V. J. MAYO.

RADIATOR CONSTRUCTION.

APPLICATION FILED MAY 3, 1909.

1,031,137.

Patented July 2, 1912.

2 SHEETS—SHEET 1.

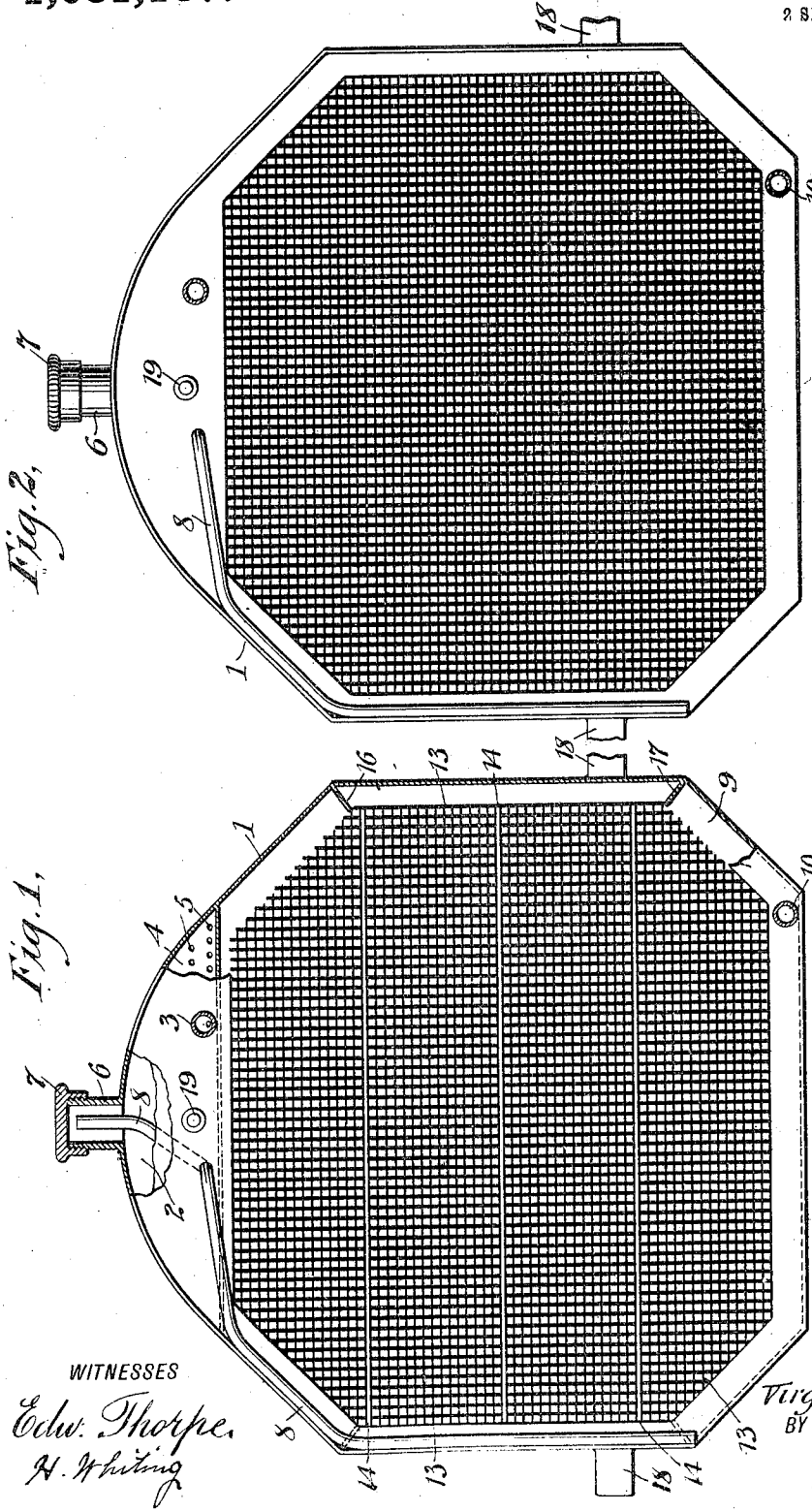

Fig. 1,

Fig. 2,

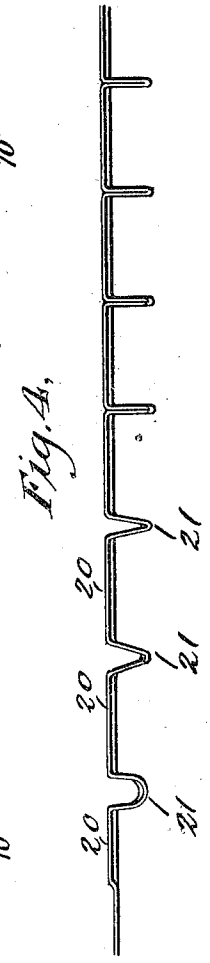

Fig. 4,

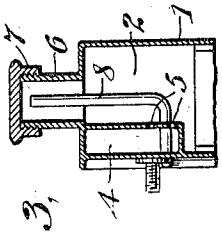

Fig. 3,

WITNESSES

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2 SHEETS—SHEET 2.

Fig. 5,

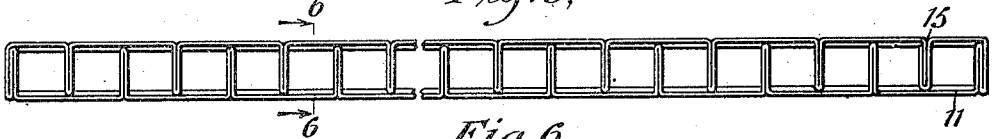


Fig. 6,

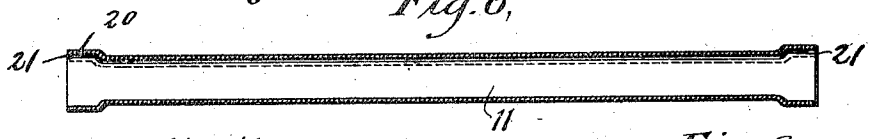


Fig. 7,

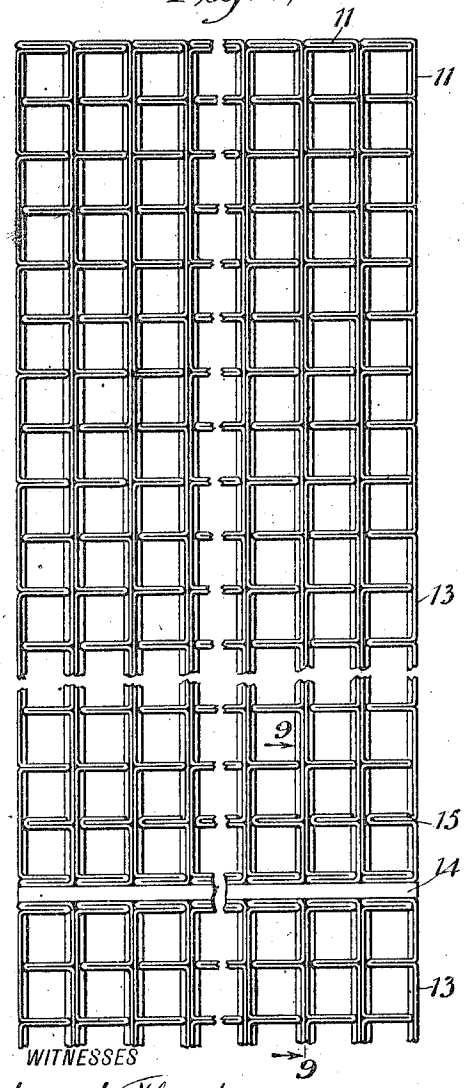


Fig. 8,

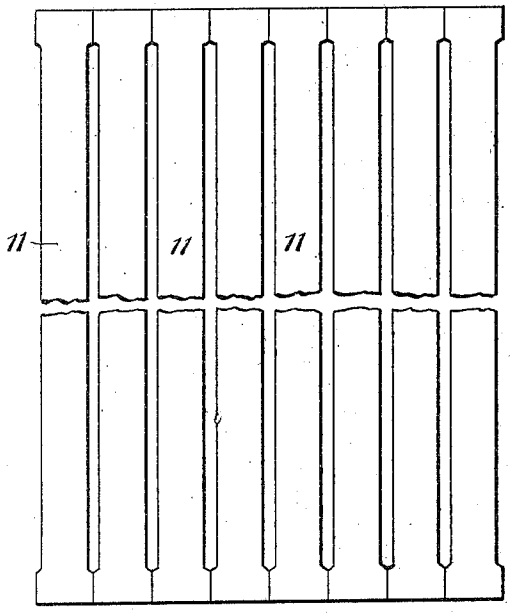
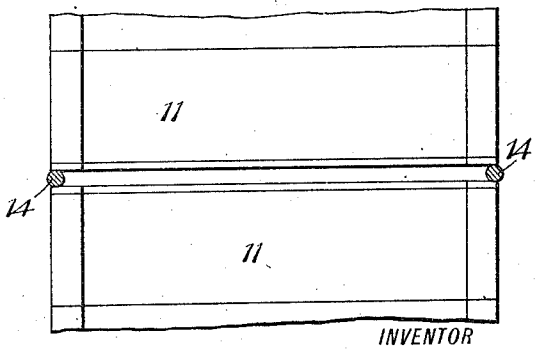


Fig. 9.



WITNESSES

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UNITED STATES PATENT OFFICE.

VIRGINIUS JULIAN MAYO, OF NEW HAVEN, CONNECTICUT.

RADIATOR CONSTRUCTION.

1,031,137. Specification of Letters Patent. Patented July 2, 1912.

Application filed May 3, 1909. Serial No. 493,544.

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 main object of the invention relates to improved structural features whereby a radiator may be produced at a minimum of expense, considering both labor and material, without sacrifice to strength or durability. A radiator, as constructed, will be found to be of particular utility when employed in connection with water cooling systems 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. 2 is a similar view of a modification. Fig. 3 is a relatively enlarged vertical section through the top of the casing of Fig. 1. Fig. 4 is an edge view of a detail of construction, namely, a strip of metal from which a radiator unit is formed, said strip being only partially finished ready for use. Fig. 5 is an end elevation of a single radiator unit. Fig. 6 is a section on the line 6—6 of Fig. 5. Fig. 7 is an end elevation, partly broken away, of a part of a radiator honeycomb structure, said figure being slightly enlarged. Fig. 8 is a top plan view of the parts shown in Fig. 7. Fig. 9 is a section on the line 9—9 of Fig. 7, looking in the direction of the arrows.

1 indicates a casing of any suitable form and material and constituting in effect the main frame of the radiator.

2 is a feeding chamber in the upper part of the casing 1.

3 is a supply pipe of a water cooling system.

4 is a distributer chamber within the feeding chamber, said distributer chamber containing a perforated wall, the function of which is to distribute the water fed in through pipe 3 well over the upper part of the honeycomb cooler later described.

6 is an inlet at the top through which a supply of water may be poured to fill the radiator and system.

7 is a cap for the pipe 6.

8 is an overflow and vent pipe which 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. If an excess of amount of water is poured into the radiator it may overflow through the pipe 8 and be conducted thence to the ground without being spilled outside on the top of the radiator. Should steam be generated by an over hot engine, the pipe 8 furnishes a vent.

9 is a draining chamber separated from the feeding chamber 2 by suitable partitions 16—17.

10 is an outlet pipe constituting part of the cooling system.

The radiator element proper of the honeycomb (the construction of which will hereinafter be described) connects chamber 2 with 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 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 and 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 from the others in such a way as to provide three horizontally arranged water passages communicating with all of the vertical water passages. The number of tiers of assembled units is immaterial in a broad sense, although for the purposes 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. As stated, each radiator block is made up of a number of units arranged side by side and properly spaced and united, a single unit being shown in Fig. 5. 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 United States Letters Patent No. 989,380. In operation, this machine manipulates a strip of metal step by step, as indicated in Fig. 4, wherein a slight U-

shaped bend, as shown at the left of said figure, is 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 sharp V-shaped bend are pressed tightly together to form a closed plait, as shown by the four finished plaits at the right hand end of Fig. 4. The importance of closing the plaits will later be explained. Not only is the metal plaited, as previously described, but at a suitable stage in the forming of the plaits the edges of the metal at both edges of the sheet are offset. This will be seen by referring to Figs. 4 and 6, wherein the metal of the main body of the strip at the base of each plait is shown as set back or offset as at 20 in a direction opposite to the plait. In the same figures it will also be seen that the edge of the metal at the end or top of the plait is offset as at 21 in an opposite direction so that when the plaits are flattened down it will be found that both edges of the strip and both edges of each end of each plait are offset. The purpose of offsetting the free edge of the plait, as distinguished from the edge connected to the main body of the sheet, is to provide at each end of the plait a filler-in which operates in the manner hereinafter described. When a strip of metal of the proper length is provided with a sufficient number of plaits, said strip is bent back upon itself, as indicated at the left hand end of Fig. 5, said bend being adjacent to the base of one of the plaits. When the strip is bent back, it will bring the plaits into alternate registry, as shown in Fig. 5, the free edge of each plait on one wall of each unit bearing against the opposite wall of the unit so as to support the latter against collapse and steady it against vibration. In Figs. 5 and 6 it will also be seen that the offsets at the free edge and at each end of the plait will fill in the space adjacent to the offset edge of the opposite wall. The free ends of each strip when folded into the form of a unit are suitably connected preferably by an interlocking joint, indicated at 15, Fig. 5. This interlocking joint is formed by folding back one end of the strip at the base of one of the plaits near the end, excepting the end plait, which latter, when turned back, presents its open edge outwardly to receive the opposite end of the strip, as in a pocket, which latter may be soldered. Other ways, of course, may be employed for connecting the free ends of the strip when bent up to form a unit, it being obvious that in all instances the unit is provided with only one seam, thereby greatly reducing danger of leakage. When a unit is thus formed, it is apparent that its opposite edges at each end flange outwardly, as shown in Fig. 6, whereby a number of units may be placed together side by side, the flanged ends resting against each other, said flanges providing the upright water passages, clearly seen in Fig. 8. By this arrangement the units are spaced without the necessity of employing separate spacing devices, the use of which involves additional expense in that additional parts and labor are required. By providing additional parts, additional weight is provided, which, in the completed honeycomb structure, adds materially to the weight. By this improvement and the elimination of unnecessary metal, a greater efficiency as a radiator is secured in the completed device. In the drawings, the several units are indicated by the reference numeral 11.

To form a block of radiator units, the desired number of units is placed in a proper holder and both ends, that is, the front and rear ends of the honeycomb structure, are dipped into solder which serves to firmly bind all of the units into one substantially homogeneous block. If, as shown in Fig. 1, it is desirable to arrange blocks of radiator units in spaced tiers, it is merely necessary to insert between the ends of each tier the spacer devices 14—14 (Fig. 9), which may be soldered therebetween in any desired way, as by dipping. By this arrangement a horizontal water space or passage is formed between the several tiers connecting all of the upright passages. When a honeycomb structure of the proper size and shape has been produced, it is fitted into the main frame 1 and securely soldered all around to prevent leakage.

16—17 are partition braces which serve to separate the chamber 1 from the chamber 9 so that any water spilled in chamber 1 will be caused to run down through the passages in the honeycomb structure, wherein it is cooled, to and into the chamber 9.

18—18 are trunnions for supporting the radiator.

19 is a rod or screw such as customarily provided to hold the top of the radiator against fore and aft movement. As hereinbefore indicated, the plaits are not only specially formed as to swaging the opposite ends, but it is most important that the walls thereof should be pressed tightly together to prevent the possibility of the accumulation between the same of foreign matter which would tend to impair the radiation of each plait and which would also tend in time to choke off partially or entirely the upright passages, for were the plaits left open, it is obvious that a multitude of short horizontal shelves would be formed extending entirely across each of the upright passages and upon which lodgment for dirt or other foreign matter would be found. By offsetting the free edge at each end of the plait to provide the filler-in extension, as pre-

viously described, I have found that the finished honeycomb structure possesses a maximum strength because, when the front and rear faces of the honeycomb structure are dipped into solder, there are no spaces that should be united that are left disconnected, as would be the case if the top edges of each plait were straight and not offset. By this construction, therefore, a maximum of strength is provided which, in view of the trying use to which such devices are subjected, guarantees a maximum of durability.

In Fig. 2 I have shown a radiator constructed in all respects, save one, like that shown in Fig. 1, the single respect of difference being that the radiator units are so constructed as to form the honeycomb in a single block instead of tiers of blocks, as shown in Fig. 1. In this and other respects my radiator is susceptible of modification without departure from the spirit and scope of the following claims.

The foregoing and other advantages will be apparent to anyone skilled in this art and familiar with the use and requirements of devices of this character. For example, by eliminating the necessity for separate spacers between the several units and by so constructing the units that integral offsets are provided for effecting the spacing without separate spacers, a very substantial amount of material and weight is saved, an item of great importance. Again, by eliminating the necessity for separate spacing devices, a large amount of labor, such as required in inserting said separate spacing devices and holding them in place during the soldering operation, is avoided. Again, by conforming the ends of the fins or plaits so as to fill out the extra space between the side walls at the ends formed by offsetting the side walls of the several units, said plaits reinforce said side walls completely to the ends, furnishing a maximum of durability, since there is no chance for vibration that would tend to crush in the offset edges of said units. Again, by contouring the plaits as aforesaid, an effective soldered joint between each of the plaits and the adjacent surface of the side wall against which the edge of the plait bears is absolutely guaranteed, as would not be the case if the plaits were not thus contoured, for, as is well known, it is next to impossible to bridge any substantial gap with hot solder where the article to be soldered is dipped into the molten metal, as in this case.

While I have shown my invention in its preferred form, obviously, in various features of design and structure, it may be modified.

What I claim is:

1. In a radiator construction, a radiator unit comprising two side walls, two end walls connecting said side walls, one of the free edges of one of the side walls being integrally offset, a plait formed integrally with one of the side walls and extending across to and supporting the opposite side wall between the end walls, the end of said plait adjacent to said offset portion of the side wall being conformed thereto, whereby said plait will extend across the space formed between the offset edge of one side wall and the adjacent edge of the opposite side wall.

2. In a radiator construction, a radiator unit comprising two side walls, two end walls connecting said side walls, one of the free edges of one of the side walls being integrally offset, a plait formed integrally with one of the side walls and extending across to and supporting the opposite side wall between the end walls, the end of said plait adjacent to said offset portion of the side wall being conformed thereto, whereby said plait will extend across the space formed between the offset edge of one side wall and the adjacent edge of the opposite side wall, the walls of said plait being closed against each other.

3. In a radiator construction, a radiator unit comprising two side walls, two end walls connecting said side walls, one of the free edges of one of the side walls being integrally offset, a plait formed integrally with one of the side walls and extending across to and supporting the opposite side wall, between the end walls, the end of said plait adjacent to said offset portion of the side wall being conformed thereto, whereby said plait will extend across the space formed between the offset edge of one side wall and the adjacent edge of the opposite side wall, one end wall of said unit being of a thickness of at least three times the thickness of one of the side walls of said unit.

4. In a radiator construction, a radiator unit comprising two side walls, two end walls connecting said side walls, one of the free edges of one of the side walls being integrally offset, a plait formed integrally with one of the side walls and extending across to and supporting the opposite side wall between the end walls, the end of said plait adjacent to said offset portion of the side wall being conformed thereto, whereby said plait will extend across the space formed between the offset edge of one side wall and the adjacent edge of the opposite side wall, both end walls of said unit being of a thickness of at least three times the thickness of one side wall.

5. In a radiator construction, a unit comprising two side walls and two end walls connecting said side walls, one free edge of each side wall being integrally offset, a plait formed integrally with one of the side walls, said plait extending across said unit to and supporting the opposite side wall between said end walls, both ends of said plait being

conformed to fill out the added space at the front and rear edges of the unit formed by offsetting the side walls thereof.

6. In a radiator construction, a unit comprising two side walls and two end walls connecting said side walls, both free edges of each side wall being integrally offset, a plait formed integrally with one of said side walls and extending across to and supporting the opposite side wall between the end walls, both ends of said plait being conformed to extend entirely across and fill out the space at the front and rear edges of the unit formed by offsetting the side walls thereof.

7. In a radiator construction, a radiator unit comprising two side walls, two end walls connecting said side walls, one of the free edges of one of the side walls being integrally offset, a plait formed integrally with one of the side walls and extending across to and supporting the opposite side wall between the end walls, the end of said plait adjacent to said offset portion of the side wall being conformed thereto, whereby said plait will extend across the space formed between the offset edge of one side wall and the adjacent edge of the opposite side wall, a plurality of such units arranged side by side and united at their front and rear edges to form a block having a plurality of vertical water passages between the side walls of adjacent units, and a plurality of horizontal air passages extending through the space between the walls of the several units respectively, from the front to the rear edges thereof.

8. In a radiator construction, a unit comprising two side walls and two end walls connecting said side walls, both free edges of each side wall being integrally offset, a plait side wall being integrally offset, a plait formed integrally with one of said side walls and extending across to and supporting the opposite side wall between the end walls, both ends of said plait being conformed to extend entirely across and fill out the space at the front and rear edges of the unit formed by offsetting the side walls thereof, a plurality of such units being arranged side by side and united at their edges to form a plurality of vertical water passages between the side walls of adjacent units, and a plurality of horizontal air passages between the walls of the several units respectively.

9. In a radiator construction, a radiator unit comprising two side walls, two end walls connecting said side walls, one of the free edges of one of the side walls being integrally offset, a plait formed integrally with one of the side walls and extending across to and supporting the opposite side wall between the end walls, the end of said plait adjacent to said offset portion of the side wall being conformed thereto, whereby said plait will extend across the space formed between the offset edge of one side wall and the adjacent edge of the opposite side wall, a plurality of such units arranged side by side and united at their front and rear edges to form a block having a plurality of vertical water passages between the side walls of adjacent units, and a plurality of horizontal air passages extending through the space between the side walls of the several units respectively, from the front to the rear edges thereof, a frame surrounding said block having a fluid chamber at the upper end thereof, communicating at the upper end of the water passages, and having another fluid chamber at the lower end thereof communicating with the lower ends of said water passages.

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.