A. NEBEL.

RADIATOR.

APPLICATION FILED OCT. 6, 1919.

1,377,912. Patented May 10, 1921.

Fig. 1.

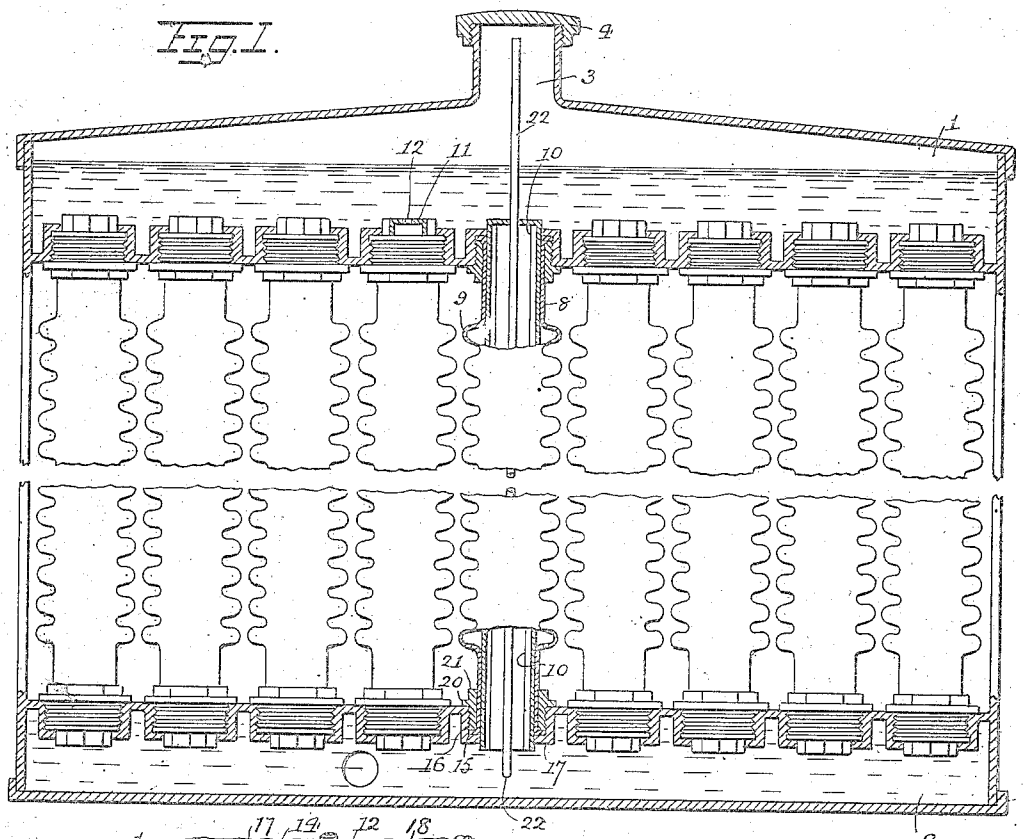


Fig. 2.

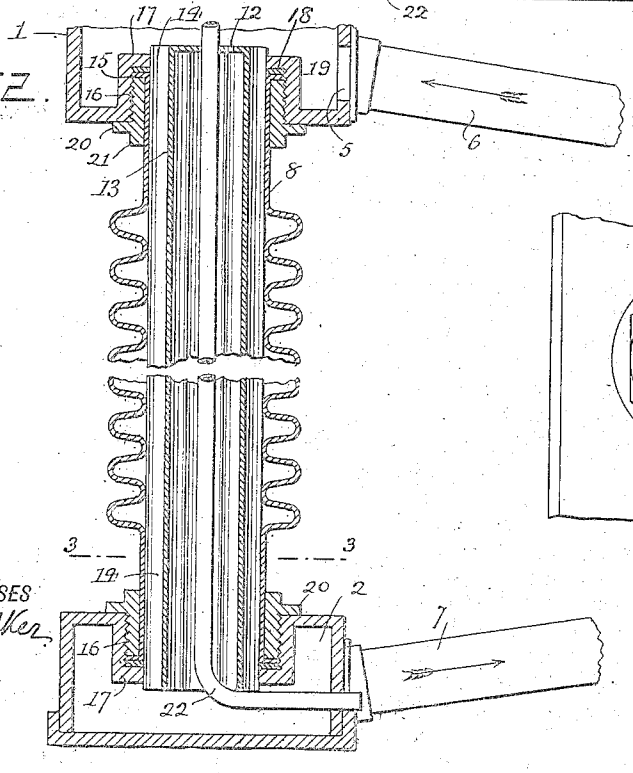
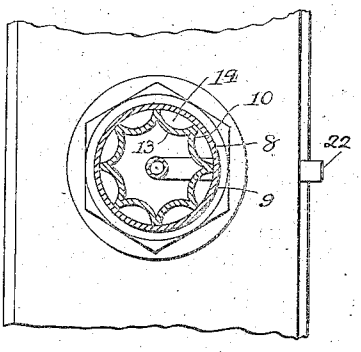


Fig. 3.



WITNESSES

H. T. Walker,

E. B. Gale

INVENTOR

Albert Nebel,

BY

ATTORNEYS

UNITED STATES PATENT OFFICE.

ALBERT NEBEL, OF BROOKLYN, NEW YORK.

RADIATOR.

1,377,912. Specification of Letters Patent. Patented May 10, 1921.

Application filed October 6, 1919. Serial No. 328,745.

To all whom it may concern:

Be it known that I, ALBERT NEBEL, a citizen of the United States, and resident of the city of New York, borough of Brooklyn, county of Kings, and State of New York, have invented a new and Improved Radiator, of which the following is a full, clear, and exact description.

This invention relates generally to liquid cooling devices, and is particularly adapted for use as a radiator for automobiles, but it is understood it may be used wherever it is desirable to cool a circulating liquid.

In radiators heretofore provided for automobiles, it has been the aim to obtain as large a surface exposed to the air as possible with which the circulating fluid, such as water, may contact so that the liquid may be cooled. In practice, the structures used embody a great number of independent passages, of varying form, which are expensive to manufacture, difficult to repair, and usually affording unsatisfactory means for compensating for expansion and contraction of the tubes upon change of temperature.

One of the objects of this invention is to provide a radiator having its parts constructed and arranged so as to bring the circulating fluid in contact with a large exposed surface whereby the liquid may be effectively cooled, and this in a limited space.

A further object of this invention is to provide a radiator having its parts constructed and arranged so as to compensate for a change in temperature. Still a further object of this invention is to provide a radiator having its parts so constructed and arranged that they may be readily and conveniently assembled, repaired or replaced.

More specifically, one of the objects of this invention is to provide a radiator in which a plurality of independent intercommunicating circulating passages are formed so as to obtain an effective cooling of the liquid in a minimum space.

A further object of this invention is to provide in a radiator having vertically extending tubes, a construction whereby the overflow pipe may be arranged within the radiator extending through one of the tubes, and having an outlet near the bottom thereof, so that there will be no chance of the said overflow pipe interfering with the rotation of the fan.

Still a further object of this invention is to provide a construction which will permit one end of the tube to be removably connected with the reservoir, without the use of solder or similar material, so that the radiator may be readily assembled and repaired.

The invention consists in the combination and arrangement of parts, one of the practical embodiments of which is shown in the accompanying drawings, and described in the following description.

More specifically, in the practical embodiment shown, the invention comprises a radiator having a plurality of reservoirs, connected by vertically extending tubes having transverse corrugations encircling the same, and a second tube within the first named tube, partially closed at one end, and having longitudinally extending grooves or channels so that independent circulating passages are formed between the two tubes, another circulating passage being formed within the second tube.

The above and other objects and advantages of the invention will be apparent from the following description and the accompanying drawings in which similar characters of reference designate corresponding parts in the several views.

Figure 1 is a broken elevational view partly in section, of a radiator embodying the invention, in which one of the tubes is broken away and shown in section, showing one of the arrangements of the tubes.

Fig. 2 is an enlarged elevational sectional view of one of the tubes, showing the arrangement of the various tubes, the overflow pipe, and the inlet and outlet of the radiator.

Fig. 3 is a sectional view taken on the line 3—3 of Fig. 2.

In Fig. 1 of the drawing, showing one of the practical embodiments of the invention, the radiator comprises a plurality of reservoirs 1 and 2 and may be of any suitable form and size, and constructed of any suitable materials well known in the art. The upper reservior is provided with the usual filling passage 3, having a cap or cover 4 therefor. As shown in Fig. 2, an inlet 5 having an inlet passage 6 communicating therewith is also provided. The lower reservoir 2, is provided with the outlet passage 7. The inlet and outlet passages 6 and 7 may be connected with an engine or other device having circulating fluids which are to be cooled.

In the form shown, the reservoirs 1 and 2 are connected by tubular members 8 shown circular in form, and provided with lateral or transverse corrugations 9 which encircle the said tubular members. The corrugated portion 9 forms a relatively large surface exposed to the air, with which the circulating liquid may contact in order that the temperature thereof may be regulated or controlled. Another tubular member 10 is arranged within the first mentioned tube, and extends longitudinally thereof, one end 11 of the tube being partially closed, leaving an opening 12. The tubular member 10 is provided with longitudinally extending grooves or channels 13 which form with the tubular member 8, a plurality of independent longitudinally extending circulating passages or channels 14 more clearly shown in Fig. 3. Further, another circulating passage or channel is formed within the tubular member 10. It is to be understood however that the corrugations on the tubular member 8, and the grooves 13 of the tubular member 10, may be of any desired form.

It is to be noted that when the grooved tubular member 10 is arranged within the tubular member 8, the transverse corrugations 9 form intercommunicating passages affording a relatively large exposed surface, with the longitudinally extending passages formed by the grooves or channels in a member 10. It is thus seen that the longitudinally extending passages afford a means of connecting numerous other channels formed by the transverse corrugations encircling the outer member 8. In operation, the latter corrugations function as pockets in which the temperature of the liquid may be changed, the said liquid entering the longitudinal circulating passages at the proper time.

Whe the radiator is used as a cooling device, s for instance will be the case when used on an automobile, the water will fill the transverse corrugations, and when sufficiently cool, will be conducted to the lower reservoir 2, through the longitudinally extending channels 14, from which reservoir the water will in due time find its way through the outlet 7 to a suitable engine, not shown. After the liquid used in the engine, has been again heated, the water will enter the upper intake 6, and will again find its way through circulating passages of the radiator.

In the form shown, the ends of the outer tubes 8, are removably held in fixed relation to the different reservoirs, by a mechanical connection without the use of solder or similar material. This is a feature which permits of the ready and convenient assembly and repair of the different parts of the radiator. In the form shown, the end of the tube 8 is provided with a shoulder 15 and is inserted within a threaded recess or aperture 16 having a restricted opening forming a shoulder 17 against which the shoulder 15 abuts, a washer 18 being preferably interposed between the shoulders 15 and 17 respectively. As a means of holding the shoulder 15 within the aperture against the shoulder 17 in fixed relation thereto, a sleeve 19 is preferably threaded in the aperture 16. Preferably, the sleeve is provided with an annular shoulder 20 abutting against the outer surface of the reservoir, and a hexagon nut 21 formed preferably integral therewith to facilitate the positioning of the sleeve 19, but it is to be understood that other suitable means may be provided for holding one end of the tube and the reservoir in relatively fixed relation.

It is to be noted that the contraction and expansion of the various parts of the radiator due to temperature change, will be compensated for by the corrugated and grooved portions of the tubes, thus eliminating leaky joints and tubes.

A further feature of the radiator, is the provision of a concealed overflow tube 22 shown extending through one of the tubes, and being bent at the bottom, passing through the side of the lower reservoir 2. By this construction, the overflow tube is concealed, and is so positioned that there is no possibility of coming in contact with the revolving fan, as is the case with the usual construction.

One end of the inner tube 10, is partially closed leaving an opening 12, which permits a certain part of the liquid to circulate therethrough, and eliminates the formation of a pocket in which non-circulating air or water might collect. With reference to the form of the transverse corrugations, encircling the outer tube 8, preferably the corrugations are wave like in form, and so proportioned that the liquid will not become pocketed therein, but when sufficiently cooled, will continue in the circulating channels.

Another feature of the radiator construction, is that if it is desired to decrease the amount of liquid circulated, the desired number of tubes may be readily disconnected and the circulating passage stopped.

While there has been shown herein a practical embodiment of the invention, it is understood that varius changes and modifications may be made without departing from the spirit and scope of this invention.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is

1. In a radiator comprising a plurality of reservoirs, and a tube connecting the same, a means for connecting one end of the tube to the reservoir, which consists in providing a threaded recess in the reservoir, a shoul-

der on one end of the tube, and a member adapted to be inserted in the recess, and to abut against the shoulder of the tube to hold the said tube and reservoir in fixed relation.

2. In a radiator, a reservoir and a tube, and means for connecting the tube to the reservoir, said means comprising a screw-threaded recess formed in the reservoir and adapted to receive the end of the tube, a shoulder formed on said end of the tube and a threaded member adapted to be received within the screw-threaded recess to retain the tube therein by reason of its engagement with the shoulder formed upon the tube.

ALBERT NEBEL.