Sept. 28, 1954 W. J. KEESLING 2,690,328

HEAT EXCHANGER

Filed April 22, 1953 2 Sheets-Sheet 1

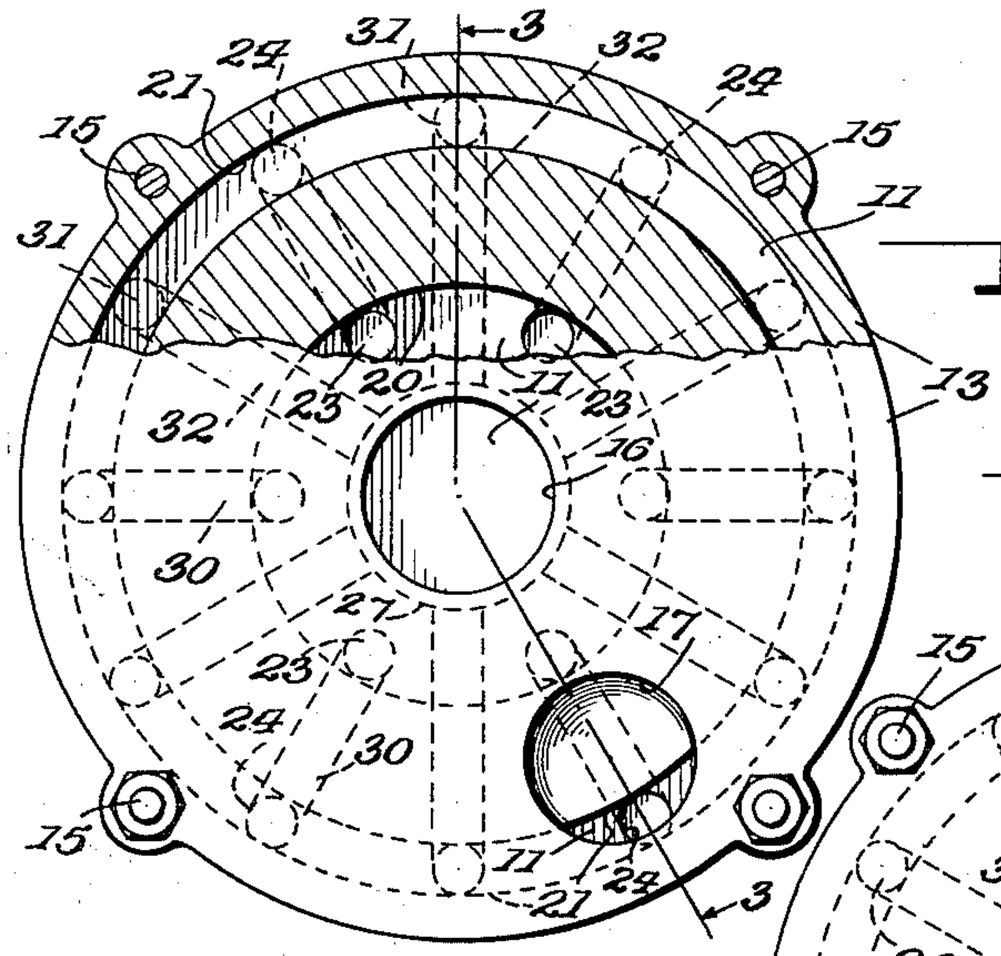

FIG. 1

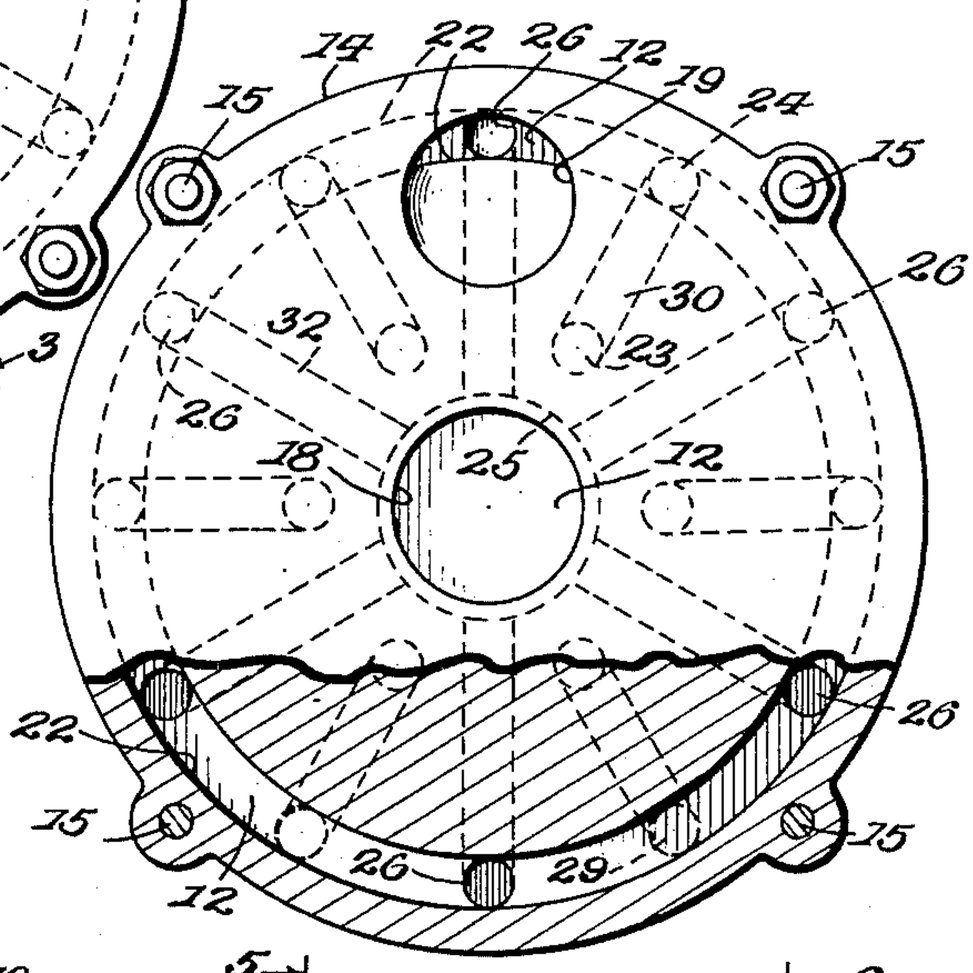

FIG. 2

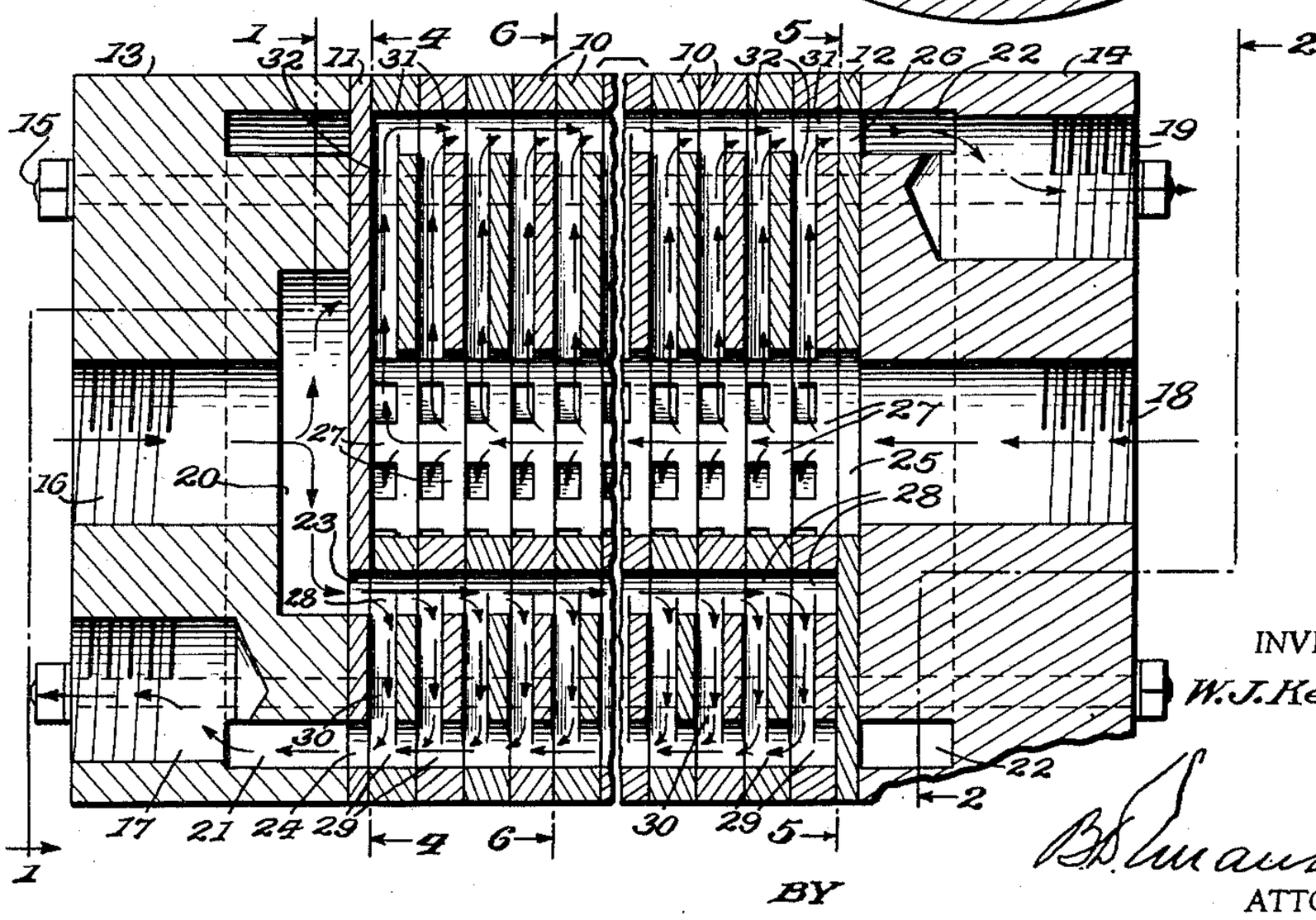

FIG. 3

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Sept. 28, 1954 W. J. KEESLING 2,690,328

HEAT EXCHANGER

Filed April 22, 1953 2 Sheets-Sheet 2

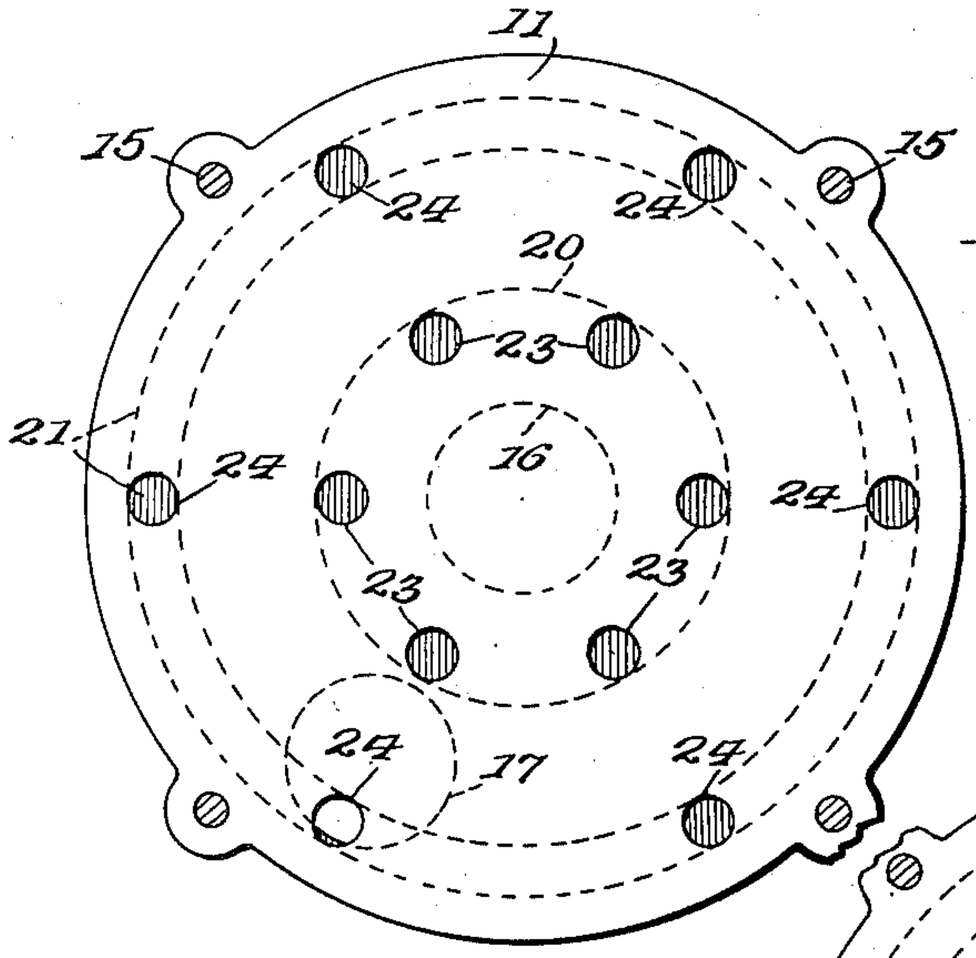

FIG. 4

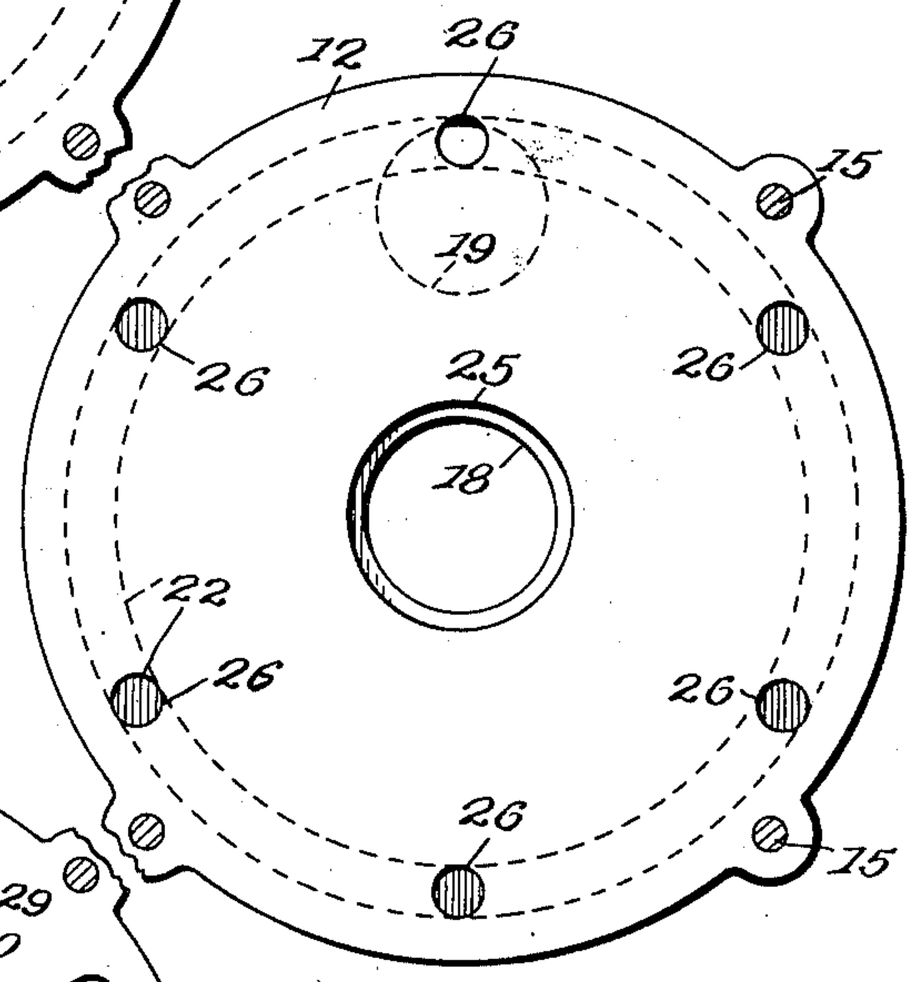

FIG. 5

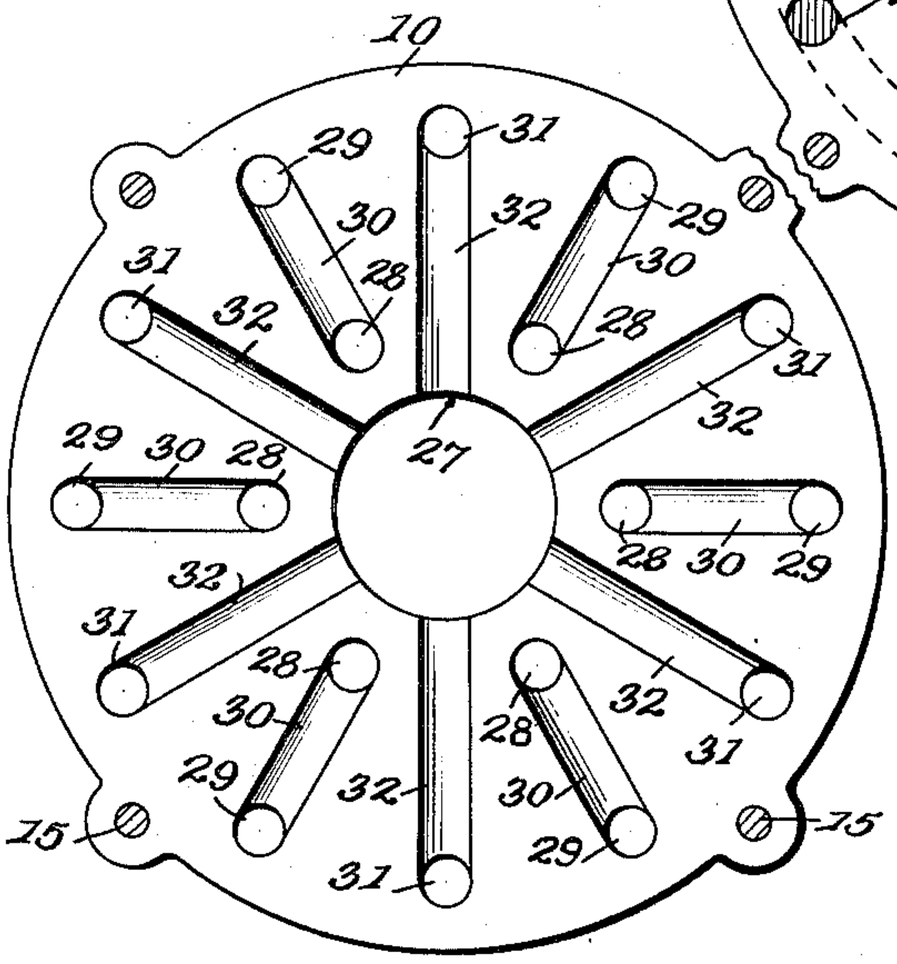

FIG. 6

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HEAT EXCHANGER

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Application April 22, 1953, Serial No. 350,479

5 Claims. (Cl. 257—245)

1

This invention relates to a novel heat exchanger for simultaneously raising the temperature of one liquid and reducing the temperature of another liquid. A system of passages is provided for each of the liquids and the passages of one of said systems are in close proximity to those for the other system to permit effective heat exchange. All of the passages are within a body having two inlets for the two liquids respectively, and two outlets for said liquids, providing for quick and easy installation in two liquid-conducting lines.

One object of the invention is to provide a novel construction in which there are two sets of radial liquid passages for the two liquids, respectively, the passages for one liquid being interposed between those for the other liquid.

Another object is to provide one set of longitudinal passages communicating with the radial passages for one liquid, and a second set of longitudinal passages communicating with the radial passages for the other liquid.

A further object of the invention is to provide two heads for the device, one having the inlet and outlet for one set of the longitudinal and radial passages and the other having the inlet and outlet for the other set.

A still further object of the invention is to provide the two heads with novel conducting means for coaction with two baffle disks in establishing proper communication between the inlets and outlets and the longitudinal passages.

Another object of the invention is to provide a novel construction in which a plurality of duplicate disks, disposed side-to-side between the two heads, are recessed in a novel way to form both the radial and the longitudinal passages.

Yet another object of the invention is to provide a novel construction which may be expeditiously manufactured and profitably marketed at a reasonable price.

With the above and other objects in view that will become apparent as the nature of the invention is better understood, the same consists in the novel form, combination and arrangement of parts hereinafter more fully described, shown in the accompanying drawings, and particularly claimed.

In the drawings:

Fig. 1 is an end elevation partly in section, on line 1—1 of Fig. 3;

Fig. 2 is an opposite end elevation on line 2—2 of Fig. 3;

Fig. 3 is a longitudinal sectional view on line 3—3 of Fig. 1;

2

Figs. 4, 5, and 6 are transverse sectional views on lines 4—4, 5—5, and 6—6 of Fig. 3, respectively.

A preferred construction has been disclosed and will be rather specifically described but it is to be understood that variations may be made within the scope of the invention as claimed.

Briefly described, the device comprises a plurality of identical flat disks 10, two flat baffle disks 11 and 12 respectively, and two flat-ended heads 13 and 14 respectively. These elements are relatively assembled to provide a cylindrical body, said elements being held in assembled relation by any suitable means, for example, tie bolts 15. The identical disks 10 are disposed side-to-side in a group forming the major part of the length of the device, the baffle disks 11 and 12 are in contact with the ends of said group of disks 10, and the two heads 13 and 14 contact with the baffle disks 11 and 12 respectively.

The head 13 is formed with a central cold-liquid inlet 16 and with a cold-liquid outlet 17 radially spaced from said inlet 16. The head 14 is formed with a central hot-liquid inlet 18 and with a hot-liquid outlet 19 radially spaced from said inlet 18. The cold-liquid inlet 16 communicates with a central chamber 20 formed in the inner end of the head 13 and the cold-liquid outlet 17 communicates with a continuous circumferentially extending channel 21 in said inner end of said head 13. The hot-liquid inlet 18 extends entirely through the head 14, and the hot-liquid outlet 19 communicates with a channel 22 corresponding to the above described channel 21, but formed in the head 14.

The baffle disk 11 has an inner series of circumferentially and uniformly spaced openings 23 which directly communicate with the chamber 20, as seen in Figs. 3 and 4. This baffle disk 11 also has an outer series of circumferentially spaced openings 24 which directly communicate with the channel 21, as also seen in Figs. 3 and 4. The openings 24 are equal in number to the openings 23 and each opening 24 of the outer series is in truly radially spaced relation from the corresponding opening 23 of the inner series.

The baffle disk 12 (see Figs. 3 and 5) has a central opening directly communicating with the hot-liquid inlet 18 of the head 14. This baffle disk 12 also has a series of openings 26 in direct communication with the channel 22 of the head 14. The openings 26 are the same distance from the axis of the device as the above described openings 24 of the baffle disk 11 and their spacing is the same. However, the openings 26 would be positioned between the openings 24 if the two

baffle plates 11 and 12 could be moved axially into contact with each other without turning either of said baffle plates from the position it occupies in use.

As all of the disks 10 are identical, a description of one will suffice and reference is invited more particularly to Figs. 3 and 6. This plate has a central opening 27, preferably of the same diameter as the central opening 25 of the baffle disk 12. The disk 10 also has inner circumferentially spaced openings 28 for alignment with the inner openings 23 of the baffle disk 11, and outer circumferentially spaced openings 29 for alignment with the outer openings 24 of said baffle disk 11. The inner and outer openings 28 and 29 are connected by radial grooves 30 formed in one side of the disk 10. This disk 10 has other openings 31 between the openings 29 for alignment with the outer openings 26 of the baffle disk 12, and said openings 31 are connected with the central opening 27 of the disk 10 by means of grooves 32. All of the grooves 30 and 32 are formed in the same side of the disk 10.

When the elements 10, 11, 12, 13, and 14 are relatively assembled, passages are provided for both the hot liquid and the cold liquid. See first, the lower portion of Fig. 3. The inner openings 28 of the disks 10 form an inner set of longitudinal circumferentially spaced passages for the cold liquid. These passages communicate at one end with the openings 23 of the baffle disk 11 and are thereby placed in communication with the central chamber 20 of the head 13. The other ends of these longitudinal passages (formed by the openings 28) are closed by the baffle disk 12. The outer openings 29) of the disks 10 form an outer set of longitudinal circumferentially spaced passages which at one end communicate with the outer openings 24 of the baffle disk 11 and are thus placed in communication with the channel 21 of the head 13. The grooves 30 of the disks 10 form one set of radial passages connecting the inner and outer longitudinal passages (formed by 28 and 29, respectively). Thus, the cold liquid entering through the inlet 16 will flow as indicated by the arrows at the lower portion of Fig. 3.

Refer now to the central and upper portions of Fig. 3. The central openings 27 of the disks 10 form a central longitudinal passage which, at one end, is placed in communication with the hot-liquid inlet 18 by means of the central opening 25 of the baffle disk 12. The other end of this central passage is closed by the other baffle disk 11. The outer openings 31 of the disks 10 form an outer set of longitudinal passages which, at one end, communicate with the channel 22 of the head 14 by means of the openings 26 of the baffle disk 12. The other ends of these longitudinal passages (formed by openings 31) are closed by the baffle disk 11. The grooves 32 of the disks 10 form radial passages connecting the last mentioned longitudinal passages with the central passage (formed by the openings 27). Thus, the hot liquid entering through the inlet 18 will flow as indicated by the arrows at the upper portion of Fig. 3.

The hot and cold liquids flowing as above explained, are in close proximity to each other and rapid heat exchange will therefore be effected. Of course, if desired, the hot-liquid line could be connected with the inlet 16 and outlet 17 and the cold-liquid line connected to the inlet 18 and outlet 19. Also, should the connections be so made that the flow will be the reverse of that indicated by the arrows, the efficiency of the exchanger will not be impaired. It is only necessary that the hot line be connected to one end of the device and the cold line to the other end, and this aids greatly in installation.

From the above detailed description of the invention, it is believed that the construction, use, and operation will at once be apparent, and while there is herein shown and described the preferred embodiment of the invention, it is nevertheless to be understood that minor changes may be made therein without departing from the spirit and scope of the invention as claimed.

I claim:

1. A heat exchanger comprising a body having one system of spaced communicating passages for one liquid, said body having an inlet and an outlet for said one system, said body also having a second system of spaced communicating passages for another liquid, said body having an additional inlet and outlet for said other system, said passages of said one system being contiguous to said passages of said second system, some of the passages of said one system being radially disposed, some of the passages of said second system being also radially disposed, the radial passages of said one system being disposed between those of said second system.

2. A heat exchanger comprising a body having one system of spaced communicating passages for one liquid, said body having an inlet and an outlet for said one system, said body also having a second system of spaced communicating passages for another liquid, said body having an additional inlet and outlet for said other system, said passages of said one system being contiguous to said passages of said second system, some of the passages of each of said systems being disposed longitudinally of and spaced apart circumferentially of said body, others of the passages of each of said systems being radially disposed and spaced apart longitudinally of said body, the longitudinal and radial passages of one of said systems being disposed between the longitudinal and radial passages of the other of said systems respectively.

3. A heat exchanger comprising a body having one system of spaced communicating passages for one liquid, said body having an inlet and an outlet for said one system, said body also having a second system of spaced communicating passages for another liquid, said body having an additional inlet and outlet for said other system, said passages of said one system being contiguous to said passages of said second system, some of the passages of each of said systems being disposed longitudinally of and spaced apart circumferentially of said body, others of the passages of each of said systems being radially disposed and spaced apart longitudinally of said body, the longitudinal and radial passages of one of said systems being disposed between the longitudinal and radial passages of the other of said systems respectively, said body having recesses in both ends, the recesses in one end of said body being in conductive communication with said inlet and outlet of said one system respectively and being also in conductive communication with said longitudinal passages of said one system, the recesses in the other end of said body being in conductive communication with said inlet and outlet of said second system respectively and being also in conductive communication with longitudinal passages of said second system.

4. A heat exchanger comprising an intermediate body having one system of passages for one liquid and a second system of passages for an-

other liquid, each of said systems including connected radial and longitudinal passages; one baffle disk lying against one end of said intermediate body and closing the adjacent ends of the longitudinal passages of said second system, said one baffle disk having openings in conductive communication with the adjacent ends of the longitudinal passages of said one system, one head lying against the outer side of said one baffle disk, said one head having an inlet and an outlet for said one liquid and being recessed to place said inlet and outlet in conductive communication with the openings of said one baffle disk; a second baffle disk lying against the other end of said intermediate body and closing the adjacent ends of said longitudinal passages of said one system, said second baffle disk having openings in conductive communication with the longitudinal passages of said second system; a second head lying against the outer side of said second baffle

disk, said second head having an inlet and an outlet for said other liquid, said second head being recessed to place its inlet and outlet in conductive communication with the openings of said second baffle disk; and means securing said body, baffle disks and heads in assembled relation.

5. A structure as specified in claim 4; said intermediate body being constructed from identical disks secured side-to-side, said disks having registering openings forming the longitudinal passages of the two aforesaid systems, said disks also having radial grooves forming the radial passages of said two systems.

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