No. 884,600. PATENTED APR. 14, 1908.

E. MOREAU.

TEMPERATURE EXCHANGING APPARATUS.

APPLICATION FILED DEC. 31, 1904.

2 SHEETS—SHEET 1.

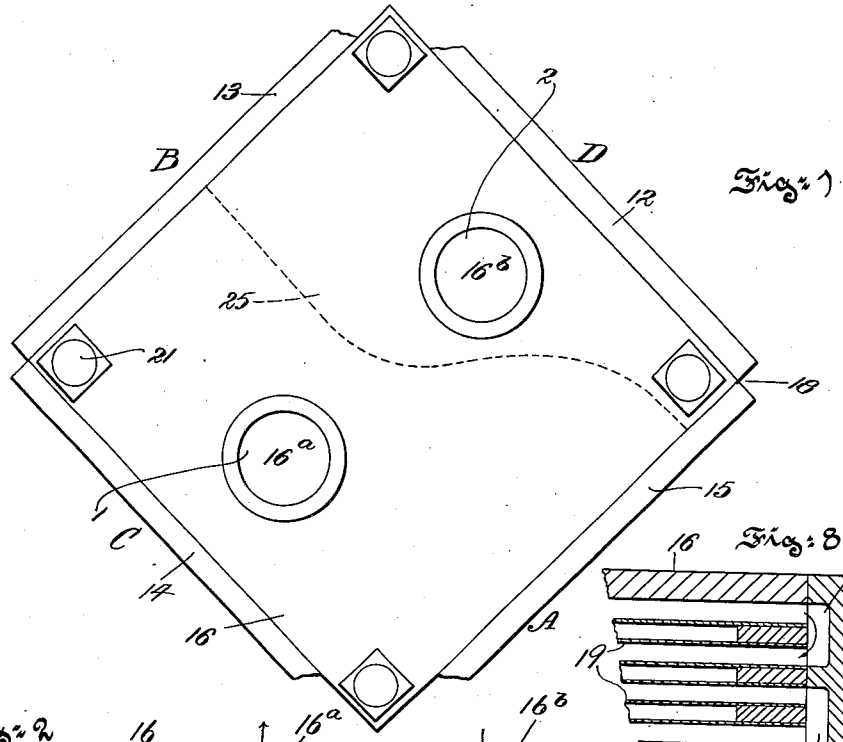


Fig. 1.

Fig. 3.

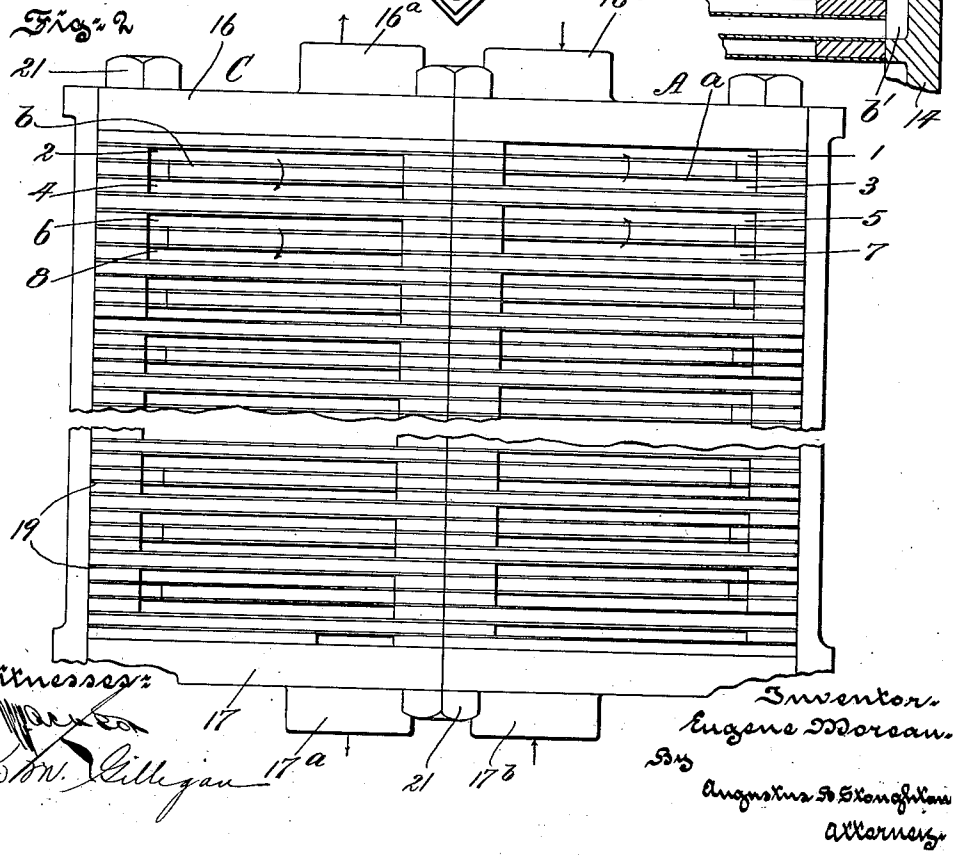


Fig. 2.

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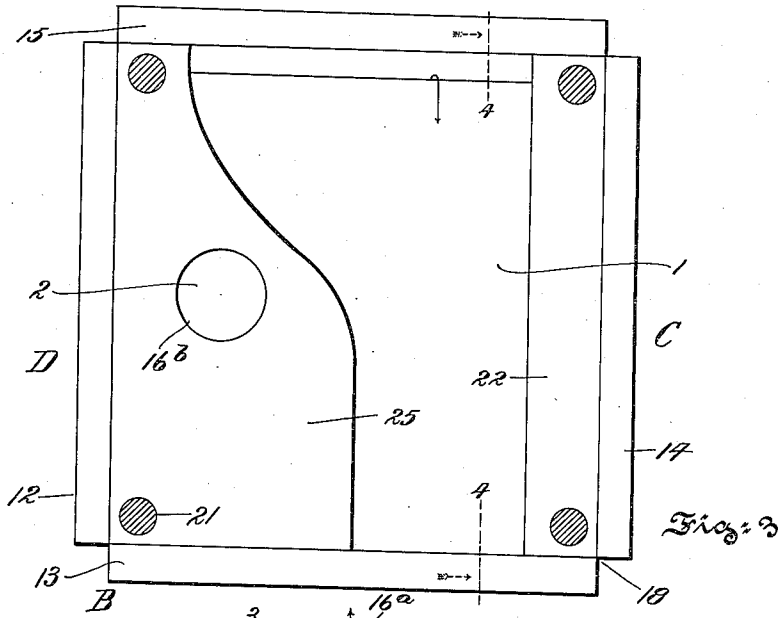


Fig: 3

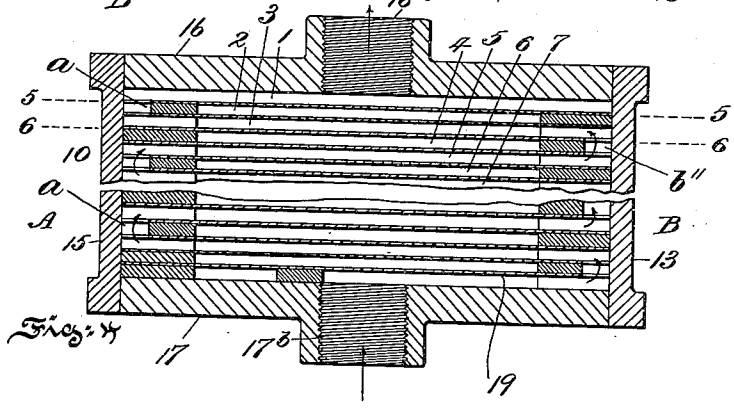


Fig: 4

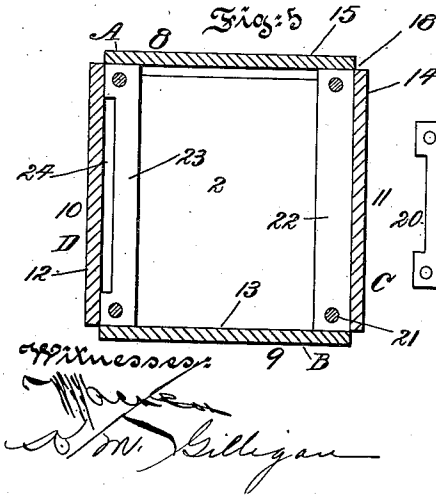


Fig: 5

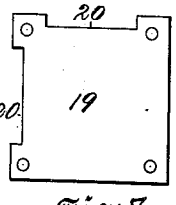


Fig: 7

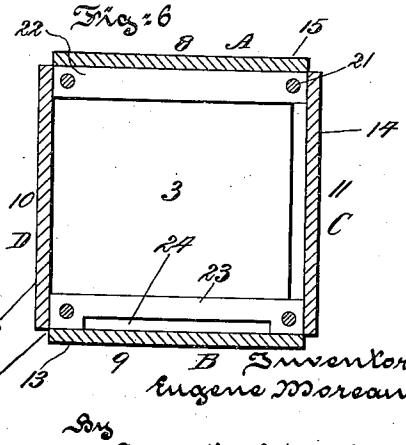


Fig: 6

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UNITED STATES PATENT OFFICE.

EUGÈNE MOREAU, OF NEW YORK, N. Y., ASSIGNOR TO CALOR STERILIZER CO., OF NEW YORK, N. Y.

TEMPERATURE-EXCHANGING APPARATUS.

No. 884,600. Specification of Letters Patent. Patented April 14, 1908.

Application filed December 31, 1904. Serial No. 239,063.

To all whom it may concern:

Be it known that I, EUGÈNE MOREAU, a citizen of the Republic of France, residing at the city of New York, in the county of New York and State of New York, have invented a new and useful Temperature-Exchanging Apparatus, of which the following is a specification.

One object of the present invention is to provide a simple, reliable and efficient apparatus for causing two streams of fluid to exchange their temperatures, or in other words, to extract heat from one and impart it to the other.

Another object of the invention is to insure complete separation of the two streams of fluid under all conditions including such slight leakage as might occur at points where it is necessary to provide the apparatus with parts made detachable for the purpose of cleaning its interior.

Another object of the invention is to effect close caloric contact as well as complete separation of the two circulating fluids whose temperatures are to be exchanged in such manner as to insure a continually changing relation of position between the circulating fluid streams.

Another object of the invention is to provide for convenient and thorough cleansing of the apparatus.

Another object of the invention is to provide a compact mechanical structure such that its parts can be readily and economically assembled.

The nature, characteristic features, and scope of my invention will be more fully understood from the following description taken in connection with the accompanying drawings forming part hereof and in which

Figure 1, is a top or plan view with parts broken away illustrating apparatus embodying features of the invention. Fig. 2, is an elevational view of the apparatus in Fig. 1, showing the apparatus with some of the cover plates removed. Fig. 3, is a top or plan view of the apparatus with the top plate removed. Fig. 4, is a sectional view taken on the line 4—4, of Fig. 3, looking in the direction of the arrows and with the intermediate parts of the apparatus except the part 17^b omitted. Figs. 5 and 6, are sectional views drawn to a reduced scale and taken on the lines 5—5 and 6—6 of Fig. 4. Fig. 7, is a view drawn to a reduced scale and illustrating in plan a detail, and Fig. 8, is a sectional view illustrating a modification.

As illustrated in the drawings the generally rectangular structure is made up of a series of adjacent chambers 1, 2, 3, 4, 5, 6, 7, etc. Each chamber has one pair of its opposite sides open and the other pair closed. For example, in Fig. 5 the chamber 2, has its sides 8 and 9, normally open, and its sides 10 and 11, closed. The cover plates 12, 13, 14, 15 are removable, and it is of course obvious that when they are removed, certain of the opposite sides of the chambers are open and others are closed, the purpose being to remove these plates when it is desired to clean the apparatus and to have them in place when the apparatus is in operation.

The construction of the chamber shown in Fig. 6, is substantially the same as that shown in Fig. 5. The pair of opposite sides that are open are in Fig. 6, marked 10 and 11, and those that are closed are marked 8 and 9. The chambers shown in Figs. 5 and 6, may be taken to be successive chambers as 2 and 3, of the series, so that the successive chambers are arranged cross-wise in respect to each other with their open ends accessible. For instance, the chambers of even number in the series would have their open ends accessible from the sides 10 and 11, of the structure, while the chambers of odd number in the series would have their open ends accessible from the sides 8 and 9, of the structure as shown in Fig. 5.

At all sides of the structure there are ports *a* and *b*, of which those that are disposed at one pair of the opposite sides of the structure connect alternate chambers. For example, the chambers 1 and 3, are connected by the port *a*, shown at the left in Fig. 4, and the chambers 3 and 5, are connected at the right by the port *b*, and so on throughout the series. Assuming that in Fig. 4, the ports *a* and *b*, are located at the opposite sides, A and B, of the structure, there are exactly similar ports at the other pair of opposite sides C and D, of the structure and they connect the chambers 2, 4, 6, etc. This will be readily understood by reference to Fig. 2, which shows at the side A, arrows that indicate the ports which connect the chambers of odd number as 1, 3, etc., and which ports are shown in Fig. 4. In Fig. 2, at the side C,

are arrows which show the ports that connect the chambers of even number in the series. The sides C and A, are the adjacent sides, and the sides respectively opposite to them present the same appearance.

16 and 17, are top and bottom plates which are fitted with inlet and outlet connections 16^a and 16^b, and 17^a and 17^b, to be presently described in detail. One stream of fluid, for example cold water, enters at 16^b, reaches the chamber 2, in a manner to be presently described, passes from chamber 2, to chamber 4, at the side C, of the structure. It then passes from chamber 4, to chamber 6, at the side D of the structure. It then passes from the chamber 6, to the eighth chamber in the series and so on throughout all the chambers of even number of the series until finally it arrives at the connection 17^a. From here it may go, for example, to a sterilizer or to any other suitable piece of apparatus which performs the function of altering its temperature. If it should happen to have gone to a sterilizer, it will return by way of the connection 17^b, and will circulate through the chambers of odd number in the series in a direction indicated by A—B, in Fig. 4, finally escaping by the connection 16^a. Thus there are two streams of liquid flowing through separate and distinct channels, one channel extending backwards and forwards through the chambers of odd number in the series in the direction A—B, and the other extending backwards and forwards through the chambers of even number in the series and in the direction C—D. In other words, these streams flow cross-wise of each other in adjacent chambers and effect between themselves an exchange of temperature. Each of these streams of course flows along its appropriate chambers and through the ports which connect these chambers, so that the fluid of each stream is constantly disturbed. When the cover plates 12, 13, 14 and 15, are removed, it is obvious that the various channels are accessible, those of even number from both sides C & D, and those of odd number from both sides A and B. The cover plates may be held to place by bolting or otherwise securing them to the structure and may be fitted on their inner faces with suitable gaskets or packings but if they should leak a little no harm would be done. If fluid should leak at the right-hand end in Fig. 4, from the chamber 1, along the cover plate to the chamber 3, the liquid would belong to one of the streams and the leakage could not pollute the other stream and the same thing is of course true of the other stream. Should leakage occur at the edges of the cover plates, it would simply run down as at 18, that is to say, if there should be leakage of the stream running in the direction A—B, it would escape at 18, and could not reach the stream running in the direction C—D, and the contrary of this is true.

The structure can be conveniently made in the following manner: 19, Fig. 7, are plates each notched on its adjacent sides as at 20, for the purpose of providing the ports which have been referred to. Instead of notching the plates 19, to form the ports, the latter may comprise recesses b^1 formed in the interior faces of the cover plates 12, 13, 14 and 15 as is shown in Fig. 8. The plates 19, may be exceedingly thin and constructed from sheet metal and they may be perforated at the corners for the passage of the bolts 21, which afford convenient means for assembling the parts of the structure as well as for supporting them.

22 and 23, are strips of which one 23, is notched as at 24, to provide the ports already described. The strips are shown as provided with openings for the passage of the bolts 21. The strips are interposed in pairs between the plates 19, so as to form the chambers which have been described and the pairs of strips are arranged in the respective chambers in cross-wise relation to the preceding and succeeding pairs so as to leave opposite sides of the chambers open. The strips are substantially co-extensive in length with the edges of the plates to which they are adjacent. The strips are soldered to the adjacent plates or a proper joint is otherwise provided. At the top and bottom of the structure one of the strips 25, Fig. 3, is made somewhat wide and is provided with an opening as shown in said figure. This opening is alined with and made a continuation of the opening 16^b, in the cover plate so that the opening 16^b, communicates through the opening in the strip 25, with the chamber 2, whereas the opening 16^a, communicates with the chamber 1. At the bottom of the structure there is the same arrangement of comparatively wide strip and openings so that a description of the bottom is unnecessary.

It will be obvious to those skilled in the art to which the invention relates that modifications may be made in details without departing from the spirit thereof, hence the invention is not limited further than the prior state of the art may require, but

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

1. A temperature exchanging device consisting of a self-sustaining structure having a series of unobstructed openings each extending through it from one side to the other so as to be accessible and said openings successively ranging crosswise to each other in the series, in combination with covers consisting of separate plates, the device being provided with ports between the structure and covers which connect said openings and form in conjunction therewith two crosswise ranging con-

tinuous circuitous channels, and means for detachably clamping the covers to the structure, substantially as described.

2. A temperature exchanging device consisting of a generally rectangular structure comprising a series of plates and marginal strips arranged in pairs and in crosswise relation to each other in the successive spaces between the plates, cover plates, the device being provided with ports between the structure and cover plates at the lateral sides of the structure and whereof those at one pair of opposite sides connect alternate spaces and whereof those at the other pair of sides similarly connect the intermediate spaces, and inlet and outlet connections, substantially as described.

3. A temperature exchanging device consisting of a generally rectangular structure, comprising a series of plates each having its adjacent sides recessed and pairs of marginal strips whereof one strip in each pair is recessed interposed between the successive plates in crosswise relation to each other and said recesses constituting ports at the lateral sides of the structure of which ports those at one pair of opposite sides of the structure connect alternate spaces between the plates and those at the other pair of opposite sides of the structure similarly connect the intermediate spaces between the plates, cover plates, and inlet and outlet connections, substantially as described.

4. In a temperature exchanging device the combination of a series of plates having a pair of marginal strips co-extensive in length with the edges of the plates and interposed between each plate and the succeeding plate and said pairs being arranged in crosswise relation in respect to each other between the successive plates, and bolts for binding said parts into a self-sustaining structure, and the device having removable means at the lateral sides of the structure for connecting the spaces between the plates into two separate crosswise ranging circuitous passages, for the purposes set forth.

5. In a temperature exchanging device the combination of a self-sustaining structure comprising marginally notched plates and pairs of strips co-extensive in length with the edges of the plates and whereof one strip of each pair is notched and said pairs of strips arranged in crosswise relation in respect to each other between the plates with the notches of the plates and of the strips in alinement to constitute spaces and the device having detachable means for connecting the spaces into two separate crosswise ranging circuitous passages, substantially as described.

6. A temperature exchanging device comprising a self-sustaining structure provided at its ends with sets of inlets and outlets appertaining to two fluids and having a series of openings extending through it from side to side and arranged successively in crosswise relation in respect to each other, and separate imperforate cover plates forming in conjunction with said openings two circuitous passages appertaining respectively to the two fluids and said plates detachably applied to the sides of the structure and removable without disturbing the inlets and outlets to permit the device to be cleaned, substantially as described.

In testimony whereof I have hereunto signed my name.

EUGÈNE MOREAU.

Witnesses:
C. H. MEAD,
N. F. SOUTHARD.