

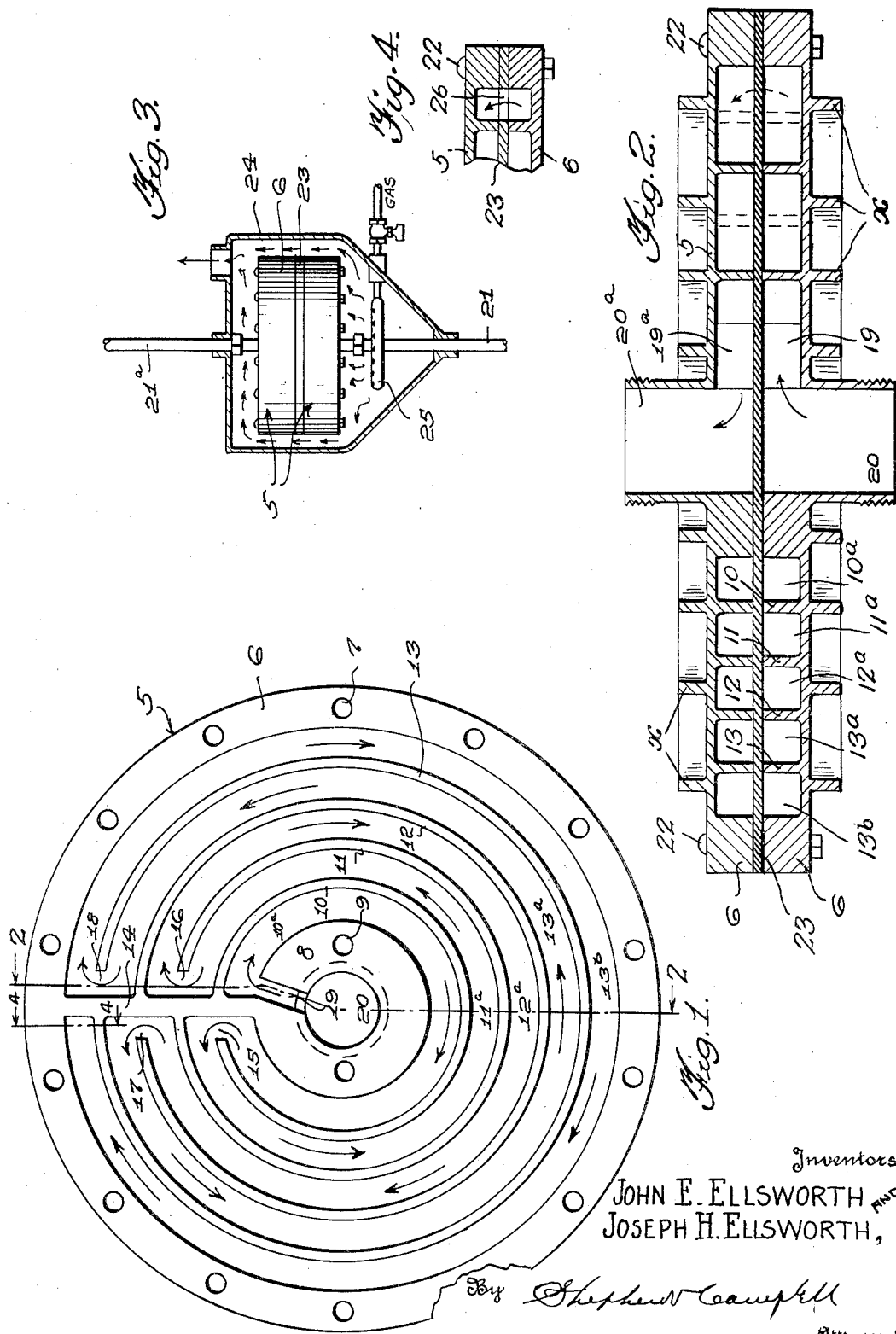
Aug. 15, 1933.

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1,922,534

HEAT EXCHANGE DEVICE

Filed Feb. 21, 1933



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UNITED STATES PATENT OFFICE

1,922,534

HEAT EXCHANGE DEVICE

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Application February 21, 1933. Serial No. 657,852

3 Claims. (Cl. 257—256)

This invention relates to a heat exchange device. For purpose of convenience it will be described as functioning as a water heater though it will be apparent, as this description proceeds, that the device is not limited to that particular use, but that it is of marked utility in many relations where the temperature of flowing liquids or gases is to be changed or modified.

In the accompanying drawing

10 Figure 1 is a face view of one of the halves, hereinafter described, a pair of said halves being preferably, though not necessarily, employed in the construction of the complete device.

15 Figure 2 is a view in transverse section of the device of the invention upon line 2—2 of Fig. 1.

Figure 3 is a sectional view illustrating one method of applying heat to the exterior of the device, and Fig. 4 is a fragmentary sectional view on line 4—4 of Fig. 1.

20 Like numerals designate corresponding parts in all the figures of the drawing.

The device of the present invention is relatively simple and quite inexpensive. It comprises only two main parts of identical construction except for the location of the spaces 16 and 18 and the port 19 with a separate gasket between them. Each of these sections consists of a disc-like member 5, a peripheral rim 6 having a plurality of bolt holes 7 formed therethrough, a central boss or hub 8 likewise having bolt holes 9 therethrough and a plurality of spaced concentric walls or ribs 10, 11, 12 and 13.

A radial bridge wall 14 extends from the hub 8 to the peripheral rim 6, and the wall 10 leads from one side of this bridge entirely around the hub 8 but terminates in slightly spaced relation to one side of the bridge, as indicated at 15. The next wall 11 is connected to that same side of the bridge extending also entirely around the structure but terminating in slightly spaced relation to the opposite side of the bridge, as indicated at 16. The next outermost wall 12 is connected to the last named side of the bridge and extends all the way around the structure and terminates in slightly spaced relation to the opposite side of the bridge, as indicated at 17. The outermost wall 13 leads from the last named side of the bridge all the way around the structure terminating in slightly spaced relation to the opposite side of the bridge, as indicated at 18.

Thus, it will be seen that there is provided a "pigs in clover" arrangement by which fluid flowing through the passages between the said walls is caused to follow a very elongated and

tortuous path. A port 19 leads from a central port 20 of the hub 8 to the first passage, namely, that which lies between wall 10 and the periphery of the hub 8, and for purpose of convenience it will be assumed that Figure 1 illustrates the lowermost half of the device or that half in which the water or other fluid enters through port 20 from a central supply pipe; the hub being extended beyond the disc 5 and threaded for the reception of such supply pipe 21.

When the two halves, constructed as described, are secured together face to face by bolts 22 and with a gasket 23 disposed between them to separate the passages of the upper half from the passages of the lower half, a device is produced which functions as follows: Assuming that the device is to be used as a water heater and that it is disposed, as indicated in Fig. 3, in a casing or housing 24 containing a gas burner 25 or any other suitable source of heat, water will enter through pipe 21 and pass through port 19, passage 10a, port 15, passage 11a, port 16, passage 12a, port 17, passage 13a, port 18, passage 13b to a point adjacent the solid bridge wall 14 where it finds an outlet through a port 26 of the gasket into the outermost passage of the upper section. The water then travels from the periphery of the structure inwardly toward the hub through the "pigs in clover" arrangement of parts, hereinbefore described, passing finally through port 19a corresponding to port 19 of the lower section into the bore 20a of the hub of the upper section and finally out of outlet pipe 21a. The gasket may be made of any suitable metal, such as copper, or, it may be made of the commonly employed rubber and canvass composition such as is commonly employed in steam diaphragms of various sorts, according to the nature of the service to which the device is to be put.

While we have illustrated the inlet and outlet pipes as extending axially from the structure, and while this arrangement is a highly desirable one in that it makes it possible to utilize the service pipes as supporting elements for the heater and also facilitates arranging a group of these heat exchange devices, in series, where desired, it is to be understood that we may lead these service pipes to the sides of the central hubs, if desired; it being clear that this would only necessitate the casting of suitable ports along the sides of the discs 5 and leading from the hubs radially outward.

No attempt has been made to illustrate all of

the many ways in which the basic principles of this structure may be utilized because they are so numerous that it would not be practicable to illustrate all of them. Therefore, we wish it to be understood that the present invention contemplates the use of the arrangement shown in any relation where it may be used to advantage. However, some of the uses to which the device may be put are as follows:

The device may be utilized as a water heater by passing the water from the inlet to the outlet pipe and by applying heat either from a gas burner, electric coils, contacting heat gases, or otherwise, to the exterior of the sections of the heater. This heating effect can be increased by enclosing the device in a casing 24 to cause the heat from the heating unit, such as the element 25, to travel first outwardly and then inwardly with respect to the sections. The heater, that is, the sections or coils described, may be disposed directly in the firebox of a furnace or may be immersed in a body of hot liquids or disposed in the path of hot gases from any source, or these coils may be disposed in a body of a refrigerating medium such as ice, or the like, where it is desired to use the device for cooling purposes.

This device is admirably adapted to serve as an instantaneous hot water heater by connecting the outlet pipe directly to a faucet to be served so that the water would flow directly to the faucet from the heater. The apparatus is also adapted for use as a distilling coil by placing the coil in a cooling medium and passing vapors to be condensed through the coil. The device of the present invention is also adapted for use as a radiator for heating purposes by passing steam or hot water through the device. It can also be used as a muffler for internal combustion engines, or as a heater for automobiles by passing exhaust gases therethrough, and, indeed, could be used as a combined heater and muffler to advantage. The device can further be used as a steam condenser or as a mixer for liquids or as a preheater for boiler water by placing the coil in a container filled with water and permitting exhaust or live steam to circulate through the coil of the present invention and pumping the water for the boiler out of the container, or the boiler water could be passed through the coil, the exterior of the coil being subjected to the heat from live or exhaust steam.

The principles involved could be utilized in automobile radiators and both in this relation and in the other relations shown the device of the present invention possesses one feature of very great utility, namely, it is capable of being very readily cleaned of mud, scale and other accumulations. It is apparent that by merely removing the bolts 22 and separating the two halves, the fluid channels or passage ways are completely exposed and made so very accessible that all of the mud and scale may be readily scraped therefrom. This is of importance in many relations and particularly in automobile radiators or in coils used for cooling drinking water.

While we have described the device as comprising both the upper and lower sections, and while it has its greatest utility and efficiency when so constructed, it is to be understood that one of the halves may be used without the other, if desired, the water in that case being taken off at the port 26 instead of being conducted at that point into another half section.

The tortuous path provided by these coils re-

sults in reducing the velocity of flow of water or other liquid passing through them, and where the burner is placed under the coil and in the center, as illustrated in Fig. 3, the heat is decreased and the circulation made slower as the water reaches the outer edge of the structure. Therefore, the volume of water to be heated per minute is decreased at the point where the heat decreases. The water then passes, as before stated, inwardly through the top section and circulates to the center with heat surrounding the outside of the section and with heat supplied by the water flowing under the gasket in the lower coil because the water passages of the upper section are directly over the water passages of the lower section. This arrangement gives a greater number of square inches of heating surface and a more equalized heating unit than any structure with which we are familiar and consequently it consumes less fuel and produces better results than ordinary water heaters. This device takes up less space than the average coil and the principle involved can be utilized for radiators in homes or other buildings by forcing steam or hot water through the water pipes.

It is within the purview of our invention to place fins or rings on the exterior of the sections, if desired, to facilitate heat exchange, and to indicate that this is so, we have shown fins or rings X upon each of the sections. The water supply or the temperature of water delivered can be regulated by increasing or decreasing the size of the water passages or by increasing or decreasing the size of the port 26 in the gasket or by increasing or decreasing the number of water passages. Instead of applying the separate ribs or rings X, the device may be corrugated upon the outside. This device may also be used as a pressure reducer under some circumstances; it being apparent that the tortuous path will necessarily result in cutting down the flow of fluids therethrough. Heat exchange between liquids or fluids could also be effected by the use of a device of this sort by employing a gasket between the two sections having no port through it. Thus, if water were contained within the upper half and steam were admitted to the lower half heat would be imparted to the water through the gasket, a film of water lying in contact with the gasket and directly over corresponding water courses containing steam.

It will be understood that we do not intend to limit this device to any particular use, but wish it to be understood that the invention includes within its purview whatever changes fairly come within either the terms or the spirit of the appended claims.

Having described our invention, what we claim is:

1. A device of the character described comprising two substantially identical halves one of which is superimposed upon the other and a gasket therebetween, each of said halves comprising a disc carrying a plurality of substantially concentric division walls forming water courses between them, said water courses being closed at their faces which are disposed toward said gasket only by the presence of said gasket so that when the sections are separated and the gasket is removed said water courses are completely exposed for cleaning, each of said sections comprising a central hub and a substantially radial bridge wall, an inlet pipe leading to one of said hubs, and an outlet pipe leading from the other

of said hubs and having a port leading through each of said hubs from its respective supply or discharge pipe to the innermost water course of that particular section, said water course com-

5 municating with the succeeding outermost water course alternating upon opposite sides of said bridge wall whereby a "pigs in clover" structure is produced to cause a back and forth flow of fluid through said water course from the inner-
10 most water course of one section to the outermost water course thereof and thence through said gasket to the outermost water course of the other section and alternating back and forth through the latter section to the central hub and
15 the discharge pipe of the last named section.

2. A device of the character described comprising axially aligned inlet and outlet pipes and a heat exchange device supported between them
20 comprising upper and lower sections, means for separating said sections, tortuous passages in the lower section through which water is led from the center of said section outwardly toward the periphery thereof, tortuous passages in the upper
25 section by which water is led from the periphery thereof inward toward the center and a communicating port between the outermost

water courses of the two sections, respectively.

3. A device of the character described comprising two substantially identical sections having central hubs for the reception of inlet and outlet pipes, respectively, each of said sections
80 carrying a plurality of arcuate walls and a substantially radially disposed bridge wall, said arcuate walls forming water passages between them and said passages being open at the inner face
85 of said sections and there being a gasket disposed between said sections whereby when said sections are separated and when the gasket is removed said water courses are completely exposed for cleaning, said arcuate walls being
90 alternately attached to or interrupted adjacent to the bridge wall and upon opposite sides thereof to thereby provide for an alternate back and forth flow through said water courses from the
95 supply pipe outwardly through one of said sections toward the periphery of said section and from the periphery of the other section inwardly toward the center of the section and thence to the discharge pipe substantially as described.

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