E. F. NORELIUS AND W. TURNBULL.

COOLING RADIATOR.

APPLICATION FILED DEC. 13, 1916.

1,344,351.

Patented June 22, 1920.

2 SHEETS—SHEET 1.

Fig. 1.

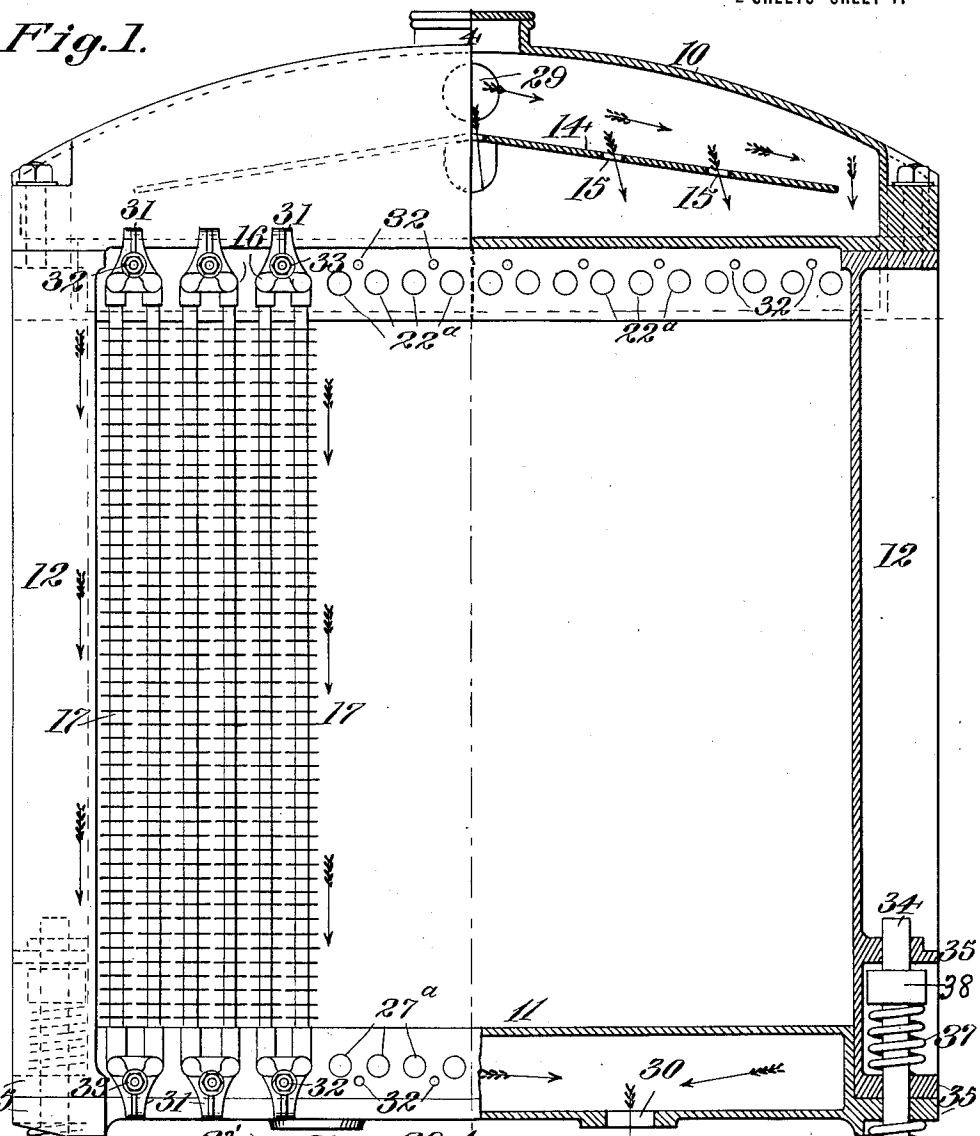

Fig. 2.

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2 SHEETS—SHEET 2.

Fig. 3.

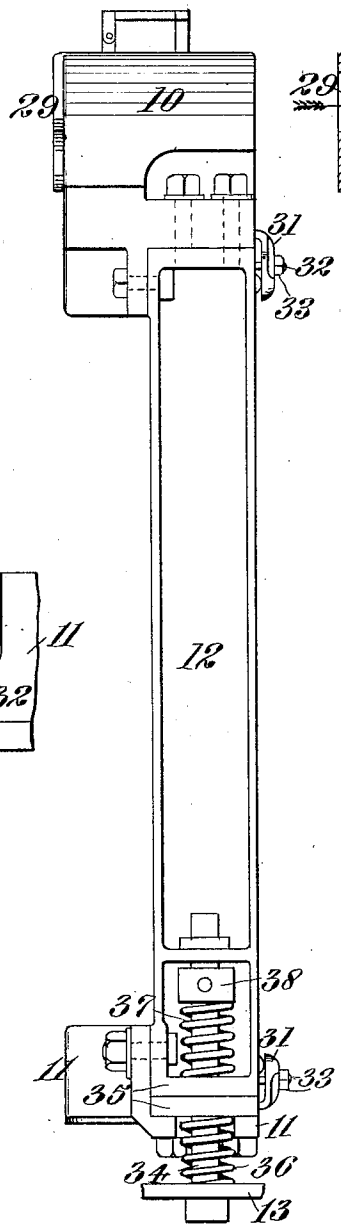


Fig. 4.

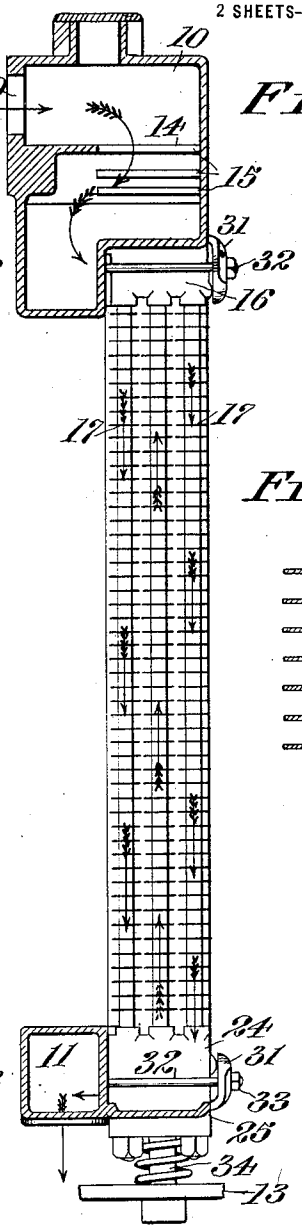


Fig. 5.

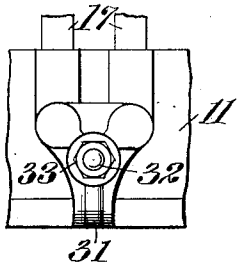
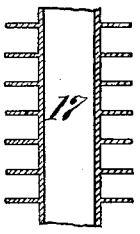


Fig. 6.



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UNITED STATES PATENT OFFICE.

EMIL F. NORELIUS, OF PEORIA, ILLINOIS, AND WILLIAM TURNBULL, OF STOCKTON, CALIFORNIA, ASSIGNORS TO THE HOLT MANUFACTURING COMPANY, OF STOCKTON, CALIFORNIA, A CORPORATION OF CALIFORNIA.

COOLING-RADIATOR.

1,344,351. Specification of Letters Patent. Patented June 22, 1920.

Application filed December 13, 1916. Serial No. 136,678.

To all whom it may concern:

Be it known that we, EMIL F. NORELIUS, of Peoria, county of Peoria, State of Illinois, and WILLIAM TURNBULL, of Stockton, San Joaquin county, State of California, both citizens of the United States, have invented new and useful Improvements in Cooling-Radiators, of which the following is a specification.

This invention relates to radiators for internal combustion engines, and especially to radiators which are employed on traction engines, and under severe conditions of use, and also where the radiator must operate effectively under extreme climatic conditions.

The object of this invention is to simplify and improve the construction and operation of a radiator of the type mentioned.

In carrying out the objects of this invention we employ novel and improved upper and lower manifolds having inlet and outlet connections respectively with an engine, said manifolds forming also a part of the radiator supporting frame; a series of novel and improved separate headers detachably carried on the manifolds and in parallel communication with each other through said manifolds; and fore and aft spaced tubes extending between vertically alined headers said headers being so constructed that the tubes are in series connection with each other through said headers.

Other novel and improved features of construction are employed as will be apparent upon a further understanding of the invention.

One form which our invention may assume is exemplified in the following description and illustrated in the accompanying drawings, in which—

Figure 1 shows a front view of a radiator embodying our invention, partly in section and partly in elevation.

Fig. 2 shows a vertical longitudinal central view through the headers for the upper and lower manifolds.

Fig. 3 shows an end elevation of the device shown in Fig. 1.

Fig. 4 shows a sectional view of the same taken on the line 4—4 of Fig. 1.

Fig. 5 shows a detail of the clamping means employed for securing the tubes and headers in place.

Fig. 6 shows a sectional view of a portion of one of the tubes employed herein.

In the particular form illustrated, the radiator comprises an upper manifold 10 and a lower manifold 11 connected together by vertical side members 12, and forming therewith a substantial rectangular open frame adapted to be directly mounted upon the frame 13 of a vehicle, the manifolds themselves constituting the upper and lower members of the radiator frame. The upper manifold has a longitudinally extending baffle plate 14 arranged between the inlet of the radiator and the point of connection of the circulating and radiating tubes, said baffle plate being provided with apertures 15 at suitable intervals to allow passage of water from the upper to the lower portion of the manifold. The lower portion of the upper manifold is in the form of an L in cross section, in the corner of which is detachably received a series of laterally arranged separate headers 16, each having connected thereto series of fore and aft spaced circulating and radiating tubes 17.

The construction and form of the headers is shown in Fig. 2, and comprises an inlet chamber 18 in communication with the upper manifold and the rear one of the tubes 17, and a connecting chamber 19 separated from the chamber 18 by a vertical partition member 20, said connecting chamber having communication with the two forward tubes of the series 17. The partition may have a small aperture 21 to prevent trapping of steam or air in the chamber 19. The connection between the header 16 and the upper manifold, comprises a circular projection 22 entering an opening 22^a, in the manifold, and a shouldered extension 23 on the header to receive a gasket 23′ and press the same against the front face of the manifold when the said header is clamped in position thereon.

Each series of tubes 17 connect at their lower ends to an individual header 24 detachably secured to the front face of the lower manifold and resting on a forwardly extending plate 25 integral with said manifold. Each of the lower headers communicates with the lower manifold and puts the series of tubes connected therewith in series communication with each other, somewhat after the manner that the upper headers

connect the upper ends of the tubes. In the present instance there are three sets of radiation pipes arranged in parallel planes. The lower headers are designed with upper compartments establishing communication between the two rear sets of the pipes and with lower separate chambers which form passages between the front set of pipes and the openings 27a. A drainhole 28 is formed in the partition between the compartments 25 and 26, so that water will be carried off from the upper compartment.

The circulation of water through each section of the radiator is indicated by arrows in Figs. 2 and 4, passing downwardly through the rear tube of each series 17, upwardly through the central tube and downwardly through the front tube in succession. All headers are in parallel communication with each other through the upper and lower manifolds, and the latter have inlet and outlet connections 29 and 30 respectively. The inlet connection 29 is shown as comprising a single pipe communicating central with the upper manifold, while the outlet connection includes two openings spaced to either side of the center of the lower manifold, with which openings a Y pipe not shown, is adapted to be connected.

A desirable feature in the construction of a radiator is to eliminate the tipping of the manifolds over bolts or fasteners and the passing of such bolts or fasteners through the manifolds in contact with the water, inasmuch as this has the effect of causing early leakage of the manifolds and rusting of the fasteners. We overcome this by employing a novel form of clamp for detachably securing the headers to the manifolds. This clamp comprises a series of clips 31 secured to the manifold and extending vertically over the front face of the headers, each clip being adapted to contact with two such headers. A stud bolt 32 welded to and extending forwardly from the manifold, passes between adjacent headers and is received by the clip, a nut 33 being applied to the bolt to clamp the parts securely in place.

Another important consideration is the mounting of the radiator and this is particularly important where, as in this construction, the upper and lower manifolds form a part of the radiator supporting frame. Some mounting should be employed which will cushion the jars and shocks received by the radiator in actual use upon a vehicle such as an automobile or tractor. We show a vertical stud bolt or projection 34 secured to the vehicle frame 13 and slidably extended through shelf plates 35 formed on each lower corner of the radiator frame. An expansible coil spring 36 is wound around the bolt and rests upon the frame 13 and resiliently supports the radiator by engagement with the lower shelf plate 35. For holding the radiator upon said resilient supports, a second expansible coil spring 37 is arranged on the bolt above the lower shelf plate 35 and is held under compression by a collar 38 fixed to the bolt. We thus obtain a cushioning support for the radiator both on the downward and upper movement thereof.

The principal change in this radiator over the style heretofore in use lies first: In the construction of the upper and lower headers and in the method of clamping to upper and lower manifolds without passing the clamp bolts through the headers; the clamp bolts being on the outside; and the upper headers having a vertical partition with a vent to prevent trapping of the air or steam in the chamber on the side or end opposite to the inlet.

Second: In the use of a drain hole in the partition in the lower header to allow drainage from the smaller upper chamber to the outlet.

Third: By putting the clamp bolt on the outside, rather than running it through the headers the difficulty is obviated of leakage around the bolts through the packings due to construction or improper adjustment as in the old devices. The new method of outside clamp and clip allows each bolt to have its individual seat and proper adjustment to be made without the use of packings and without injury to the castings of the headers.

Many changes in the construction and arrangement of the several parts herein shown and described may be employed without departing from the spirit of our invention as disclosed in the appended claims.

Having thus described our invention, what we claim and desire to secure by Letters Patent is:—

1. A radiator comprising upper and lower manifolds, and a plurality of removable nests of fore and aft spaced tubes extending vertically between said manifolds and in series communication with each other.

2. A radiator comprising upper and lower manifolds, a plurality of fore and aft spaced tubes extending vertically between said manifolds, and removable means in connection with said manifolds for putting said tubes in series communication with each other.

3. A radiator comprising upper and lower manifolds having inlet and outlet connections respectively, a series of laterally spaced separate headers detachably carried on the manifolds and arranged in parallel communication with each other through said manifolds, and a plurality of fore and aft spaced tubes extending between vertically alined headers and arranged in series communication with each other.

4. A radiator comprising upper and lower manifolds, having inlet and outlet connections respectively, a series of laterally spaced

separate headers detachably carried on the manifolds and in communication therewith, a plurality of fore and aft spaced tubes extending between vertically alined headers, said headers each including separated compartments to put the tubes in series communication with each other.

5. A radiator comprising upper and lower manifolds, having inlet and outlet connections respectively, a series of laterally spaced separate headers detachably carried on the manifolds and in communication therewith, a plurality of fore and aft spaced tubes extending between vertically alined headers, said headers each including separated compartments to put the tubes in series communication with each other, said separated compartments having restricted communication directly with each other for the drainage and escape of steam or water.

6. A radiator comprising upper and lower manifolds having inlet and outlet connections respectively, a series of laterally spaced separate headers detachably carried on the manifolds and communicating therewith, a series of fore and aft spaced tubes extending between vertically alined headers and communicating therewith, the upper headers each having an inlet chamber for the rear tube, a connecting chamber for the two forward tubes, and the lower headers each having a connecting chamber for the two rear tubes, and an outlet chamber for the front tube, whereby said tubes are put in series communication with each other.

7. A radiator comprising upper and lower manifolds having inlet and outlet connections respectively, a series of laterally spaced separate headers detachably carried on the manifolds and communicating therewith, a series of fore and aft spaced tubes extending between vertically alined headers and communicating therewith, the upper headers each having an inlet chamber for the rear tube, a connecting chamber for the two forward tubes, and the lower headers each having a connecting chamber for the two rear tubes, an outlet chamber for the front tube whereby said tubes are put in series communication with each other, and connections between the feed chamber and the upper manifold and between the outlet chamber and the lower manifold.

8. A radiator comprising upper and lower manifolds having inlet and outlet connections respectively, a series of laterally spaced separate headers detachably carried on the manifolds, and communicating therewith, a series of fore and aft spaced tubes extending between vertically alined headers and communicating therewith, the upper headers each having an inlet chamber for the rear tube, a connecting chamber for the two forward tubes, and the lower headers each having a connecting chamber for the two rear tubes, an outlet chamber for the front tube whereby said tubes are put in series communication with each other, and a partition between the chambers in each of said headers, provided with an aperture for permitting the escape or drainage of water or steam from the connecting chambers to the inlet or outlet chambers.

9. In a radiator, an upper manifold, the lower portion thereof having an L-extension, said manifold having an inlet in its upper portion and a plurality of outlets in the depending portion of the L-extension, and a longitudinally extending plane member positioned in the manifold between said inlet and outlet openings and provided with apertures at suitable intervals, the depending portion of the manifold and the perforate portion of the longitudinally extending plane member being located in different vertical planes.

10. In a radiator, the combination of upper and lower manifolds of separate headers connected thereto by means which are external of the headers and manifolds, the upper series of headers having an inlet chamber and a return chamber separated by a partition having a vent against the trapping of any air in the return chamber, the lower series of headers each having upper and lower chambers with a drainage connection from the upper to the lower chamber, and radiator tubes connecting the several chambers of the headers in series.

11. In a radiator, the combination of upper and lower manifolds, a series of separate headers for the upper manifold and a series of separate headers for the lower manifold, circulating tubes connected in series with the headers, and means arranged on the outside of the manifolds and headers for connecting the parts together and thereby avoiding the use of packing except where the headers join the manifolds.

In testimony whereof we have hereunto set our hands in the presence of two subscribing witnesses.

EMIL F. NORELIUS.
WILLIAM TURNBULL.

Witnesses:
FRANK H. CHISHOLM,
H. H. BOSWELL.