(No Model.) 2 Sheets—Sheet 1.

P. J. McDONALD.

REFRIGERATING APPARATUS.

No. 307,484. Patented Nov. 4, 1884.

Fig. 1.

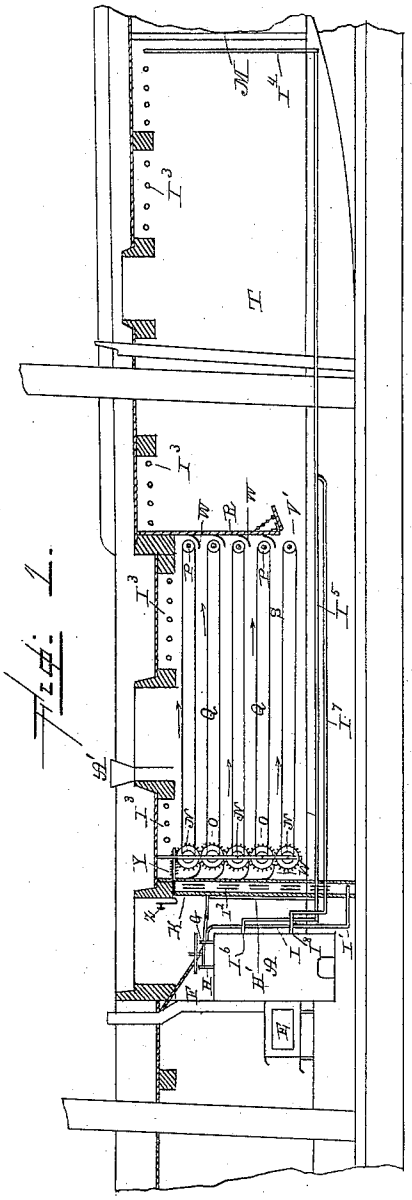
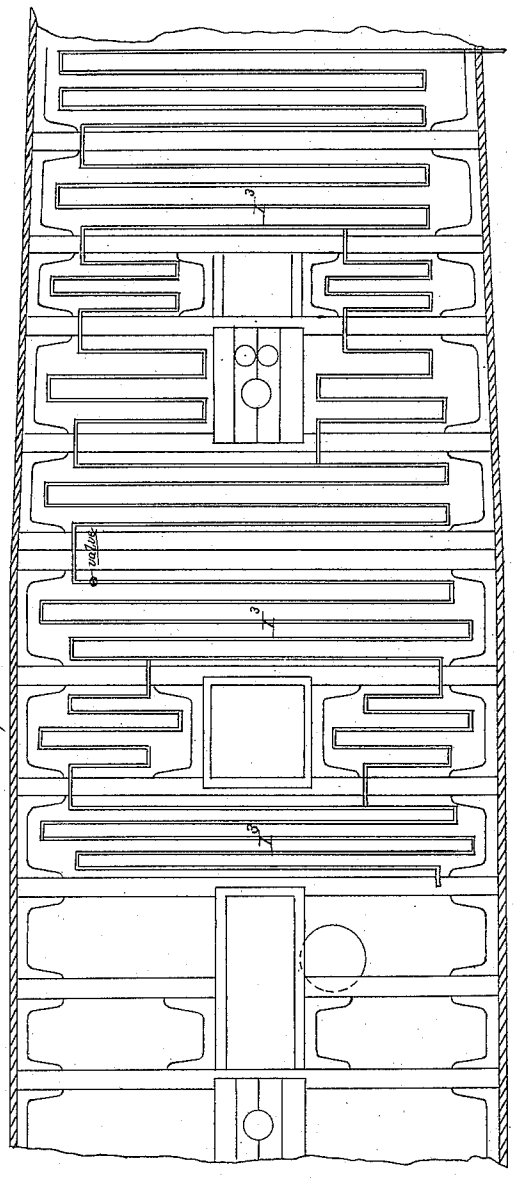


Fig. 2.



Witnesses.
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J. W. Garner

Inventor.
P. J. McDonald
per F. A. Lehmann
Atty.

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(No Model.) 2 Sheets—Sheet 2.

P. J. McDONALD.

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Fig. 4.

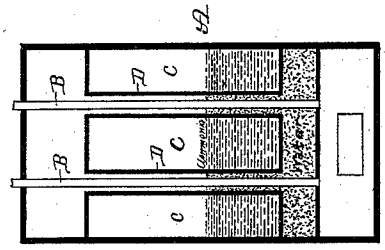


Fig. 3.

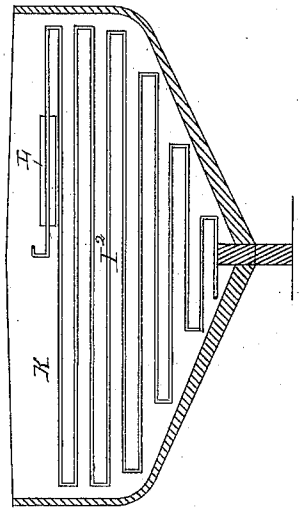
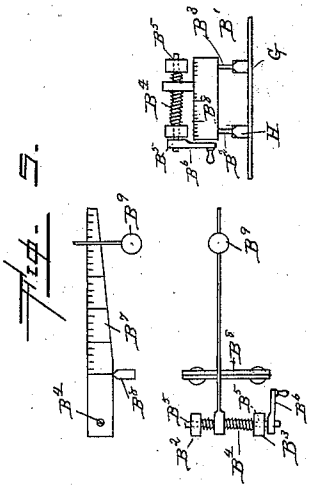


Fig. 5.



Witnesses.

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UNITED STATES PATENT OFFICE.

PETER JOHN McDONALD, OF GLOUCESTER, MASSACHUSETTS.

REFRIGERATING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 307,484, dated November 4, 1884.

Application filed March 17, 1884. (No model.)

To all whom it may concern:

Be it known that I, PETER J. McDONALD, of Gloucester, in the county of Essex and State of Massachusetts, have invented certain new and useful Improvements in Refrigerating Apparatus; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it pertains to make and use it, reference being had to the accompanying drawings, which form part of this specification.

My invention relates to an improvement in apparatus for preserving fish, &c.; and it consists—

First. In a boiler of peculiar construction that is provided with two chambers, one for containing water and the other for containing ammonia. The object of this part of my invention is to enable me to convert the ammonia into gas by interposing water between it and the direct action of the fire. By this means the simultaneous heating of the ammonia with the water causes the gas to be formed more gradually than if heated by the direct action of the fire, and a much purer article of gas is thus obtained. Moreover, priming of the ammonia in the boiler is prevented.

Second. In the combination, with the boiler, of a valve that is adapted to be used in connection both with the escape-pipe from the ammonia-boiler and with the escape-pipe from the steam-boiler, said valve being provided with a regulating device that enables it to be so adjusted as to cause the steam and ammonia to be blown off at whatever pressure may be desired.

Third. In the combination and arrangement of devices that will be more fully set forth hereinafter.

In the accompanying drawings, Figure 1 is a vertical central longitudinal section taken through the hull of a vessel, showing my preserving apparatus attached thereto. Fig. 2 is a plan view of the same, partly in section. Fig. 3 is a vertical cross-section taken on the line *x x* of Fig. 1. Fig. 4 is a detail central sectional view of my boiler. Fig. 5 is a detached view of the valve.

A represents a boiler having flues B for the passage of the heat and products of combustion, and an interior chamber, C, that is situated at a suitable distance between the top and bottom of the boiler, so as not to come in contact with them. This chamber is provided with pipes D, of greater diameter than the flues B, and through these pipes D the flues B pass. The space between the flues B and pipes D forms water-legs surrounding the flues B, as shown. Water is pumped into the body of the boiler A, and ammonia is placed in the interior chamber, C. This boiler, as shown in Fig. 1, when to be used in connection with the apparatus for preserving fish, fruit, &c., for transportation in vessels, is generally placed in the forecastle, slightly abaft of the foremast. The galley E is preferably placed immediately against it, and by this means one smoke-stack, F, can be used for both the boiler and the galley.

G represents the escape-pipe leading from the ammonia-chamber, and H a similar pipe leading from the boiler. From the pipe G the pipe I extends down alongside of the boiler to the point I′, where it forms a bend. At this point the pipe is below the bottom lining of the hold, where it can be acted upon by the bilge-water. From there the pipe extends upward, and is coiled backward and forward, as at I^2, Fig. 3, until it reaches the under side of the deck. These coils I^2 are confined between the double bulk-head K, which is packed with sawdust or other suitable non-conducting material. This bulk-head K divides the forecastle from the hold, as shown.

L represents the compressor in which the coils I^2 terminate, and from this compressor L extend the similar coils I^3, which are secured below the deck of the vessel, and which extend rearwardly to the after bulk-head M of the hold. At this point the pipe I^4 leads downward below the casing of the hold and into the bilge-water.

I^5 represents the forwardly-extending pipe which connects the pipe I^4 with the ammonia-chamber, as at I^6. A second pipe, I′, is connected to the pipe I^5 and to the ammonia-chamber, as at I^8.

H′ represents a pipe that leads from the pipe H of the boiler to the pipe I^5, for the purpose to be hereinafter set forth. Journaled vertically in suitable bearings in the

hold slightly abaft of the bulk-head K are a number of rollers, N, which reach from side to side of hold, and which are provided on one end with spurred pinions O, that mesh with each other. At a suitable distance to the rear of the rollers N are journaled vertically a second series of rollers, P. Endless belts Q connect the rollers N and P.

R represents the bulk-head which divides the hold into compartments S T. To the lower end of this bulk-head is hinged a door, V, which can be closed air-tight, so as to completely shut off communication between the chambers S and T.

W represents guards formed of sheet metal or other suitable material, which are secured to the bulk-heads R and K on the inner sides thereof, and which curve downward in between the belts Q, as shown in Fig. 1.

Y represents a worm, which meshes with the upper pinion, O. The shaft from this worm is journaled in and passes through the bulk-head K, and has attached to its forward end a crank, Z.

A′ represent a hopper that is secured in the hatchway immediately above the upper belt, Q. By this construction it will be apparent that by turning the crank Z the belts Q will convey fish or fruit that is discharged upon the upper belt, Q, through the hopper A′ backward and forward through the chamber S, as indicated by the arrows in Fig. 1, until they are discharged through the opening V′ into the chamber T. The guards W prevent the fish or fruit from falling off the ends of the aprons.

The operation of my refrigerating apparatus is as follows: The ammonia contained in the chamber C is heated by the water which is being converted into steam in the boiler, and the gas from the ammonia passes through the pipe I down to the bilge-water, then up through the coils I^2 in the bulk-head, through the compresser L, and through the expansion-coils I^3 under the deck. The expansion of the gas through the coils I^3 lowers the temperature in the hold, and freezing takes place therein. When the gas becomes exhausted in the pipes I^3, it drops down through the pipe I^4 into the pipe I^5, where it receives further cooling from the bilge-water, and becomes mixed up with the waste-water from the boiler, which is discharged into the pipe I^5 through the pipe H′. This mixture of the ammonia and the water is then forced back into the boiler by means of a suitable inspirator, pump, or other device which may be employed for this purpose, and which is not here shown. The fish or fruit are frozen during their passage on the endless belts in the chamber S, and are compactly stored in the chamber T, in which chamber the same low temperature is maintained until the vessel reaches port. As it is necessary that steam should be blown off from the boiler at far less pressure than the ammonia, I provide a valve, B′, as shown in Fig. 5. B^2 is a valve which has its seat in the pipe H, and B^3 is a similar valve which has its seat in the pipe G. The stems of these valves B^2 B^3 extend upwardly and form bearings for the screw B^4, which is swiveled in them at the points B^5, and which is provided at one end with a crank, B^6. A scale-lever, B^7, has its inner end secured on the screw B^4, and is fulcrumed at a suitable distance from the valve-seats upon the scale-bearing B^8.

B^9 represents a weight that is adapted to be adjusted backward and forward upon the scale B^7, as in the common safety-valves. The operation of this valve is as follows: Suppose it were required to have sixty pounds steam-pressure and sixty pounds ammonia-pressure. In this event the crank B^6 would be turned so as to cause the screw B^5 to move the scale B^7 to the center between the valves B^2 B^3, where it would rest upon the central point, 60, of the scale B^8, and the weight B^9 would be moved to the point 120 on the beam B^7. If it were required to blow off the steam at forty pounds and the ammonia gas at sixty, the weight B^9 would be moved to the point 100, and the screw B^5 turned so as to cause the beam B^7 to move a suitable distance to the left or right of the center of the scale B^8. By this construction it will be readily seen that the pressure at which both the steam and the ammonia gas is to be blown off can be regulated by a single mechanism.

The operation of freezing a cargo or part of cargo of fish or fruit in a vessel or building is as follows: Close all the trap-doors and hatches so that the freezing-chamber will be air-tight. Shut off the gas in the expansion-pipes at a point at or near the bulk-head R, by turning a valve in the pipes, so as to prevent the gas from entering the storage-chamber before frozen fish goes into it. This will lessen the volume of expansion-pipe to be cooled and permit more gas and more pressure to be applied to the chamber wherein the fish are being frozen on the belts. When the fish on the belts or screens have received the necessary freezing and are ready to be stored away in the after chamber, the valve which holds the gas in check will be turned and the gas liberated into the rest of the after pipes, and thus a uniform temperature through the entire length of the chamber will be obtained. It is for the purpose of giving the freezing-chamber the full weight of all the gas and pressure in the boiler that this valve is put into the expansion-pipes at a point at or near the bulk-head R.

It will be apparent that when fish is on the belts undergoing refrigeration, it would not be of any use to have gas supplied to the pipes in the after chamber, as there would be no fish there but what had already received a treatment in the manner that the fish on the belts were undergoing.

Having thus described my invention, I claim—

1. The boiler A, having the chamber C, flues B, and water-legs D, in combination with suitable expansion-pipes, for the purpose set forth, substantially as shown.

2. A boiler provided with an interior chamber and ammonia-chamber, in combination with a valve that is adapted to regulate the pressure both of the steam in the boiler and the gas in the ammonia-chamber, substantially as specified.

3. The combination of the boiler A, having the chamber C, escape-pipe H, leading from the boiler, and escape-pipe I, leading from the ammonia-chamber, with the valves B^2 B^3, screw B^5, beam B^7, and weight B^9, substantially as and for the purpose set forth.

4. The combination of the boiler A, having chamber C, escape-port H, connected with the boiler, and escape-port I, connected with the ammonia-chamber, with the valves B^2 B^3, screw B^5, scale-beam B^7, weight B^9, and scale-bearing beam B^8, substantially as shown and described.

5. The combination of a boiler and ammonia-gas generator located therein, and suitable expansion-pipes leading therefrom through the chamber or chambers of a vessel or building, for the purpose specified, substantially as described.

6. The combination of the boiler A, ammonia-chamber C, valve B′, pipe I, coils I^3, return-pipe I^5, and pipe H′, with a suitable storing chamber or chambers of a vessel or building, substantially as set forth.

7. The combination of the boiler A, ammonia-gas generator C, pipe I, leading therefrom, chambers S and T, provided with the bulk-head R, door V, and a suitable mechanism, substantially as here shown, for conveying the fish or fruit through the chamber S and discharging it into chamber T, whereby the fish or fruit is exposed to a gradual refrigeration in the chamber S, and can be packed compactly in the chamber T, substantially as specified.

8. The combination of the boiler A, ammonia-gas generator C, pipes H I, leading therefrom, chambers S and T of a building or vessel, and conveyers Q, provided with wheels O, and worm Y, substantially as and for the purpose set forth.

9. The combination of the boiler A, ammonia-gas generator C, pipes H′ I, expansion-pipes I^3, return-pipe I^5, and the chambers S T of a vessel or building, one of said chambers having a conveying mechanism, Q, substantially as shown and described.

10. The combination of a refrigerating-chamber, a storage-chamber adjacent thereto, expansion-pipes extending through said chambers, means for supplying said pipes with ammonia or other vapor, and a mechanism, substantially as here shown, for conveying fish, fruit, &c., backward and forward through the refrigerating-chamber, whereby the articles to be preserved are reduced to a freezing temperature before being conveyed to the storage-chamber, substantially as described.

11. The combination of a refrigerating-chamber, a storage-chamber adjacent thereto, expansion-pipes extending through said chamber, means for supplying said pipes with ammonia or other gas or vapor, a valve or cock located in said pipes at the point that divides the chambers, whereby the gas can be confined to the portion of the pipes that is located in the refrigerating-chamber, or be permitted to circulate through the pipes in both chambers, and a mechanism, substantially as here shown, for conveying the articles to be preserved backward and forward through the refrigerating-chamber before discharging them into the storage-chamber, substantially as and for the purpose set forth.

In testimony whereof I affix my signature in presence of two witnesses.

PETER JOHN McDONALD.

Witnesses:

FRANK E. SMOTHERS,

DANIEL MACINTYRE.