M. KAMAN.

RADIATOR.

APPLICATION FILED AUG. 13, 1917.

1,265,340.

Patented May 7, 1918.

2 SHEETS—SHEET 1.

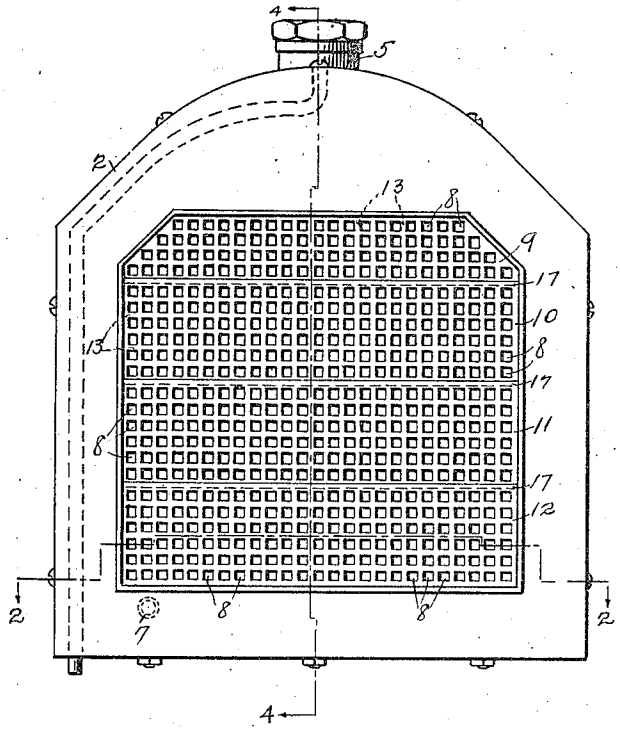


FIG 1

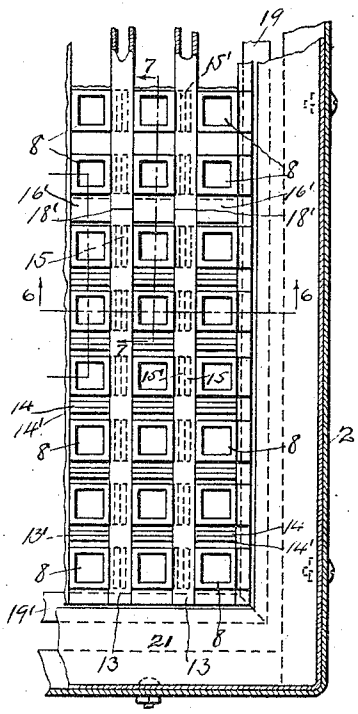


FIG 3

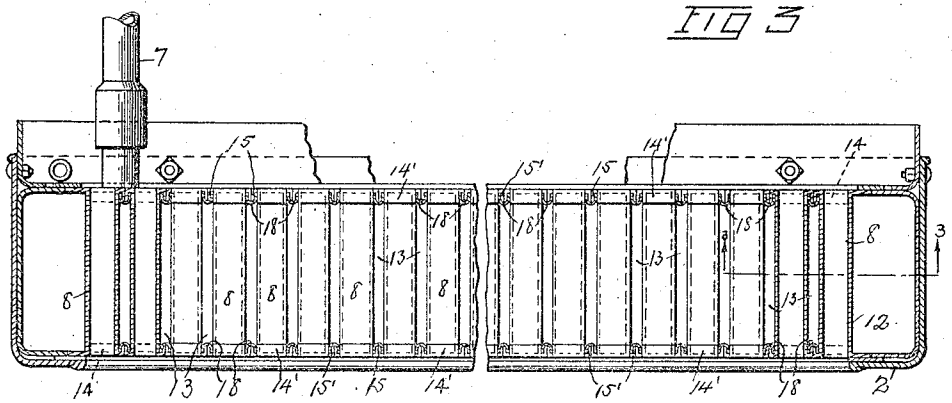


FIG 2

WITNESS

Clark M. Gray.

INVENTOR

Max Kaman.

BY

Harry D. Wallace

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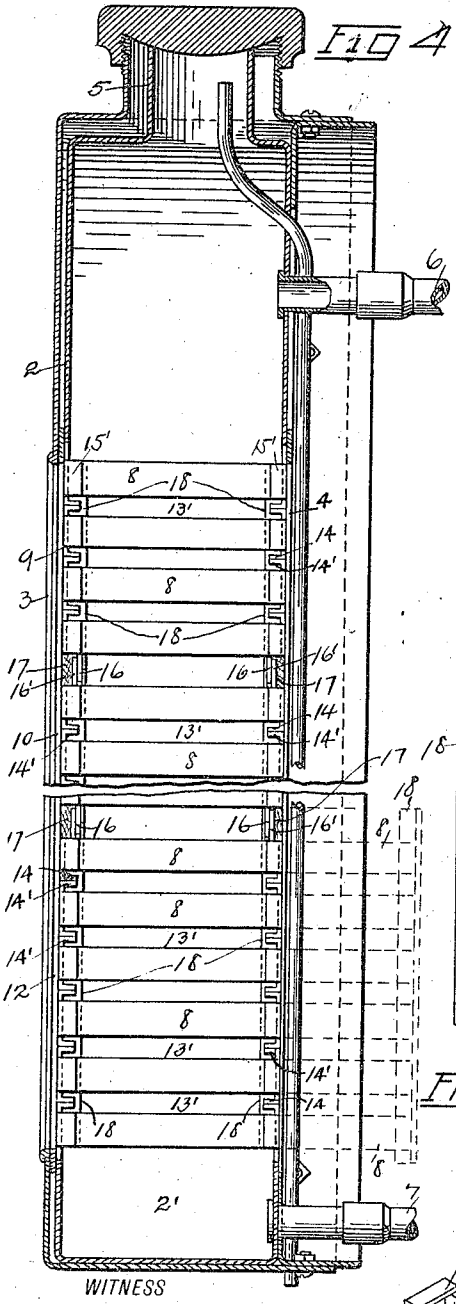


FIG 4

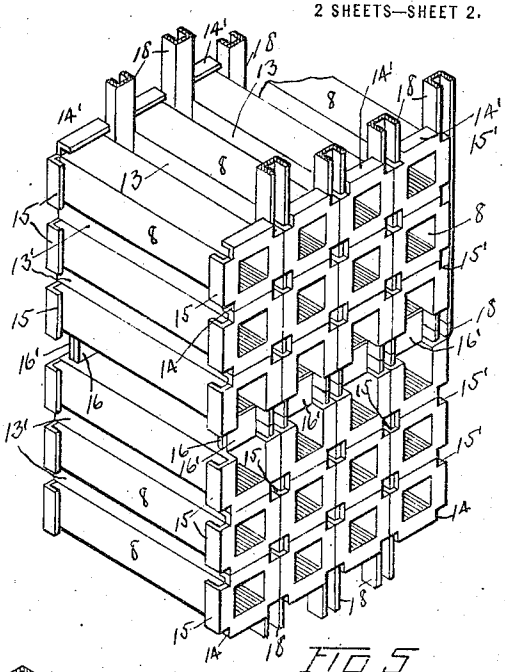


FIG 5

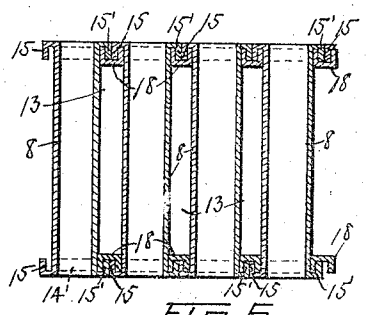


FIG 6

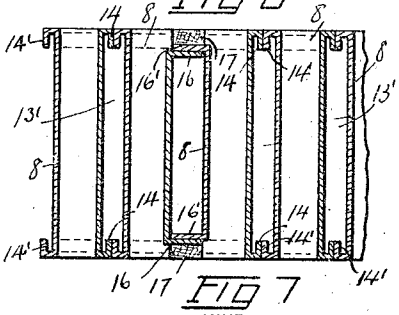


FIG 7

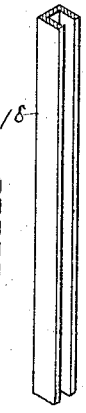


FIG 8

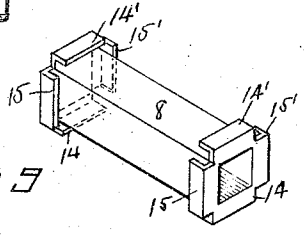


FIG 9

WITNESS

Clark M. Gray.

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UNITED STATES PATENT OFFICE.

MAX KAMAN, OF ROCHESTER, NEW YORK, ASSIGNOR TO MINNIE KAMAN, OF ROCHESTER, NEW YORK.

RADIATOR.

1,265,340. Specification of Letters Patent. Patented May 7, 1918.

Application filed August 13, 1917. Serial No. 185,814.

To all whom it may concern:

Be it known that I, MAX KAMAN, a citizen of the United States, residing at Rochester, in the county of Monroe and State of New York, have invented certain new and useful Improvements in Radiators, of which the following is a specification.

This invention relates to improvements in radiators, of the class employed for cooling the water which protects the cylinders of automobiles and other internal combustion engines, and has for its object to provide a radiator structure which is novel, simple and effective, wherein a given quantity of water may be readily and quickly cooled, and wherein the amount and weight of the metal employed in the structure are greatly reduced, thereby lessening the cost of construction, and still producing a radiator which is durable and which has greater flexibility and strength for withstanding the vibrations of the engine, than any other device of the class known to me. And a further object is to provide a radiator of the class which is sectional, and wherein each section is capable of being applied, removed or replaced, without disturbing the other sections.

I attain these objects by the means set forth in the detailed description which follows, and as illustrated by the accompanying drawings, in which—

Figure 1 is a front elevation of the complete radiator. Fig. 2 is an enlarged horizontal section taken on line 2—2 of Fig. 1. Fig. 3 is an enlarged vertical transverse section taken on line 3—3 of Fig. 2. Fig. 4 is an enlarged central vertical cross section taken substantially on line 4—4 of Fig. 1. Fig. 5 is an isometric view; showing the construction and arrangement of the air flues and channels that interlock the tiers of each section. Fig. 6 is an enlarged broken horizontal section taken on line 6—6 of Fig. 3. Fig. 7 is an enlarged broken vertical section taken on line 7—7 of Fig. 3. Fig. 8 is a perspective view of one of the channels. And Fig. 9 is a perspective view of one of the air tubes.

In the drawing, 2 represents the usual hollow casing or body of the radiator, having relatively large front and rear openings 3 and 4, which correspond in location, size and shape. 5 represents the usual filling neck, by means of which the water for cooling the motor cylinders (not shown) is supplied. 6 represents a pipe which conducts the hot water to the top of the radiator, and 7 represents a pipe through which the cooled water is returned from the bottom of the radiator to the motor jackets. The hot water delivered to the top of the radiator, as explained, in gravitating to the bottom of the body 2, passes between and around a relatively large number of tubes or flues 8, which are grouped together, preferably in regular vertical and horizontal tires. The tubes 8 are preferably disposed horizontally and they are also preferably spaced equi-distantly in all directions, as shown. The tubes 8 are preferably square and have clear openings throughout for the free passage or circulation of the air, which is the cooling agent. In the preferred form, the tubular portion of my radiator is preferably arranged in several sections, as 9, 10, 11, and 12, which for convenience in constructing, assembling, and repairing are disposed horizontally, and these sections are placed one above the other until the required cooling field is provided. The vertical and horizontal water spaces between the tubes 8 of each section may vary in size to suit different conditions, but I prefer a uniform and clear spacing of one-sixteenth to one-eighth inch between the adjacent tubes. During the cooling operation, the water gravitates from the top to the bottom of the tank 2 mainly through the vertical spaces 13, but the water also fills the horizontal spaces 13′, so that there is a complete circulation of the water around each individual tube. When the several sections 9, 10, 11, and 12, are placed in position, as shown in Figs. 1 and 4, they together comprise a single radiating field, as there are no barriers or partitions between the flues of the adjacent sections. After the water has been cooled as described, it is collected in a clear space 2′ in the bottom of the body 2 from which it discharges through the pipe 7.

The tubes 8 are preferably made of relatively thin brass and drawn square, and their opposite ends are slitted longitudinally at the four corners a sufficient distance to permit the top and bottom sides or webs to be folded backward upon the bodies of the tubes for providing similar hook-flanges 14—14′. In like manner, the opposite lateral sides are folded backward to the same

extent, for providing similar hook-flanges 15—15′ (see Figs. 2, 5, 6, 7, and 9). The bottoms of the lowermost tiers of tubes, and also the tops of the uppermost tiers of tubes of the adjacent sections, are provided with vertically arranged flanges 16—16′, instead of the hook-flanges of the other tubes, and these flanges 16—16′ are arranged to overlap each other (see Figs. 3, 4, and 5) for interengaging the sections. The flanges 16—16′ are preferably disposed about one-eighth of an inch inwardly from the opposite ends of the tubes, so as to provide a sort of trough extending horizontally across the face of the radiator, the said trough being finally filled with solder 17, for effecting a watertight and rigid joint between the sections. The sections may be readily and quickly separated by removing the solder 17. When the tubes 8 are assembled, the tubes of each vertical tier are placed one above the other, with the hook-flanges 14 registering with and resting upon the flanges 14′ of the adjacent tubes. The flanges 14—14′ serve as the gages for the horizontal water spaces 13′. In like manner as the tubes are placed in position the lateral hook-flanges 15—15′ are brought together and form or gage the vertical water spaces 13. The several rows or tiers of tubes 8 of each section are locked and held together by a number of channel-shaped stays or parts 18, which are disposed vertically, two of said stays being placed between each pair of adjacent tubes of the vertical tiers (see Figs. 2, 3, 5, and 7). The channels 18 are preferably formed-up substantially the width of the vertical water spaces 13, and are inserted between the opposite ends of the tubes with their hollow sides facing outwardly, so as to receive and grip the lateral hook-flanges 15—15′, as shown. The channels 18 are preferably slightly longer than the depth of each section, so that the ends of the corresponding channels meet about midway in the horizontal space (17) between the adjacent sections, as at 18′ in Fig. 3. By this arrangement, the channels 18 substantially close the gaps which otherwise would occur between the flanges 16—16′ of the adjacent vertical tiers. After all of the tubes 8 and the channels 18 of a section are assembled, as described, the front and rear faces of the sections are dipped in melted solder which solidly unites all of the parts as one, and effects a water-tight seal of all of the joints between the several flanges and channels. Then as several sections are placed one above the other, the troughs occurring between the sections are filled with the solder 17, as explained. The vertical tiers of tubes may be readily separated by running a hot soldering iron over the joints formed by the channel stays or by directing the flame of a blow-torch against said joints and then injured or leaking tubes may be removed, repaired or replaced without disturbing the other tiers or tubes.

The tubular portion of the radiator may be secured to the frame or casing 2 in any suitable manner, as by vertically and horizontally disposed strips 19—19′ which may be fastened to the respective parts by solder or by any other usual means.

My improved radiator is extremely simple, and owing to the number and close arrangement of the flues 8, it is capable of readily and effectually cooling the water it receives from the motor cylinders.

Th provision of the large number of radiating tubes 8 which are arranged to divide the body of hot water into relatively thin sheets or columns, affords the maximum amount of radiating service without increasing the size of the radiator. The grouping and arranging of the flues 8 into sections of convenient size, each of which are readily detachable without disturbing the adjacent sections in case of leakage or injury to any of the tubes, greatly enhances the value of my improvement. And furthermore, by the novel provision of the hook-flanges 14 and 15 and the channels 18, as well as the flanges 16, all of which coöperates for interfitting and interlocking the parts together, enables me to construct my new radiators of relatively light weight metal and still produce a strong and durable device. By the provision of the aforesaid flanges and channels, I am able to eliminate the usual front and back plates for holding the tubes in place, and thereby reduce the amount and weight of metal, which effects a great saving in the cost of the radiators.

It is obvious that the hollow tubular portion of the radiator may be made in one part by extending the channels 18 the full depth of the radiating field without departing from the spirit of the invention.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent, is—

1. In a sectional radiator, the combination with a plurality of sections, each section comprising a plurality of square tubes arranged in vertical and horizontal rows, the opposite ends of each tube having hook-flanges disposed on the top and bottom sides, and each tube at each end having hook-flanges disposed on its opposite lateral sides, the hook-flanges of the adjacent tubes in both the vertical and horizontal rows contacting and gaging he vertical and horizontal water-spaces between the tubes, and a pair of channel-stays disposed between the adjacent vertical rows of tubes receiving and gripping said lateral hook-flanges.

2. A radiator including a plurality of air flues disposed in vertical and horizontal tiers, each tube being square and having at its opposite ends top and bottom and also

lateral hook-flanges adapted to contact corresponding hook-flanges of the adjacent tubes for providing between said tubes vertical and horizontal water spaces of uniform area, and a plurality of angular stays disposed between, and gripping the lateral hook-flanges of the adjacent vertical tiers of tubes.

3. In a sectional radiator, the combination with a plurality of sections, each section comprising a plurality of air-tubes spaced equi-distantly and said sections disposed horizontally, the corresponding tubes of the adjacent sections having vertically arranged flanges adapted to overlap each other for connecting said sections together, the tubes of each section having at their opposite ends hook-flanges adapted to space said tubes horizontally, said tubes also having similar hook-flanges for spacing said tubes vertically, and channels interposed between the opposite ends of the adjacent tubes receiving and gripping certain of said hook-flanges for locking the tubes of each section together as one part.

4. A radiator including a plurality of air tubes arranged in horizontal and vertical tiers, said tubes having hook-flanges at their opposite ends for spacing said tubes horizontally and having similar hook-flanges at their opposite ends for spacing said tubes vertically, and channel-stays disposed in the vertical spaces between said tubes and engaging the corresponding hook-flanges for locking the tubes together.

In testimony whereof I affix my signature.

MAX KAMAN.