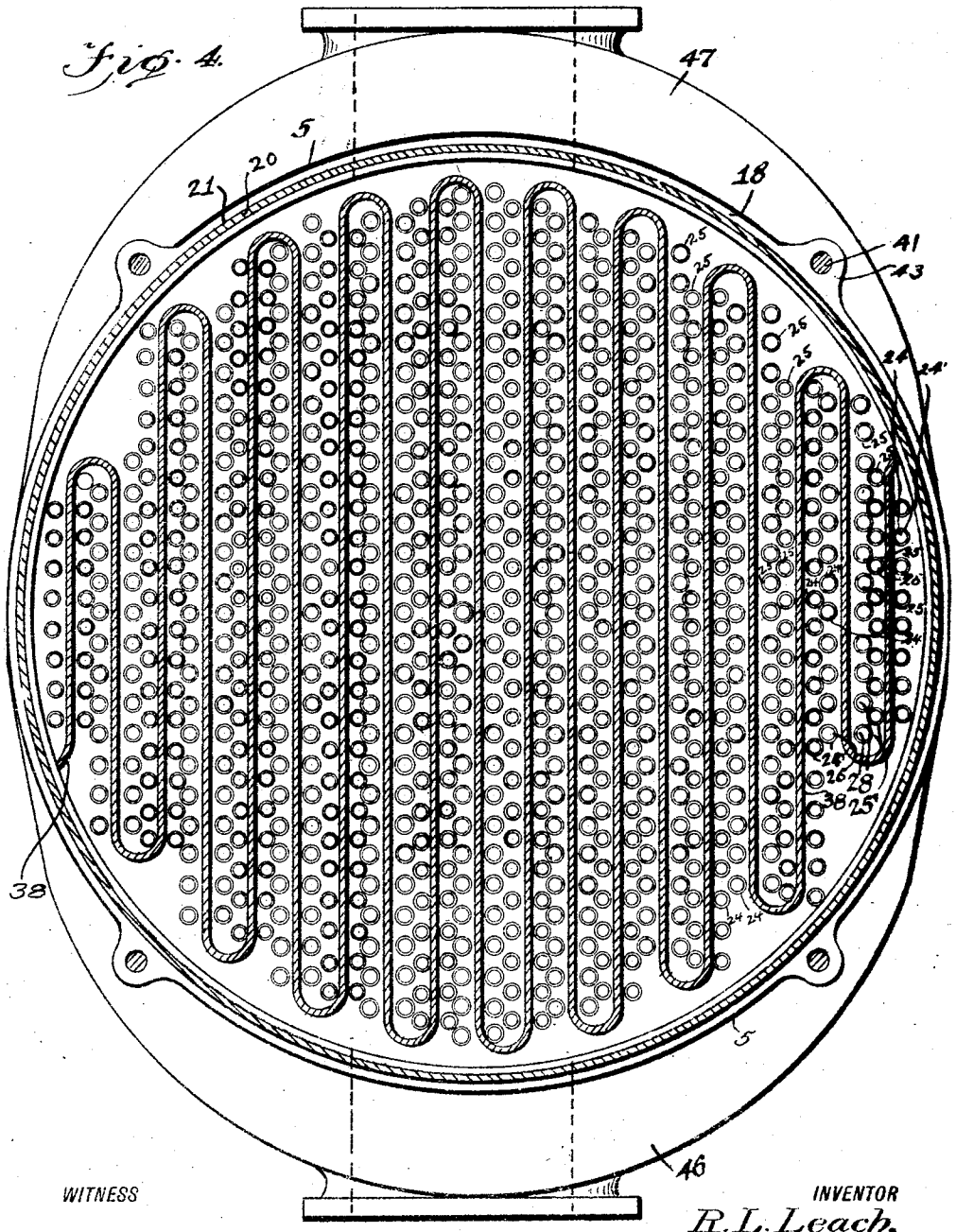
Oct. 13, 1925. 1,556,697

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STANDARD UNIT MARINE CONDENSER

Filed Aug. 19, 1922 4 Sheets-Sheet 4

Fig. 4.



WITNESS

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Patented Oct. 13, 1925. 1,556,697

UNITED STATES PATENT OFFICE.

RICHARD L. LEACH, OF NEW ORLEANS, LOUISIANA.

STANDARD-UNIT MARINE CONDENSER.

Application filed August 19, 1922. Serial No. 582,976.

To all whom it may concern:

Be it known that I, RICHARD L. LEACH, a citizen of the United States, and a resident of New Orleans, in the parish of Orleans and State of Louisiana, have invented certain new and useful Improvements in Standard-Unit Marine Condensers, of which the following is a specification.

My invention relates generally to condensers for reconverting steam into water, and more particularly to marine surface condensers and it consists in the combinations, constructions and arrangements herein described and claimed.

In general, marine surface condensers, of which I am aware, comprise horizontally disposed shells or casings provided with headers at their respective opposite ends, the headers having removable covers and being connected by a plurality of tubes extending through the shells or casings. One header of each condenser is ordinarily divided by a horizontal partition into upper and lower compartments. The lower compartment of the one header of each condenser is provided with an inlet for a cooling fluid and the upper compartment of the same header is provided with an outlet. The cooling fluid, which in the case of marine surface condensers, is salt water, is forced through the inlet into the header provided with the partition and passes through connecting tubes to the other header, then passing through tubes which are located above the plane of the partition to the upper compartment, which upper compartment is provided with an outlet. Since salt water is ordinarily used as the cooling fluid, it will be understood that the header and the connections of the tubes with the headers of each condenser must be water tight. Otherwise, the operation of the condenser must be discontinued until the leak is located. In marine surface condensers of the character described, it is impossible to have a rigid connection between the tubes and the headers, as the unequal expansion and contraction between the tubes and the shell of the condenser, caused by the great variations of temperature, would soon cause the tubes to break. Consequently, in order to form an expansive and fluid tight joint where the tube joins the headers, the openings in the headers for the reception of the end portions of the tubes ordinarily are counter-bored and threaded to receive a suitable ferrule and packing. By screwing the ferrule hard against the packing a fluid tight expansion joint is made between the header and the tube. This arrangement of ferrule and packing joint has never been satisfactory and will never give long continued service without leaking. The ferrules must be tightened at short intervals and the packing renewed often, and it is even then most unreliable. When a leak develops, the covers of the headers must be removed and the condenser tested by filling the exhaust chamber with fresh water to find the tube that is leaking. This operation ordinarily requires three to six hours and of course the vessel equipped with the condenser is at a standstill while the leak is being located and the leaky tube repaired. Vessels equipped with condensers of the character described, are for economy provided with a relatively large marine condenser for use while the vessel is being propelled and a relatively small auxiliary condenser for use when the vessel is in port.

It is therefore an object of my invention to obviate the objectional features of the marine surface condenser now in use, of which I am aware, by providing a simplified arrangement in which only one header is necessary, and in which the tubes may be rigidly soldered or fastened to that one header and at the same time be capable of relatively great expansion and contraction.

A further object of my invention is to provide a condenser unit of novel construction which is adapted to be used alone or in association or conjunction with other condenser units, connected in parallel so that any unit or a plurality of units of a complete condenser apparatus may be disconnected from the apparatus as a whole when it is desired to use less than the total number of units in the complete apparatus, as for instance, when in port or when repair of one of the units while the other units are in operation is made necessary by leakage or for any other cause.

A still further object of my invention is to provide a condenser unit of the character described which is of simplified construction and includes in the construction thereof a plurality of tubes and a header, the tubes being in communication at their ends with the header whereby communication between any one of the tubes and the header may be discontinued.

Other objects and advantages will be apparent from the following description, and the novel features of the invention will be particularly outlined in the appended claims.

My invention is illustrated in the accompanying drawings, forming a part of this application in which

Figure 1 is a top plan view of a multiple unit condenser apparatus embodying the invention,

Figure 2 is an enlarged view, mainly in side elevation and partly in section of one of the units included in the apparatus exhibited in Fig. 1.

Figure 3 is a still further enlarged fragmentary vertical section through the unit, the view being taken substantially at right angles to Figure 2,

Figure 4 is a view partly in plan and partly in section, showing the unit exhibited in Figure 2, the section being taken horizontally through a header located at the upper end of the unit, and the inlet and outlet of the header being shown in plan, and

Figure 5 is a fragmentary vertical section, showing cooperative portions of the body and cover of the header.

Referring now to the drawings and particularly to Figure 1 thereof, I show a plurality of condenser units U connected in parallel by an intake pipe manifold M. In the apparatus shown, the intake manifold M is connected by separate conduits K with a plurality of sources of cooling fluid supply, as for instance to a main circulating pump, an auxiliary circulating pump and a ballast pump, the specific pumps of sources of supply not being shown. Valves V are provided for controlling the flow of a cooling fluid from the source of supply to the intake manifold. Other valves V^1 are provided for controlling the flow of the cooling fluid from the intake manifold to the respective condenser units U. Still other valves V^2 are provided for controlling the flow of the cooling fluid from the condenser units U to the discharge manifold D. It will be apparent that any one of the condenser units U can be cut out of communication with the intake and discharge manifolds and with the remaining units of the apparatus by closing the valves V^1 and V^2 of the particular unit to be disconnected from the apparatus.

By this arrangement, a greater number of the units U can be utilized when a vessel in which the apparatus is installed is being propelled than when the vessel is idle, whereby the necessity of providing a main condenser and an auxiliary condenser in a vessel, as has heretofore been necessary, is obviated.

Referring now more particularly to Figs. 2 and 4 inclusive of the drawings I have shown one of the units U as comprising a substantially cylindrical shell or casing I which is adapted to be vertically disposed and is closed at its upper end by a header, indicated generally at 8 and at its lower end by a lower cover plate 2. The casing I is provided with an outwardly extending annular flange 3 at its upper end upon which rests a cooperating flange 4 which extends outwardly from the substantially cylindrical body 5 of the header 8 at the lower end of the latter. The flanges 3 and 4 are detachably secured together by any suitable means, such as the bolt and nut arrangements indicated at 6. The casing or shell I is formed with integral outwardly extending annular flange 7 at its lower end adapted to cooperate with the lower cover 2 whereby the latter can be releasably secured through the agency of bolts and nuts 8′ or the like to the casing I in such a manner as to close the lower end of the latter and to provide a liquid tight joint or connection between the lower cover and the casing I. In addition, the lower cover 2 is preferably attached to the flange 7 by a hinge 9 whereby corresponding bolt receiving openings through the flange 7 and the lower cover 2 will register when the lower cover has been swung upwardly about the pintle of the hinge into closing relation with respect to the case I. The lower cover 2 may have suitable integral reinforcing ribs as at 10 on the lower face thereof, if desired.

The casing I is provided with a flanged outlet opening 11 at its lower end for establishing communication between the interior of the casing and a delivery conduit 12 for conducting a liquid from the casing to any desirable place, as for instance to an air pump, not shown. A valve 13 is provided for controlling the flow of a liquid from the opening 11 through the delivery conduit 12.

The casing I is shown as being provided also with a plurality of inlet openings having flanged pipe connections 14 adjacent to the upper end therof. The pipe connections 14 are connected with valves 15 which communicate with supply conduits 16 for conducting a fluid, such as steam, from a plurality of sources to the casing I.

The header 8 includes a bottom plate 17 formed integrally with the cylindrical body 5 and constituting a cover plate for the casing I. The bottom and the body 5 of the header are made of brass or other non-oxidizable material and the body 5 is enlarged or flanged externally at its upper end at 18.

A top cover plate 19, which is made of brass and has a reinforced cast iron top plate 19^a secured thereon by screws 19^b is provided for the body 5 of the header and

rests upon the flange 18 of the latter, a depending annular rib 20 on the lower face of the cover plate 19 fitting into an annular groove 21 in the upper face of the flange 18. The arrangement is such that a fluid tight joint is provided between the top cover plate 19 and the body 5. The cover is bolted to the flange 18, as indicated at 22, or may be secured to the latter in any suitable known manner.

The bottom 17 of the header has a serpentine or sinuous groove 23 formed in the upper face thereof extending from a point on the inner wall of the body 5 to a diametrically opposite point thereon. The bend portions of the sinuations terminate adjacent to but short of the body 5. Series of openings 24 and 25 are formed through the bottom plate 17, the openings 24 being located along one edge of the groove 23 while the openings 25 are arranged in corresponding position along the opposite edge of the groove. With this arrangement, all openings 24 will be located at one side of the groove 23 and all openings 25 will be located at the opposite side of the said groove. The openings 24 or 25 of the respective series or rows extending between adjacent sinuations of the grooves 23 are located in staggered relation in respect to each other. Depending from the plate 17 are a plurality of U-shaped members 27, each comprising two tubes 26 and 28 connected by a return bend 31.

Each of the openings 24 is adapted to receive the extremity of one tube 26 while each of the openings 25 is adapted to receive the extremity of the other tube 28 of the U-shaped tubular member. The openings 24 and 25 are counter-bored adjacent to their upper ends as indicated at 24′ and 25′ respectively, to receive a suitable packing, not shown, such as a filler of asbestos cord and a top layer of solder, whereby the connections of the tubes 26 and 28 with the header bottom plate 17 are made rigid and fluid tight. The tubes 26 and 28 of each of the tubular members 27 communicate with the interior of the header 8 at opposite sides of the groove 23 and depend in parallel relation from their connections with the plate 17 through the casing I and through openings 29 in a horizontally disposed circular rest or spacing plate 30. The latter is secured adjacent to its outer edge by cap bolts 30^a to an inwardly extending annular flange 30^b on the casing I, the plate 30 being located at a level slightly higher than that of the upper side of the outlet 11. The return bend 31 of each tubular member 27 connects the tubes 26 and 28 of that member at their lower ends and is located below the level of the spacing plate 30. The bend portion 31 of each U-shaped tubular member may be formed separately from the tubes 26 and 28 thereof and then permanently secured to the lower ends of said tubes by means of solder or the like, so that the bore 33 of each bend portion 31 is in open communication at one end with the bore of the tube 26 of one of the tubular members 27 while the other end of the bore 33 is in open communication with the bore of the tube 28 of the same tubular connecting member. The return bend 31 has a fluid tight connection with each tube. The return bends 31 may have a threaded bore 34 extending in an enlarged lower portion thereof in alignment with the tube 26 to which the bend is attached and in communication with the bore 33. A plug 35 in threaded engagement with the bore 34 normally closes the latter. A bore 36 extends from the lower side of the enlarged portion of the return bend 31 to the bore 33 in alignment with the end portion 28 to which the bend is attached. The bore 36 is normally closed by a plug 37 which is in threaded engagement therewith.

The cover plate 19 of the header 8 is provided with an integral depending serpentine or sinuous baffle rib 38 which is adapted along its lower end to fit into the serpentine or sinuous groove 23 and to compress a packing 39 in the latter when the top cover 19 is bolted down in the manner described so that a fluid tight joint is provided between the serpentine baffle rib 38 and the header bottom plate 17 at all points at which the latter is contacted by the rib. Moreover, the ends of the rib 38 contact with the inner walls of the body 5 at diametrically opposite points in such manner as to have a fluid tight fit therewith and to thus divide the interior of the header into two compartments. The header cover 19—19^a is provided with a plurality of outwardly extending lugs or ears, as indicated at 40, each having an opening 42 in which fits an upstanding stud or guide bolt 41 carried by an ear 43 on the flange 18 of the header body 5. The header cover thus may be readily placed upon the body 5 in such position that the rib 38 will depend within the header body in position to engage with the groove 23, in the manner described.

The header bottom plate 17 is braced by a plurality of transverse girders 44 which extend between the inner side walls of the casing I. The casing I also has formed thereon external lugs 45 arranged in vertical spaced relation and being adapted for engagement with horizontal supports, not shown, whereby the unit U may be supported in elevated position, if desired. The header 8 is provided with an inlet 46 and with an outlet 47. The inlet and outlet connections 46 and 47 are formed integrally with the body 5 and are located at opposite sides of the serpentine or sinuous baffle 38. The inlet communicates with one of the

branches of the intake manifold M through one of the valves V^1 and the outlet 47 communicates through one of the valves V^2 with one of the branches of the discharge manifold D. Obviously, the inlet and outlet connections may be connected to any suitable conduits other than the branches of the intake manifold and discharge manifold, respectively, as for instance when it is desired to make use of one of the units U as a complete apparatus.

The lower cover 2 of the casing I is provided with an opening 48 which is threadedly engaged by a tubular inlet connection 49 of a container 50. The inlet connection 49 is controlled by a cock or valve 51. The container 50 is provided with an outlet 52 at its lower end controlled by a valve or cock 53. A laterally extending outlet 54 communicating with the container 50 intermediately is controlled by a valve or cock 55.

From the foregoing description of the various parts of the device, the operation thereof may be readily understood. The steam to be condensed is admitted to the interior of the casing I through any or all of the inlets 14 and upon contact with the U-shaped condenser members 27 is reconverted into water and passes through the outlet 11 to a desired place, as for instance to an air pump, for further use. It of course will be understood that the rest plate 30 is provided with perforations, as at 32, so that the condensate may pass freely from the space within the casing I above the rest plate to the outlet 11.

A cooling fluid, which in the case of marine surface condensers, is salt water, is forced through the inlet 46 into one of the compartments of the header 8. The cooling fluid passes downwardly through the open upper ends of the tubes 26 of the tubular members 27, which communicate with the intake side of the header, and after passing through the tubular members 27 enters the discharge side of the header and passes therefrom through the outlet 47. In the event that a leak should develop in one of the tubular members 27, when a plurality of the units U are being used in an apparatus, any unit in which such leak occurs may be disconnected from the other units without the interruption of service. The header cover 19—19a may then be removed and the defective tubular member plugged or closed at the upper ends of the tubes thereof. It will be obvious that this operation will consume but little time and that the condenser will not be out of commission or operation for any extended period of time as has heretofore been necessary.

In the event that it is desired to obtain a sample of the liquid within the casing I without interrupting the operation of the condenser, the upper valve cock 51 of the trap attached to the bottom cover 2 may be opened until a quantity of the liquid has entered the container. The upper valve or cock 51 is then closed, the sample collected is taken therefrom as by opening the lower valve or cock 53 and the intermediate valve or cock 55.

Obviously, my invention is susceptible of embodiment in forms other than that illustrated in the accompanying drawings, and I therefore consider as my own all modifications of the forms of the device disclosed herein, which fairly fall within the scope of the appended claims.

I claim:

1. In an apparatus of the character described, a vertically disposed substantially cylindrical casing closed at its lower end, said casing having an outlet adjacent to its lower end and an inlet at a higher level, a header closing the upper end of the casing, said header being provided with a serpentine partition extending between the sides thereof and dividing the interior of the header into two compartments, one of said compartments being provided with an inlet and the other compartment being provided with an outlet, and a plurality of conducting tubes of substantially U-shaped formation, each of said tubes being connected with the header to provide communication between the two compartments of the header.

2. In an apparatus of the character described, a vertically disposed substantially cylindrical casing closed at its lower end and provided with an outlet adjacent to its lower end and an inlet located at a higher level, a header closing the upper end of the casing, said header comprising integral bottom and side portions and a removable cover closing the upper end of the header, said bottom having a serpentine groove in the upper face thereof and said cover having a depending serpentine rib adapted to engage said serpentine groove and the side walls of the header to divide the latter interiorly into two compartments, one of said compartments being provided with an inlet and the other compartment being provided with an outlet, and a plurality of substantially U-shaped tubes depending within the casing and having the ends thereof rigidly attached to the bottom of the header in open communication with the respective compartments.

3. In an apparatus of the character described a vertically disposed substantially cylindrical casing closed at its lower end and provided with an outlet adjacent to its lower end and with an inlet located at a higher level, a header closing the upper end of the casing, said header comprising integral bottom and side portions and a removable cover closing the upper end of the header, said bottom having a serpentine groove in the

upper face thereof and said cover having a depending serpentine rib adapted to engage said serpentine groove and the side wall of the header to divide the latter interiorly into two compartments, one of said compartments being provided with an inlet and the other compartment being provided with an outlet, a plurality of substantially U-shaped tubes depending within the casing and having the ends thereof rigidly attached to the bottom of the header in open communication with the respective compartments, and cooperating guide means on the side walls of the header and the cover thereof for guiding the cover into proper position relative to the side walls of the header so that the serpentine rib will be in position to engage the serpentine groove.

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