No. 843,864. PATENTED FEB. 12, 1907.

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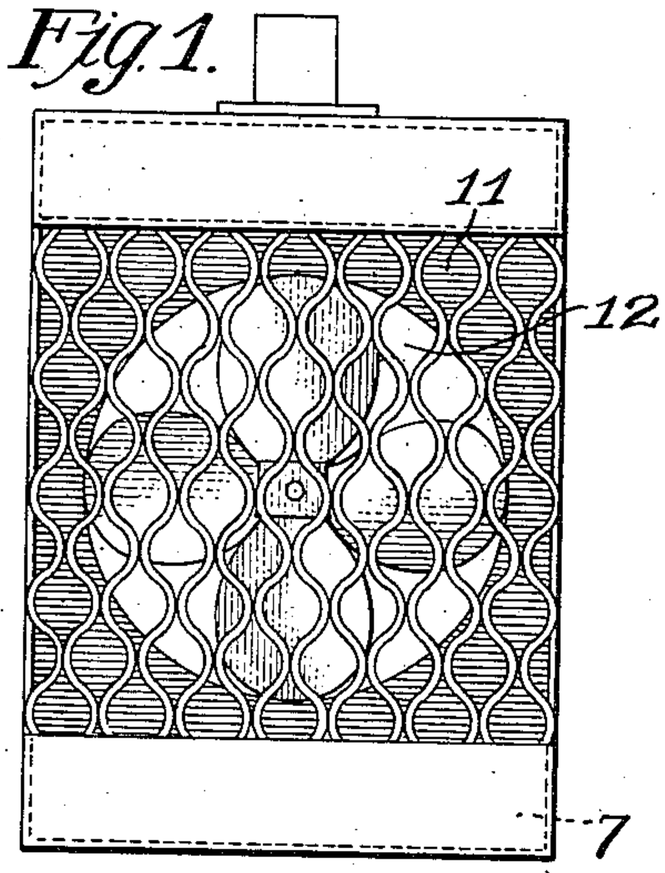
COOLER.

APPLICATION FILED JAN. 29, 1903.

Fig. 1.



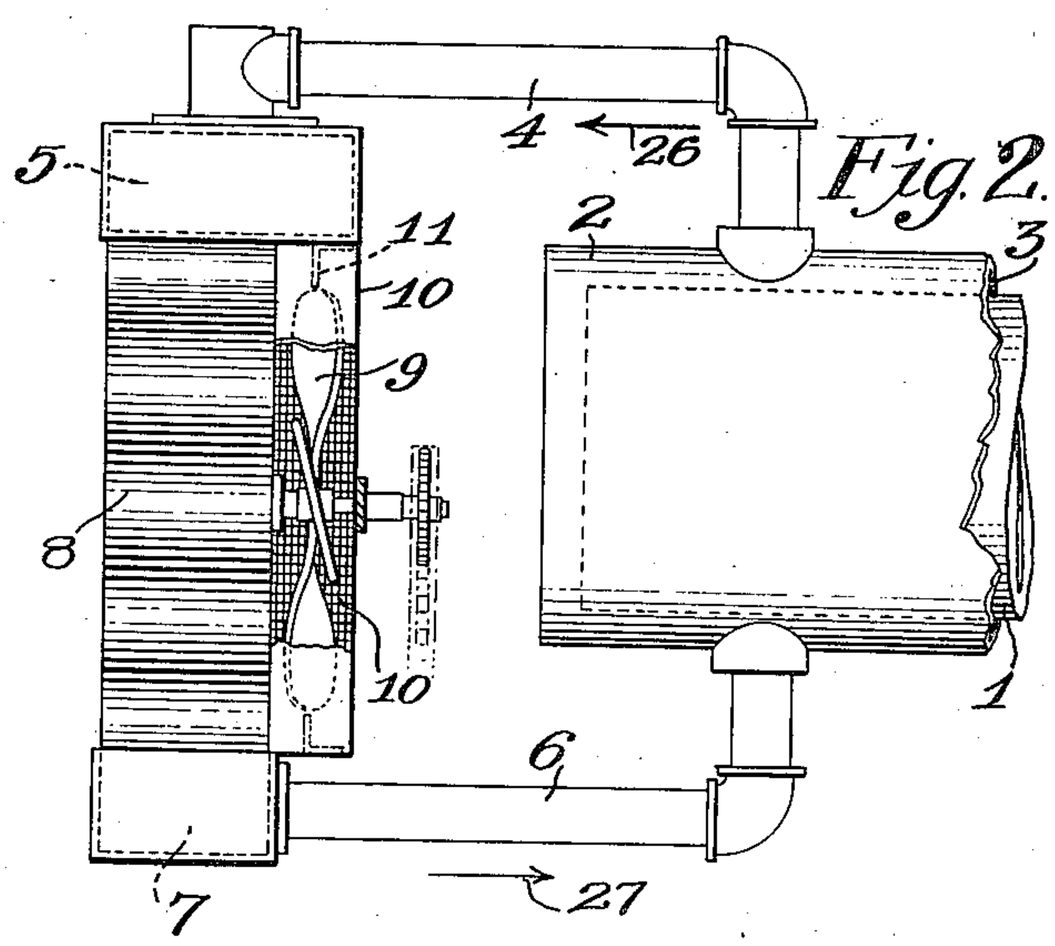


Fig. 2.

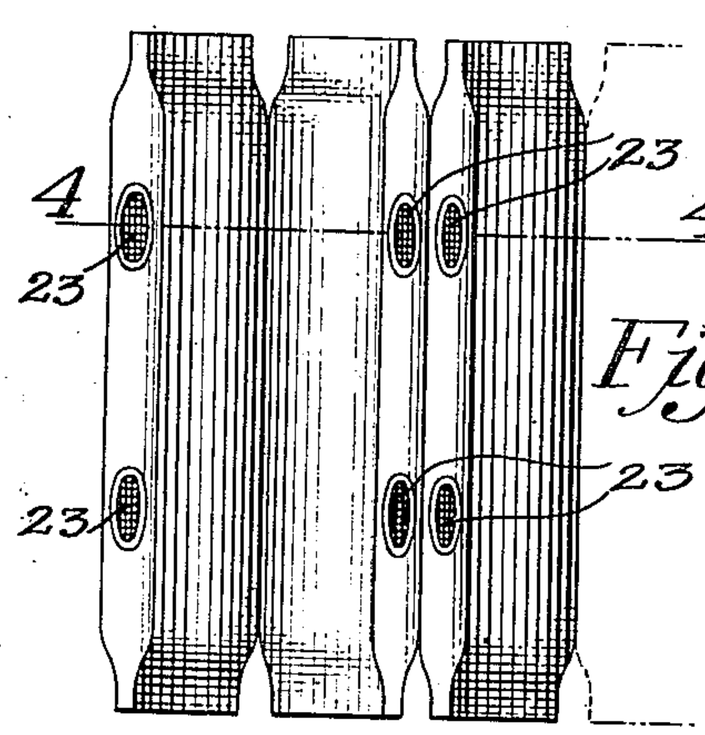


Fig. 3.

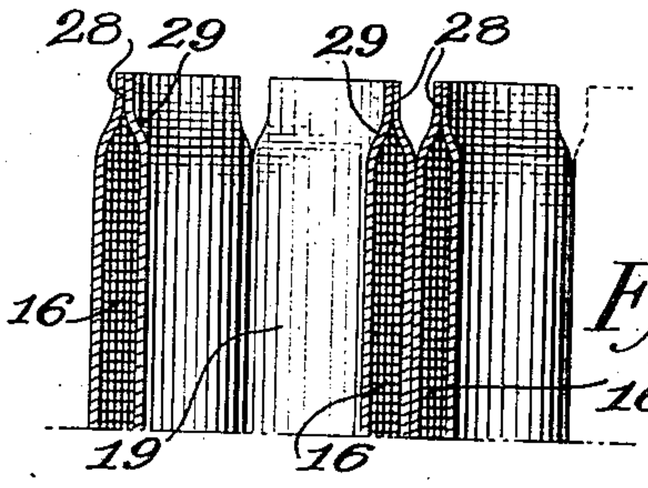


Fig. 5.

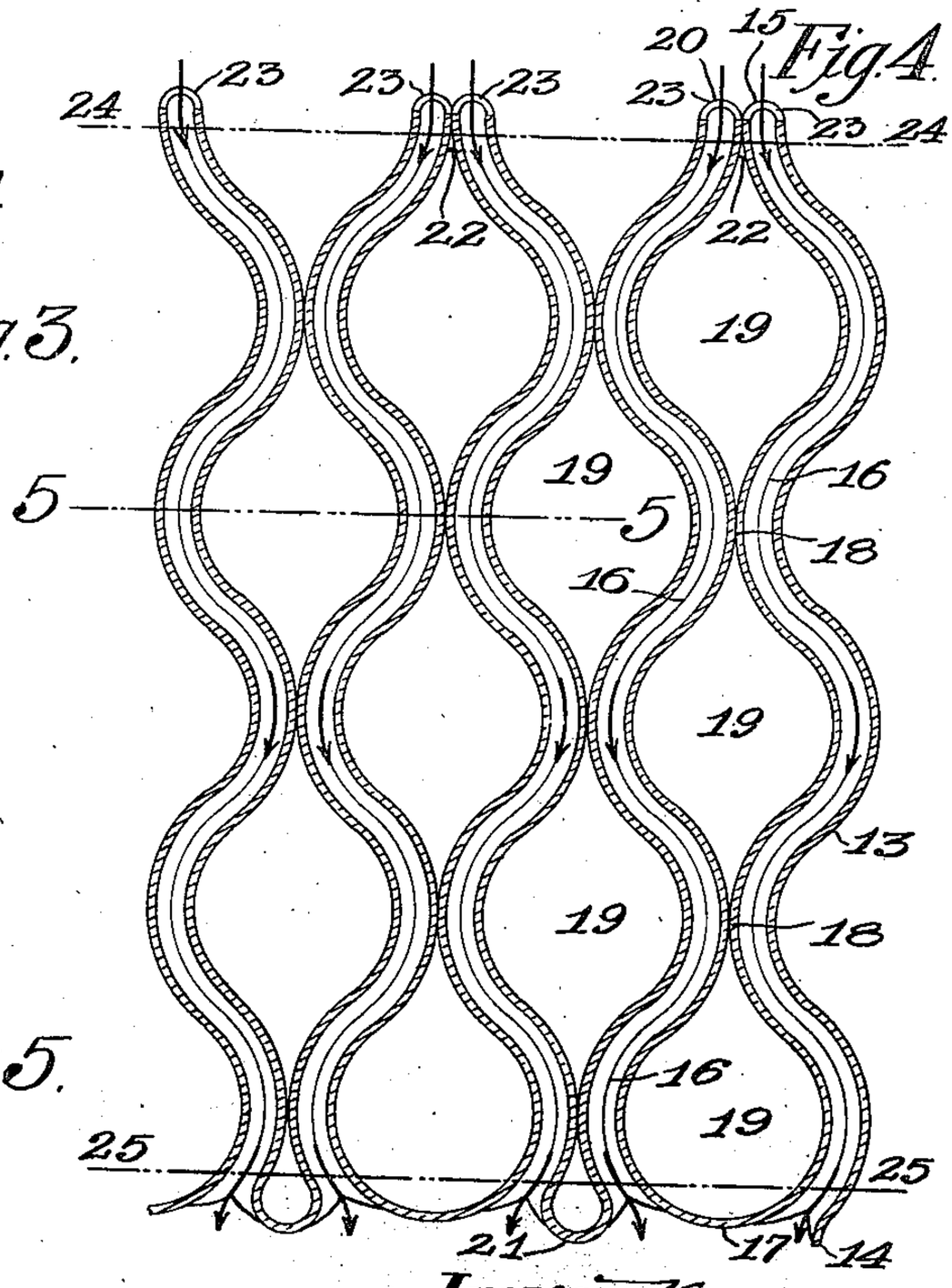


Fig. 4.

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COOLER.

No. 843,864. Specification of Letters Patent. Patented Feb. 12, 1907.

Application filed January 29, 1903. Serial No. 140,999.

To all whom it may concern:

Be it known that I, LOUIS HERMAN BRINKMAN, a citizen of the United States, residing at West Hartford, in the county of Hartford and State of Connecticut, have invented a new and useful Improvement in a Cooler, of which the following is a specification.

My present invention relates to an apparatus for effecting the cooling of one fluid by the application of another and a cooler fluid—such, for example, as the cooling of air by water or of water by air or the condensation of steam by either air or water—and in the accompanying drawings, forming a part of this specification, I have shown such an apparatus embodying my invention as applied to the purpose of cooling a body of water which circulates around the cylinder of a gas or single acting engine in order to reduce the heat of the cylinder generated by the operation of the engine.

Figure 1 of the drawings represents a front view of my improved apparatus. Fig. 2 is a side view of the same. Fig. 3 is a top view of the refrigerating-tubes shown removed from the apparatus. Fig. 4 is a sectional view on line 4 4, Fig. 3, of a portion of the refrigerating-tubes shown on a larger scale; and Fig. 5 is a sectional view on line 5 5, Fig. 4.

Similar figures of reference refer to similar parts in the different views.

Referring to the drawings, 1 denotes a portion of the cylinder of a single-acting engine surrounded by a jacket 2, which incloses an annular water-space 3 around the cylinder, as is common in engines of this class. The water-space 3 communicates at its upper side by means of a pipe 4 with a water-chamber 5 and at its lower side by means of a pipe 6 with a water-chamber 7. The water-chambers 5 and 7 are connected by a refrigerating-section 8, said refrigerating-section embodying my invention.

In order to illustrate more clearly the construction of my improved refrigerating-section, I have shown a refrigerating-section of like construction, but upon a larger scale, in Figs. 3, 4, and 5. That portion of the apparatus to which my invention relates, in common with other and similar apparatus, comprises a series of air-tubes surrounded with water-passages forming part of a water-circulating system by which the water which has become heated by its contact with the cylinder 1 will lose its heat by its contact with the air-tubes, through which, in order to increase the efficiency of the apparatus, currents of air are caused to move.

In the apparatus represented in the drawings the movement of air through the air-tubes is accomplished by means of a rotating fan 9, which is inclosed within a flange 10, projecting rearwardly from the refrigerating-section 8, said flange having a partition 11 in the central plane of the fan 9, which is provided with a circular opening 12, Fig. 1, within which the blades of the fan rotate.

By my invention I simplify the construction, decrease the weight, and reduce the cost of this class of refrigerating apparatus and at the same time increase its efficiency, and I accomplish these objects by constructing the section 8 from a continuous strip of sheet metal, which is crimped or corrugated, so that when the corrugated sheet is bent or returned upon itself at regular intervals the corrugations will match and form the opposite sides of a tubular space for the passage of air; but I corrugate the sheet at every alternate interval in opposite directions in order that every alternate fold of the sheet will produce a narrow continuous serpentine passage through which water may flow in a thin layer in contact on both sides with the walls of the air-tubes.

Referring to Fig. 4, 13 denotes a crimped or corrugated strip of sheet metal, preferably of copper, which, beginning at 14, is sharply bent at 15 and returned upon itself with a series of corrugations corresponding to and parallel with those between 14 and 15, whereby a continuous and narrow channel 16 is formed. The sheet is again bent in a circular curve at 17 and returned upon itself in a series of corresponding but oppositely-curved corrugations, which are brought into contact at regular intervals, as at 18, to form a series of tubular passages or air-tubes 19, arranged in a vertical row. At 20 the sheet is again returned upon itself to form a second continuous passage 16, and at 21 the sheet is returned upon a shorter curve and corrugated to form a second series of air-tubes 19, and the operations are repeated to produce a refrigerating-section of the desired area.

The joints 22 in the section so formed are closed by soldering or brazing to prevent the admission of water to the air-tubes, and holes 23 are then formed in the upper bends of the sheet, communicating with the continuous passage 16. The tips of the bent sheet embracing the holes 23 are soldered into the bottom of the upper water-chamber 5 on the plane of the broken line 24, Fig. 4, and with the lower end of the section inserted in the lower water-chamber to the broken line 25, so the serpentine passages 16 will communicate their lower and open ends with the lower water-chamber. A complete water circulation is thereby established in the direction of the arrows 26 and 27 when the water-spaces are filled, due to the difference in gravity between the heated water around the cylinder and the cooled water as it passes through the passages 16, or, as is frequently done in devices of this class, mechanical means, such as a pump, may be employed to maintain a forced circulation.

I do not confine myself to the specific shape of the corrugations on lines of uniform curvature, as shown, as this feature may be modified without departing from the scope of my invention.

The edges of the sheet-metal strip are offset to bring them into contact to close the edges of the water-passages 16, and the contacting edges are then soldered, as at 28, Fig. 5. The offsetting of the edges also serves to form a flaring or funnel-shaped entrance to the air-tubes 19, as represented at 29 29, Fig. 5, thereby facilitating the passage of air through the tubes.

By my improved construction the circulating water is caused to flow in a thin sheet in close contact with the opposite walls of the water-space 16, said walls also forming the walls of the air-space 19. By the use of a continuous strip of corrugated sheet metal I avoid joints between the water-space and the air-spaces, and the offset edges of the sheet metal determine the thickness of the water-space 16, which is twice the amount of the offset in the edge of the corrugated sheet metal, or equal to the sum of the offset of each of the edges soldered together. The offset edges can be conveniently and effectually united by dipping them in a receptacle containing molten solder.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. In an apparatus of the class described, the combination with a water-chamber 5 and a water-chamber 7, of an interposed refrigerating-section consisting of a continuous strip of corrugated sheet metal doubled upon itself in a series of folds, with the ends of the folded sections attached to said water-chambers, and inclosing a series of restricted water-spaces communicating at the ends of the folds with said water-chambers, substantially as described.

2. In an apparatus of the class described, the combination with water-chambers, of an interposed refrigerating-section consisting of a continuous strip of corrugated sheet metal having offset edges, said sheet-metal strip being doubled upon itself in a series of folds separated by said offset edges to form water-spaces, with the ends of said folds attached to said chambers and with the inclosed water-spaces communicating therewith, substantially as described.

3. In an apparatus of the class described, the combination with upper and lower water-chambers, of a refrigerating-section between said water-chambers, said refrigerating-section consisting of restricted water-passages between said chambers, said water-passages having inclosing walls of sheet metal with their edges offset in opposite directions, brought into contact and soldered together, and of a series of parallel air-passages between said water-passages and transversely thereto, formed by the contact of said inclosing walls.

Dated this 26th day of January, 1903.

LOUIS HERMAN BRINKMAN.

Witnesses:
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