Aug. 19, 1924. 1,505,576

R. A. MIKALSEN

HEAT EXCHANGE DEVICE

Filed June 29, 1921

Fig. 1

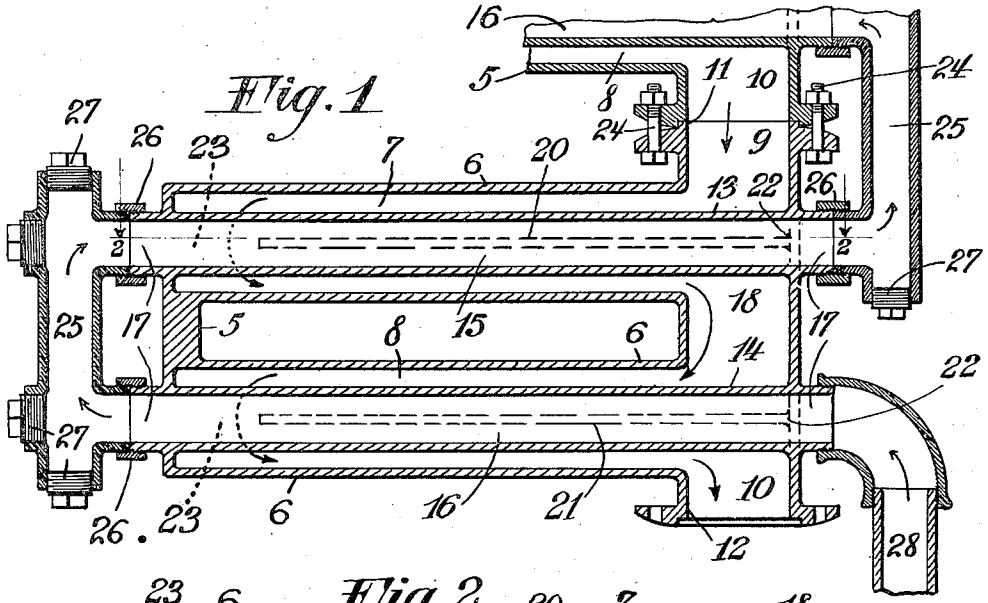


Fig. 2

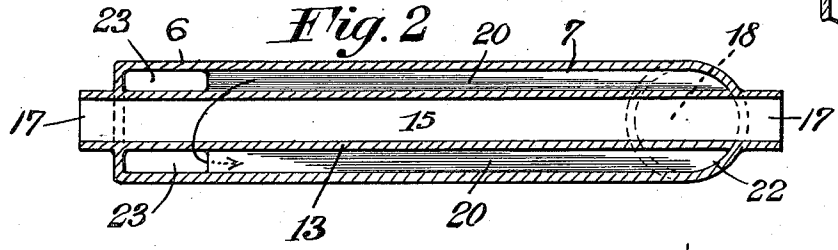
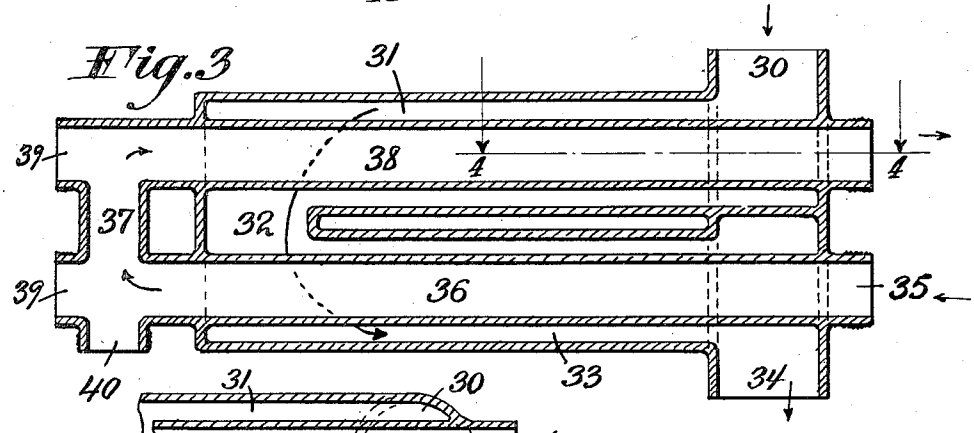


Fig. 3



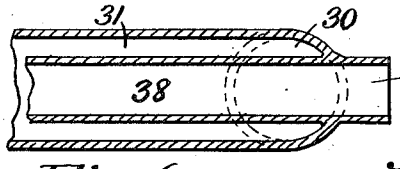


Fig. 4

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Patented Aug. 19, 1924. 1,505,576

UNITED STATES PATENT OFFICE.

RANDOLF A. MIKALSEN, OF BROOKLYN, NEW YORK.

HEAT-EXCHANGE DEVICE.

Application filed June 29, 1921. Serial No. 481,278.

To all whom it may concern:

Be it known that I, RANDOLF A. MIKALSEN, a citizen of the United States, and resident of Brooklyn, in the county of Kings and State of New York, have invented certain new and useful Improvements in Heat-Exchange Devices, of which the following is a specification.

This invention relates to apparatus for heat exchange devices of the type in which there is provided an inner pipe enveloped by an outer pipe, and two liquids flow in opposite directions, one liquid through the inner pipe and which may be the cooling or heating liquid, and another liquid flows through the space between the inner pipe and the wall of the outer pipe, and which latter liquid may be the one which is to be cooled or heated as the case may be.

Heretofore such apparatus has been constructed mainly of pipes or tubes screwed together necessitating many joints, stuffing boxes and like parts, which present numerous opportunities for leakage and waste, and which, therefore, are apt to result in inefficient operation and loss.

The object of this invention is to provide heat exchange devices constructed and arranged with a view of eliminating as many joints as possible, so as to provide a very simple, inexpensive and highly efficient apparatus for the purposes set forth. Accordingly my invention is embodied in an apparatus constructed and arranged as hereinafter described and as illustrated in the accompanying drawing in which—

Figure 1 is a sectional view of a liquid cooling or heating apparatus embodying my invention.

Figure 2 is a sectional view on line 2—2 of Fig. 1.

Figure 3 is a view similar to Figure 1 but illustrating a modification.

Figure 4 is a detail sectional view on line 4—4 of Figure 3.

In order to eliminate joints and to construct the apparatus at a low cost of manufacture, I propose to build the apparatus in units or sections, each of which is cast to provide a unitary structure so that it may be easily connected to adjacent units to provide an apparatus of the desired capacity.

Referring to Figure 1, the reference numeral 5 denotes in general a section or unit comprising an outer shell 6 having two parallel passages 7 and 8 of relatively large diameters and having an inlet 9 and an outlet 10 provided with female and male flanges 11 and 12 respectively.

Cast integral with the said outer shell or casing 6, there are provided two inner shells 13 and 14 having passages 15 and 16 which extend clear through the passages 7 and 8 aforesaid. The inner passages are open ended as at 17, 17 and threaded or otherwise constructed for connecting purposes. The inner and the outer passages do not communicate.

The two outer passages 7 and 8 communicate at one end by means of a transverse passage 18 in preferable axial alinement with the inlet and outlet 9 and 19 respectively. In order to direct the flow of the liquid throughout the length of the outer passages before it passes from the one to the other, each of said outer passages is provided with a shelf, partition or baffle plate 20 and 21, which is cast integral with the inner and outer shells 6, 13 and 14, which plates 20 and 21 extend from one end of the said passages, where said plates join the casing as at 22, 22 to within a short distance from the opposite ends of said passages providing a space 23, 23 around and on both sides of the inner passages.

In Figure 1 a portion of an adjacent section or unit 5 is shown as being connected to the inlet 9, said adjacent unit having an outlet 10 connected by bolts 24 to the inlet 9 aforesaid. Communication between the inner passages 15 and 16 is established at the one end by means of a connection 25 connected to the passages 15 and 16 by joints or connections 26, 26 of any approved liquid and air tight character. Plugs as 27, 27 are provided for cleaning purposes.

A similar connection 25 is shown as leading from the inner passage 15 to the inner passage 16 of the adjacent unit, which is only partially illustrated.

From the foregoing it will be seen, that an apparatus has been provided in which a liquid or gas, as for instance ammonia, is condensed by entering the apparatus through the inlet 9 (from the source of supply or from the adjacent unit) and which liquid or gas then flows through the passage 7 in opposite directions around the baffle plates 20, 20, thence downward through the passage 18, thence through the passage 8 in opposite directions around the baffles 21, 21 and then out through the outlet 10.

At the same time, another liquid, as cooling water for instance, is caused to flow through the inner passage 16 from a source of supply, not shown, through a connection 28. From passage 16 the second liquid passes upward through connection 25, thence through passage 15, thence through another connection 25 to the adjacent unit and so on until the liquid has completed its course through the apparatus.

It will be understood without further illustration that the outlet 10 in the last section of the apparatus will be connected to suitable apparatus, not shown, for collecting or disposing of the condensed ammonia.

It will also be understood, that the apparatus is not limited in its use to any particular liquids or to cooling only, but that any liquid may be caused to flow through the inner passages and another suitable liquid may flow through the outer passages for heating or cooling, and vice versa.

It will be noted that there are no joints in the apparatus itself comprising the outer casing or shell and the inner passages and that only two standard castings are required namely the unit 5 and the unit or connection 25.

While the apparatus is not limited in its uses, nevertheless, it presents peculiar advantages in being used as an ammonia condenser, in that the only joints through which the ammonia passes, are the joints between adjacent sections, which by being cast as a male and a female joint are readily made tight, while the connections for the cooling water present no difficulties, except those which are present in any water pipe line.

Figure 3 illustrates a modification in which the unit comprises an inlet 30, an outer tubular passage 31 communicating at 32 with another similar passage 33 leading to an outlet 34. Also cast integrally with the aforesaid passages are inner passages comprising an inlet 35, an inner passage 36, which communicates through a vertical passage 37 with a second inner passage 38 leading to an outlet 41.

Openings at 39, 39 and 40 are provided to receive plugs, not shown, for cleaning purposes and it will be understood, that suitable connections, not shown, will be made to the inlet and outlet of the several passages in order to properly connect the apparatus. In this case, the liquid flows in one direction only in the outer passages 31 and 33.

From the foregoing it will be noted that I have provided a cooling or heating apparatus, in which the unit itself is cast complete and without joints, so that it may be produced at relatively low cost of manufacture and without the troublesome features which are unavoidable where many joints are required. The apparatus may be made of any desired capacity and is easily installed and connected. It will further be understood that while I have shown my invention in its preferred form, nevertheless, I reserve the right to make such minor changes and alterations in the design and construction as come within the principles of the invention and the scope of the appended claim.

I claim:—

In an apparatus of the character described a unit having a plurality of parallel outer passages spaced a distance apart, a communicating transverse passage between the same at one end thereof, an inlet leading to one of said outer passages at the one end thereof, an outlet leading from another of said outer passages at the one end thereof, said inlet and said outlet being in alinement with the said transverse passage, open ended inner passages located axially within said outer passages, which latter and the said inner passages are non-communicating, partition plates for dividing said outer passages in upper and lower chambers within the space between the inner and outer passages, and extending from the one end of said outer passages to within a short distance of the opposite ends of said outer passages providing a space at said opposite ends around and on both sides of the said inner passages whereby to establish communication between the upper and the lower chambers within each of the said outer passages, apertured connecting flanges on the said inlet and outlet for connecting the said unit to adjacent similar units, a connection for connecting the open ends of adjacent inner passages within the unit and for joining adjacent inner passages in adjacent units, means for joining said connections to the said inner passages as aforesaid, all of the said passages and plates being cast in one piece to form the said unit.

RANDOLF A. MIKALSEN.