V. J. MAYO.

RADIATOR CONSTRUCTION.

APPLICATION FILED MAY 3, 1909.

1,055,407.

Patented Mar. 11, 1913

2 SHEETS—SHEET 1.

Fig. 1.

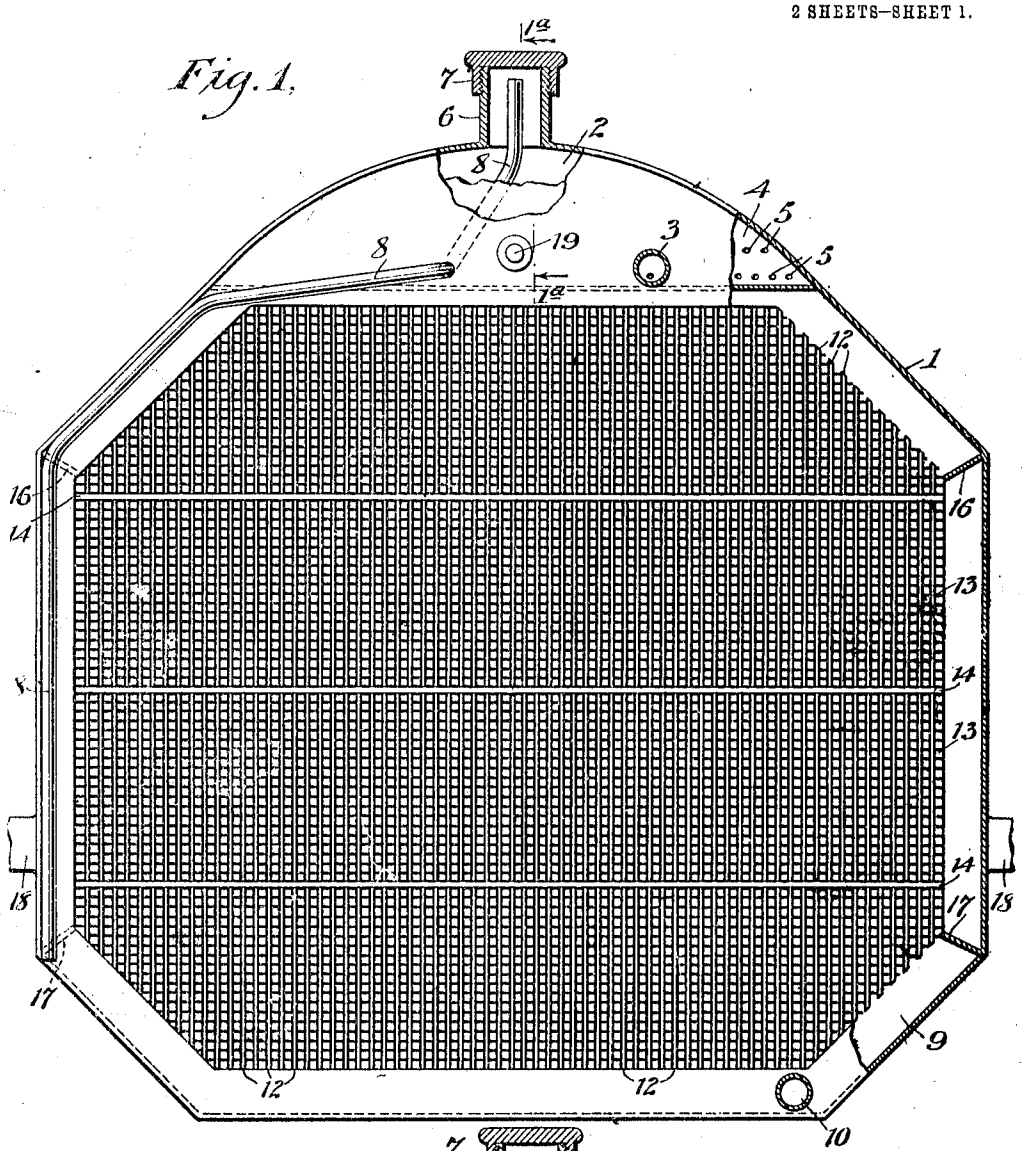


Fig. 1a

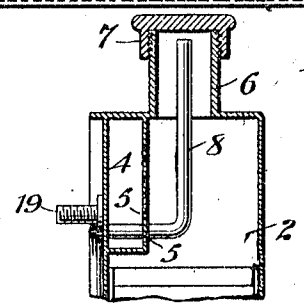
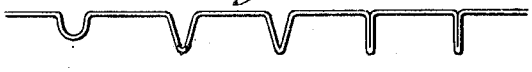


Fig. 2.



WITNESSES

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2 SHEETS—SHEET 2.

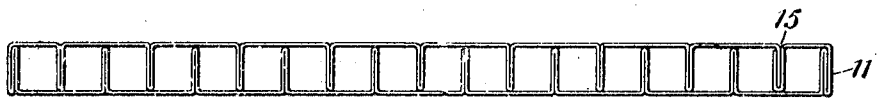


Fig. 3.

Fig. 4.

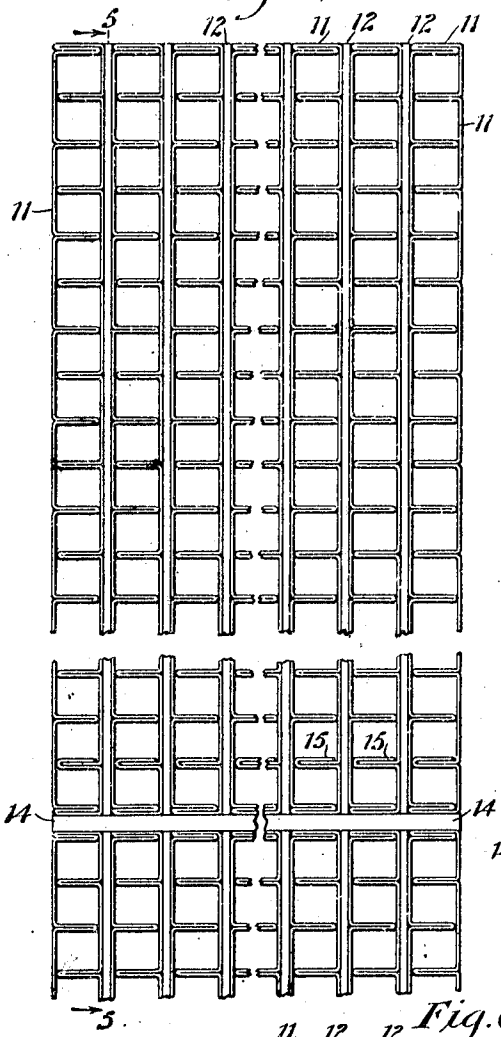


Fig. 5.

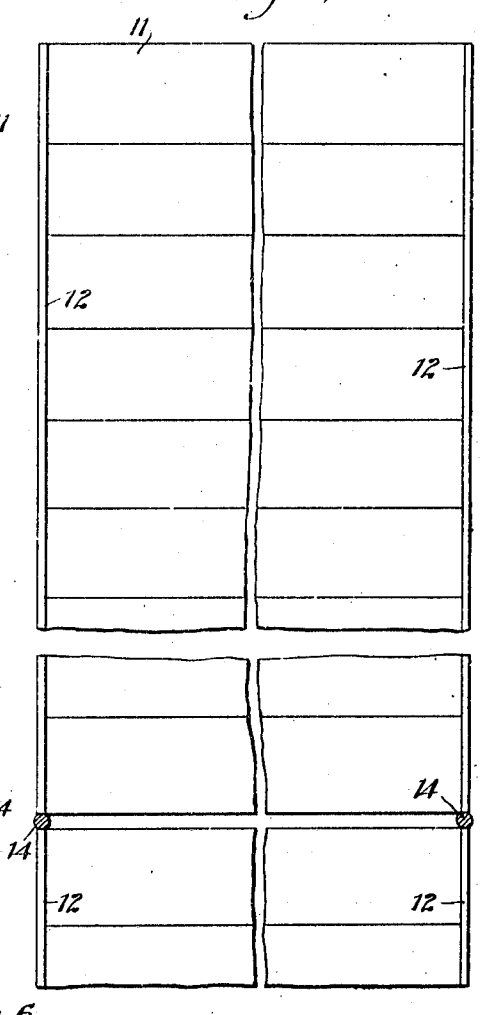
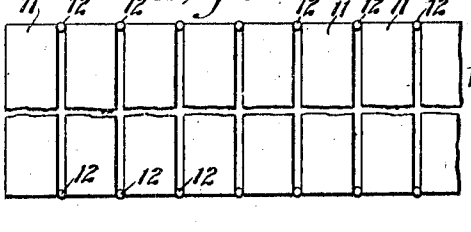


Fig. 6.



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UNITED STATES PATENT OFFICE.

VIRGINIUS JULIAN MAYO, OF NEW HAVEN, CONNECTICUT.

RADIATOR CONSTRUCTION.

1,055,407. Specification of Letters Patent. Patented Mar. 11, 1913.

Application filed May 3, 1909. Serial No. 493,545.

To all whom it may concern:

Be it known that I, VIRGINIUS J. MAYO, a citizen of the United States, and a resident of New Haven, in the county of New Haven and State of Connecticut, have invented a new and improved Radiator Construction, of which the following is a full, clear, and exact description.

My invention relates to a new and improved radiator construction.

The object of the invention is to provide a simple, yet strong and durable construction for the effective cooling of fluids, the completed structure being of particular utility when used in connection with a water cooling system for cooling internal combustion engines.

In the accompanying drawings, Figure 1 is a rear elevation partly in section of a complete radiator constructed to embody my invention. Fig. 1ª is a vertical section on the line 1ª—1ª, Fig. 1, showing the interior of the feeding chamber. Fig. 2 is an edge view of a detail. Fig. 3 is an end view of what I will term one unit of the radiator "honeycomb". Fig. 4 is a front elevation of part of the radiator "honeycomb", the same being relatively enlarged, and being broken away at certain points. Fig. 5 is a section on the line 5—5, Fig. 4. Fig. 6 is a top plan view of a group of radiator units before completion, looking down through the water passages between the same.

1 indicates a casing of any suitable form and material, the same constituting in effect the main frame; 2 is a feeding chamber located in the upper part of the casing 1 and into which flows the water to be cooled.

3 is the supply pipe of a water cooling system.

4 is a distributer chamber having large number of perforations 5—5 therein, said distributer operating to distribute the water evenly to the upper ends of the passages wherein the water is cooled.

6 is an inlet pipe provided at the top for the purpose of permitting the water cooling apparatus to be filled with water.

7 is a cap for the pipe 6.

8 is an overflow and vent pipe which preferably extends partially up into the pipe 6, the lower end passing out through the wall of the radiator at any suitable point, and preferably leading down to a point near the bottom. This vent pipe furnishes an outlet or overflow in the event an excessive amount of water is poured into the radiator and it also furnishes a vent for any steam which might accumulate in the event the water is overheated, as by overheating the engine.

9 is a draining chamber spaced apart from the feeding chamber 2 by suitable partitions.

10 is an outlet pipe constituting part of the cooling apparatus and which may connect the draining chamber 9 with the jacket of an engine.

The radiator element proper, or "honeycomb", (the construction of which will be hereinafter described) connects the feeding chamber 2 with the draining or the receiving chamber 9, and includes a multitude of straight unobstructed upright fluid passages down through which the fluid to be cooled is permitted to freely flow. The walls of these water passages are made extremely thin and are separated by horizontal air passages running fore and aft through the radiator, whereby said walls may be effectively cooled to in turn cool the water passing down between them.

In Fig. 1 I have shown four tiers or blocks of assembled radiator units, each block being separated by preference, in such a way as to provide three horizontally arranged water passages communicating with all the vertical passages. The number of tiers of assembled units is immaterial in a broad sense, although for the purpose of manufacture, and in certain practice, it is preferable that there should be two or more spaced tiers depending upon the size and the particular use of the radiator. Each radiator block is made up of a number of units, a single unit being shown in Fig. 3. A unit is formed by taking a strip of thin metal of suitable length and width, and first providing therein a number of plaits. These plaits may be formed by such a machine as set forth in United States Letters Patent 1,012,568 of Dec. 19, 1911. In operation this machine manipulates a strip of metal step by step in the manner shown in Fig. 2, wherein a slight U-shaped bend, as shown at the left of said figure, is first formed. The next bend to the right is V-shaped, while the next bend to the right, though V-shaped, is sharper than the former. When the metal is in this condition, the walls of the sharper

V-shaped bend are pressed tightly together to form a closed plait, as shown by the two plaits at the right hand end of Fig. 2. The importance of tightly closing the plaits will later be explained. When a strip of metal of the proper length is provided with a sufficient number of closed plaits, said strip is bent back upon itself as shown at the left hand end of Fig. 3, so as to bring the plaits into alternate registry, the edge of each plait on one wall of each unit bearing against the opposite wall of the unit so as to support the same against collapse and steady it against vibration. The two ends of each strip of plaited metal are preferably formed and connected as follows:—One of the ends is turned back upon itself at the base of the next to the last plait, as shown at 11, so as to present the open edge of the end plait in position to receive the opposite end 15 of the strip. In this manner the ends of the strip are locked together. It is obvious that the plaits may be formed in only one of the two side walls instead of in both, as shown. When a sufficient number of units have been formed to build up a single tier for the radiator, said units are placed in a suitable holder, and are separated or spaced apart by means of wires 12—12 located close to the opposite ends of said unit sections, (see Fig. 6,) said wires 12—12 spacing said units apart sufficiently to provide the vertical water passages before referred to. When the wires are in place, each end of each group of units is dipped in a bath of solder, which firmly binds together all of said units, and the wire spacing elements into one substantially homogeneous structure. When two or more tiers of units are used, horizontal spacing wires, as indicated at 14—14 (see Fig. 5) are preferably provided between each tier, so that when the solder is applied as previously referred to, all of the units, together with the vertical, as well as the horizontal spacing wires will be firmly bound together at the front and the rear of the "honeycomb," to provide both the vertical and the horizontal water passages, when the "honeycomb" structure, thus described, is finished, the same is mounted within the casing 1, and soldered thereto entirely around its edges in such a manner as to prevent leakage of water, but nevertheless so as to permit the water to freely flow entirely over the upper end of the radiator down through the vertical passages and into the receiving chamber 9 in the lower end of the radiator.

16—17 are partitions separating the feeding chamber 1 from the draining chamber 9.

18—18 are trunnions by which the radiator may be supported.

19 represents a rod or screw by which the upper part of the radiator is steadied from fore and aft movement.

In Fig. 1 I have shown the four corners of the "honeycomb" structure cut away diagonally by reason of the shape of the radiator frame or casing. When such corners are cut away, it is obvious that in finishing up the same, care should be observed to leave the upright water passages free and unobstructed, so that water in the upper part of the radiator can freely flow down through the upright passages between all the radiator units.

I have heretofore called attention to the importance of closing tightly together the two walls of each plait. By so doing, I absolutely prevent dirt or foreign substance from accumulating in or adjacent to the upright water passages, for, as will be seen, were these walls left open or spaced apart, a multitude of short horizontal shelves or pockets would thereby be formed, which would not only retard the circulation, but it would in a short time, fill up with foreign matter to such an extent as to not only encroach upon the upright passages and thereby retard or entirely shut off circulation, but also materially retard the cooling of the plait. Again, by folding both walls of each plait tightly against each other, they stiffen the plait and afford a stronger support for the opposite side wall of the unit of which they are a part, there being less danger of collapse of the plaits by reason of the mutual reënforcement between said contacting walls; again, by closing the walls of each plait tightly together, a substantially greater cross-sectional area is provided for the passage of air through the "honeycomb" than would be the case if the walls of each plait were separated, inasmuch as in exact proportion to the extent that the plaits are unnecessarily thickened, is the cross-sectional area of the air passage reduced in a "honeycomb" of given size.

The method of forming each unit, and the construction thereof, possesses superior advantages in that, by doubling a sheet of plaited metal upon itself, it provides only one seam to be soldered to complete a single unit, thereby greatly reducing the danger of leakage. Again, by doubling the metal at the end of each unit back upon itself at the base of one plait, three thicknesses of metal are provided instead of two, which gives added stiffness and strength, so that when a number of tiers of units are arranged in a block, the end walls will be found to be sufficiently strong to resist the pounding tendency upon the horizontal spacing and supporting wires 14—14.

The foregoing and other advantages will be apparent to any one skilled in this art and familiar with the use and requirements of devices of this character.

While I have shown my invention in its preferred form, it should be understood that

in design and structure it may be modified in various ways without departing from the scope of the following claims.

What I claim is:

1. In a radiator, a unit formed of a strip of metal having plaits therein, said strip being folded intermediate its ends to form a box-like structure and to bring the plaits between the side walls thereof, said plaits extending entirely across the space between said side walls to support both of the same against collapse and vibration, one end of said strip being bent at the base of one of the inside plaits to bring the end plait into a plane between the walls of said unit with the base of said plait facing outwardly, the opposite end of said strip extending into the last mentioned plait to form an interlocking joint.

2. A radiator unit construction comprising two oppositely arranged spaced sheet metal walls, plaits formed in one wall and extending to and supporting the other wall, a pocket formed in one wall, a portion of the metal of the other wall extending into said pocket to form an interlocking joint.

3. A radiator unit comprising two oppositely arranged spaced sheet metal walls, plaits formed in one wall and extending to and supporting the other wall, a pocket formed in one wall, said pocket extending transversely of said strip and opening toward the opposite wall, a portion of the metal of the opposite wall being extended into said pocket to form an interlocking joint.

4. A radiator unit construction comprising two oppositely arranged spaced sheet metal walls, plaits formed in one wall and extending to and supporting the other wall, a pocket formed in one wall, a portion of the metal at the end of the other wall extending into said pocket to form an interlocking joint.

5. A radiator unit construction comprising two oppositely arranged spaced sheet metal walls, plaits formed in one wall and extending to and supporting the other wall, a pocket formed in one wall, a portion of the metal of the other wall extending into said pocket to form an interlocking joint, the plane of said joint being at an angle to the plane of the adjacent parts of the side walls, said joint being parallel with said plaits.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

VIRGINIUS JULIAN MAYO.

Witnesses:

WM. A. WRIGHT,

HEATON WRIGHT.