Nov. 3, 1931. G. SHOOP 1,830,375

HEAT EXCHANGE ARTICLE

Filed April 4, 1930 3 Sheets-Sheet 1

Fig. 1.

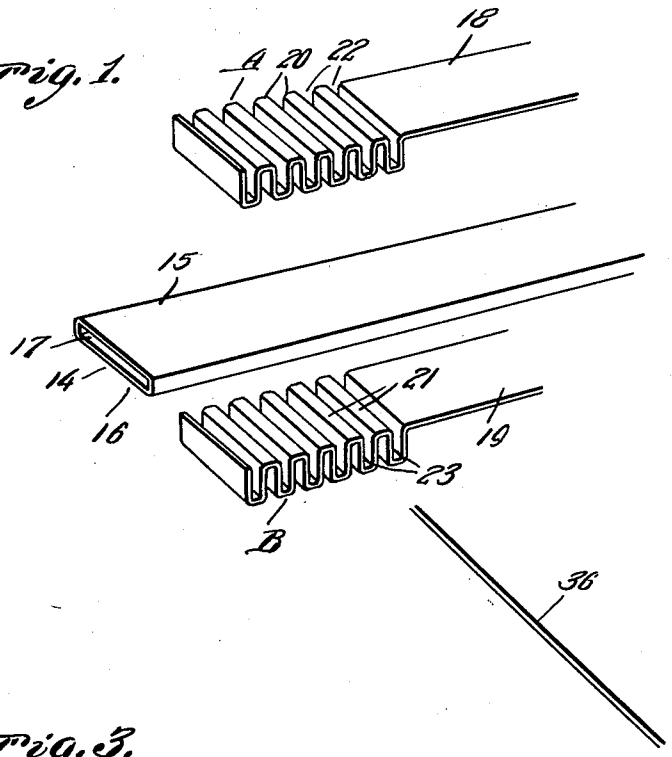


Fig. 3.

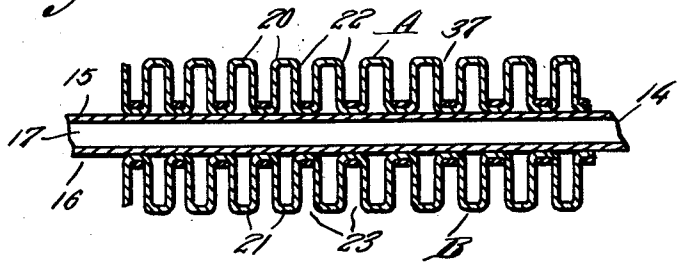
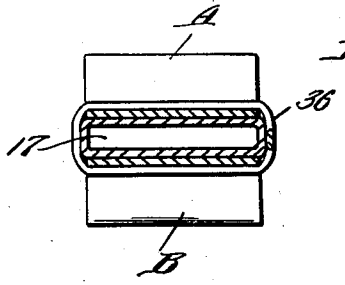


Fig. 4.



Inventor

Gertrude Shoop

By Clarence A. O'Brien

Attorney

Nov. 3, 1931. G. SHOOP 1,830,375

HEAT EXCHANGE ARTICLE

Filed April 4, 1930 3 Sheets-Sheet 2

Fig. 2.

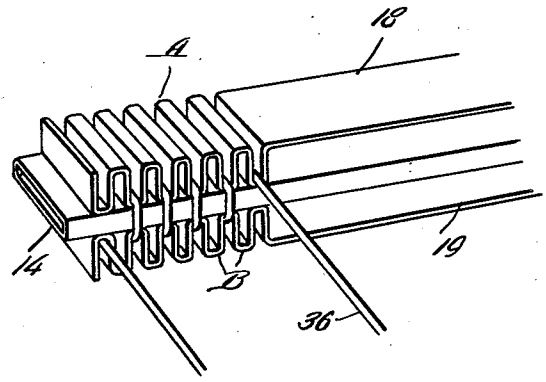


Fig. 5.

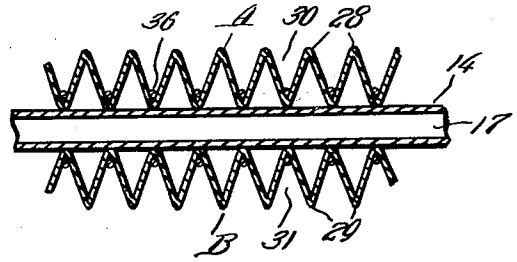
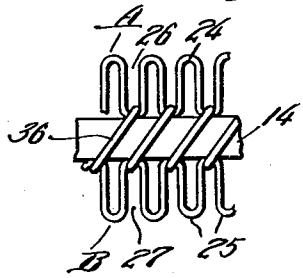


Fig. 7.



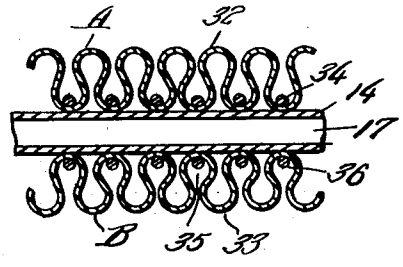


Fig. 6.

Inventor

Gertrude Shoop

By Clarence O'Brien

Attorney

Nov. 3, 1931. G. SHOOP 1,830,375

HEAT EXCHANGE ARTICLE

Filed April 4, 1930 3 Sheets-Sheet 3

Fig. 8.

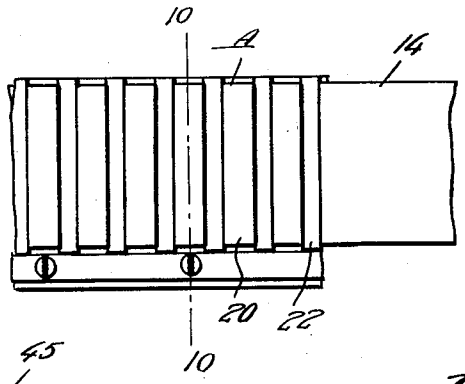


Fig. 9.

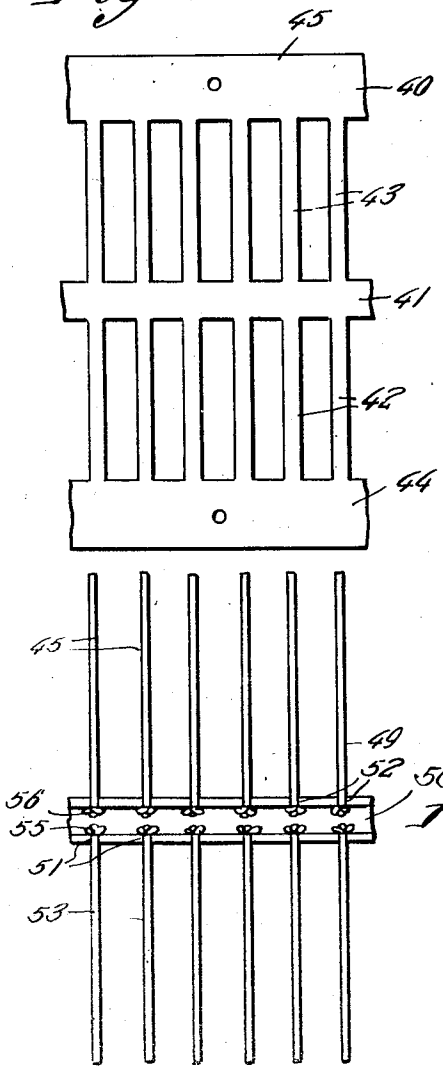


Fig. 10.

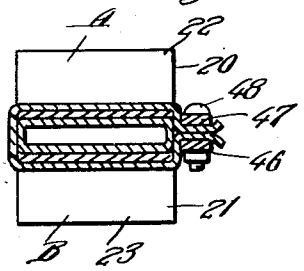


Fig. 11.

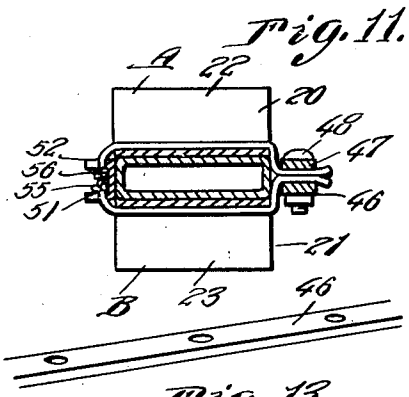


Fig. 13.

Fig. 12.

Inventor

Gertrude Shoop

By Clarence A. O'Brien

Attorney

Patented Nov. 3, 1931

1,830,375

UNITED STATES PATENT OFFICE

GERTRUDE SHOOP, OF SHAMOKIN, PENNSYLVANIA

HEAT EXCHANGE ARTICLE

Application filed April 4, 1930. Serial No. 441,607.

This invention relates to a method of forming, and the article to promote heat exchange. An object of the invention is to provide for a very simple and inexpensive method of forming heat exchange elements to be used for steam condensers, refrigerant gas, radiators for automobiles, aeroplanes, air conditioning in all kinds of buildings, heat systems, and for all heat and cooling systems wherein exchange is desired.

Another feature of the invention is to provide a heat exchange conductor that is very strong, compact and durable, thoroughly reliable for its intended purpose, very simple in its method of assembly, facilitating increased production, and that is comparatively inexpensive to manufacture.

With the foregoing and other objects in view, the invention consists of a novel construction, combination and arrangement of parts as will be hereinafter more specifically described and illustrated in the accompanying drawings, wherein is disclosed an embodiment of the invention, but it is to be understood that changes, variations and modifications may be resorted to without departing from the spirit of the claim hereto appended.

In the drawings wherein like reference characters denote corresponding parts throughout the several views:—

Figure 1 is a dis-assembled, perspective view of a fluid conducting member illustrating an application of one form of the fins therewith.

Fig. 2 is a perspective view thereof being assembled,

Fig. 3 is a fragmentary, longitudinal, vertical section thereof in assembled relation,

Fig. 4 is a transverse, detailed vertical section thereof,

Fig. 5 is a fragmentary, longitudinal, vertical section of a fluid conducting member showing a modified form of fin assembled thereon,

Fig. 6 is a fragmentary, longitudinal vertical section of the fluid conducting member showing assembled therewith another modified form of fin,

Fig. 7 is a fragmentary side elevation of the fluid conducting member showing a modified form of fin and fin attaching means, also in side elevation,

Fig. 8 is a fragmentary plan view of the fluid conducting member and the fin construction shown in Fig. 1 of the drawings, with a modified form of fin attaching means,

Fig. 9 is a fragmentary top plan view of the stamped metal fin attaching means, illustrated in Fig. 8, prior to the attachment thereof,

Fig. 10 is a transverse, vertical detailed section taken substantially on the line 10—10 of Fig. 8,

Fig. 11 is a transverse vertical detailed section through a fluid conducting member with the fin attaching means illustrated in Fig. 12,

Fig. 12 is a fragmentary plan view of a modified form of fin attaching means, prior to the assembly thereof, and

Fig. 13 is a fragmentary perspective view of the anchor bars associated with the fin attaching means, shown in Figs. 9 and 12.

The invention in its broadest aspect comprehends the method of constructing and the resulting article of manufacture, for exchanging heat from a confined body of fluid to a free body of fluid or vice versa. The fluid conducting member, as will hereinafter appear may be polygonal or circular in cross section, and of any desired lineal configuration, since it would be a simple matter of application to form the radiating fins, with a contacting surface contour and lineal configuration to meet the shape of the cross section and configuration of the conducting member.

The conducting member and radiating fins are preferably of metal such as brass, copper, steel, aluminum or alloys thereof, or any other ductile rigid material capable of being fabricated by the present method.

Furthermore, it is to be understood that the radiating fins may be anchored to the conducting members as will hereinafter appear, or by spot-welding, soldering, or in any other suitable manner.

In the drawings, wherein for the purpose of illustration is shown an embodiment of the invention, 14 indicates the hollow confin-

ing or conducting member, in which is enclosed a fluid, either at rest, or in motion. This member 14 may be one of a plurality of interconnected tubes that form a heating system radiator, an automobile radiator, an evaporator in gaseous or liquid refrigerating systems, or any other devices adapted for the exchanger.

As shown, the conductor member is straight and rectangular in cross section having opposed flat faces 15, 16. The chamber 17 interiorly of the conductor 14 is entirely closed and in this chamber is the one fluid either at rest or in motion, with which it is desired to effect a heat exchange with the fluid surrounding the outside of this conductor member.

In all forms of the invention, the two series of radiating fins, are indicated at A and B. All of the radiating fins are preferably formed of bendable metal strips 18, 19 of substantially the same width as the faces 15, 16 of the conducting member 14, to which they are attached.

These strips are of sufficient rigidity to sustain their own shape after they have been crimped to the desired shape.

In the form of the invention shown in Figs. 1, 2, 3, 8, 10 and 11, the metal strips 18, 19 are each crimped transversely into a series of continuous substantially U-shaped crimps 20, 21 having straight legs and crown portions with alternate crimps reversed with respect to intermediate crimps, thereby providing inset pockets 22, 23, on each series.

In the form of the radiating fins A, B, shown in Fig. 7, the strips 18, 19 are each crimped transversely into a series of continuous U-shaped crimps 24, 25, having curved crowns and straight legs.

The alternate crimps are also reversed with respect to intermediate crimps to provide inset pockets 26, 27 with respect to the intermediate crimps.

In the form of the radiating fins A, B shown in Fig. 5 of the drawings, the strips 18, 19 are each formed transversely with a continuous series of V-shaped crimps 28, 29 having alternate crimps of each series reversed with respect to intermediate crimps, to provide alternate pockets 30, 31.

In the form of the radiating fins A, B, shown in Fig. 6 of the drawings, the strips 18, 19 are each crimped transversely with a continuous series of crimps 32, 33 in the form of loops with alternate loops reversed with respect to intermediate loops to provide alternate pockets 34, 35.

In view of the foregoing, it therefore follows that the single strips or webs of metal in either of the forms shown are very economically fabricated into a series of continuous, spaced outstanding projections, that by reason of their continuous nature and intervening pockets, present the maximum heat exchange area and a very inexpensive means for anchoring the fins, to the conductor 14.

All forms of the series of fins A, B, after crimping are placed on the conductor 14, the one series A superimposed on the face 15, and the other series, B depending from the other face 16. The series are so arranged that the pockets and the projections on the one series A are in alinement with the other series B.

Then a round strand of wire 36 as shown in Figs. 1, 2, 5, 6, and 7 is wrapped about the conductor 14 and seats in the pockets of each series holding each series into contact with the conductor at the inner ends of the crimps.

The wire 36 is wrapped in the continuous coil the entire length of the conductor and fins, alternating from one pocket diagonally to another as shown in Fig. 7 of the drawings. On the other hand, a flat strip 37 as shown in Fig. 3 may also be used to advantages in the attachment of the series of fins having the crimps formed of straight crowns, and legs. This flat strip 37 gives a better anchorage for those series of fins having the straight crowns.

It will be understood that the flat strand 37 is wound the same as the round strands 36 and described above.

I have other fastening means for the series of fins A, B, as shown in Figs. 8, 9, and 10. This fastening means is formed of a stamped piece of metal indicated generally at 40 having a central longitudinally extending rib 41 projecting laterally from each side of which are a series of transversely extending, longitudinally spaced slat strips 42 and 43 which in turn merge at their outer ends in the respective flat strips 44, 45 respectively.

To use the fastening means 40, the longitudinal rib 21 is superimposed on the end of the conductor member 14 and the strips 44, 45 bent downwardly over the series of crimps A, B with the series of spaced ribs 42, 43 seating in the pockets of the crimps thereby holding the series of crimps in contact with the opposed faces of the conductor member 14.

Then end strips 44, 45 are brought into abutting relation with each other and the elongated anchor bars 46, 47 are disposed on the outer faces of the strips, and the bolts 48 extending through apertures in the anchor bars and the strips together, about the conductor.

It will be apparent that the fastening means indicated at 40 in Figs. 8, 9 and 10 are particularly adapted for fastening the series of crimps A, B of the U-shape and of the straight leg and crown type.

Another form of fastening means for the series of crimps is shown in Figs. 11 and 12, and indicated generally at 49. This fastening means consists of a central longitudinal channel bar 50 formed with a series of notches 51, 52 in the upper edges of each leg.

A series of transversely extending longitudinally spaced round wires 53 project laterally from one side of the channel bar and another series 54 projects laterally from the other side of the channel bar. The inner ends of each series of wires 53, 54 extends through the respective series of notches 51, 52 and are anchored to the channel bar 50 by means of knots 55, 56 on the inner ends thereof.

To use the fastening means 49, the channel bar 50 is disposed with the inner face of the web against the inner end of the conductor member 14 as is clearly shown in Fig. 11. The series of wires 53, 54 are then wrapped over the series of crimps A, B seating in the pockets between the crimps and the ends of the wires crimped between the flat anchor bars 46, 47 by the bolts 48 similar in all respects to the means of anchoring the fastening means 40.

It is thought that the present embodiment of the invention has been disclosed in considerable detail, merely for the purpose of exemplification, since in actual practice it attains the features of advantage enumerated as desirable in the statement of the invention and the above description.

It is to be understood that by describing in detail herein any particular form, structure or arrangement, it is not intended to limit the invention beyond the terms of the claim or the requirements of the prior art.

Having thus described my invention, what I claim as new is:—

A heat exchange element comprising a tubular member, a number of strips, each crimped transversely to provide a plurality of recesses, with bottom walls of alternate recesses contacting the tubular member, and a fastening strip spirally wound around the recess strips and tubular member and engaging the inner walls of said alternate recesses.

In testimony whereof I affix my signature.

GERTRUDE SHOOP.