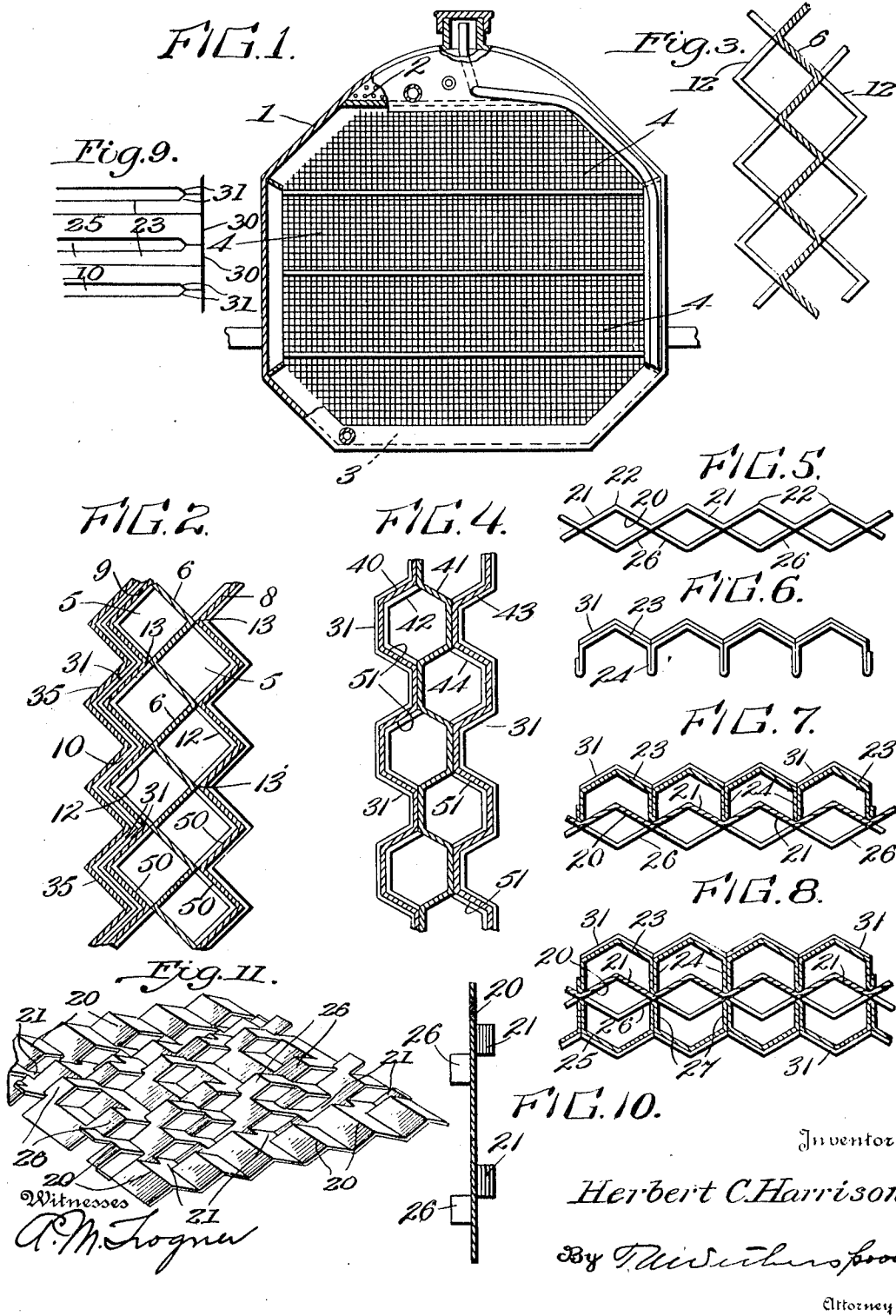


H. C. HARRISON.
RADIATOR CONSTRUCTION.
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UNITED STATES PATENT OFFICE.

HERBERT CHAMPION HARRISON, OF LOCKPORT, NEW YORK.

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Specification of Letters Patent.

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Original application filed December 11, 1914, Serial No. 876,687. Divided and this application filed October 20, 1915. Serial No. 56,915.

To all whom it may concern:

Be it known that I, HERBERT C. HARRISON, a subject of the King of Great Britain, residing at Lockport, in the county of Niagara and State of New York, have invented certain new and useful Improvements in Radiator Constructions; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to radiator constructions and has for its object to provide a simple and more efficient radiator which may be made in accordance with the construction disclosed in my copending application, filed Dec. 11, 1914, Serial No. 876,687, entitled Process of making radiator cores, and now Patent #1120744, dated March 27, 1917, of which this is a division.

With these and other objects in view, the invention consists in the novel combinations of parts and details of construction more fully hereinafter disclosed and particularly pointed out in the claims.

Referring to the accompanying drawings, forming a part of this specification, in which like numerals designate like parts in all the views,

Figure 1 is an elevational view partly in section of a radiator made from sheet metal strips in accordance with my invention;

Fig. 2 is a detail sectional view of one form of my invention showing the construction and assemblage of the plates constituting a radiator unit;

Fig. 3 is a sectional view showing in detail the construction of one form of division plate used in my radiator units;

Fig. 4 is a view similar to Fig. 2 illustrating another form of division plate and of radiator units;

Fig. 5 is an edge view looking down upon a still further modified form of division plate;

Fig. 6 is a view similar to Fig. 5 showing a further modified form of outer plates for radiator units;

Fig. 7 shows the division plate of Fig. 5 in section and the outer plate of Fig. 6 brought in contact therewith.

Fig. 8 shows the parts of a radiator unit assembled when said parts are of the forms shown in Figs. 5 and 6;

Fig. 9 is a diagrammatic plan view showing the offset edges of the outer plates of several units to form a water passage.

Fig. 10 is an edge view partly in section of a still further modified form of division plate; and Fig. 11 is a perspective view of another form of division means suitable for separating the unit plates.

My invention is applicable to radiators having a variety of differently shaped or formed air cells, and in the above drawings, I have shown by way of example three of such forms of cells, but of course it is to be understood that other forms may be readily devised and still come within the limits of my invention.

Referring to the accompanying drawings, 1 indicates the usual radiator frame inclosing the water space 2 at the top and the space 3 at the bottom from which water is delivered. Between the spaces 2 and 3 is located the nest of air cells 4. The cubic space available in modern automobiles for the accommodation of radiators is exceedingly limited so that the cooling efficiency of the radiator must be high if satisfaction is to be had. Further, competition is severe from a commercial point of view, and therefore the manufacture is met with the exacting conditions of making a highly efficient and a comparatively inexpensive radiator, as well as inclosing it in a very inconvenient space.

Referring to my Patent No. 1,076,115, I disclose a radiator unit composed of the division plate lettered 8 in said patent and of the side plates there lettered 1 and 5. Water passages lettered 22 in the patent pass down between the radiator units thus formed and the water thus imparts heat to the air in the double row of opposed cells formed by the said plates 1, 5 and 8. This construction it will be observed comprises the use of very thin plates, with only a single thickness of metal between the cooling air and the water from which the heat is to be extracted, and therefore a relatively high efficiency of operation is attained. A somewhat similar structure and operation is adopted in the present invention in that a radiator unit is formed in Fig. 2 for example, from the division plate 6 and the two outer or side plates 8 and 9, while 10 represents one of the water passages located between each pair of units and extending from

the space 2 to the space 3 illustrated in Fig. 1.

The fact, however, that the plates are of very thin material and of necessity are in the form of corrugated strips say 2 feet long and 2 inches wide render them easily bent out of shape and difficult to handle if the cost of assembling is to be kept low. In my said patent, the fitting of the extreme ends of the plaits there lettered 2 and 6 into the spaces between the ears there lettered 10, is a more or less expensive operation, in that it must be done by hand, and in carrying out said operation, the side plates of the unit such as those lettered 1 and 5 in the patent are apt to be bent out of shape. It results from this that in the making of ten thousand radiators, for example, not only is a great deal of time lost, but also a great deal of extra money is actually expended, both of which adds to the final cost of the radiators.

In the present invention, on the other hand, I avoid these objections by providing guiding inclined centering surfaces 12 on a division plate such as 6, as will be clear from Figs. 2 and 3, so that when a projecting angle such as 13 in the process of assembling strikes between a pair of guide surfaces 12, it will upon pressing the plates 6, 8 and 9 together, cause all three plates to be accurately centered.

This assembling feature of my invention is very important and in order to render it more clear the modified form of construction illustrated in Figs. 5, 6, 7 and 8, and the method of assembling the parts will now be disclosed. In Fig. 5, a division plate 20 provided with the inclined guiding, or centering surfaces 21, 26 and projecting angles or points 22 is shown. In Fig. 6, is shown an outer plate 23 of a radiator unit, which may be substantially the same as the outer plates in my Patent Number 1,076,115 above mentioned. Now as the outer plate 23, comes from the machine it may be supported in any suitable manner and the division plate 20 thrust against it either by hand or by a machine as said plate is delivered from the apparatus which is making it. A convenient way to accomplish the assemblage of the two plates is to merely lay the outer plate 23 flat on its side and feed or drop the plate 20 on top of it. Then owing to the centering surfaces 21, of the plate 20, no matter where the fins 24 of the plate 23 may contact with the surfaces 21, a little pressure on the plate 20, or a slight clamping action between the two plates will cause them to become accurately centered as shown in Fig. 7, and the heretofore loss of time and money avoided.

Having thus, automatically, so to speak, centered the plates 20 and 23, it is only necessary to drop a second outside plate

such as 25 on top of or press said plate 25 against the other side of said division plate 20 whereupon the three plates 20, 23 and 25 will be automatically centered as indicated in Fig. 8.

It will thus be seen that by the simple expedient of providing the division plate 20, with the oppositely projecting centering surfaces 21 and 26, and by providing the outer plates 23 and 25 with the projecting fins 24 and 27 respectively, it is only necessary to lay the plate 20 on top of the plate 23, to then lay the plate 25 on top of the plate 20, and to then press the parts together in order to cause all three plates to become accurately centered for the formation of a radiator unit.

These units I have designated in Fig. 9 by the numeral 30, and when they are placed together they form the water passages 10 by reason of the fact that the outer plates such as 23 and 25 have their extreme edges offset as indicated at 31 in Fig. 9, and these offset edges abut to form the said water passages, while the extreme top ends or edges of the plates 23, and 25 are folded over toward each other to close the space above the double row of opposing cells 5 as will be readily understood.

When a plurality of radiator units such as 30 are thus built up, their individual plates being automatically centered as above disclosed, the whole set of units are clamped together by any convenient means, and their offset ends 31 are dipped in solder so as to firmly secure the parts together.

After one edge of the nest of cells thus formed is thus soldered together, the entire nest or radiator body is reversed and the other edge dipped in solder, whereupon the radiator is ready for testing as to leaks, etc.

It will now be clear that precisely the same series of steps are or may be followed in connection with the form of the invention illustrated in Fig. 2. In other words, it will be clear that one unit plate such as 8 may be laid upon its side, a division plate such as 6 may be placed thereon without regard to whether the parts match or not, whereupon the projecting angles 13 formed by the inclined sides or corrugations of the plate 8 will coact with the centering inclined surfaces 12 of the division plate 6, to cause said division plate to become accurately centered in relation to the plate 8. But before waiting for this centering action to take place, another outer unit plate 9 may be placed on top of the division plate 6 whereupon a slight pressure and movement of the parts longitudinally will cause its projecting angles 13 to be guided by additional corrugations 12 and an accurate centering of the three plates to take place, as is indicated in Fig. 2. Another outer plate such as 35 may now be laid upon

the outer plate 9, whereupon the offset ends such as 31 of the two outer plates 9 and 35 will form a water passage such as 10, and the above process may be repeated until a complete radiator body or nest of cells is had. It will thus be seen that practically no extra labor is required to center the plates such as 6, 8 and 9, etc., because the centering of the parts in each unit takes place automatically, after the plates are brought into contact.

The division plates such as 6 and 20 are conveniently formed by subjecting thin ribbons of metal to the action of suitable dies which cuts out and presses out on opposite sides of their respective plates any suitable inclined centering projections such as 12 and 21, as will be clear from Figs. 3, 5 and 10 of the drawings. The guiding projections 21 and 26 that are associated with the division plate 20 are preferably located near the edges of the said division plate as will be clear from Fig. 10 of the drawings.

In the modified form of construction shown in Fig. 4, the same process is carried out and the parts are of substantially the same construction as those just disclosed, but their form is varied in order to produce unobstructed hexagonal cells instead of cells of the shape disclosed, in the other figures.

That is to say in Fig. 4, an outer unit plate such as 40 is given the shape disclosed by any suitable means, a division plate such as 41 having the centering projection 42 is laid upon the plate 40, whereupon the centering projections cause the said plate 41 to be automatically centered, and a second outer unit plate 43 is laid upon the division plate 41, whereupon the centering projections 44 cause said plate 43 to also be centered, and the radiator unit thus formed is associated with a similar unit, whereupon the offset edges such as 31 carried on the outside of each outer plate causes the units to be separated from each other and water passages such as 10 to be formed between the units. A sufficient number of units are assembled, clamped together and their offset ends are dipped in solder in the manner disclosed above, whereupon a complete nest of opposing cells is finished.

It will now be clear that my construction of sheet metal radiator units having a double row of opposed air cells with a separating means, or a single thickness of metal between them is applicable to a wide variety of forms of cells; but that in all cases it involves the forming of a pair of outer radiator unit plates each provided with opposed projections constituting cell walls extending from the inner side thereof such for example as the inclined walls 50 in Fig. 2, the plaits or fins 24 in Fig. 7, and the inclined walls 51 in Fig. 4.

Said construction further comprises the

forming of inclined guiding or centering projections on the separating means, preferably on the opposite sides of the division plates, to coact with the opposed or oppositely projecting cell walls on the side plates, in order to automatically center the parts when pressure is applied. Such preferably oppositely disposed inclined centering projections are lettered 12 in Fig. 3, and lettered 21 and 26 in Figs. 5 and 10, but, of course other forms of centering projections could be employed if desired.

The construction also contemplates the bringing of the opposed or projecting cell walls such as 50, 51 or 24, into contact with centering projections such as those disclosed, and thereupon, applying pressure and a movement lengthwise of the plates to cause the parts to automatically find their final accurately centered positions. And the construction finally comprises the holding of the parts in said final positions while they are suitably secured together. Of course, a plurality of units in almost every instance must be brought together with suitable water passages between them, and therefore the practicable construction for automobile radiators also involves the assemblage of a plurality of units, and the separation of said units to form the desired water passages before fixing the parts firmly in position. A convenient way of accomplishing this final step is by providing the offset edges 30 on the outer unit plates, so that a plate 25 for example may contact with a plate 23, during the continuous formation of a plurality of units, and thereby avoid stopping the process after each unit is assembled.

In fact, a convenient method of making a whole radiator section is to merely throw the various plates, such as 23, 20 and 25 in their proper sequence into a box or jig of the proper dimensions, and when the proper number of plates have been assembled give them a few shakes and apply a clamping pressure whereupon the members of a whole radiator section comprising a plurality of units separated by water passages will be found to be accurately centered and ready to have their edges immediately dipped in solder and the section thus finished ready for testing.

It will be noticed that my radiator units differ in construction from those disclosed in my former patent, among other features, in that the division plates such as 6, 20 and 41, are provided with enlarged holes formed by punching out their respective guide surfaces 12, 21 and 42, so that air can freely circulate from one row of cells through the division plate to the opposed row of cells. Of course, these holes may be made as large as desired. Further, since cooling air is usually forced through the cells under pres-

sure, more or less of it strikes against the edges of these centering projections and is deflected against the outer cell walls; it thereby comes more intimately into contact
 5 with the heated surfaces and cooling efficiency is accordingly promoted.

It is obvious that those skilled in the art may vary the details of construction as well as the arrangement of parts, without departing from the spirit of the invention;
 10 for example it is obvious that the centering projections on the division plate could be straight like the plaits 24, and they would coact with inclined cell walls like 50 and 51
 15 to center the parts. Therefore I do not wish to be limited to the above disclosure except as may be required by the claims.

What I claim is:—

1. A radiator unit comprising a pair of
 20 sheet metal outer plates having on one side thereof a set of opposed projections constituting cell walls; and division means having centering projections adapted to separate said first named projections, one of
 25 said sets of projections having associated therewith inclined guiding surfaces, substantially as described.

2. A radiator unit comprising a pair of outer sheet metal plates having on one side
 30 thereof a set of opposed projections; and division means having guiding inclined centering projections between which said first named projections are adapted to be located, substantially as described.

3. A division plate for radiator units consisting of a sheet metal body portion having
 35 integral inclined guiding and centering projections extending from each side thereof, substantially as described.

40 4. A radiator section composed of a plu-

ality of radiator units secured together and provided with separating means to form water passages; each unit comprising a pair of outer plates, each having on one side a set of inwardly extending projections to
 45 form cell walls, and a single division plate having a set of centering projections on each side adapted to span the individual spaces between said first named projections, substantially as described.

5. A radiator unit comprising a pair of sheet metal outer plates each having on the inner side thereof a set of projections constituting cell walls; and division means having
 55 projections on each side thereof adapted to separate the projections on said plates, one of said sets of projections having associated therewith inclined guiding surfaces, substantially as described.

6. A radiator made up of sheet metal
 60 plates successively bent to form alternated channels and connected in parallel to form spaced zig-zag water tubes, and alining means located between the tubes and extending into the channels of the adjacent
 65 plates.

7. A radiator core comprising a plurality of water tubes, and a plurality of radiating fins at least one of which is arranged between two adjacent water tubes, each of
 70 said tubes having two walls each of which is constructed of a strip of corrugated metal and each of said fins being constructed of a single corrugated strip of metal and each of
 75 said fin strips being provided with centering loops which project into the concave sides of the corrugations of an adjacent strip.

In testimony whereof I affix my signature.
 HERBERT CHAMPION HARRISON.