April 13, 1926. 1,580,633

F. X. ATZBERGER

RADIATOR

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Fig. 1.

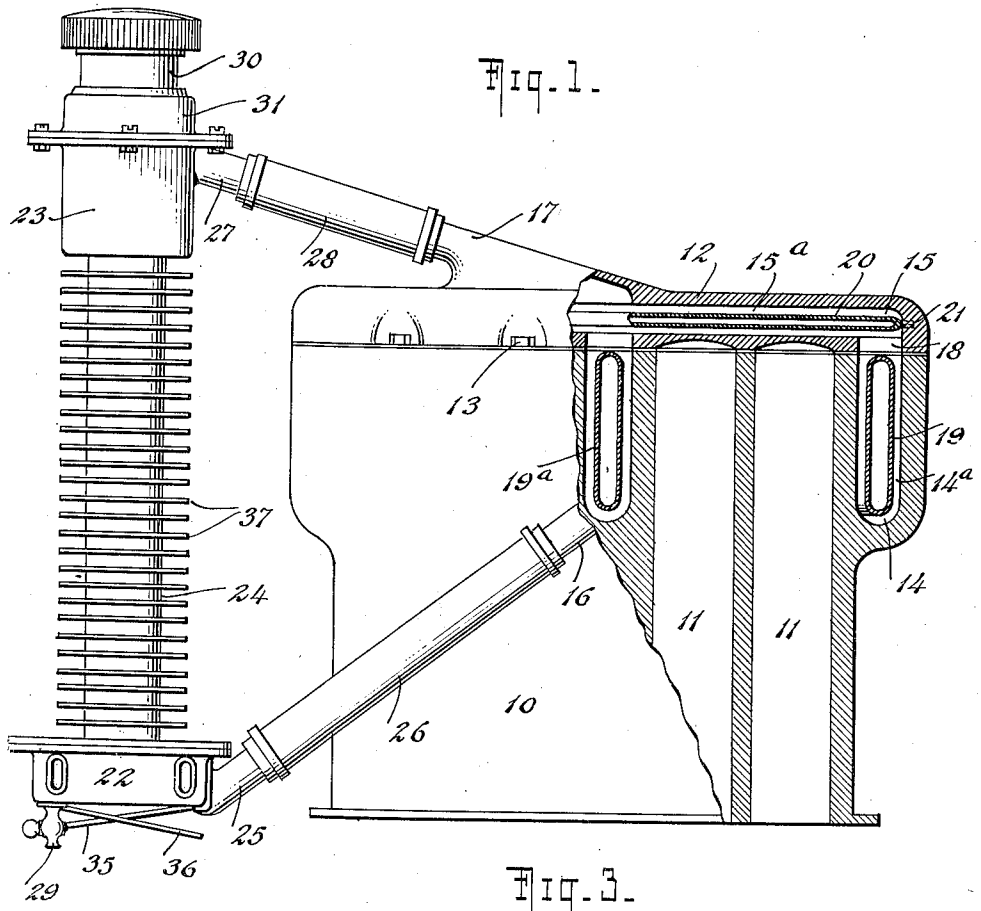
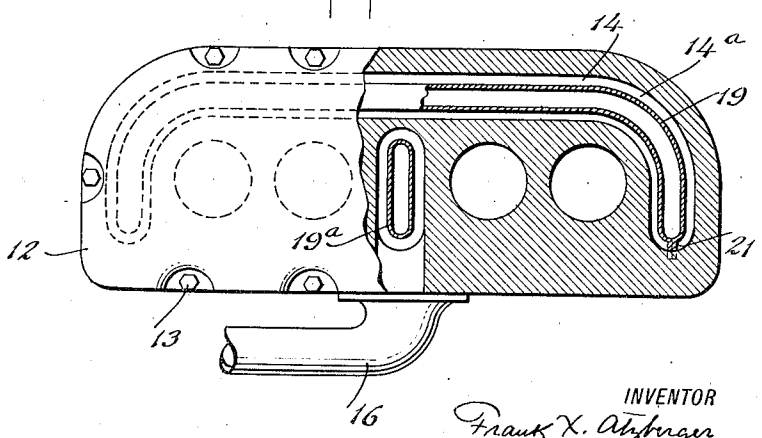



Fig. 3.




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Fig. 2.

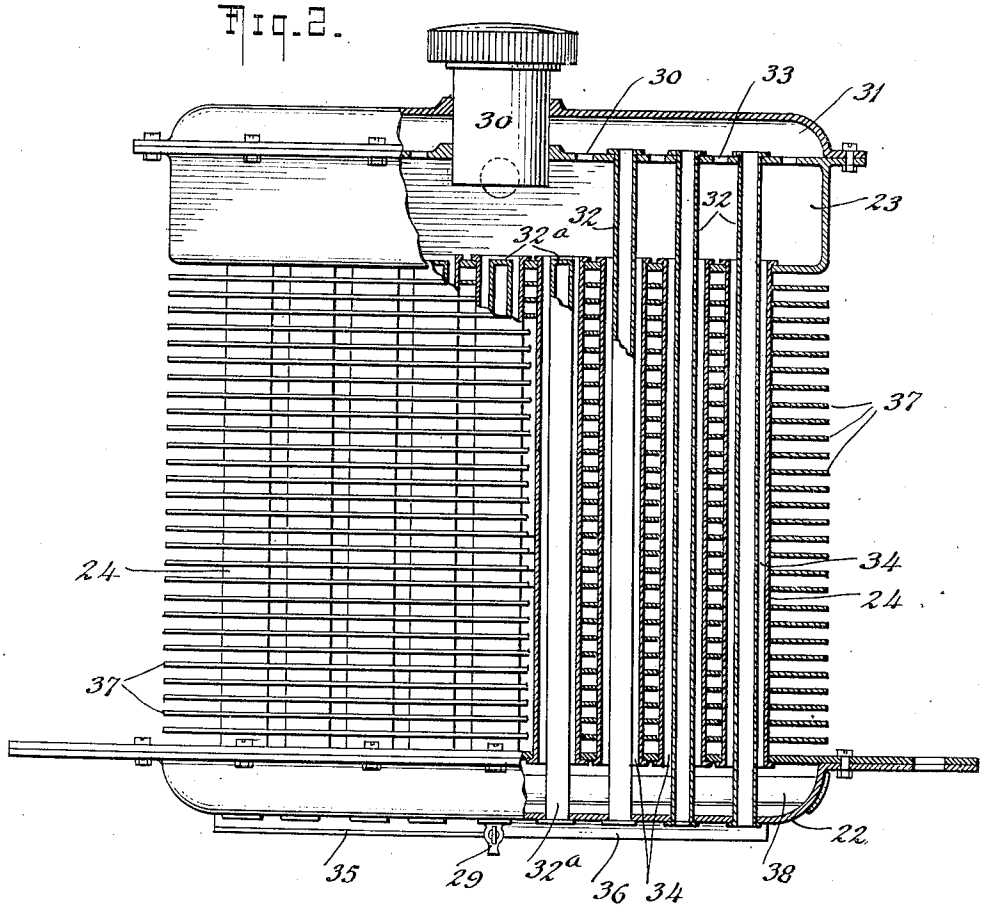
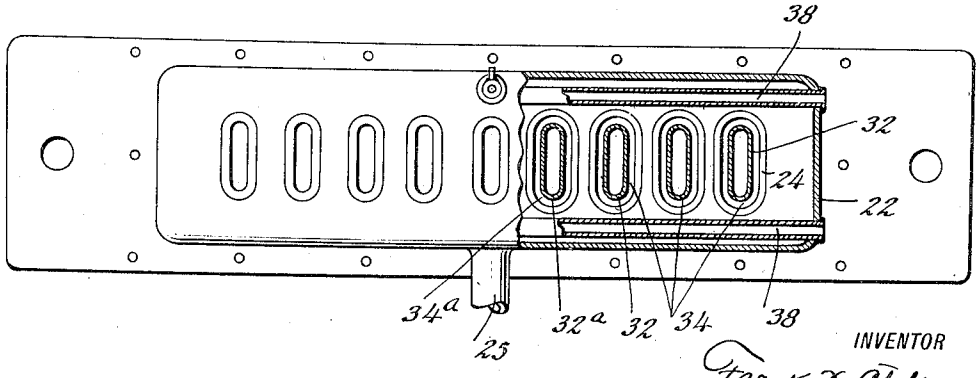



Fig. 4.




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# UNITED STATES PATENT OFFICE.

FRANK X. ATZBERGER, OF EAST ISLIP, NEW YORK.

## RADIATOR.

Continuation in part of application Serial No. 360,784, filed February 24, 1920. This application filed June 5, 1922. Serial No. 566,048.

*To all whom it may concern:*

Be it known that I, FRANK X. ATZBERGER, a citizen of the United States, and resident of East Islip, county of Suffolk, State of New York, have invented certain new and useful Improvements in Radiators, of which the following is a specification.

My invention relates to radiators for internal combustion engines of the type commonly used in automobiles, auto-trucks, aeroplanes, and other automotive vehicles or craft, which generally include a water circulating system for cooling the engine and its associated elements. The object of the invention is to provide a novel and simple construction arranged to insure quick cooling of the water in the cooling system without requiring the use of a cooling fan or similar device and whereby rupture of or injury to the radiator in case the water in said cooling system freezes is efficiently prevented. The invention further contemplates a construction in which the ice, resulting from freezing of said cooling water, is quickly melted without interference with the operation of said engine. Other more specific objects of the invention will appear from the description hereinafter and the features of novelty will be pointed out in the appended claim. This application is in part a continuation of another application filed by me in the Patent Office on February 24, 1920, Serial No. 360,784.

In the accompanying drawings, which illustrate an example of the invention without defining its limits, Fig. 1 is a side elevation, partly in section, showing the engine and radiator; Fig. 2 is a front view of the radiator partly broken away; Fig. 3 is a plan view, partly broken away of Fig. 1 and Fig. 4 is a similar view of Fig. 2.

The engine primarily may be of any conventional construction and type and includes the customary block 10 in which the cylinders 11 are located, a head 12 being secured upon said block by bolts 13 in the well-known way. The block 10 and head 12 are provided respectively with chambers 14 and 15 comprising cooling jackets and provided respectively with an inlet connection 16 and an outlet connection 17, it being understood that the chambers 14 and 15 are in communication with each other by means of passages 18. The chambers 14 and 15 are provided respectively with closed tubes 19 and 20 fixed centrally in position in said chambers in any convenient manner as by means of flanges 21 extending into the metal of which the engine is constructed. These tubes 19 and 20 are smaller in cross-sectional dimensions than the chambers 14 and 15 and form therewith passages $14^a$ and $15^a$ through which the cooling water circulates. If, at any time the water in the chambers 14 and 15 should freeze, the pressure of the resulting ice will compress the tubes 19 and 20 and will be absorbed thereby, thus protecting the engine against injury from this source.

To still further reduce the danger of injury to the engine from the freezing of the cooling water, a tube $19^a$ may be located in the cylinder block 10 for instance as indicated in Fig. 3; this tube $19^a$ operates in the same manner as the tubes 19 to neutralize the pressure of any ice which may form in the engine.

The engine is combined with a radiator which primarily may be of any conventional type and as shown consists essentially of a bottom water chamber 22 and upper water chamber 23 and tubes 24 extending between the water chambers 22 and 23 and connecting the same with each other for instance by attaching the lower ends of the water tubes 24 to the top of the bottom water chamber 22 and the upper end of the tubes 24 with the bottom of the top water chamber 23. With the arrangement described the water may circulate from the water chamber 23 by way of the tubes 24 into the water chamber 22. The latter may be connected with the water circulation system of the engine in the usual manner; for instance, as shown in the drawings, an outlet 25 is arranged on the rear wall of the bottom chamber 22 for connection, by means of a hose 26, with the inlet connection 16 leading to the water jackets of the engine, the outlet connection 17 of said engine in turn, being connected with the upper water chamber 23 at the inlet 27 by means of a hose 28. The bottom water chamber 22 may be provided with a suitable drain cock 29 for draining the water out of the radiator whenever it is desired to do so. The upper water chamber 23 is provided in the well-known way with a filling funnel 30 of usual construction for filling the radiator with water as needed.

If desired the radiator may include a

chamber 31 arranged on the top of the water chamber 23, and through which, in such case, the filling funnel 30 extends; into this chamber 31 open the upper ends of air circulating tubes 32 which extend through the upper water chamber 23, through sundry of the water tubes 24 and through the bottom water chamber 22. The chamber 31 if it is included in the construction, communicates with the upper water chamber 23 by means of openings 33 formed in the partition between said chambers. The lower ends of the air tubes 32 open into the atmosphere below the under side of the bottom water chamber 22 as shown in Fig. 2. With the arrangement described, the air tubes 32 form with the water tubes 24 annular passages 34 for the water to circulate from the upper water chamber 23 into the lower water chamber 22. In practice, the water tubes 24 and the air circulating tubes 32 are preferably made of elongated shape in cross section, as plainly indicated in Fig. 4, thereby forming water circulating passages 34 which are narrow, and this insures a thorough cooling of the water during its passage through the water tubes 24, by the air which contacts with the outer surface of the tubes 24 and by the air which passes through the air tubes 32. It will further be noted that in case the water in any of the passages 34 should freeze it will bulge the adjacent wall of the corresponding tube 32 in an inward direction without rupturing said tube and thus will relieve the water tubes 24 from any pressure resulting from the formation of ice therein and consequently avoiding the possibility of injury to the radiator. It will further be noted that by constructing the water tubes 24 and the air circulating tubes 32 as described and shown in the drawings, a large amount of water and air can circulate through the tubes to satisfy the demands of the internal combustion engine as to the cooling of the cylinders and other water jacketed parts.

To facilitate the circulation of air through the tubes 32 and to increase the efficiency thereof as a medium for withdrawing heat from the cooling water, deflector plates 35 and 36 are secured beneath the radiator and inclined respectively toward the front and rear of the vehicle in which the invention is installed. With this arrangement, as the vehicle is in motion, air will be scooped up by the deflector plate 35 and forced up through some of the air tubes 32 while at the same time suction will be developed at the edge of the deflector plate 36 whereby air will be drawn through other tubes and through said radiator.

Air tubes 32[a] extend through the remaining water tubes 24, that is, preferably those located near the centre of the radiator, as plainly indicated in Fig. 2. The tubes 32[a] form, with the corresponding water tubes 24 passages 34[a] similar to the passages 34 and serve the same purpose, that is, to aid in circulating the water from the water chamber 23 into the water chamber 22. The upper ends of the air tube 32[a] are sealed in any convenient manner while the lower ends thereof extend downward through the bottom water chamber 22 and open into the atmosphere at their lower ends, the same as the tubes 32.

Cooling ribs 37 are preferably attached to the water tubes 24 to provide additional cooling surfaces for the same and to stiffen said water tubes to prevent them from bulging outward in case the water freezes in the passages 34 and 34[a].

From the foregoing it will be seen that by the arrangement described the water passes in thin, hollow columns from the top water chamber 23 to the bottom water chamber 22, and during this passage is subjected to the cooling influence of the water tubes 24 and air tubes 32 the former being directly exposed to atmospheric air while the latter are exposed to the cooling influence of the atmosphere air circulating through said tubes and the chamber 31.

It will further be noted that in case the water in any of the passages either in the engine or in the radiator should freeze, it will not rupture the engine or the radiator for the reasons explained above.

In case the water in the water circulating passages 32 between the tubes 12 and 21 should become frozen and thus obstruct the said passages, then steam formed by overheating of the water by the action of the engine will reach the chamber 23 and pass therefrom through the communicating openings 33 into the chamber 31 and thence through the air tubes 32 and melts the ice in the said passages.

The invention thus not only protects the parts against the effects of frost but also quickly eliminates any ice which may have formed in the passages and thereby quickly restores the circulation before any injury has resulted from the obstruction of said passages.

If desired, tubes 38 may extend lengthwise through the chamber 22 with their opposite ends in communication with the atmosphere whereby air is conducted through said chamber to still further assist in the cooling of the water.

While the invention is primarily intended for use in connection with internal combustion engines and their radiators it is equally well adapted for incorporation in any type of carrier through which water passes or in which any liquid is contained and which is liable to become frozen and the claim is to be construed accordingly.

Various changes in the specific form

shown and described may be made within the scope of the claim without departing from the spirit of the invention.

I claim:

In a radiator for internal combustion engines, the combination of a lower water chamber, an upper water chamber, a chamber located above said upper water chamber and connected therewith through restricted openings, water tubes connecting the upper and lower water chambers, and tubes smaller than said water tubes and passing lengthwise through the same, said smaller tubes passing through the lower water chamber and having their lower ends in communication with the atmosphere and also passing through said upper water chamber and having their upper ends terminating in the chamber above said upper chamber.

In testimony whereof I have signed this specification.

FRANK X. ATZBERGER.