J. GAMGEE.

Condenser for Ice-Machines.

No. 208,454. Patented Sept. 24, 1878.

Fig. 1.

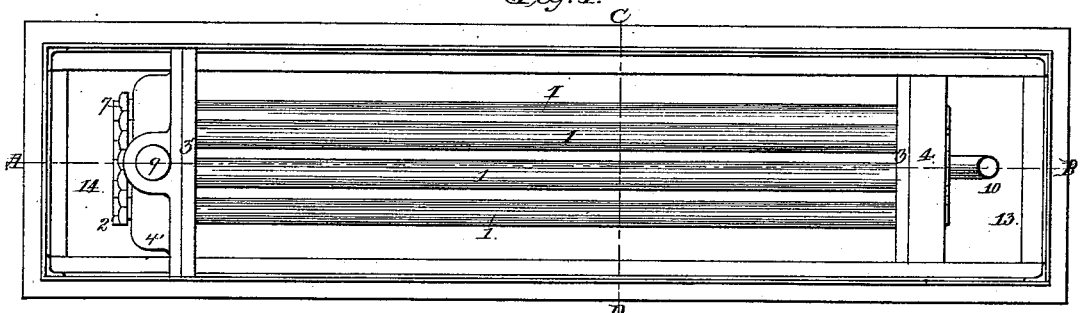


Fig. 2.

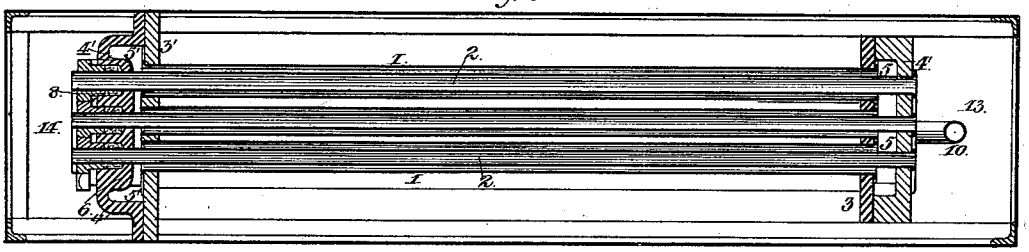


Fig. 3.

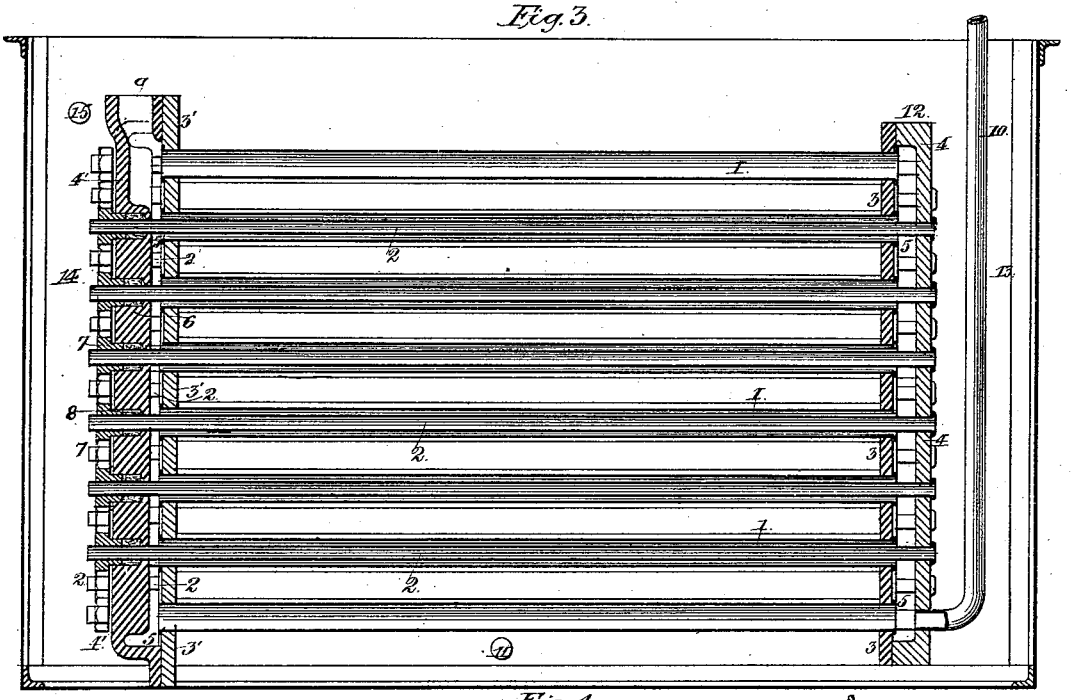
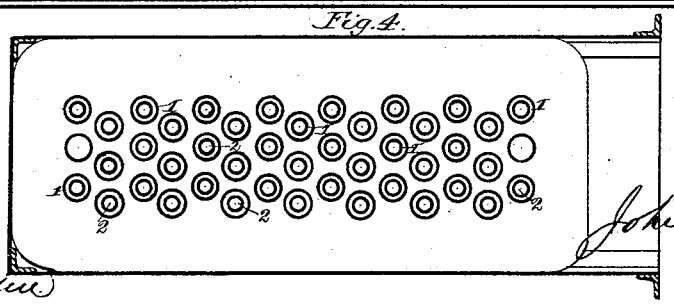


Fig. 4.



Witnesses:

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UNITED STATES PATENT OFFICE.

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IMPROVEMENT IN CONDENSERS FOR ICE-MACHINES.

Specification forming part of Letters Patent No. **208,454**, dated September 24, 1878; application filed October 16, 1877.

To all whom it may concern:

Be it known that I, JOHN GAMGEE, of 379 King's Road, Chelsea, in the county of Middlesex and Kingdom of Great Britain, at present residing at the Metropolitan Hotel, Washington, D. C., in the United States of America, have invented certain Improvements in the Construction of Refrigerators, Condensers, and Attemperators, of which the following is a specification:

These improvements consist in means of obtaining a greater area of conducting-surface in proportion to the space occupied than has hitherto been attained.

The manner in which I propose to construct these refrigerators or condensers and attemperators is as follows: Through a series of long tubes, fixed at their ends in tube-plates in the ordinary manner, I run a corresponding series of tubes, but of a smaller diameter and slightly longer; and the ends of the latter are likewise fixed in tube-plates, and the spaces between these tube-plates are made to form closed chambers, as hereinafter described. The interiors of these chambers, at the different ends of the pipes, are connected with one another by the thin annular spaces which intervene between the inner and outer tubes. The refrigerating or heating medium is caused to flow from one chamber to the other through these annular spaces between the pipes, while the liquid to be cooled or heated passes over the outer surface of the large tubes and also through the small tubes; or this arrangement can, if preferred, be exactly the reverse of this, when the liquid to be cooled or heated would pass through the annular space between the pipes; but this latter arrangement is not preferred.

On the accompanying sheet of drawings, Figure 1 represents a plan view of the improved apparatus arranged as the condenser of a refrigerating or ice-making machine; Fig. 2, a sectional plan of the same. Fig. 3 is a longitudinal vertical section through about the line A B, Fig. 1, of the condenser and trough, showing the double arrangement of condensing-tubes; and Fig. 4 is a transverse vertical section through about the line C D of the same.

1 1 represent the outer series of tubes, through which the smaller (and corresponding series of longer) tubes 2 2 pass. The ends of the outer tubes, 1 1, are fixed, by expanding or otherwise, in inner tube-plates, 3 3′, and the ends of the inner and longer tubes 2 2 are fixed in other tube-plates, 4 4′, which run parallel to the tube-plates 3 3′. The spaces between each opposite pair of tube-plates 3 4 3′ 4′ are formed into close chambers 5 5′ by the edges of the said tube-plates 3 4 3′ 4′ being bolted together so as to form an air-tight joint all round, as shown. The outer tubes, 1 1, open at either end into the closed chambers, and by means of the thin annular spaces which intervene between the inner and outer tubes a communication is formed between the interiors of the two opposite and parallel chambers 5 5′. The tubes 2 2, however, being longer, are caused to penetrate through and are secured to the opposite tube-plates 4 4′, and so form a through communication from the outside of one chamber, 5, to the outside of the other—*i. e.*, its opposite one.

The inner series of tubes, 2 2, may either be firmly and permanently secured at both ends into the tube-plates 4 4′ or, as shown in the figures, firmly secured at one end to the one tube-plate 4, and at the other end passed through stuffing-boxes 6 6 in the other plate, 4′, gas-tight joints being secured by the glands 7 7 and packing 8 8, in the usual manner.

This arrangement permits any inequality of contraction or expansion in the inner and outer tubes to take place without straining either, and also facilitates the taking to pieces of the apparatus for repairs.

9 represents the pipe for admitting the gaseous cooling medium from the refrigerator to the condenser, and 10 represents the pipe for conveying the liquefied cooling medium back from the condenser to the refrigerator. The gas forced into the chamber 5 passes through the annular spaces between the tubes 1 1 and 2 2, being subjected on one side to the cooling influence of the condensing liquid which surrounds the outer tubes 2 2, and on the other to the cooling influence of the condensing liquid contained in the inner tubes, 1 1, and is condensed therein in the usual way, either by the effect of the cold condensing liquid alone

or by that and pressure jointly, according to the nature of the medium employed. The condensing water or other liquid may be caused to flow into the lower part of the condenser-tank at 11, and rising up around the outer tubes, 2 2, overflows at 12 into the chamber 13 of the tank, thence through the inner tubes, 1 1, into the chamber 14 of the tank, whence it escapes by the overflow 15.

I have above described the apparatus as applied to a condenser for a refrigerating or ice-making machine.

I claim as my invention—

The combination of the tubes 1 1 with the connecting chambers 5 5′ and the tubes 2 2 extending at each end into the open tank, substantially as hereinbefore described, and for the purposes set forth.

JOHN GAMGEE.

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