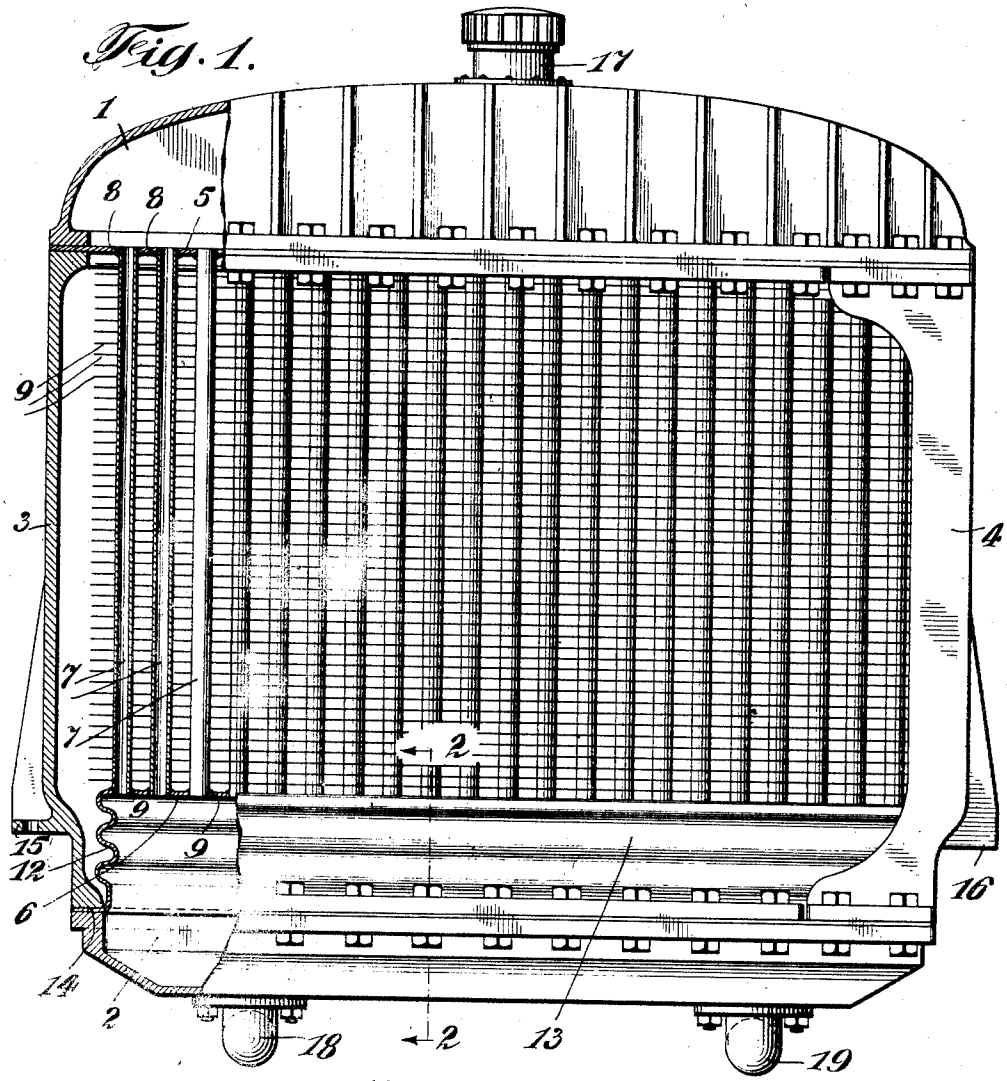
Oct. 26, 1926. 1,604,197

S. W. RUSHMORE

RADIATOR

Filed Nov. 18, 1922

Fig. 1.



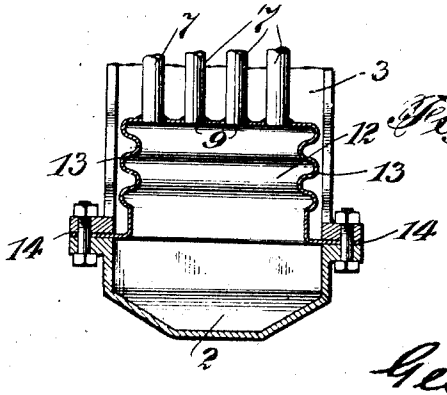
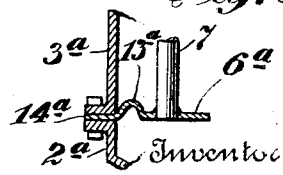


Fig. 2.

Fig. 3.



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Patented Oct. 26, 1926. 1,604,197

UNITED STATES PATENT OFFICE.

SAMUEL W. RUSHMORE, OF PLAINFIELD, NEW JERSEY.

RADIATOR.

Application filed November 18, 1922. Serial No. 601,683.

My present invention relates to radiators of a type principally used on trucks, in which there is a rigid cast metal frame surrounding and supporting the relatively thin air-cooling elements. Usually the frame is made up of four integral castings, the radiator top tank, the bottom tank and two intermediate side frame members spacing apart the top and bottom members and framing in the "core" or "honeycomb". Usually the "core" consists of vertical tubes which are secured water-tight in slightly resilient brass top and bottom plates bolted to the top and bottom castings. This makes a very rigid construction well adapted for rough usage but great trouble has been experienced from breaking of the little tubes or their connections with the top and bottom plates. This may be caused merely by the excessive vibration in use but an important contributing cause is differential expansion or contraction, as when the tubes become very hot while the side frames are cold. The cold tends to shorten the side castings while the heat lengthens the tubes. This, especially when combined with the vibration on rough roads, puts a great strain on the point where the tubes are brazed or soldered to the brass top and bottom plates because the space between these plates is rigidly fixed by the length of the side castings. Consequently either with or without vibration the soldering may be cracked or the tubes broken.

An extreme condition of this kind is where radiators of this rigid frame type are used for up-flow condensers for steam in accordance with the method set forth in my prior Patent No. 1,378,724, granted May 27, 1891. Under such conditions if the radiator has been assembled without stress at a normal temperature of say 70° F., copper tubes say 24 inches long will expand say .03 inch and the side castings will contract .012 inch, a total difference of .042 inch. That is to say the tubes may be nearly one-sixteenth of an inch longer than the distance between the top and bottom plates as determined by the length of the side castings. The plates being substantially rigidly held something has to yield. In practice much less than one-sixteenth of an inch differential expansion, combined with vibration, will cause breakage.

Similar strain and breakage occurs when the core consists of the usual cellular or honeycomb block. In such case instead of breaking the small tubes, the core block tends to be ripped away from the bottom plate.

My invention for obviating the above and other difficulties contemplates raising the bottom plate in which the vertical tubes are secured some three or four inches, preferably making it in the form of an inverted trough or tank with an edge flange. The flange corresponds to the edge of the bottom plate which it is now customary to bolt to the bottom tank casting, and the sides of the inverted tank-like structure are made springy preferably by horizontally molded curves or corrugations to allow a certain amount of elastic vertical movement of the bottom plate to which the tubes are secured, with respect to the flange by which it is rigidly secured to the frame. This permits unequal or opposite expansions and contractions of the tubes with respect to the side castings, without imposing any serious strain.

The top sheet could, of course, be similarly made in trough or tank-like form with corrugated sides, either as a substitute for or in combination with the corrugated tank structure at the bottom.

Thus the invention applies to that class of radiators in which rigid top and bottom tank castings are connected by rigid side members and where temperature changes in the core and side members are not uniform.

My invention may be more fully understood from the following description in connection with the accompanying drawings, in which:—

Fig. 1 is a sectional elevation showing one embodiment of my invention.

Fig. 2 is a section on the line 2—2, Fig. 1, and

Fig. 3 is a sectional detail showing a modification.

In the drawing the upper tank 1, lower tank 2, and side members 3, 4, are each integral castings, rigidly bolted together. The bottom of upper tank 1 is formed by the top plate 5 of the core and the top of the bottom tank is formed by the bottom plate 6 of the core. The upper tank communicates with the lower tank through the tubes 7, 7, the ends of which are expanded, welded, brazed, or otherwise secured water tight in perforations 8, 9, in said upper and lower plates respectively. Usually there are sheet metal fins 9 which are cooled by the air draft and which are in intimate contact

with the tubes in order to effectively conduct heat therefrom.

The lower core plate 6 is preferably integral with the downwardly extending curved or corrugated sides 12, 13, which have outward flanges 14 bolted to the bottom tank 2. With this construction the differential expansion and contraction is taken care of by flexing of the corrugations without imposing any serious strains on the vertical tubes 7, 7.

The inverted trough construction increases the space in the lower tank and this is of advantage as affording more space for steam separation in case the radiator is used as an up-flow condenser.

15, 16, are the usual lugs for supporting the weight of the radiator on the frame members of the truck and 17 is the filler pipe adapted to be closed by a cap.

18, and 19, may be respectively inlet and outlet for circulation of the cooling medium through the bottom of the radiator.

Fig. 3 shows a modification in which the bottom plate 6^a of the core is in or near the same plane with the margin portion 14^a, which is clamped between the rigid side member 3^a and the bottom tank 2^a. In this case circumferential corrugations 13^a are formed between clamped margin and the base of the nearest tube. This may be designed to afford the proper degree of springiness without sacrificing so much space as is required for the inverted trough construction.

I claim:

1. A radiator comprising an air-cooled core and a frame surrounding and protecting the same, the frame including castings constituting top and bottom tanks and rigid side members, to the respective upper and lower portions of which castings the top and bottom plates of the core are secured, the bottom plate being in the form of an inverted trough or tank having resilient corrugated sides and a marginal flange extending from the lower edges of said sides and secured in fixed relation to the bottoms of said rigid side members.

2. A radiator comprising rigid top and bottom tank members spaced apart by rigid side members constituting a frame, in combination with a radiator core having top and bottom plates respectively secured to the upper and lower tanks, one of said plates having a corrugated resilient connection between its tube engaging area and the marginal area whereby it is secured to the tank.

3. A radiator comprising rigid top and bottom tanks spaced apart by rigid side members constituting a frame, in combination with a radiator core having resilient top and bottom plates respectively secured to the upper and lower tanks, the bottom plate being the bottom of an inverted trough or tank with corrugated sides secured to the bottom tank.

4. A radiator comprising an air-cooled core and a frame surrounding and protecting the same, the core being of a type in which straight radiator tubes are secured in resilient top and bottom plates, the frame including top and bottom tanks and rigid side members, to the respective upper and lower portions of which side members the resilient top and bottom plates of the core are secured, one of said plates being in the form of a trough or tank having resilient corrugated sides connecting it to said side members.

5. A radiator comprising an air-cooled core and a frame surrounding and protecting the same, the core being of a type in which straight radiator tubes are secured in top and bottom plates, the frame including top and bottom tanks and rigid side members, to the respective upper and lower portions of which side members the top and bottom plates of the core are secured, the bottom plate being in the form of an inverted trough or tank having resilient corrugated sides and a marginal flange extending from the lower edges of said sides and secured in fixed relation to the bottom of said side members.

6. A radiator comprising rigid top and bottom tanks spaced apart by rigid side members constituting a frame, in combination with a radiator core of a type in which straight radiator tubes are secured in resilient top and bottom plates, and having its top and bottom plates respectively secured to the upper and lower tanks, the bottom plate being the bottom of a trough or tank with corrugated sides secured to the bottom tank.

Signed at New York, in the county of New York and State of New York, this sixteenth day of November, A. D. 1922.

SAMUEL W. RUSHMORE.