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R. S. BLAIR

HEAT CONDUCTING APPARATUS

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Fig. 1.

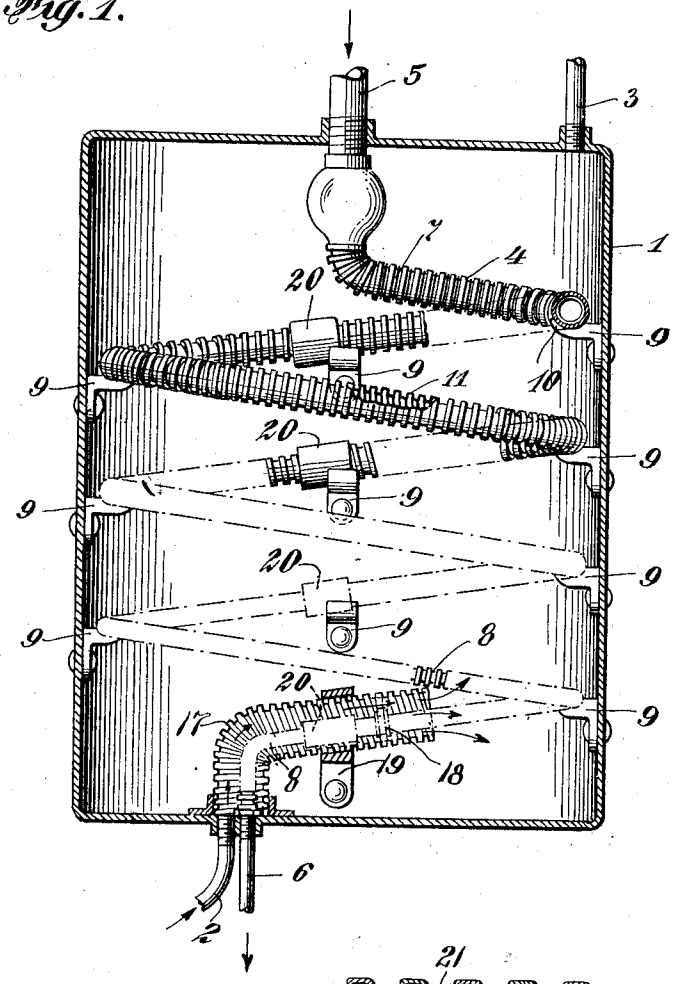
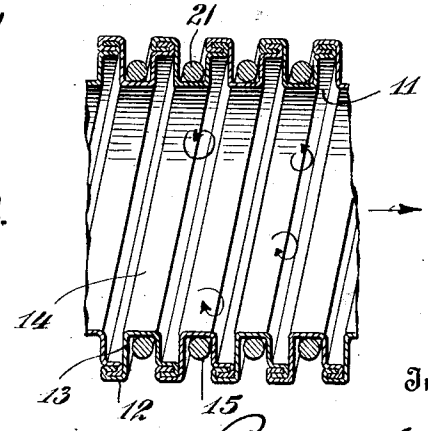


Fig. 2.



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HEAT-CONDUCTING APPARATUS.

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This invention relates to apparatus for changing the state of substances by cooling, and with regard to its more specific features to distilling apparatus.

One of the objects is to provide in a system of the above type, a conduit for fluids, which shall be light and simple in construction and of increased effectiveness for heat exchange.

Other objects will be in part obvious and in part pointed out hereinafter.

The invention accordingly consists in the features of construction, combinations of elements and arrangement of parts which will be exemplified in the construction hereinafter set forth, and the scope of the application of which will be indicated in the following claims.

In the accompanying drawings, wherein is shown one of various possible embodiments of the several features of this invention,

Fig. 1, is a longitudinal sectional view of a still, showing parts of the worm broken away.

Fig. 2, is a detail view in longitudinal section of a segment of my conduit.

Similar reference characters refer to similar parts throughout the different views of the drawings.

Referring now to the drawings, I have shown a still comprising a vessel 1, having an inlet opening 2 near its bottom for entry of cooling fluid and an outlet opening 3 near its top for discharge of the cooling fluid, which is designed by some means not shown, to be kept in continual circulation, the cool fluid entering at the bottom and exhausting at the top, bearing away heat abstracted from the contents of the worm 4, enclosed in vessel 1.

The worm preferably is provided with an inlet opening 5 for entry of vapors to be condensed, and said worm preferably exhausts near the bottom of the vessel at an opening 6. As appears more clearly in Fig. 1, the worm preferably comprises a conduit, wound to have a helical conformation, and has a maximum cross sectional area at the top as shown at 7, said cross sectional area gradually decreasing until a minimum cross sectional area 8 at the bottom is reached.

I prefer to support my worm within the vessel 1, by a plurality of brackets 9, preferably equi-distantly spaced at short intervals to support the coils of the worm in place without sagging. The brackets 9 may be of any desired construction, preferably however, having an arcuate supporting surface 10, for holding the cooperating coil in position.

I prefer to form my conduit with helically encircling supplementary passages 11, communicating with the interior thereof. For this purpose, I prefer to make my conduit of flexible tubing of the type shown on Fig. 2. This tubing is by preference made from a single band of metal having a central groove, and wound into helical form, contiguous edges of adjoining convolutions being bent together, as shown for instance at 12, to form a supplementary encircling passageway or a helically extending hollow vane 13 about the main conduit 14. The groove originally in the band prior to its conversion into a tube, appears at 15 forming a helical exterior groove adjacent to and between the convolutions of helical vane 13.

The specific construction of the tube shown in Fig. 2, taken by itself, and the method of forming this tube are not my invention and are therefore not more fully described.

The cooling fluid enters at the bottom of the tank as through an inlet pipe 2 and preferably passes into an outer tubing 17, which surrounds and is spaced from the inner tubing as shown in the drawing. This outer tubing which is of the same flexible corrugated form as the inner tubing is held in spaced position as by the spaced radial arms 18 and supported at its ends by the bracket 19.

I prefer to employ a number of segments of tubing of the type shown in Fig. 2, of varying diameter, and connect the segments together end to end, arranging them in the order of their diameter, using for purposes of fluid tight connection, any desired and appropriate form of union, as shown for instance at 20 in Fig. 2. The composite tube may then be coiled into a worm of the proper diameter, and inserted into the vessel 1, with the small diameter tubing at the bottom.

In operation, the vapor enters the worm through the opening 5, and the cooling fluid enters the vessel through the opening 2. The vapor is allowed to pass through the worm in a continuous stream and fresh cool

fluid is, by some means not shown, continually admitted through the bottom of the vessel. In a manner which will now be clear, this fluid will abstract heat from the worm exhausting through the opening 3. The outer tube 17 which may inclose the inner tubing for any desired portion of the length of the latter holds the cooling fluid close to the outer surface of the inner member and enhances the cooling action particularly toward the discharge end of the latter tubing and at which point its contents are of lower temperature.

The vapor is converted into condensed liquid by this process of heat abstraction and in view of the narrowing of the worm near its exhaust end 6, this condensed fluid will rapidly emerge from the still. Throughout the entire length of the inner tubing there is preferably wound in the outer helical groove a brass wire 21 or the like, which fits this groove loosely at its sides. This wire not only adds to the strength of the tubing but increases its effective outer surface.

It is to be noted that as the vapor passes through the conduit, it enters the hollow vane 13, and being limited against further direct movement axially of the conduit, will assume a rotary movement within the groove. Eddy currents are also set up in the vapor within the groove, as suggestively indicated by the arrows shown in Fig. 2.

In a similar manner, the cooling fluid on the outside of the conduit enters the external helical groove 15, and circulates therein to cause a continual changing contact of cooling fluid with the walls of the conduit. As the vapor within groove 13 is cooled by the cooling fluid, it makes way for other vapor in a less cool state.

Thus by my invention, I not only provide an increased surface between the vapor and the cooling fluid, but my interposed surface is so arranged that both the vapor to be condensed and the cooling fluid, are in continual eddy movement, to efficiently abstract heat from the vapor.

It is to be understood that my invention is applicable not only for condensing vapors, but also for cooling liquids. In general, it may be used in any case in which the state of a substance is to changed to another physical state of lessened molecular activity and certain of its features are of broader application. My invention, however, has its preferred application in the specific relation shown and described.

It is to be understood that instead of the specific form of conduit shown in the drawings, I may provide a conduit with vanes of different conformation from those disclosed, and said conduit may be made by methods other than that set forth in Fig. 2, and said conduit may further be either of brass or other suitable material. As to all these features, it is to be understood that I prefer to employ the specific construction shown and described.

It will thus be seen that there is herein described apparatus in which the several features of this invention are embodied, and which apparatus in its action attains the various objects of the invention and is well suited to meet the requirements of practical use.

As many changes could be made in the above construction, and many apparently widely different embodiments of this invention could be made without departing from the scope thereof, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

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

1. In apparatus of the general nature of that herein described, in combination, a flexible metallic conduit, a second flexible metallic conduit into which said first conduit is fitted, means interposed between said conduits intermediate their ends adapted to hold them in spaced relation one from the other, and means adapted to lead a current of fluid thru one of said conduits, and another current of fluid thru the space between said conduits in the opposite direction.

2. In apparatus of the general nature of that herein described, in combination, a flexible metallic conduit, a second flexible metallic conduit into which said first conduit is fitted, means positioned within said first conduit supporting said second conduit therein in spaced relation to the inner surface thereof, means adapted to lead a current of fluid thru one of said conduits, and another current of fluid thru the space between said conduits, each of said conduits having its walls corrugated with the corrugations extending transverse to the axes of the conduits and means adapted to support one of said conduits in spiral position.

3. In condensing apparatus, in combination, a conduit composed of a plurality of connected sections of flexible metallic tubing of progressively varying diameters and adapted to carry a fluid, means for surrounding said conduit with a medium for effecting heat exchange between said fluid and said medium, and means for rigidly supporting the extreme ends of said conduit within said first-mentioned means.

4. In apparatus of the class described, in combination, a main conduit, a supplementary channel helically encircling said main conduit and integral therewith, and a wire wound exteriorly within the outer helical depression formed by said channel.

5. In condensing apparatus, in combina-

tion, a flexible metallic conduit composed of a substantially U-shaped strip of metal helically wound and having the edges of adjacent turns crimped together, thereby forming an outer helical depression throughout the extent of said conduit, a wire wound within said helical depression and means adapted to lead a fluid over the outside of said conduit in heat-conducting relation thereto.

6. In condensing apparatus, in combination, a conduit adapted to carry a fluid, a vessel adapted to receive said conduit and to surround said conduit with a heat exchange medium, means for conducting said medium into and out of said vessel, and means for conducting the incoming medium in intimate contact with said conduit throughout a substantial portion of the discharge end of said conduit, said means comprising a passage relatively restricted with respect to the succeeding path of said medium through said vessel.

7. In condensing apparatus, in combination, a container adapted to contain a cooling fluid, and a flexible corrugated conduit of heat conductive metal forming a passage through said container for fluid to be cooled, said conduit having a wire coiled thereabout in the corrugations thereof.

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