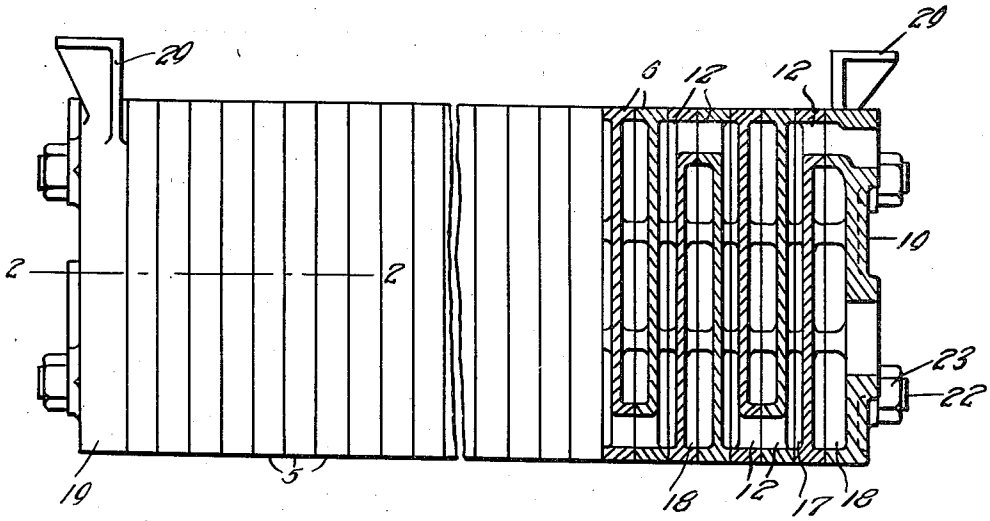
July 18, 1933. A. L. STAMSVIK 1,918,434

HEAT EXCHANGE DEVICE

Original Filed April 23, 1930 2 Sheets-Sheet 1

Fig. 1.



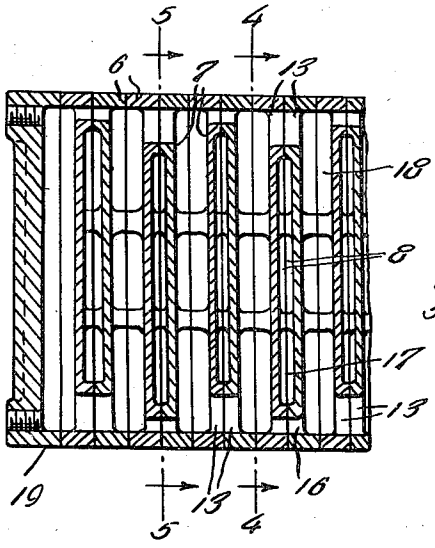
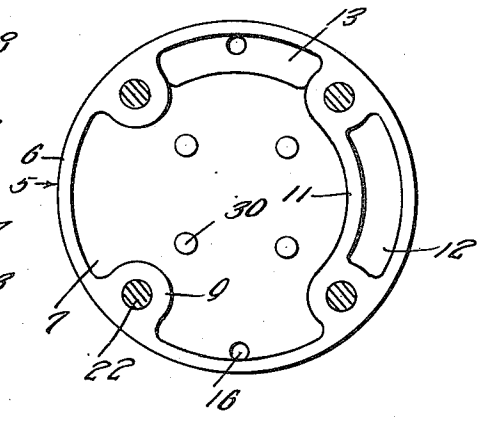


Fig. 2.

Fig. 4.



Inventor

A. L. Stamsvik

By Clarence A. O'Brien

Attorney

July 18, 1933. A. L. STAMSVIK 1,918,434

HEAT EXCHANGE DEVICE

Original Filed April 23, 1930 2 Sheets-Sheet 2

Fig. 3.

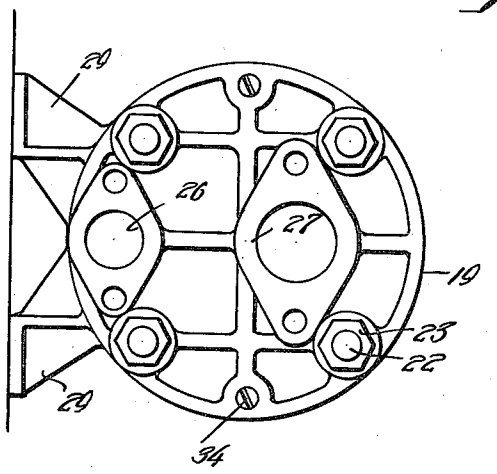


Fig. 5.

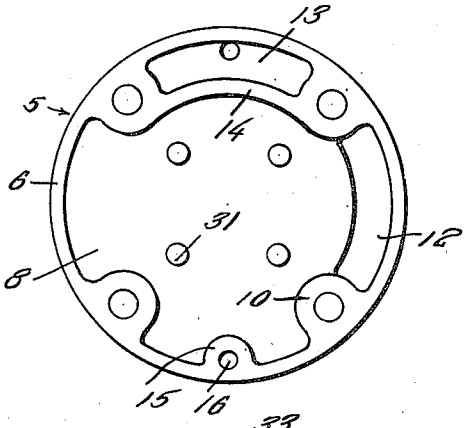
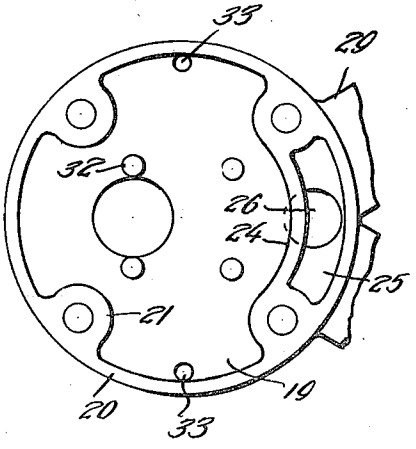


Fig. 6.



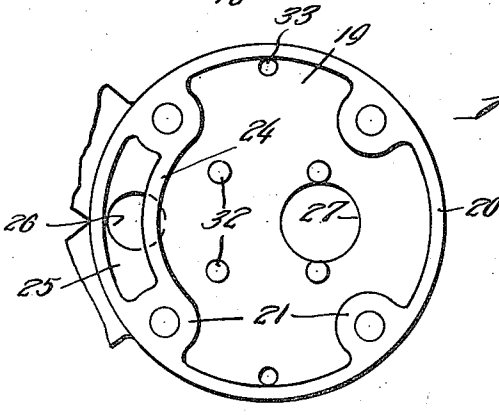


Fig. 7.

Inventor

A. L. Stamsvik

By Clarence A. O'Brien

Attorney

Patented July 18, 1933 1,918,434

UNITED STATES PATENT OFFICE

ALFRED L. STAMSVIK, OF CLEVELAND, OHIO, ASSIGNOR OF ONE-SIXTH TO HOMER E. McMILLEN, OF GROVE CITY, PENNSYLVANIA

HEAT EXCHANGE DEVICE

Application filed April 23, 1930, Serial No. 446,669. Renewed October 27, 1931.

This invention relates to heat exchangers or cooling devices, and has more particular reference to a device especially designed for cooling lubricating oils.

The primary object of the invention is to provide a cooling device or heat exchanger of the above type which is made up of a series of plates whose size and/or number may be increased or reduced in accordance with the desired installation and which embody features of construction which render the device unusually efficient in operation.

With the foregoing object in view, the plates of the device are of simple construction and interchangeable, and provided with means which, among other advantages, permit convenient drainage and cleaning of the device while in assembled condition, reduce the pressure in the device by eliminating congestion of fluids circulating therethrough, serve to direct the course of the cooling fluid in its tortuous path, equalize the head pressure of the cooling fluid, and also eliminates the necessity for by-pass connections for any excess cooling fluid that may be present in the cycle.

The various features of novelty and advantage resident in my improved heat exchanger will become more apparent in view of the following descriptive matter taken in conjunction with the drawings, wherein:—

Figure 1 is a top plan view of my improved heat exchanger, certain parts being shown in section.

Figure 2 is a vertical detail sectional view taken substantially on the line 2—2 of Figure 1.

Figure 3 is an end elevation of the device.

Figure 4 is a vertical transverse sectional view taken substantially on the line 4—4 of Figure 2.

Figure 5 is a similar view taken substantially on the line 5—5 of Figure 2.

Figure 6 is a plan view of one of the head or end plates.

Figure 7 is a similar view of the other of the end or head plates.

According to the present invention, the device comprises a plurality of intermediate units or plates, each being identical in construction and therefore interchangeable together with a pair of end heads or plates both of which are identical in construction and interchangeable.

Each of the intermediate plates 5 is formed with an integral peripheral flange 6 producing a recess or hollow on each side 7 and 8, respectively, of the plates, note Figures 4 and 5. On each side the plate is provided with inwardly directed radial lugs 9 and 10. The lugs 9 and 10 are suitably apertured for a purpose hereinafter apparent. Between two adjacent lugs 9 and integral therewith, there is provided on the side 7 of the plate an arcuate boss or rib 11 provided with an arcuate slot or port 12. (See Figure 4.) Between one of the said adjacent lugs 9 and a next adjacent lug 9 there is formed in the plate an arcuate slot or port 13. On the opposite side of the plate, that is, on the side 8 and opposite the slot 13 there is provided between two adjacent lugs 10 and integral with said lugs 10 an arcuate boss or rib 14.

The boss 14 is disposed at, what, for the sake of convenience may be termed the top part of the plate while the boss 11 is disposed at one side of the plate.

On the side 8 of the plate diametrically opposite the boss 14, a lug 15 is provided having an orifice 16 formed therethrough and opening on opposite sides of the plate. This orifice 16 has a number of advantageous functions, as will hereinafter appear, and may be termed a combined drain and pressure drop or by-pass orifice.

In assembling the plates, the plates have corresponding faces disposed in opposed relation forming alternate shallow and deep chambers 17 and 18 respectively, while to put the chambers in alternate communication so that the shallow chambers communicate one with another, and the deep chambers do likewise, each plate is set a half of a turn in advance of the next preceding plate.

Thus, as will be seen from Figures 1 and 2, when assembled, the relationship of the plates is such that the ports 12 communicate the chambers 17 at opposite sides of the device in an alternate manner. The ports 13 communicate the chambers 18 at the top and

bottom in an alternate manner. As is also manifest, the orifices 16 communicate the chambers 18 at the top and bottom of the device in an alternate manner.

From the foregoing, it will be seen, that the oil or other fluid to be cooled entering the first chamber 17 through ports 12 on one side of the device will flow across the chamber 17 to pass through registering ports 12—12 on an opposite side of the device to enter the next chamber 17.

The water, or other cooling medium entering the first chamber 18, flowing through the first pair of registering ports 13—13, will enter the second chamber 18 and flow upwardly, or substantially at right angles to the flow of oil, to pass into the third chamber 18 through the second pair of registering ports 13—13 at the top of the device.

End plates 19 are provided and have formed integrally therewith an inwardly directed peripheral flange 20. On their inner faces, the end plates 19 are each provided with lugs 21 radiating inwardly and arranged in circumferential spaced relation. These lugs are suitably apertured for registry with the apertured lugs on the intermediate plates 5. The several intermediate plates 5 and said end plates 19 are secured together by rods 22 passing through the lugs 9, 10 and 21. Nuts 23 are threaded on the ends of the rods 22.

Between two adjacent lugs 21 there is formed integrally therewith and with the plate 19 an arcuate boss 24 having an arcuate recess or port 25 formed therein. Communicating with the recess 25 is an oil orifice 26. The end plate, within the confines of its rim 20 in transverse alignment with the oil orifice 26 is provided with a relatively large water port or opening 27. In practice, then it will be seen that oil entering through the orifice 26 of one end plate will flow through the chambers 17 to discharge from the device thru a like orifice 26 on the end plate 19 at the opposite end of the device. Likewise water will enter the first chamber 18 through the water port 27 in one end plate and flow in alternate directions through the chamber 18 to discharge from the device through the water orifice 27 in the end plate at the other end of the device.

Each of the end plates on a corresponding side thereof is provided with suitable attaching brackets 29 whereby the apparatus may be secured to an engine or to any suitable support dependent upon the use to which the apparatus is put.

On each face 7 and 8, the plates are provided with studs or projections 30 and 31, respectively, while on their inner faces the end plates 19 are likewise provided with studs or projections 32, to prevent buckling of the plates and to further enable the plates to withstand a high degree of pressure.

At the top and bottom thereof, the end plates 19 are provided with suitable orifices 33, to align with the orifices 16 at the top and bottom of the device, the said drain orifices 33 being normally closed through the medium of suitable plugs 34.

It is thought that from the foregoing description, taken in connection with the accompanying drawings, the many advantages of my improved apparatus will be readily appreciated by those skilled in the art, as well as the details of construction and the fact that the apparatus is adaptable to be used for a variety of purposes.

Simply by removing the plugs 34, the water or other cooling fluid may be drained from all of the chambers 18 when desired, and this may be done whether the device be disposed in a horizontal or vertical position or at an angle thereto. These aligned orifices 16 also serve to guide the fluid on into the next compartment and increase the force of flow while at the same time decreasing the pressure in the exchanger by eliminating congestion of fluids at the points where the latter reverses direction of flow. Furthermore, any heavy sediment or other matter which may deposit in the exchanger may be readily removed by passing a cleaning rod or the like through the entire length of the same, after which a cleaning medium such as compressed air, steam or the like may be introduced through the holes 33, 16, to further clean the passages without removing any connection or piping or otherwise disturbing the installation.

Another advantage of this aligned orifice and port construction is that any excess fluid in the system or cycle above that required for cooling may be taken care of by simply enlarging the orifices 16. Thus no by-pass connections are necessary, a feature which is of considerable advantage in certain installations. Actual experience has shown a marked pressure drop in exchangers due to the orifices 16, and furthermore, the head pressure becomes more equalized, and other advantages accrue which are not mentioned and which soon become apparent with actual use of an exchanger built in accordance with my invention.

The plates of the exchanger are simple in construction and interchangeable and may be subtracted from or added to at will. The device may be easily assembled and taken apart and the plates are well braced by the particular arrangement of studs or projections 30, 31 and 32.

Even though I have herein shown and described the preferred embodiment of my invention, it is to be understood that the same is susceptible to changes fully comprehended by the spirit of the invention as herein described, and the scope of the appended claims.

I claim:

1. A heat exchange device formed of a plurality of flanged plates arranged in a longitudinal series so that an edge of the flange of each plate is disposed against an edge of the flange of the next adjacent plates whereby a chamber is formed between the adjacent plates, said plate being respectively provided on opposite sides with a boss having a port opening therethrough, said plates respectively being further provided on one side thereof with a lug diametrically opposite to the boss on said one side, said lug having an orifice opening therethrough, said plates being so arranged relative to one another as to have respectively opposed bosses and lugs disposed one against the other, whereby alternate chambers are adapted respectively to have a cooling medium and a material to be cooled circulated therethrough, said orifices communicating the chambers through which the cooling medium is circulated.

2. A heat exchange device formed of a plurality of flanged plates arranged in a longitudinal series so that an edge of the flange of each plate is disposed against an edge of the flange of the next adjacent plate whereby a chamber is formed between the adjacent plates, said plates being respectively provided on opposite sides with a boss having a port opening therethrough, said plates respectively being further provided on one side thereof with a lug diametrically opposite to the boss on said one side, said lug having an orifice opening therethrough, said plates being so arranged relative to one another as to have respectively opposed bosses and lugs disposed one against the other, whereby alternate chambers are adapted respectively to have a cooling medium and a material to be cooled circulated therethrough, said orifices communicating the chambers through which the cooling medium is circulated, whereby to provide an uninterrupted passage through the cooler, plugs closing the ends of the passage, and means for securing the plates in assembled relation.

3. A heat exchange device formed of a plurality of plates arranged in longitudinal series, said plates being respectively provided on opposite sides with a boss having a port opening therethrough, said plates respectively being further provided on one side thereof with a lug diametrically opposite to the boss on said one side, said lug having a drain orifice opening therethrough, each of said plates being set a half of a turn in advance of the next preceding plate as to have respectively opposed bosses and lugs disposed one against the other whereby to provide two sets of tortuous passages adapted respectively to have a cooling medium and a material to be cooled circulated therethrough, said drain orifices providing a pair of oppositely disposed drain passages communicating with that tortuous passage through which the material to be cooled is circulated.

4. A heat exchange device formed of a plurality of flanged plates arranged in longitudinal series so that an edge of the flange of each plate is disposed against an edge of the flange of the next adjacent plate whereby alternate deep and shallow chambers are formed between adjacent plates, said plates being respectively provided on opposite sides with a boss having a port opening therethrough, said plates respectively being further provided on one side thereof with a lug diametrically opposite to the boss on said one side, said lug having a drain orifice opening therethrough, each plate being set a half a turn in advance of the next preceding plate to have respectively opposed bosses and lugs disposed one against the other whereby the deep and shallow chambers are adapted respectively to have a cooling medium and a material to be cooled circulated therethrough, said drain orifices communicating the deep chambers and providing therewith two diametrically opposite drain passages for said last mentioned chamber.

5. A heat exchange device comprising a plurality of intermediate flanged plates and end plates arranged in longitudinal series, each of the intermediate plates being substantially identical in construction as are also the end plates, each of said intermediate plates being formed on one side with a relatively deep chamber and on the other side with a shallow chamber and separate ports, one communicating the deep chambers and the other the shallow chambers when the plates are assembled, each of said intermediate plates being further formed with an orifice at a point opposite or substantially opposite the orifice which communicates the deep chambers whereby when the plates are assembled a restricted passageway is formed in a straight line through the plates and also in alignment with the ports which communicates the deep chambers.

6. In a heat exchange device, a plurality of intermediate plates and end plates, said intermediate plates when assembled in longitudinal series forming alternately deep and shallow chambers, said plates being provided with ports which communicate the deep chambers and the shallow chambers, respectively, said plates being each formed with a restricted orifice opposite the port which communicates the deep chambers, whereby when the plates are assembled the ports and chambers provide a tortuous passageway for the fluid to be cooled and the cooling fluid while the said orifices provide an aligned restricted passageway for the cooling fluid

which facilitates drainage and cleaning, reduces pressure in the device by guiding the fluid and eliminating congestion at reverse turns in the path of the fluid, and equalizes head pressure at opposite ends of the device.

7. A heat exchange device comprising a plurality of intermediate interchangeable circular plates which are identical in construction and end plates also identical in construction, each intermediate plate being formed with peripheral flanges which provide a relatively deep chamber on one side of the plate and a relatively shallow chamber on the other side thereof, each plate being also formed with a pair of ports adjacent its flange so positioned that when the plates are arranged in longitudinal series a half turn in advance of one another said ports respectively alternately communicate the deep and shallow chambers and provide a tortuous passageway for the fluid to be cooled and the cooling fluid.

8. In a heat exchange device, a plurality of intermediate plates provided with ports and end plates, said intermediate plates when assembled in longitudinal series forming alternate chambers for the tortuous passage of a cooling fluid and a fluid to be cooled, each of said plates being formed with a port which when the plates are assembled provide a continuous passageway through the device which serves as a by-pass for a certain quantity of the cooling fluid.

9. In a heat exchange device, a plurality of flanged partitions arranged in series and forming therebetween chambers for the tortuous passage of a fluid to be cooled and a cooling fluid, said partitions each being formed with ports defining inlets and outlets to said chambers and said partitions being also formed with orifices which are sealed from the chambers for the fluid to be cooled and are located so that they form a substantially direct passage through the device for a certain amount of the cooling fluid.

10. In a heat exchange device, a plurality of flanged partitions arranged in series and forming therebetween chambers for the tortuous passage of a fluid to be cooled and a cooling fluid, said partitions each being formed with ports defining inlets and outlets to said chambers and said partitions being also formed with orifices which are sealed from the chambers for the fluid to be cooled and provide a continuous by-pass through the device for a certain amount of the cooling fluid.

11. In a heat exchange device, a plurality of partitions arranged in series and forming therebetween chambers for the tortuous passage of a fluid to be cooled and a cooling fluid, said partitions being each formed with ports defining inlets and outlets to said chambers, said partitions being also formed with orifices which are sealed from the chambers for the fluid to be cooled and are located so that they by-pass a certain amount of the cooling fluid directly from one chamber to another, said by-pass being aligned with the ports for the cooling fluid.

12. In a heat exchange device, a plurality of flanged and ported partitions arranged in series and forming therebetween chambers for the tortuous passage of a fluid to be cooled and a cooling fluid, and means for by-passing a certain amount of the cooling fluid directly from one chamber therefor to another.

ALFRED L. STAMSVIK.