April 28, 1942. J. HROMADKO 2,281,154

RADIATOR

Filed Aug. 28, 1940

Fig. 1.

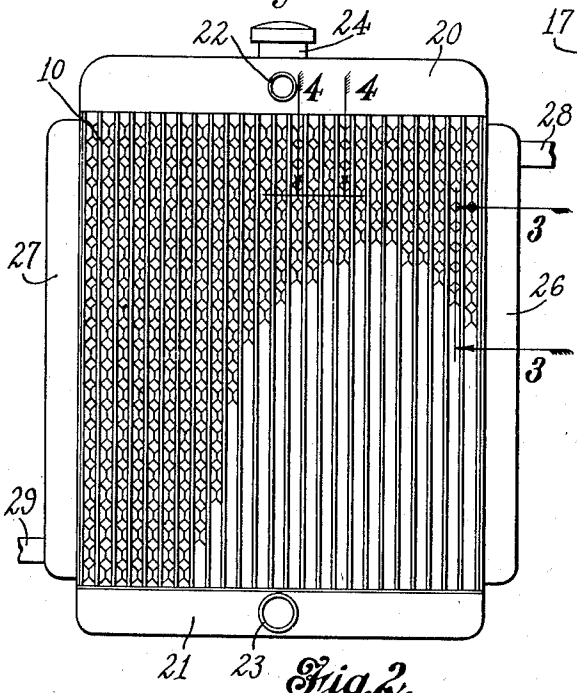


Fig. 3.

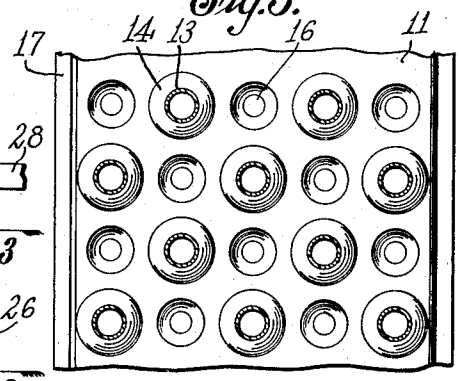


Fig. 4.

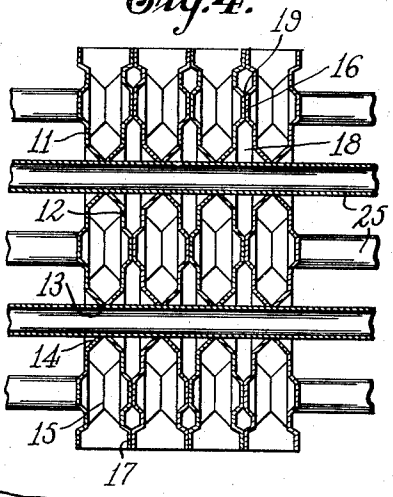
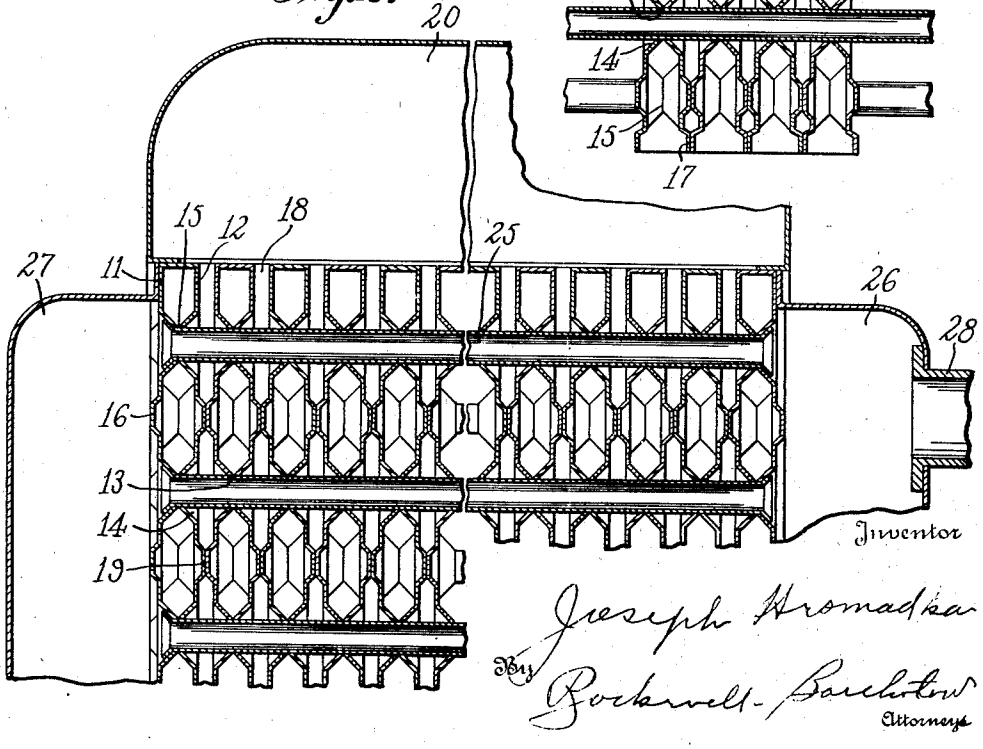


Fig. 2.



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RADIATOR

Joseph Hromadko, Hamden, Conn.

Application August 28, 1940, Serial No. 354,561

2 Claims. (Cl. 257—241)

This invention relates to heat exchange apparatus, and more particularly to a device of this character usually designated as a radiator, in that it is employed to dissipate or radiate heat from the fluid passed through the radiator. While I have illustrated the invention as being applied to a radiator for internal combustion engines, for example, my device is not limited to this use, but may be employed in other relations as well.

In the construction of radiators of this character, there is usually provided a series of water channels connecting upper and lower tanks or headers, the water channels being separated by air spaces through which air is passed to extract the heat from the water. The water channels are usually extremely narrow passages and are easily clogged. Also in some instances, particularly in connection with marine engines, which are usually constructed to operate by the drawing in of sea water, this salt water is quite detrimental to the engine and results in corrosion.

The present invention relates particularly to a radiator for a marine engine, which will have provision for passing fresh water through the radiator in one direction, which fresh water serves to contact and cool the engine cylinders, while this fresh water in turn is cooled by a supply of salt water carried through the radiator structure in passages separated from the fresh water passages. At the same time air may be passed through the radiator to assist in the cooling operation. Salt water is sometimes detrimental to the engine cylinders, and therefore in the present construction only fresh water will come in contact with the engine, but it will in turn be cooled by the salt water passed through the radiator core in separate passages.

One object of the invention is the provision of a radiator having provision for the passage of a plurality of liquids therethrough, one of which serves to cool an internal combustion engine, for example, and the other of which serves to cool the first liquid.

A still further object of the invention is the provision of a radiator having passages for a plurality of liquids therethrough, one of which serves to cool the other, and having the usual air passages also to assist in the cooling operation.

A still further object of the invention is the provision of a radiator having water passages and air passages therethrough, the water passages being connected to an internal combustion engine to cool the same, and the radiator also having a separate set of water passages serving to assist in cooling the water in the first-named passages.

To these and other ends the invention consists in the novel features and combinations of parts to be hereinafter described and claimed.

In the accompanying drawing:

Fig. 1 is a front elevational view of an internal combustion radiator embodying my improvements;

Fig. 2 is a sectional view of the radiator showing the internal construction;

Fig. 3 is a sectional view on line 3—3 of Fig. 1; and

Fig. 4 is a horizontal sectional view on line 4—4 of Fig. 1.

To illustrate a preferred embodiment of my invention I have shown a radiator construction of the sheet metal or cellular type, although it will be understood that the invention is not limited to this particular type of structure. In the embodiment illustrated the radiator core 10 is made up of a plurality of units, each unit comprising a pair of plates 11 and 12 secured together in parallel spaced relation, and closed at the top and bottom. It may be found convenient to make the two plates integral, that is, by forming a single plate of the required size and bending it upon itself at an intermediate portion to form the unit with the two spaced walls. In any case this unit will be closed at the bottom and top thereof.

As shown in Fig. 3, each of the walls 11 and 12 are formed with a plurality of openings 13 and a countersunk or frusto-conical recess 14 formed about this opening, the recess being conveniently formed by displacing the metal of the plate. As shown, the walls of the recess 14 of one plate project oppositely to those of the adjacent plate, so that the plates meet about the openings 13, as shown at 15, for example, so as to brace or space apart the walls 11 and 12 of the unit.

The elements 11 and 12 are also provided with outwardly struck bosses 16, these bosses being displaced in a direction opposite to the countersunk portions about the opening 13, so that when the two plates are assembled to form a unit, as shown in Figs. 2 and 3, the portions 14 will project toward each other within the unit and the bosses 16 will project outwardly toward an adjacent unit.

As shown in Fig. 4, for example, the ends of the plates are offset, as at 17, the offset being in a direction outwardly from the space between two cooperating plates forming a unit, so that

the offset portion 17 of one unit will lie closely adjacent the offset portion of the next unit. When two of the units have been formed and placed side by side with the offset portions abutting each other, a channel will be formed between the two units or between the adjacent plates of the two units, which channels will be open at the top and bottom, as shown, for example, at 18 in Fig. 2, but will be closed at the front and rear edges, as shown in Fig. 4, by the offset portions 17. It will be understood that the radiator structure so formed may be dipped in solder so as to seal the end edges 17 of the plates, and form water-tight channels therebetween.

It will also be understood that the units formed by the plates 11 and 12 will be open from front to back so as to provide a circulation of air therethrough contiguous to the water channels between the units. It will also be noted that the outwardly displaced bosses 16 of one unit will contact those of the adjacent plate of the next unit, as shown at 19, to assist in bracing the structure and spacing apart the walls of the water channels formed between the units. These water channels through the openings 18 are in communication with headers 20 and 21 at the top and bottom of the core, which headers are provided with inlet and outlet necks 22 and 23, and the upper header being provided with a filling neck 24.

As described above, one of the water channels would be in communication with the adjacent channels through the openings 18. This communication is cut off, however, and provision for the circulation of a second fluid through the radiator is provided by inserting through these openings a plurality of transverse pipes 25, as shown, for example, in Figs. 2 and 4, these pipes or tubes extending from one side edge to the other of the radiator core, and being in communication at their ends with side headers 26 and 27, the headers being provided with inlet and outlet necks 28 and 29. The joints between the tubes 25 and the metal of the plates adjacent the openings 13 may be sealed in any desired way, such as by solder or a suitable cement.

With a radiator core constructed as above, it will be obvious that a liquid may be circulated from the upper header 20 to the lower header 21 through the upper openings 18 of the narrow water channels between adjacent plates of the core in a more or less usual manner, but that a fluid or liquid may also be circulated through the tubes 25 from the header 26 to the header 27, and that an exchange of heat will take place between the two fluids. It may be considered, for example, that the plates 11 and 12 form fins for the tubular members 25 to dissipate the heat therefrom or conduct it thereto, and that these fins in themselves form additional water channels for a further exchange of heat to the liquid within such channels. It will, of course, also be obvious that a circulation of air from the back to the front of the radiator, as shown in Fig. 1, takes place between the plates 11 and 12 of each of the units.

In addition the radiator will be well braced by the tubular members 25, which will make of it a very rigid structure, even though these tubes are not employed as water-circulating tubes.

In the case of marine engines it sometimes occurs that the salt water usually employed to cool the same has a harmful effect upon the engine block through which it is circulated. With the use of the radiator herein shown, for example, fresh water may be placed in the headers 20 and 21 through the filler neck 24, this water passing through the openings 18 between adjacent plates of the core in the usual way, and the inlet and outlet tubes 22 and 23 being connected to the motor so that only fresh water will be employed in contact with the motor. However, salt water may be drawn in in the usual manner through the tube 28 into header 26 and circulated through the tubes 25 into the header 27 and vented through the tube 29. In this way the cooling of the fresh water circulating through the motor is effected by means of the salt water circulated through the tubes 25, in addition, of course, to the cooling which is performed by the air passing through the radiator structure. Thus, while the actual cooling is performed by salt water as usual, this is used to cool fresh water, which in turn absorbs heat from the motor so that no salt water is in contact with the parts of the motor. Other uses of the structure will at once suggest themselves, such, for example, as the heating of one liquid from another, and in some instances it may be desired to heat oil, for example, to be used in the motor.

Also if desired a user of my device may pass air through the horizontal tubes 25 to assist in cooling the water or other liquid passing through the channels formed by the plates, which will be in addition to the air passing through the radiator from front to back. If, for example, the latter is not sufficient to perform the necessary cooling function, additional air may be passed through the tubes 25.

While I have shown and described a preferred embodiment of my invention, it will be understood that it is not to be limited to all of the details shown, but is capable of modification and variation within the spirit of the invention and within the scope of the appended claims.

What I claim is:

1. A radiator comprising a plurality of spaced parallel tubular members forming fluid passages and having spaced plates thereon, headers at opposite ends of said tubular members, said plates being in heat transfer relation with said members and having integrally formed abutting projections thereon to space apart adjacent ones of said plates and form water passages and open-ended air passages therebetween, said water passages being distinct from the fluid passages formed by the tubes, and additional header members at opposite ends of said water passages whereby two separate liquids may be passed through the radiator in addition to the passage of air through the air passages.

2. A radiator comprising a plurality of pairs of plates disposed in substantially parallel relation, said plates having integrally formed projections thereon, and the projections on one plate abutting those of an adjacent plate to space said members apart and form fluid passages therebetween and open-ended air passages between the fluid passages, headers at opposite ends of said plates in communication with said passages, said plates having registering openings therein, tubular members passed snugly through said openings and extending from one side of the radiator to the other forming additional fluid passages, and headers at opposite sides of the radiator in communication with said tubular members.

JOSEPH HROMADKO.