

J. D. BEEBE.

PROCESS OF ASSEMBLING RADIATORS.

APPLICATION FILED DEC. 14, 1908. RENEWED MAR. 8, 1912.

1,025,898.

Patented May 7, 1912.

4 SHEETS—SHEET 1.

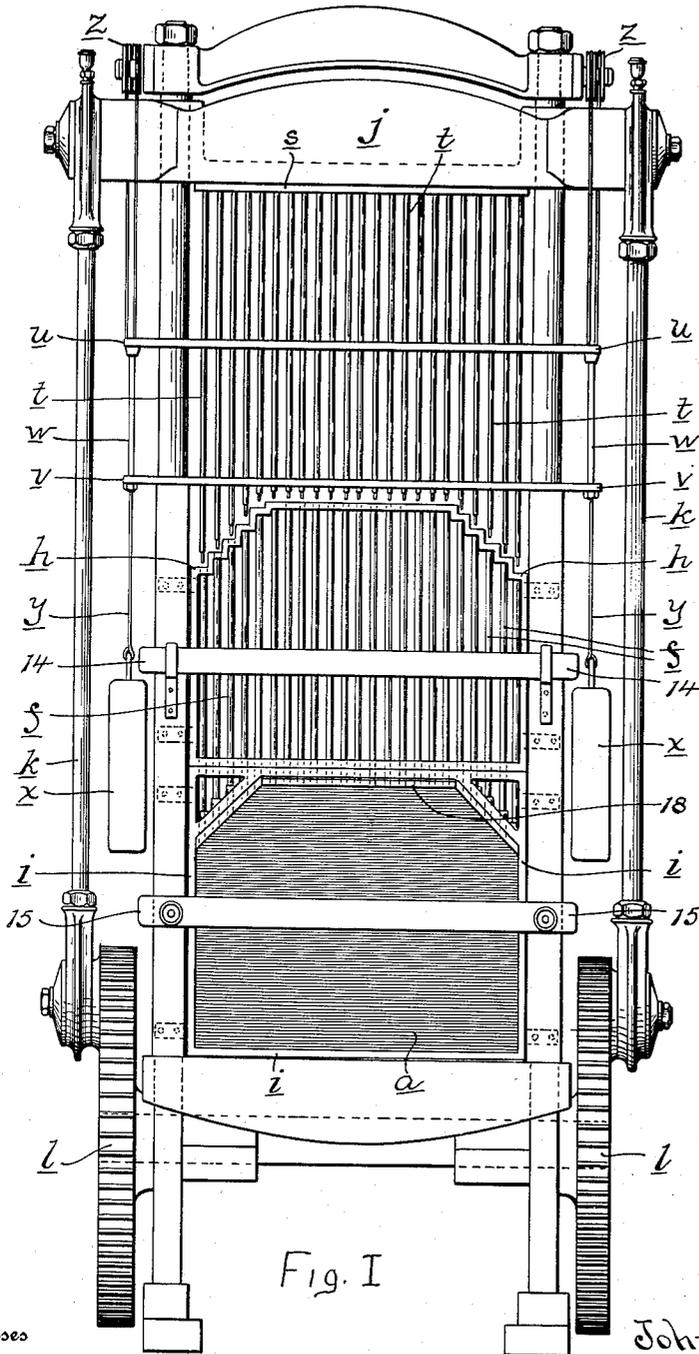


Fig. I

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Witnesses

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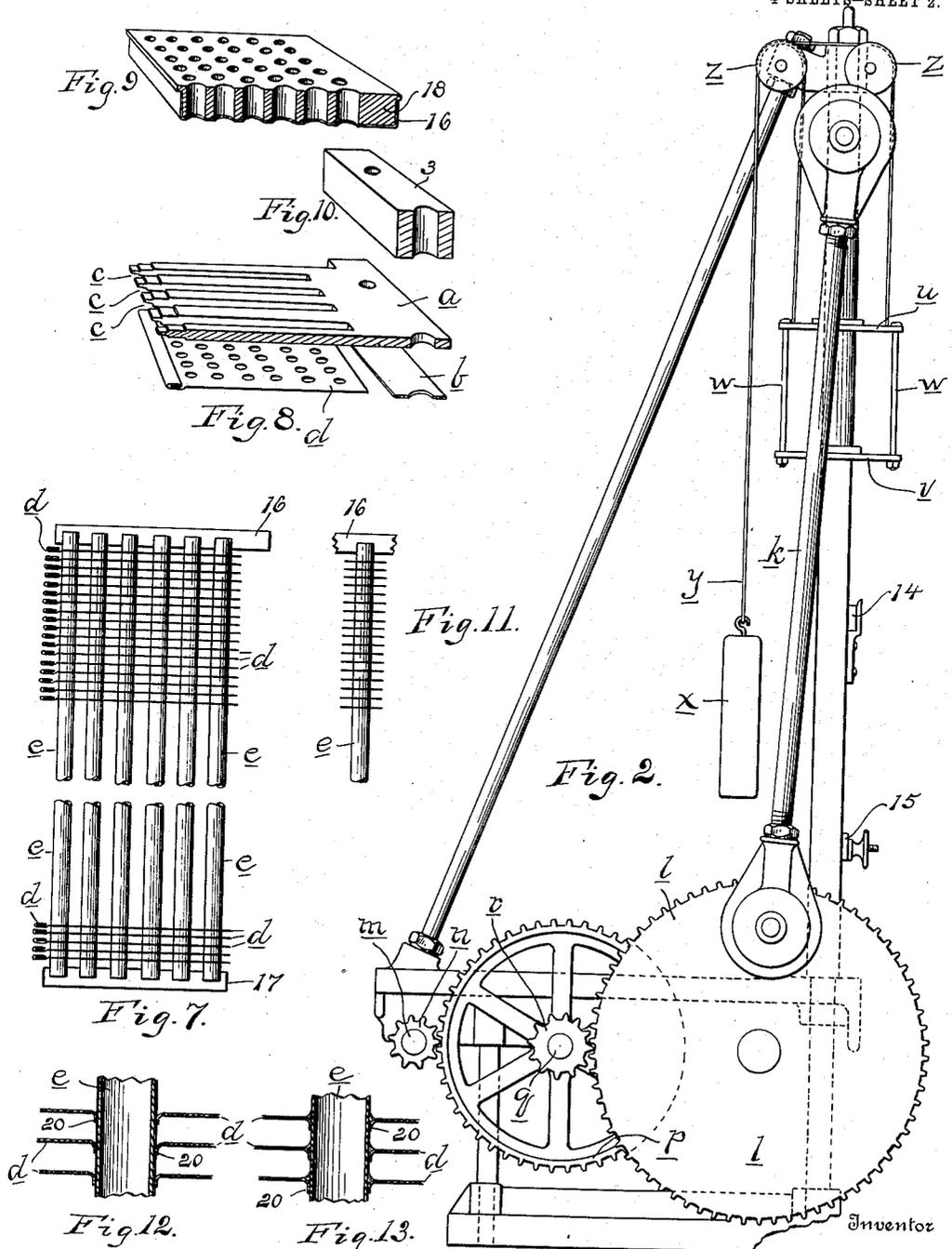
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4 SHEETS—SHEET 2.



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4 SHEETS-SHEET 3.

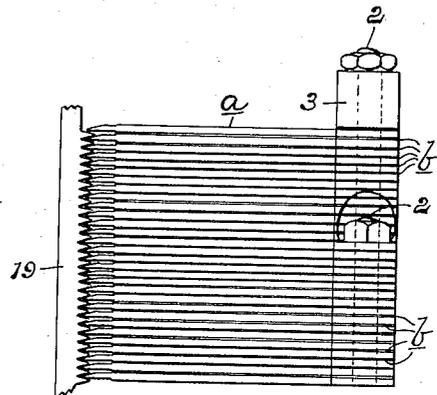
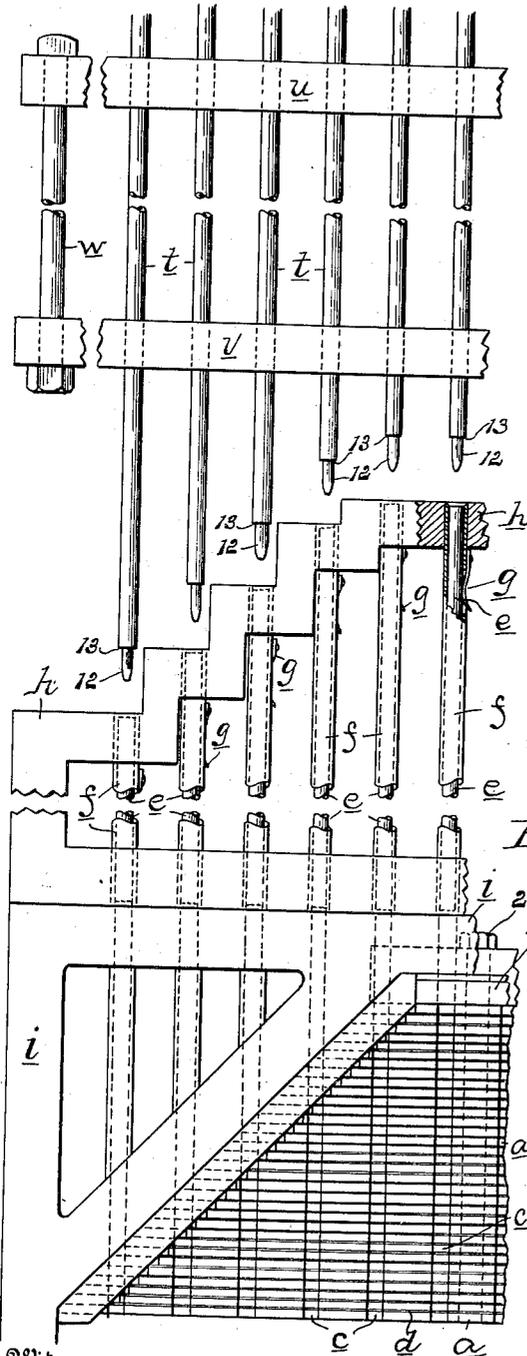


Fig. 4.

Fig. 3.

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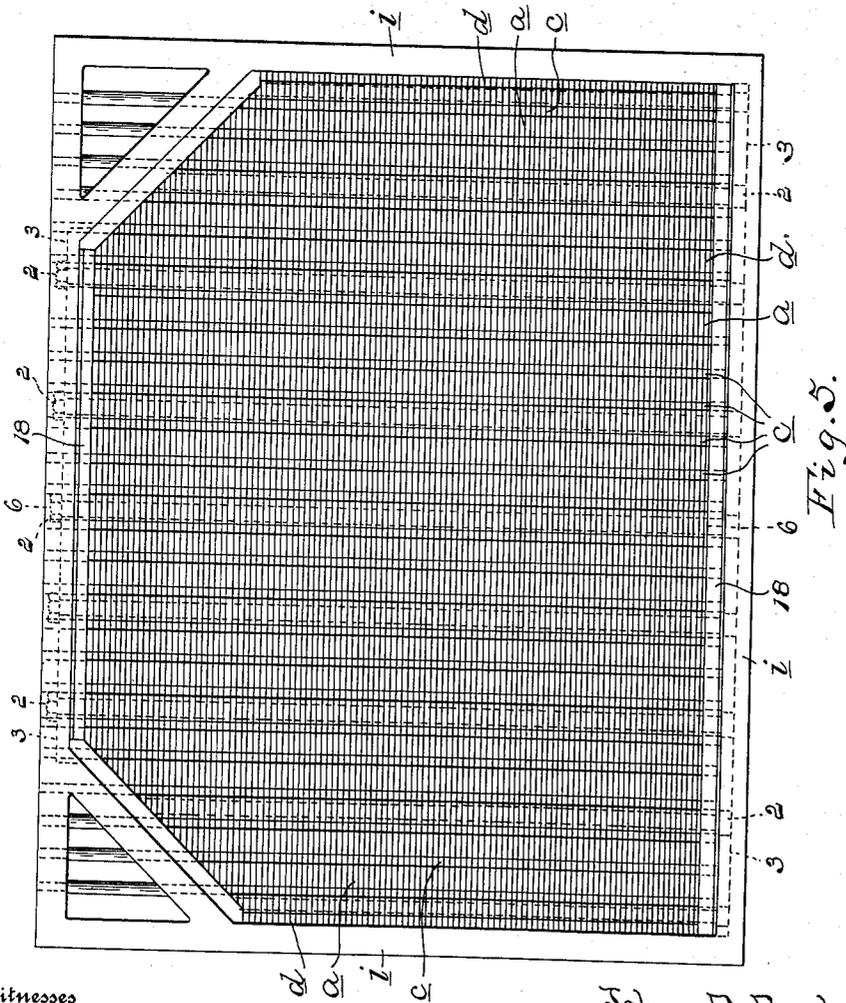
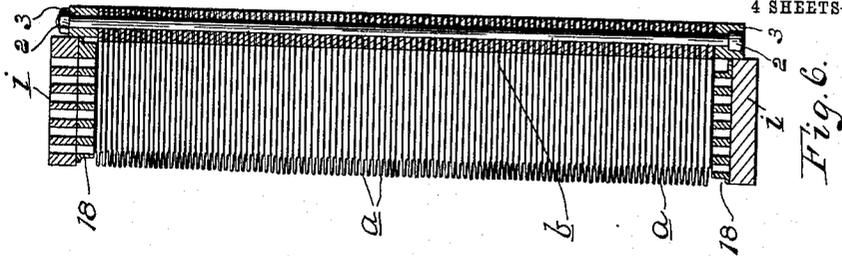
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4 SHEETS—SHEET 4.



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UNITED STATES PATENT OFFICE.

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PROCESS OF ASSEMBLING RADIATORS.

1,025,898.

Specification of Letters Patent.

Patented May 7, 1912.

Application filed December 14, 1908, Serial No. 467,548. Renewed March 8, 1912. Serial No. 682,514.

To all whom it may concern:

Be it known that I, JOHN D. BEEBE, a citizen of the United States, residing at Detroit, in the county of Wayne and State of Michigan, have invented certain new and useful Improvements in the Process of Assembling Radiators, of which the following is a specification.

My invention relates to an improved process of assembling radiators in a more expeditious, economical, and simple manner than that heretofore commonly employed.

More specifically my invention relates to an improved process of assembling radiator fins and water tubes and securing the fins to the tubes in the formation of radiators, more expeditiously, and more economically than the same has been heretofore accomplished.

My invention also pertains, more particularly, to the assemblage of radiators commonly used in automobiles, although I do not limit myself exclusively thereto, as I contemplate as coming within the scope of my invention any and all uses to which it is found applicable. It will be understood that such radiators comprise copper or other suitable perforated plates, the same being preferably made of thin sheet copper constituting the radiator fins through which are passed the water tubes. It has been common hitherto to assemble the radiator fins and tubes by forcing one fin at a time upon the tubes which is necessarily a slow and expensive operation. The common method also of securing the fins in place upon the tubes has been to solder them in place in the usual manner of soldering.

The main principle of my invention contemplates first, building up a nest of fins with intervening spacing plates or other suitable means for spacing the fins apart, as many fins being thus nested together with the intervening spacing devices as is required in the construction of a radiator, the spacing devices being removable from between the fins. The fins may be constructed to engage a single water tube which may be termed single fins, or the fins may be formed of perforated plates or sheets to receive multiple water tubes as may be preferred.

My invention also contemplates locating a completed nest or series of fins so built up in a suitable machine adapted to force the tube or tubes into the entire nest of fins so

nested, the tubes being simultaneously forced through the entire nest of fins. This may be accomplished all in a single operation thus greatly expediting and simplifying the work. I would have it understood, however, that I do not limit myself to the process of forcing all the tubes simultaneously through the nest of fins or to forcing the tubes through the nest of fins by machinery as the tubes might be forced into the nest of fins one by one either by machinery or by hand, within the scope of my invention. Within the scope of my invention the fins may be forced into engagement with the tubes or the tubes may be forced into engagement with the fins as may be desired.

My invention further contemplates the uniting or securing of the fins to the tubes when so assembled upon the tubes, in a very simple and expeditious manner, by providing tubes which have been previously tinned or coated with a metallic substance having a low fluid or melting temperature, and subjecting the assembled tubes and fins to a temperature which is sufficient to cause the metallic coating of the tubes to flow, filling the angle formed by the junction of each fin with its tube, and when cooled firmly uniting the same.

My invention includes the general method or process of carrying out the formation of radiators, as hereinafter described and claimed and illustrated in the accompanying drawings in which is shown mechanism adapted for carrying out my improved process, the mechanism itself being the subject matter of an application filed by me September 30, 1908, Serial Number 455,438.

In the drawings, Figure 1 is a view in side elevation. Fig. 2 is a view in end elevation. Fig. 3 is a fragmental enlarged view to more clearly illustrate the invention in side elevation. Fig. 4 is a view of a nest of the spacing plates and certain adjacent parts. Fig. 5 is a view in elevation showing a nest or stack of plates in position to receive the tubes. Fig. 6 is a view in section on the line 6-6 Fig. 5. Fig. 7 is a detail view illustrating the fins and tubes assembled. Fig. 8 is a detail view showing the relation of the spacing plates, the fins, and the spacing shims. Fig. 9 is a detail view of the block over which the tank is formed. Fig. 10 is a detail view of the securing bar which is engaged over the stack of spacing

plates to hold the plates together. Fig. 11 is a detail view showing a nest of single fins forced into engagement with a single water tube. Fig. 12 is an enlarged detail illustrating a series of fins in place upon a tube which is covered with a fusible metallic coating. Fig. 13 is a similar view illustrating the manner in which the fins and tubes are united by the fusible metal after being subjected to heat.

In order to illustrate my improved process I will explain the mechanism illustrated in the drawings submitted herewith, in order that the process may be more fully understood, although it will be obvious that I do not, in the present application, seek to claim the mechanism and apparatus herewith shown and described.

My invention contemplates any suitable means for receiving and properly spacing a nest or stack of perforated fins formed of a required series or number of fins so that their perforations will be in alinement, in order to carry out my improved process.

It will be understood that the series of fins should be properly spaced apart. As shown in the accompanying drawings *a* represents a series of steel or other suitable spacing plates between the ends of which may be placed a series of spacing shims *b*. My invention, however, contemplates any suitable means of spacing the fins apart. The spacing plates *a*, if employed, are preferably constructed with a series of open recesses *c*, the fins *d* being located between the spacing plates in building up a nest or stack. These spacing plates, it will be observed, all form a comb-like structure between the teeth or fingers of which the fins are to be placed. The shims are placed at one edge between the spacing plates. It will be understood that the gist of my invention consists in nesting the series of fins in any proper manner or by any desired means so as to permit one or all of the water tubes *e* being forced through the entire nest of fins in one operation. Instead of forcing one or more tubes through the nest of fins, I would have it understood that the nest of fins might be forced upon one or more of the tubes, inasmuch as the tubes may either be forced through the nest of fins, or vice versa, the fins might be forced on the tubes, pressure being applied either to the tubes or to the fins to accomplish the desired engagement of the one with the other as above observed. The tubes as well as the fins as is well known, are very light and thin and therefore need to be carefully handled in accomplishing their assemblage. I contemplate, therefore, employing a series of steel guide or retaining tubes *f* to retain the water tubes *e* and through which retaining tubes the water tubes are forced into the fins. I do not limit myself, however, to the use of these retain-

ing tubes. If used they are preferably provided with any suitable arrangement of springs *g* to support the water tubes therein and prevent the water tubes from dropping through the retaining tubes before the assemblage of the tubes and fins has been accomplished. To hold a nest of the steel tubes containing the water tubes, I provide a frame *h* removable from the frame of the machine in order that the steel tubes may be readily charged with the water tubes.

To hold a nest of spacing plates and fins I provide a frame *i* which is also removable from the frame of the machine in order that it may be charged with the fins, the spacing plates being attached to the removable frame *i* so that the spacing plates with their interleaved shims may be removed with the frame *i*. To this end the spacing plates may be held together by blocks or bars *3*, a rod or bolt *2* holding the opposite bars together, said rod passing through the adjacent extremities of the spacing plates and shims. The machine is provided with a cross head *j* with which is properly engaged connecting rods *k* eccentrically engaged at their opposite extremities with gears *l* driven from a driving shaft *m* provided with a pinion *n* meshing with the intermediate gear *p* the shaft *q* of which is provided with pinions *r* meshing with the gears *l*, the train of gears being employed to properly regulate the rate of speed. To the cross head is engaged a plate *s* carrying a series of plungers *t*, guide bars *u*, *v*, being employed, the guide bar *u* being reciprocatory upon the rods *w*, said bar *u* when engaged by the plate *s* being forced downward upon the rods *w*, the bar *u* being returned to normal position in any suitable manner as by a weight *x* extended from a cord *y* extended from a pulley *z* and connected at the opposite end from the weight with said guide plate. The retaining tubes *f* are employed to prevent the buckling of the water tubes as they are being forced into the fins. The lower extremities of the plungers are preferably constructed with pilots *12*, above which is formed a shoulder *13*. It will be perceived that when the plungers are forced downward the pilot extremities will enter the water tubes *e* until the shoulders *13* contact with the upper edges of the water tubes, the further movement of the plungers forcing the water tubes through the retaining tubes into the fins. It will be obvious that in operation the retaining tubes with the water tubes therein and the perforations in the fins nested within the spacing plates are so set up with relation to the plungers as to be in perfect alinement.

Any suitable means of actuating the plungers may be employed, and as already observed, any suitable means of forcing the water tubes through the nest of fins one

or more at a time either by machinery or by hand, while the nest of fins and the means for spacing the same, together with the water tubes, may be employed without other mechanism if desired, and the nest of fins may be either stationary or movable, the water tubes either being stationary or movable as already noted, to engage the fins with the water tubes. When the frame *h* containing the retaining and water tubes is in place in the machine the same may be held in firm position by means of a cross bar 14 engaged at its extremities with the frame of the machine. The nest of fins and spacing plates may also be held in the machine by a cross bar 15 engaged at its extremities in the frame of the machine. The frame of the machine is provided with a bed plate as shown, upon which the frame *i* rests. The assembled radiator is also to be provided with an upper tank 16 and a bottom tank 17. In the assemblage of the radiator in the upper tank 16 is located a perforated block or plate 18 to strengthen and hold the same in place during the operation, an analogous block or plate being also preferably employed within the bottom tank, said perforated tank blocks being removable from the tanks when the radiator is assembled. These perforated tank blocks are located within the frame *i* after the nest of spacing plates and fins are located in the frame. If desired a toothed strengthening bar 19 may be employed to engage the edges of the spacing plates opposite the shims.

As shown in Figs. 12 and 13, the edge of the opening in each fin for the tube, is preferably spun or otherwise turned downward to form the downwardly extending rim or flange 20 to more firmly support the fin, and form a greater contact surface between the fin and the tube. This flange is preferably so turned as to round the angle of juncture of the fin and flange, and a small groove or depression is thus formed at the upper side of the fin around the tube. A stock of tubes is previously prepared by tinning or otherwise coating the same with a fusible metallic substance, in the usual manner and these prepared tubes are placed in the steel guide tubes *f* in the frame *h*, and as previously described are forced through the nest of fins. The assembled fins and tubes are then removed from the frame *i* and stack of spacing plates, and dipped in an acid or flux and placed in an oven or other device, where the structure is subjected to sufficient heat to melt the fusible coating of the tubes, which coating will flow down thereon into the depression in the upper side of each fin around the tube. The device is then removed from the oven

and the coating hardening within its grooves, firmly unites the fins to the tubes in a very efficient manner. The tinning or preparing the tubes for use does not necessarily form a part of this process, as those tubes may be purchased from the manufacturer so prepared, and I do not wish to limit myself to the use of fins having flanged openings, or fins having flanges of the particular form described, the essence of the invention being the subjecting of the assembled fins and coated tubes to a heat sufficient to fuse the coating. The assembling of the radiator including the securing of the fins to the tubes, is thus accomplished in a very simple, cheap and expeditious manner, and from the foregoing description my improved process will be fully understood.

What I claim as my invention is:

1. The process of assembling radiators comprising the placing and spacing of a series of fins upon a coated tube and then subjecting the tube while in an upright position with the fins thereon to heat to fuse the coating of the tube between said spaced fins so that said coating will flow into the angles formed by the junction of the tube and fins and firmly unite the same when cooled.
 2. The process of assembling radiators comprising water tubes having a coating of fusible material and a series of fins of thin flexible material, consisting of supporting the fins in spaced relation forcing the tubes through the fins, and then uniting the fins to the tubes by subjecting the same while the tubes are in an upright position to heat sufficient to fuse the coating on the tubes between the fins so that said coating will flow into the angles formed by the junction of the fins with the tubes and when cooled unite the same.
 3. The process of assembling radiators comprising the spacing apart of a series of fins of thin flexible material having a series of perforations and supporting said fins adjacent to each perforation, forcing a series of coated tubes through the perforations in a single continuous operation, then uniting the fins to the tubes by subjecting the tubes while in an upright position with the fins thereon to heat sufficient to fuse the coating on the tubes between the fins whereby said coating will flow into the angles formed by the junction of the fins and tubes and unite the same.
- In testimony whereof I affix my signature in presence of two witnesses.

JOHN D. BEEBE.

Witnesses:

LIONEL SCHMIDT,
G. E. McGRANN.