C. E. SAFFORD.

RADIATOR.

APPLICATION FILED MAR. 9, 1907.

904,729.

Patented Nov. 24, 1908.

2 SHEETS—SHEET 1.

Fig. 1

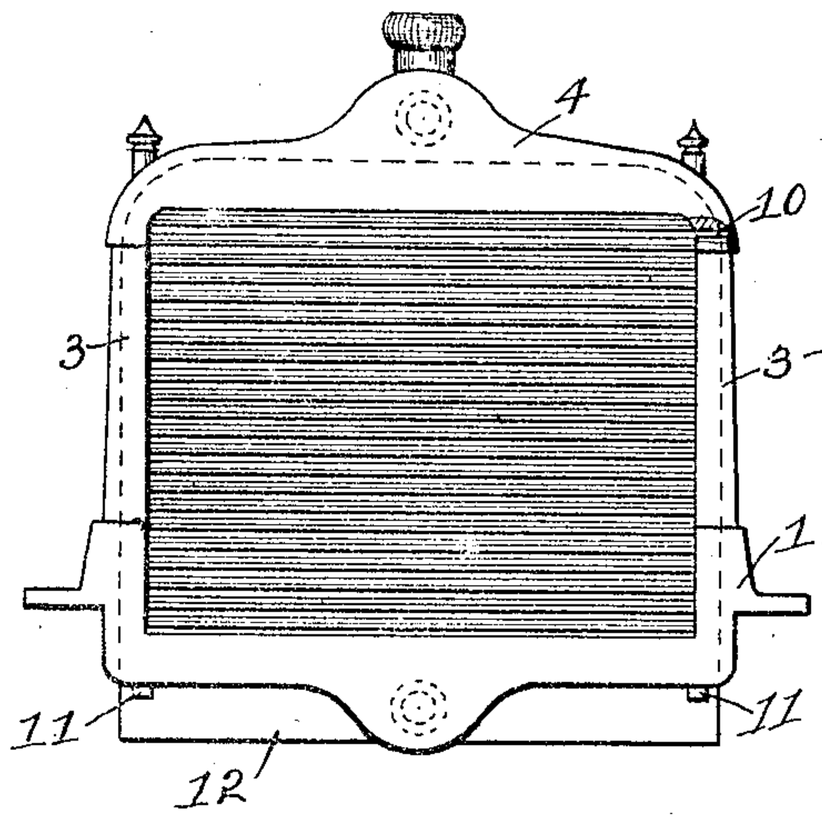


Fig. 2

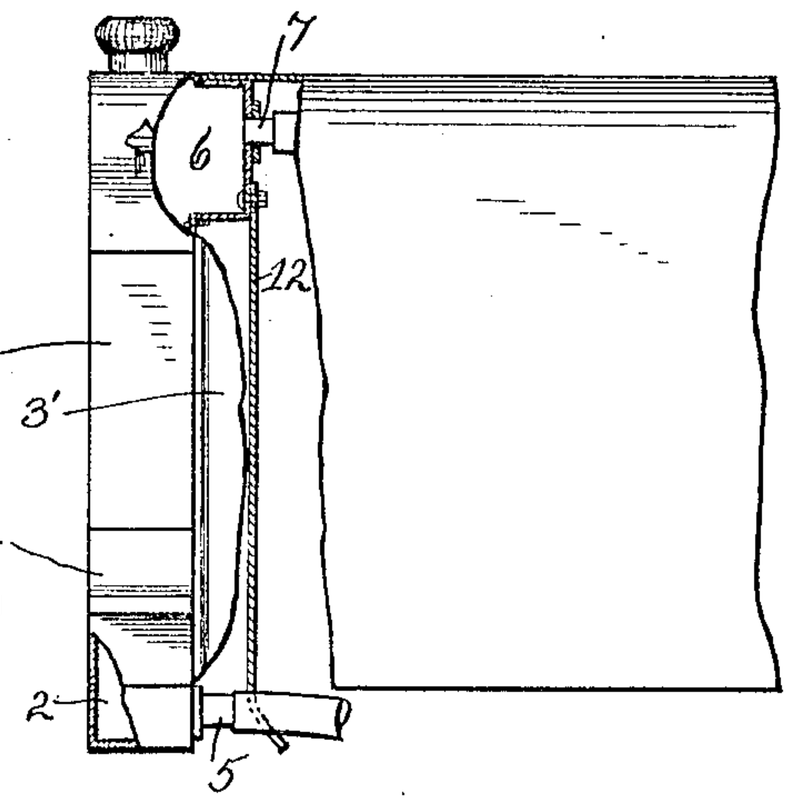
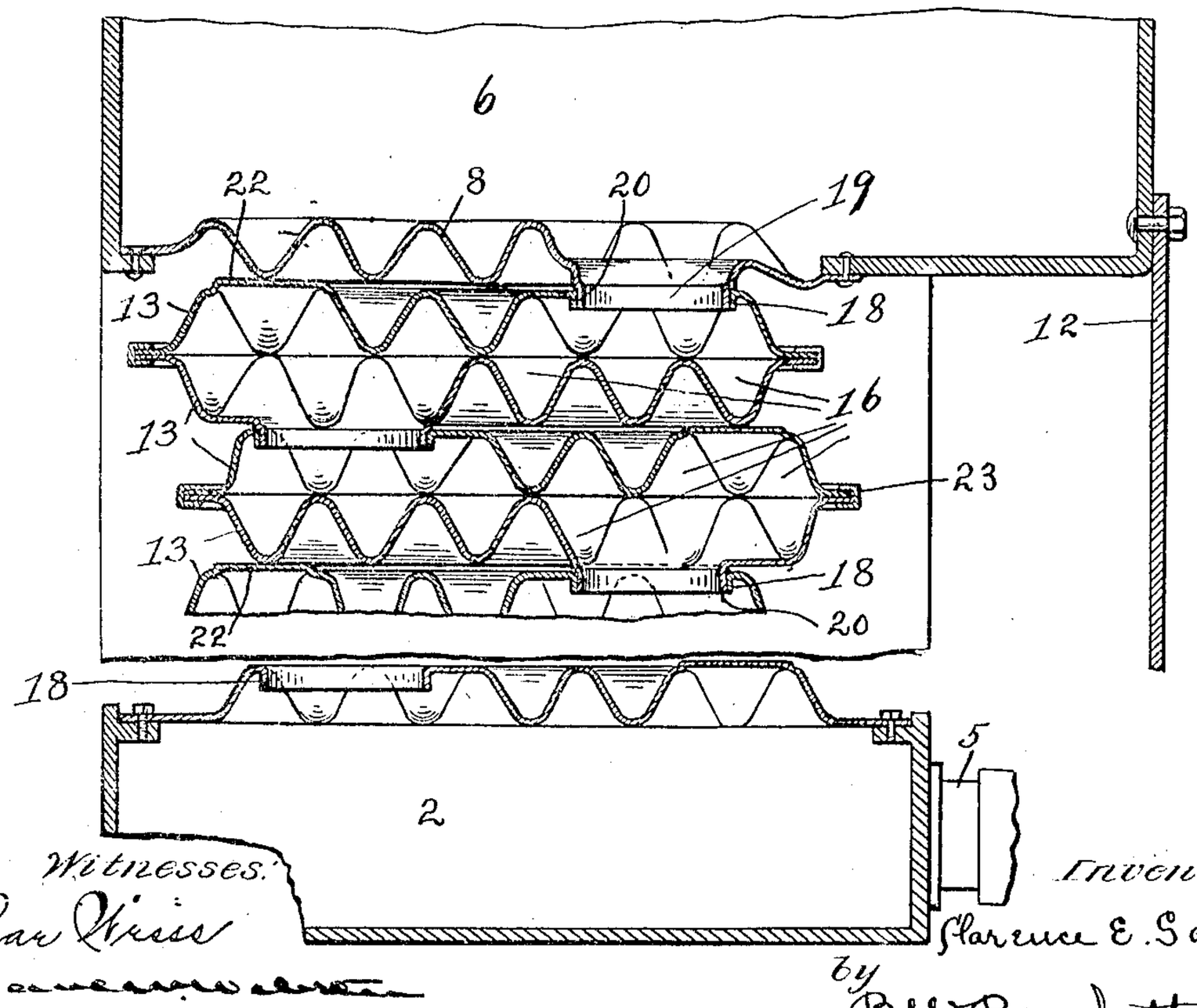


Fig. 3



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2 SHEETS—SHEET 2.

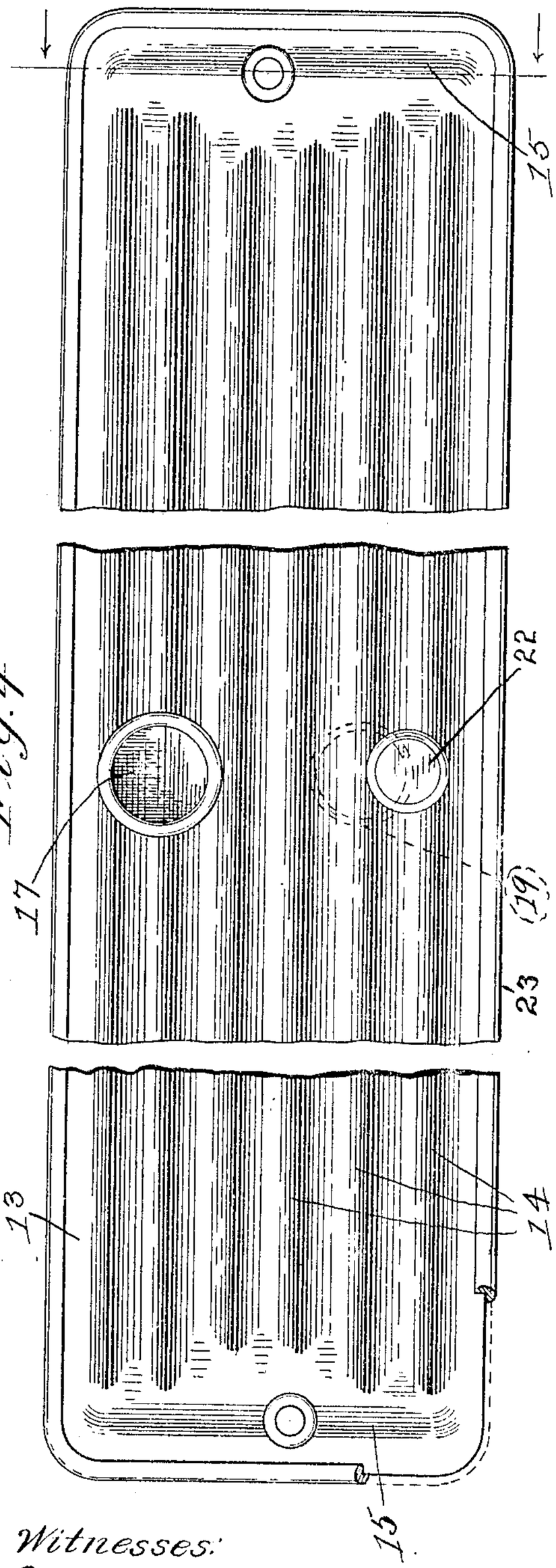

Fig. 4.

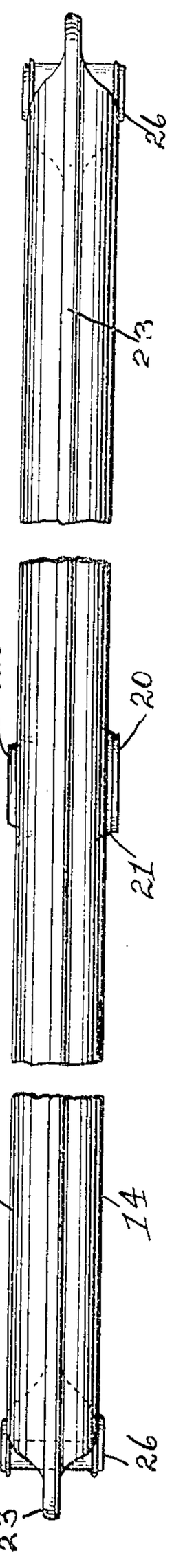

Fig. 5.

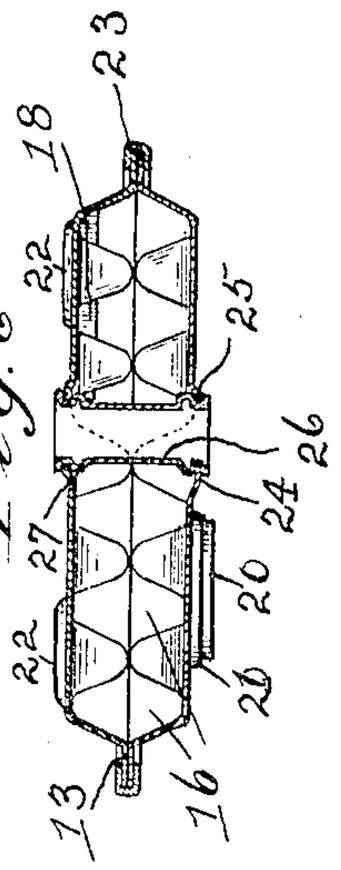

Fig. 6.

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UNITED STATES PATENT OFFICE.

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RADIATOR.

No. 904,729. Specification of Letters Patent. Patented Nov. 24, 1908.

Application filed March 9, 1907. Serial No. 361,464.

To all whom it may concern:

Be it known that I, CLARENCE E. SAFFORD, residing at Buffalo, in the county of Erie and State of New. York, have invented a certain new and useful Improvement in Radiators, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings.

This invention relates to improvements in radiators generally but is especially designed for taking the place of the devices of this character as applied to motor vehicles for cooling the water in the circulating system of the engine.

More specifically the invention contemplates a radiator composed of sections built up one upon the other and of a construction in cross section such that the rush of air caused by the movement of the vehicle will pass between the sections and in its passage will be baffled back and forth against the faces of the sections so as to engage the greatest possible amount of radiating surface and thereby give the device the greatest possible efficiency.

It is also a feature of this invention to deliver the water to the sections in a manner such that it spreads from the center thereof to the ends and then is brought back to the center again in the same section ready for delivery to the next and so on, thereby becoming completely cooled.

Another important feature of the invention is the arrangement of the parts in a manner such that when the vehicle is standing cool air will be delivered from under the same to the radiating sections without being mixed with heated air from the engines.

Still further the invention contemplates the construction of a radiator for use in connection with motor vehicles and arranged so that it may be taken apart readily and the several sections repaired or replaced by others.

Other features of the invention are shown in the connection of the radiator sections one with the other.

The invention may be further briefly summarized as consisting in the construction and combination of parts hereinafter set forth in the following description, drawings and claims.

Referring to the drawings, Figure 1 is a front view of my improved radiator applied to the hood of a motor vehicle, Fig. 2 is a side elevation partly in section showing the arrangement for delivering air from under the car to the radiator, Fig. 3 is a sectional view of portions of the radiator through the center showing the connections between the tanks and the radiator sections, Fig. 4 is a top plan view of a radiator section, Fig. 5 is an edge view thereof and Fig. 6 is a view upon the line 6—6 of Fig. 4 looking to the left.

In carrying out my invention any preferred form and construction of parts may be employed but I have shown one form in the drawings which meets the requirements with great efficiency and in such embodiment 1 represents a supporting frame for the radiator adapted to be secured to the frame of the vehicle in any suitable manner and it is preferably constructed with a lower tank 2 adapted to receive the water from the radiator. Suitable side upright members 3 support the top 4 of the radiator and they are provided with side plates 3′. The tank 2 is connected by a pipe 5 with the engine.

The upper part 4 of the radiator is in the form of a tank 6 which extends back further than the other parts, so as to give sufficient capacity to the same. A pipe 7 leads from the tank 6 to the engine. Just over the radiator the bottom 8 of the tank 6 is corrugated from one end to the other, as shown in Fig. 3, so as to coöperate with the radiating sections to be described and it is provided with a nipple struck up from the metal and forming a connection between the tank and the first radiating section. In practice it has been found convenient to use one of the plates of the radiating sections as the bottom of the upper water tank. The ends of the upper portion 4 are provided with recesses 10, which receives the side members 3 of the radiator, and suitable bolts 11 extend from the top of the radiator through to the bottom for holding the same together and for clamping the radiating sections one against the other. The side plates 3′ of the side members 3 extend out to the rear as far as the back of the tank 6 and these side plates, together with the back of the tank serve to support a plate 12 which forms a flue or passage way in the rear of the radiator for directing the air passing therethrough underneath the car away from the engine and at the same time serves as a suitable means for furnishing cool air to the radiator from under the vehicle when standing. This construction

also prevents the heated air from the engines coming in contact with the radiator.

The radiating sections are preferably made up of plates 13 which are pressed into [illegible] so that they are provided longitudinally with corrugations 14 extending substantially from one end to the other where they merge into transverse ridges or corrugations 15, which extends from one edge to the other. So far as the corrugations are concerned the same upper and lower plates may be used for all the radiating sections and at the same time the radiating sections may be staggered one with respect to the other, as shown in Fig. 3, whereby the ridges on the one section will stand directly above or below the recesses or cavities of the other, whereby any currents of air passing through [illegible] will be baffled back and forth in [illegible] These transverse passages are indicated in the zig-zag course thus formed. [illegible] each radiating section is provided with an opening 17, which is preferably sufficient in [illegible] of the longitudinal passages formed in the radiating section, and is located centrally between the ends of the radiating section whereby when water is delivered through said opening it will travel from the center toward each end of the radiator section through three of the longitudinal passage ways where, by reason of the transverse passage ways already described, it will be led to the remaining three longitudinal passage ways in the same radiating sections. This same construction and the direction of travel of the water prevails in all of the radiating sections. The opening is formed by striking the metal of the plate at the opening and then forming an inwardly projecting nipple 18. The lower plate of each radiating section is preferably provided with an opening 19 formed by striking up the metal of the plate to form a nipple 20, which fits snugly within the nipple 18 and thus forms a connection between the plate of one section and the plate of the other, or in fact between one section and the other. A shoulder 21 is formed about the base of the nipple 20 for the purpose of spacing one radiating section from the other, and a suitable boss 22 is provided in the upper plate opposite to the opening in the lower plate, whereby when the radiating sections are connected together and pressure is brought to bear upon them, the coupling nipples of one section may be [illegible] nipples of the adjacent [illegible] and lower plates of each [illegible] are secured together by [illegible] rim 23 which envelops [illegible] a snug fit and prevents [illegible] point. Each of the radi- [illegible] both ends is further pro- [illegible] portions 24 provided with [illegible] d to receive a sleeve 26.

This sleeve is provided with a bead 27 near each end for engagement on the inside of each plate and the outer edge at each end of the sleeve is spun over, as shown in Fig. 6, to hold the plates rigidly against the headers and prevent any leakage. These sleeves serve [illegible] receive the assembling bolts 11 as they pa [illegible] through the radiating sections. The sleev [illegible] on the same radiating sections are arrang [illegible] on opposite sides of the longitudinal cent [illegible] ceive the upper and lower [illegible] diating sections are identi [illegible] they are placed together, [illegible] tudinal passages. These p [illegible] end from one end of the [illegible] as shown in Fig. 3 and th [illegible] gations; however, [illegible] sages which establish co [illegible] size to establish comm

The tank 2, at the lower end of the radiator, is provided with a top 2′, which is similar to the lower plate of one of the radiating sections, whereby it will coöperate with them in carrying out the invention already set forth.

As the circulating water is delivered to the upper tank above the engine it passes down into the first radiating section in the rear as shown and then spreads out through three of the longitudinal passages to either end of the first radiating section where it passes forward to the remaining three radiating sections and then is delivered at the center to the next radiating section in the front of the radiator and in this manner continues to circulate until it reaches the lower tank from whence it is drawn by any suitable means not shown and delivered to the engine again. In its passage through the radiating sections the heat unit which has been transmitted to the water by the engine is radiated out into the air which passes through the zig-zag passages already described and impinges against practically all of the radiating surfaces of each of the sections. The heat which is then incorporated in the air is conveyed by the flue or the deflecting plate under the car and away from the engine. Likewise any dust or dirt coming from the road and passing through the radiator is kept away from the machinery. When the car is standing the [illegible] readily forced into [illegible] section. The upper [illegible] radiating section a [illegible] means of a suitable [illegible] the two edges with [illegible] any leakage at this [illegible] ating sections at b [illegible] vided with raised p [illegible] openings 25 adapte

Having described my invention, I claim:

1. In a radiator, in combination, means for supplying the liquid to be cooled and a plurality of radiating sections having corru-

gations on both sides thereof arranged to form separated tubular passageways within the same and suitable passageways for currents of air between the sections.

2. In a radiator, in combination, a plurality of radiating sections adapted to receive at their central points longitudinally and distribute toward the ends and to discharge at their central point longitudinally means for supplying the liquid to be cooled to said radiator and means whereby the air currents are directed against the radiating surfaces in passing through the device.

3. In a radiator, in combination, means for supplying the liquid to be cooled, a plurality of radiating sections provided with corrugations adapted to form zig-zag passages through the radiator, means for delivering such liquid to the center of each section longitudinally and permitting it to distribute toward the ends thereof, means for discharging the liquid at the central point of each section longitudinally, and means for securing said sections together.

4. In a radiator, in combination, a suitable frame work therefor, a plurality of radiating sections having longitudinal passages for the liquid to be cooled, means whereby liquid to be cooled may be delivered at substantially the central point of each section and to one or more of said passages, means at the ends of said passages whereby the liquid therefrom may be delivered to the remaining passage or passages, means whereby the liquid from such remaining passages may be discharged at substantially the central point of the radiating section, and means for securing such radiating sections in the frame work.

5. In a radiator, in combination, a frame, means for supplying a liquid to be cooled, a plurality of radiating sections, each having longitudinal corrugations forming internal passages for the liquid to be cooled, a suitable opening adapted to communicate with one or more of said passages at the central point of the section, transverse passages for conveying the liquid from those in communication with the supply opening to the remaining passage or passages in the same section and a suitable opening for the discharge and arranged at substantially the central point of the section, suitable connections between the discharge of one section and the inlet of the other, and means for holding said sections together.

6. In a radiator, in combination, a suitable frame work, means for supplying the liquid to be cooled, a plurality of radiating sections each having longitudinal corrugations on the sides thereof and adapted to form passages within the same for the liquid, an inlet nipple at substantially the central point of each section and adapted to communicate with one or more of said passages, transversely disposed passages for delivering the liquid from the same to the remaining passage or passages in the same section and a discharge nipple communicating with the remaining passages, said sections being arranged one above the other and said nipples being arranged so that the discharge nipple of one section takes in the inlet nipple of the other and means for holding said sections together.

7. A radiator section having corrugations on either side thereof and adapted to form longitudinal passages and to also present corrugated surfaces on the outside, transverse passages establishing communication between all of said longitudinal passages, an inlet opening communicating with a portion of said longitudinal passages and a discharge opening communicating with the remainder.

8. A radiator section having corrugated sides on the interior and exterior thereby forming longitudinal passages within the same, transverse passages establishing communication between all of said longitudinal passages at the ends of the radiating sections, an opening communicating with a portion of the passages at substantially the central point of the section, a male nipple about said opening, an opening communicating with the remaining longitudinal passages, and a female nipple about said opening.

9. A radiating section composed of a pair of plates having corresponding longitudinal arranged corrugations adapted to form two or more internal longitudinal passages, transversely arranged corrugations for establishing a passage way within the section and between the longitudinal passages at both ends, thereof, an opening in one of said plates and communicating with at least one of said longitudinal passages, a male nipple about said opening, an opening in the other plate communicating with the remaining longitudinal passage or passages, and a female nipple about said opening.

10. In a motor vehicle, in combination, a hood, a radiator carried thereby and means for deflecting the air passing through said radiator out of said hood and away from the machinery therein.

11. In a motor vehicle, in combination, a hood, a radiator mounted in the front thereof, and a shield in the rear of said radiator for deflecting the air passing through the same out of said hood.

12. In a motor vehicle, in combination, a hood, a radiator and a flue formed in the rear of said radiator for directing the air passing through the same out of said hood.

13. In a motor vehicle, in combination, a hood, a radiator mounted in the front of the same and a deflecting shield carried by said radiator in the rear thereof and spaced at a distance therefrom for directing the air passing through said radiator out of the hood.

14. In a radiator for motor vehicles, in combination, and a suitable flue in the rear

of said radiator for directing the air passing through the same under the vehicle when moving and for supplying cool air for the same from under the vehicle when standing.

15. In motor vehicles, in combination, a radiator, and a flue extending from the top of said radiator down in the rear of the same to a point below the car for directing the air passing through the radiator under the car and for supplying cool air to the radiator when the car is standing.

16. In a motor vehicle, in combination, a radiator, means for supplying a circulating water thereto, a plurality of corrugated radiating sections adapted to receive the water, said corrugated sections forming zig-zag passages through the radiator, and a flue in the rear of said radiator and extending from the top of said radiator to a point below the car for supplying cool air to the radiator when the vehicle is standing.

In testimony whereof I affix my signature in the presence of two witnesses.

CLARENCE E. SAFFORD.

Witnesses:
RAE WEISS,
B. W. BROCKETT.