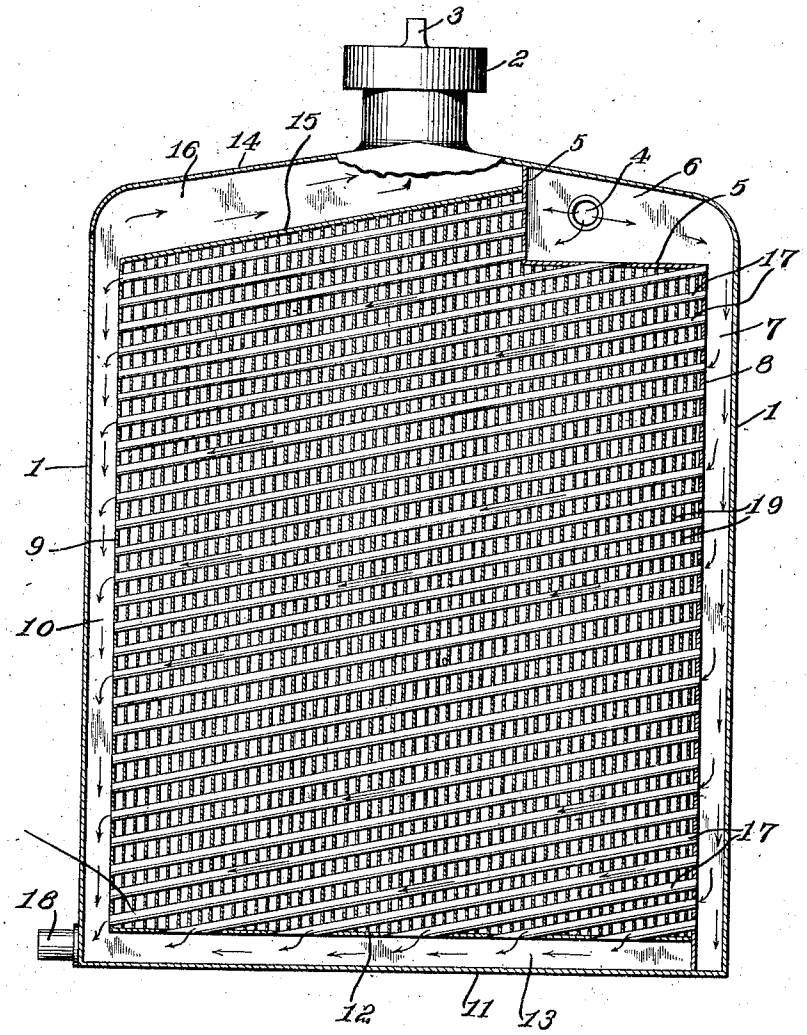
March 16, 1926. 1,576,756

W. W. MUIR

RADIATOR FOR INTERNAL COMBUSTION ENGINES

Filed August 16, 1922 2 Sheets-Sheet 1

Fig. 1.



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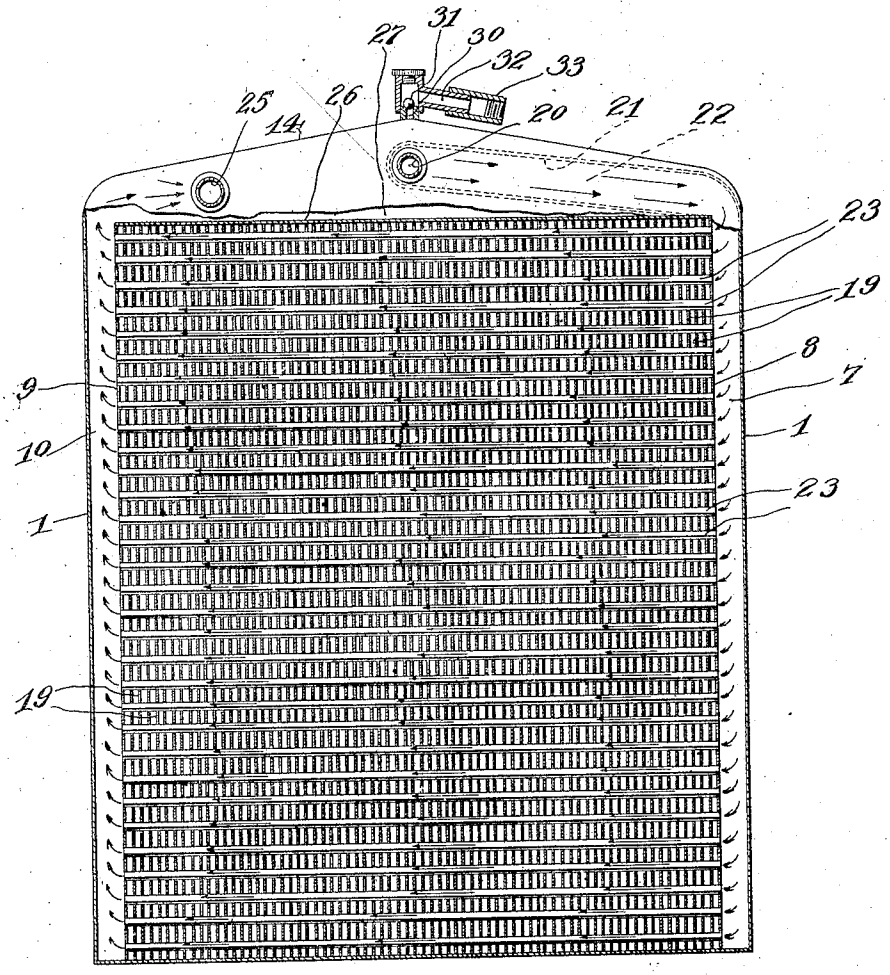
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Fig. 2.



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Patented Mar. 16, 1926. 1,576,756

UNITED STATES PATENT OFFICE.

WELLINGTON W. MUIR, OF LOCKPORT, NEW YORK.

RADIATOR FOR INTERNAL-COMBUSTION ENGINES.

Application filed August 16, 1922. Serial No 582,217.

To all whom it may concern:

Be it known that I, WELLINGTON W. MUIR, a citizen of the United States, residing at Lockport, in the county of Niagara and State of New York, have invented certain new and useful Improvements in Radiators for Internal-Combustion Engines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to radiators for internal combustion engines and has for its object to improve the construction as well as the efficiency of radiators heretofore proposed.

With these and other objects in view the invention consists in the novel details of construction and combinations of parts more fully hereinafter disclosed and particularly pointed out in the claims.

Referring to the accompanying drawings forming a part of this specification in which like numerals designate like parts in all the views:—

Figure 1 is a diagrammatic sectional view of a radiator made in accordance with this invention; and

Figure 2 is a view similar to Figure 1, showing a somewhat modified form of radiator.

1 indicates any suitable outer shell or casing, 2 a filling cap therefor provided with a vent 3 and 4 indicates a pipe or passage through which steam, hot water, or a mixture of steam and fluid passes into the radiator. 5 indicates an imperforate partition on the inside of the shell 1, to provide a chamber or space 6 into which the fluid to be cooled enters from the pipe 4, and 7 indicates a vertically disposed passage connected with said space 6 down which said fluid flows from said space 6. The passage 7 is formed by the plate or partition 8 spaced from the vertical outer shell 1 as shown, and which is provided with an imperforate extension or partition which extends between the plates 11 and 12, as shown. A plate 9 somewhat similar to plate 8 is spaced from the other side of the shell 1 to form the vertically disposed passage 10 as illustrated. Spaced from the bottom plate 11 of the radiator shell is a third plate 12 to form the passage 13, and spaced from the top plate 14 of the shell is a fourth plate 15 to form the air space 16.

It will thus be seen that there is present a pair of channels formed by the spaces 6 and 7 on the one hand and the spaces 16, 10 and 13 on the other hand, which are separated by a pair of imperforate partitions.

In the form of the invention shown in Figure 1, the water tubes 17 of the radiator are inclined to the horizontal and some of the same pass through an extension of the partition 5, and the plate 9 as illustrated, while others of the same pass through the plates 8 and 9, and still others pass through the plates 8 and 12, as shown. The last mentioned water tubes 17 deliver into the space 13, while the other of said tubes 17 deliver into the vertically disposed channel or space 10. 18 represents a pipe or passage connected to the spaces 10 and 13, and adapted to lead off the condensed fluid to a pump as is usually the case in radiators. The core of the radiator may be of any suitable construction, but for convenience of illustration, the one shown in Figure 1 consists of tubes 17 which are provided with the fins 19 in the manner well known.

In the modified form of the invention shown in Figure 2 the inlet pipe 20 enters near the center of the shell 1, and is provided with the partition walls 21 to form a chamber 22 leading directly to the vertically disposed passage 7.

The water tubes 23 are horizontally disposed instead of inclined as in Figure 1, and they deliver into the vertical passage 10 as shown. The bottom chamber or passage 13 illustrated in Figure 1 is omitted in Figure 2, and the delivery pipe 18 of Figure 1 is moved up to the top of the radiator shell and finds its equivalent in the pipe 25 which may be connected to the pump in the usual manner.

The partition 15 of Figure 1 finds its equivalent in the partition 26 which extends entirely across the radiator and is spaced from the top plate 14 thereof to form an air chamber 27 which is the full equivalent of the chamber 16 in Figure 1. In both of the forms of the invention it will be observed that the hot fluid first enters the vertical passages 7, and passes along the water tubes toward the vertically disposed passages 10 and becomes condensed through the cooling action of the air passing between the fins 19.

In Figure 1, the condensed fluid leaves the extreme ends of the tubes 17 as it reaches the passage 10, and any air which may have been carried over into the radiator readily escapes at the ends of the various tubes 17, passes up the said passages 10, finds its way into the chamber 16, and escapes out the vent 3. The same is true of any air that finds its way into the passage 13 because, as the fluid in said passage 13 reaches the pipe 18, any air entrained therein will bubble up through any fluid which may exist in the passage 10 and likewise find its way into the chamber 16. It thus results that no matter how much liquid may be condensed in this radiator shown in Figure 1, there will always be an escape of air up the passage 10 into the chamber 16 and out the vent 3. This constitutes an important feature of this invention for as is well known it is very desirable indeed to use centrifugal pumps in pumping hot water in automobile and other internal combustion engines, and that when the water accmulates in the raditors on the suction sides of said pumps, the cooling system fails to operate satisfactorily. That is to say, when the water rises in the ordinary radiator honey combs through condensation, the vents which are provided and which communicate with the lower portions of the radiator, become covered with water or liquid and as the pressure increases in the honey comb the cooling fluid is forced out of said vents and lost. That is, it is customary to use more or less alcohol or other non-freezing fluid in the jackets, and as the alcohol is entrained or trapped in the condensed fluid its loss through the vent causes serious inconvenience and expense and other evils follow which it is not necessary to detail here.

By employing the construction shown in Figure 1, on the other hand, involving a cross flow of the cooling fluid through the water tubes 17, it makes no difference how high the said fluid may rise in the honey comb of the radiator for there will always be a vent up the passage 10 into the chamber 16 and out the vent tube 3 for any air that may be carried over and accordingly, the pressure may rise in the radiator to any reasonable extent without forcing the valuable non-freezing compound with the fluid out of said vent 3. A further important feature of this invention resides in the fact that the partition 5 separating the chamber 6 from chamber 16 is imperforate, for if it was provided with one or more holes above the tubes 17 water and alcoholic vapors would readily escape through said holes and pass out of the system through the vent 3. That is to say, as is well known the loss of alcoholic vapor alone is quite serious in systems of this kind, and the loss of the cooling fluid such as water whether in the form of water or vapor is also serious for in modern systems of cooling, steam is employed as the medium and it is not necessary to renew the cooling liquid as has been heretofore the case. In other words with a modern system, should there be a constant loss of vapor through partition 5 from chamber 6 into chamber 16 and out of vent 3, the operator would be liable to forget to renew the water in the system and thus the latter might become depleted of cooling liquid and the engine injured before said depletion was discovered.

On the other hand by making the partition 5 imperforate as illustrated and thus compelling both the water vapor and alcoholic vapor to pass down through the tubes or channels 17, the alcoholic vapor is largely caught in, or absorbed by, the condensed water in said tubes and the water vapor, itself, is converted into the liquid form so that no serious loss of alcoholic or water vapor is experienced. It follows that this form of radiator is especially adapted for automobile and other engines employing centrifugal pumps, and it has other advantages not necessary to mention here.

In the form shown in Figure 2, substantially the same advantages exist for in this particular modified form of the invention the condensed fluid collects at the bottom of the core, rises to the top thereof, and fills a portion of the space 27 before it can pass out of the pipe 25 to the pump. Therefore, any air which may be carried over by the radiator has a free escape from the surface of the fluid in the space 27 through the vent 30, past the ball valve 31 and out the tube 32, all as will be readily understood from the drawings.

It is thus impossible, in this form of construction, for the increase of pressure in the radiator to force out of the vent tube 30 any valuable alcohol or other non-freezing compound before the radiator shell becomes entirely full of liquid. The nipple 33 is provided so that the vent may be connected to a suction apparatus when desired. That is, this radiator may be operated at both pressures above and below that of the atmosphere.

It will now be clear that in both forms of the invention I employ a cross flow core, wherein the condensed fluid flows from side to side of the radiator, instead of from top to bottom, and this has the important advantage that the air present can always escape to the atmosphere, and an accumulation of pressure in the radiator will not cause any loss of cooling fluid. Another important advantage of this construction resides in the fact that it is not necessary to run a centrifugal pump joined to this radiator at high speeds when the engine is running slow, as is the case with other radiators,

for the liquid will accumulate in the colder passage, and gradually balance the head of fluid on the force side of the pump without permitting a steam pressure to accumulate in the radiator. This enables the pump at relatively low speeds to force said fluid back into the jacket, which is a feature not present in other radiators so far as I know.

It is further clear that these radiators may extract heat from water or steam or a mixture of water and steam used as a cooling fluid with equal facility.

It is obvious that those skilled in the art may vary the details of construction as well as the arrangement of parts without departing from the spirit of the invention, and therefore, I do not wish to be limited to the above disclosure except as may be required by the claims.

What is claimed is:—

1. In a radiator the combination of an outer shell; plates located inside said shell and spaced from the opposite walls thereof to form a pair of chambers and a pair of passages joined to said chambers; an imperforate partition inside said shell separating said chambers from each other; means to conduct the fluid to be cooled into one of said chambers; a plurality of water tubes inclined to the horizontal plane joining said pair of passages; a vent leading from the other of said chambers; and means to withdraw the cooled fluid from the radiator.

2. In a radiator the combination of an outer shell; plates spaced from opposite walls of said shell to form a pair of chambers and a pair of passages joined to said chambers; a pair of imperforate partitions separating said chambers and passages; a plurality of water tubes supported by said plates and terminating in said passages; one of said imperforate partitions provided with an extension to form one of said chambers; means to conduct fluid to said radiator; means to withdraw fluid from said radiator; and means to vent air from said radiator.

3. In a radiator the combination of an outer shell provided with a pair of vertical inside passages disposed along opposite walls of said shell; means comprising a plurality of water passages joining said first named passages; means comprising a chamber to receive a fluid and pass the same to be cooled into one of said passages; means comprising a second chamber to receive any air given off from said water passages; means comprising an imperforate partition separating said first and second named chambers adapted to compel all fluids entering said first named chamber to traverse said water passages before entering said second named chamber; and means to conduct off the condensed fluid from said radiator.

4. In a radiator the combination of an outer shell provided with a pair of vertically disposed inside passages along opposite walls; a plurality of water tubes joining said passages; means comprising a chamber to conduct the fluid to be cooled to one of said passages; means comprising a second chamber and vent to conduct off any air present from the other of said passages; means to conduct off the condensed fluid from the radiator; and means to compel water and other vapors entering said first named chamber to pass through said tubes before reaching said vent.

5. In a radiator the combination of an outer shell having two opposite sides and a top between said sides; a pair of plates inside said shell spaced from said sides to form a pair of passages; a plurality of water tubes extending between said plates and terminating in said passages; a plurality of imperforate partitions inside said shell spaced from said top to provide separate chambers communicating with said passages; means to introduce hot fluid into one of said chambers; and means to permit air to escape from the other of said chambers.

6. A radiator for internal combustion engines provided with vertically disposed passages and cross flow water tubes connected in parallel therewith for conducting the fluid to be cooled from side to side of the radiator instead of from top to bottom thereof; means comprising a chamber disposed above said passages by which each tube and the entire radiator may be vented of any air present therein even though said tube be immersed in fluid; and means to compel any water or other vapor present to pass through said tubes before it can be vented.

In testimony whereof I affix my signature.

WELLINGTON W. MUIR.