V. J. MAYO.

RADIATOR CONSTRUCTION.

APPLICATION FILED JULY 10, 1911.

1,000,339.

Patented Aug. 8, 1911.

2 SHEETS—SHEET 1.

Fig. 1.

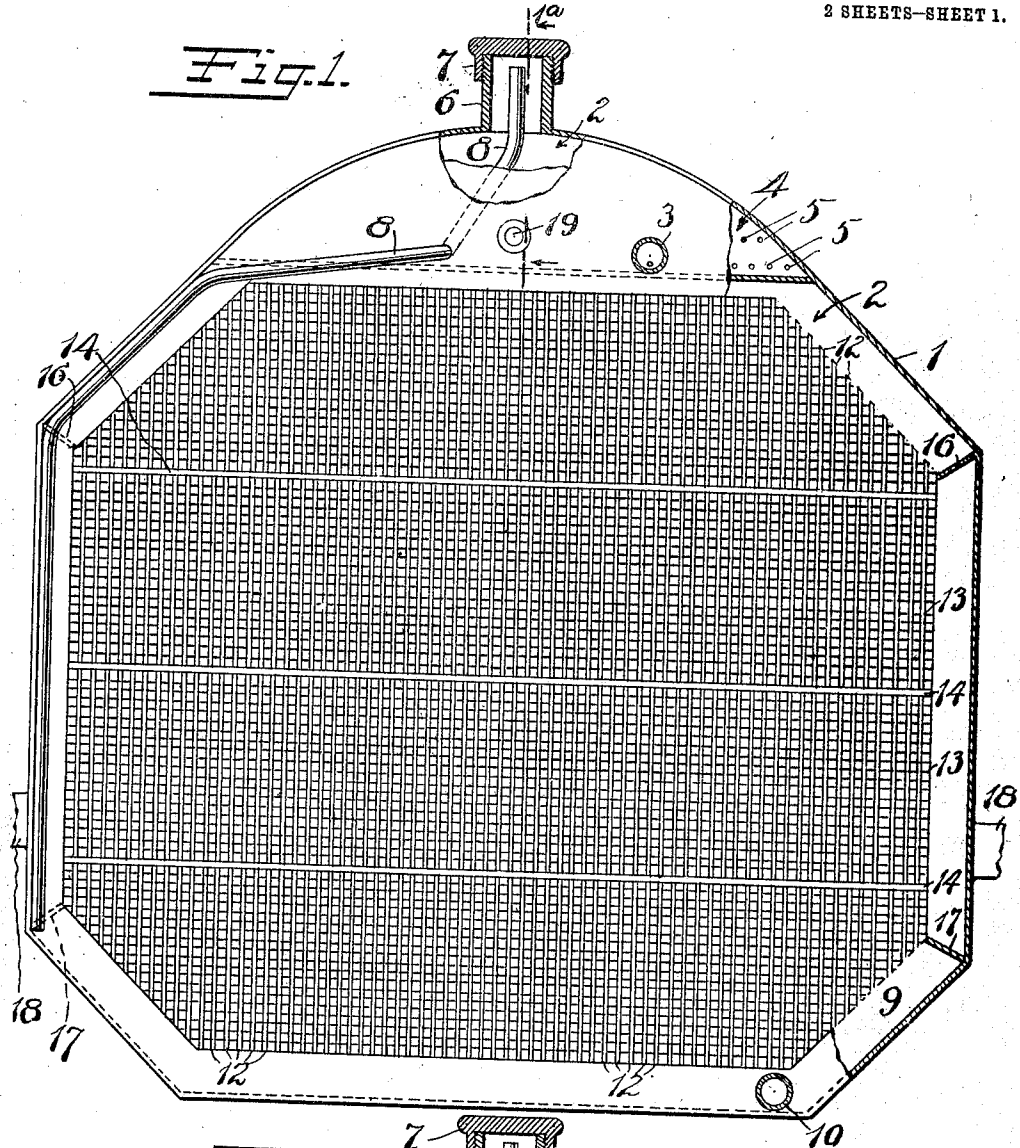

Fig. 1a

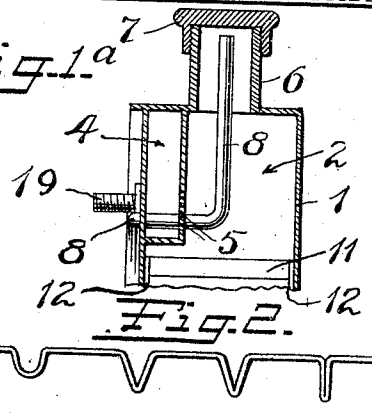

Fig. 2.

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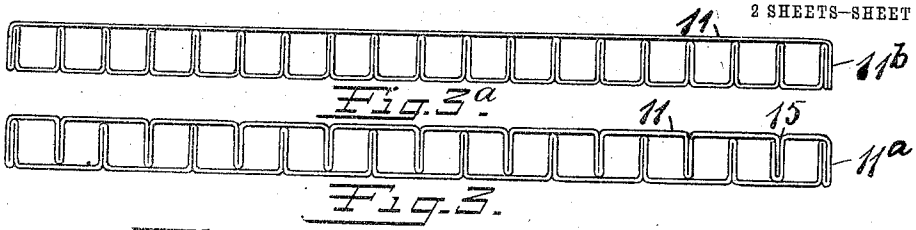

Fig. 3a.

Fig. 3.

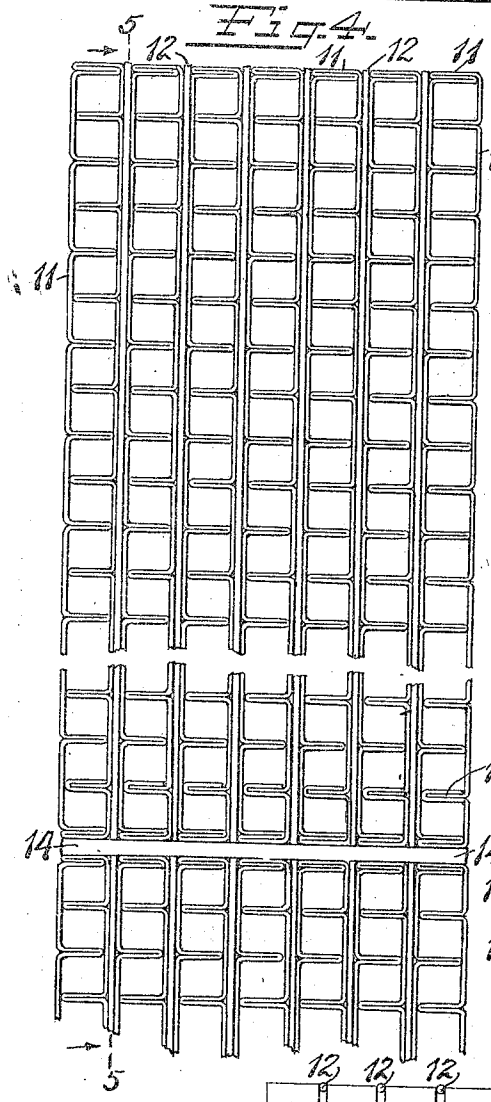

Fig. 4.

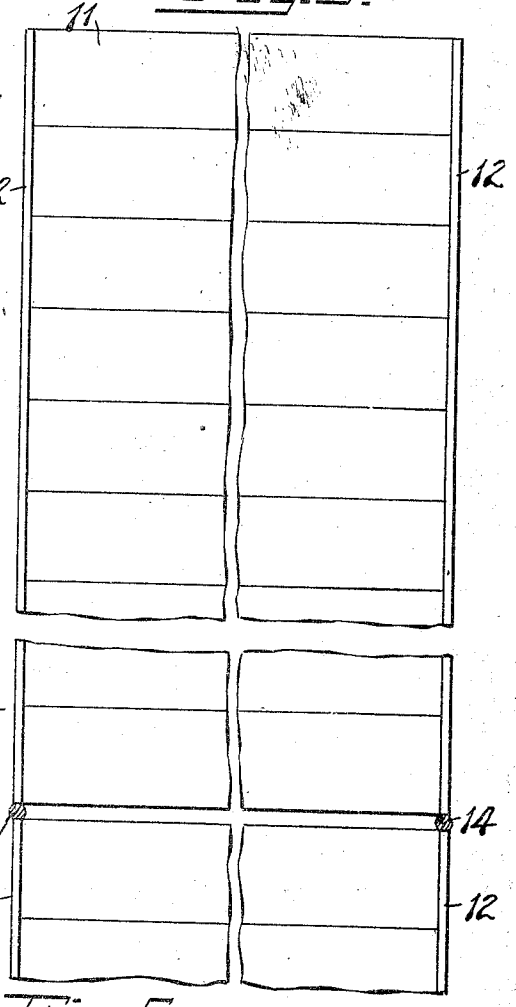

Fig. 5.

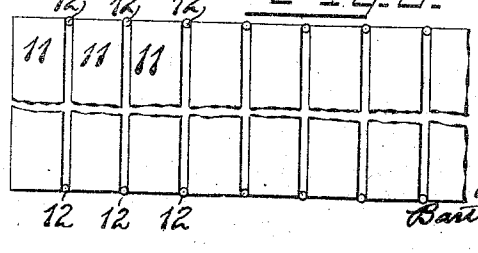

Fig. 6.

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UNITED STATES PATENT OFFICE.

VIRGINIUS J. MAYO, OF NEW HAVEN, CONNECTICUT.

RADIATOR CONSTRUCTION.

1,000,339. Specification of Letters Patent. **Patented Aug. 8, 1911.**

Original application filed May 3, 1909, Serial No. 493,545. Divided and this application filed July 10, 1911. Serial No. 637,664.

To all whom it may concern:

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

My invention relates to a new and improved radiator construction, and this case is a division from my co-pending application, Serial No. 493,545, filed May 3rd, 1909.

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. 3ª is a similar view of a modification. 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 system 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 system 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 11—11, 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 my co-pending application, Serial No. 486,909. 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^a, 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, see Fig. 3.

In Fig. 3^a I have shown a modified form of unit in construction, in which only a part of the strip is plaited, the unplaited part being doubled back as before, so as to rest tightly against the edges of the plaits on the other part. In this case, the ends of the strip overlap and are soldered together at 11^b. 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 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 plaits. 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 reinforcement 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 construction, a radiator unit comprising two side walls, two end walls connecting said side walls, a plait in one side wall between said end walls, said plait extending across to and supporting the opposite side wall, the walls of said plait being closed against each other.

2. In a radiator construction, a unit comprising two side walls and two end walls, a plurality of plaits formed in one side wall, said plaits extending across to and supporting the opposite side wall, the walls of each of said plaits being closed together.

3. In a radiator construction, a unit comprising two side walls and two end walls, a plait formed in each of said side walls, each of said plaits extending from the side wall upon which it is formed across to and supporting the opposite side wall, the two walls of each plait being pressed tightly together.

4. In a radiator construction, a radiator unit comprising two side walls, two end walls connecting said side walls, a plait in one side wall between said end walls, said plait extending across to and supporting the opposite side wall, the walls of said plait being closed against each other, one end wall of said unit being of a thickness of at least three times the thickness of one side wall.

5. In a radiator construction, a radiator unit comprising two side walls, two end walls connecting said side walls, a plait in one side wall between said end walls, said plait extending across to and supporting the opposite wall, the walls of said plait being closed against each other, both end walls of said unit being of at least three times the thickness of one side wall.

6. In a radiator, a honeycomb structure comprising a plurality of units arranged side by side in an upright position with spacing devices between the ends of said units serving to separate said units to form upright water passages, a plait in one side wall of each unit extending substantially horizontally, the walls of said plait being folded tightly against each other, said plait extending entirely across said unit, and to and against the opposite side wall to reinforce both side walls and prevent vibration thereof.

7. 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 open at the ends and to bring the plaits between the walls thereof, said plaits extending entirely across the space between the side walls to support both of the latter against collapse and vibration, the walls of each plait being pressed tightly together.

8. 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 open at the ends and to bring the plaits between the walls thereof, said plaits extending entirely across the space between the side walls to support both of the latter against collapse and vibration, the walls of each plait being pressed tightly together, the ends of the strip being soldered together to form a closed seam, the ends of each plait being soldered to one of the side walls of the unit.

9. In a radiator, a honeycomb structure comprising a plurality of units arranged side by side in an upright position with spacing devices between the ends of said units to separate the latter to form upright water passages, each of said units comprising two side walls and two connecting end walls between said side walls, one of said side walls having formed therein a plurality of plaits, the two walls of each plait being closed against each other, said plaits extending across said unit and against the opposite side wall from that on which said plaits are formed to support both side walls against collapse or vibration.

10. In a radiator, a honeycomb structure comprising a plurality of units arranged side by side in an upright position with spacing devices between the ends of said units to separate the latter to form upright water passages, each of said units comprising two side walls, and two connecting end walls between said side walls, one of said side walls having formed therein a plurality of plaits, the walls of each plait being closed against each other, said plaits extending across said unit and against the opposite side wall from that on which said plaits are formed to support both side walls against collapse or vibration, said radiator also including a plurality of tiers of units arranged as aforesaid, and spacing devices between said tiers at the ends of the units composing said tiers.

11. In a radiator, a honeycomb portion comprising a plurality of units arranged side by side in an upright position, with means at the ends of said units for spacing the same to form vertical water passages, each of said units comprising two side walls and two connecting end walls between said side walls, a plurality of plaits formed integrally with said units located between and extending across the space between said

side walls to mutually reinforce both of said side walls against collapse and vibration, said plaits being formed of two thicknesses of metal pressed tightly together, a frame or casing for said honeycomb structure including a fluid chamber above said honeycomb structure communicating with the upright water passages aforesaid, and another fluid chamber at the bottom of said frame in communication with the lower ends of said upright water passages.

12. In a radiator, a honeycomb portion comprising a plurality of units arranged side by side in an upright position, with means at the ends of said units for spacing the same to form vertical water passages, each of said units comprising two side walls and two connecting end walls between said side walls, a plurality of plaits formed integrally with said units located between and extending across the space between said side walls to mutually reinforce both of said side walls against collapse and vibration, said plaits being formed of two thicknesses of metal pressed tightly together, a frame or casing for said honeycomb structure including a fluid chamber above said honeycomb structure communicating with the upright water passages aforesaid, another fluid chamber at the bottom of said frame in communication with the lower ends of said upright water passages, a filler opening at the top of the uppermost fluid chamber, a cap therefor, and an overflow and vent pipe, the upper end of the same being located in said filler opening, said pipe leading down into said upper fluid chamber and piercing the wall thereof at the rear of said radiator.

13. In a radiator, a honeycomb structure comprising a plurality of units arranged side by side in an upright position with spacing devices between the ends of said units to separate the latter to form upright water passages, each of said units comprising two side walls and two connecting end walls between said side walls, one of said side walls having formed therein a plurality of plaits, the walls of each plait being closed against each other, said plaits extending across said unit and against the opposite side wall from that on which said plaits are formed to support both side walls against collapse or vibration, said radiator also including a plurality of tiers of units arranged as aforesaid, spacing devices between said tiers at the ends of the units composing said tiers, a frame surrounding said honeycomb structure, said frame having a water chamber in the upper part thereof in communication with the upper ends of the upright water passages aforesaid, and having another water chamber in the lower part thereof in communication with the lower ends of said upright water passages.

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