(No Model.)

T. GANNON.

CONDENSER OR COOLER.

No. 263,504. Patented Aug. 29, 1882.

Fig1.

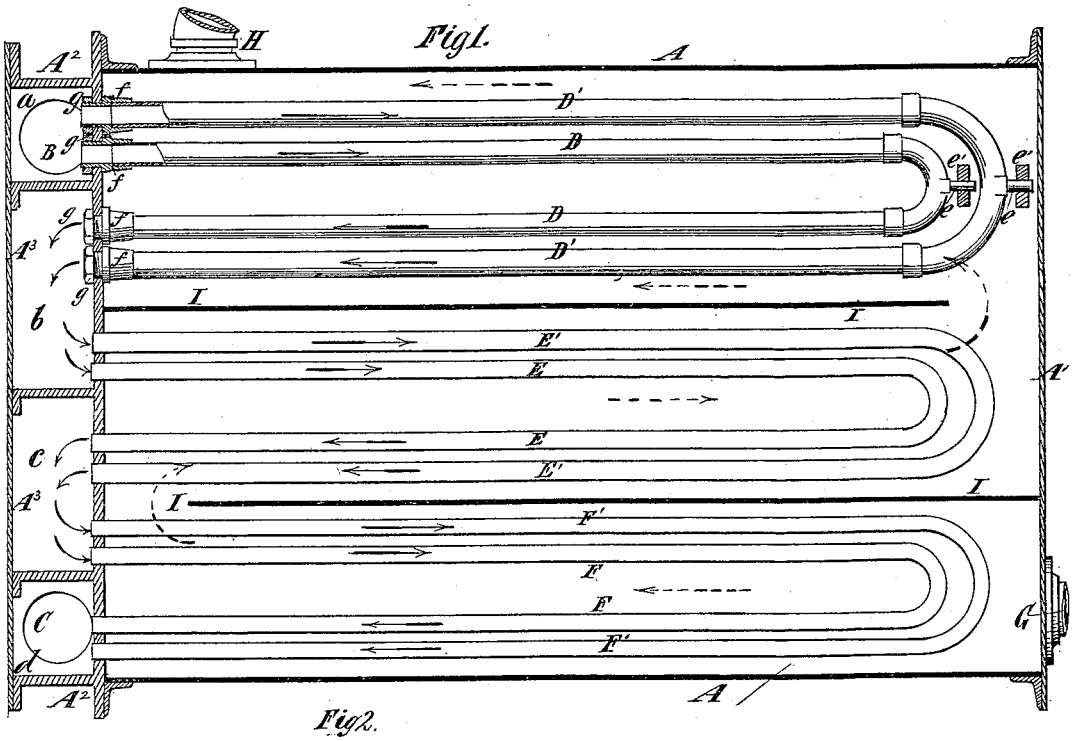


Fig2.

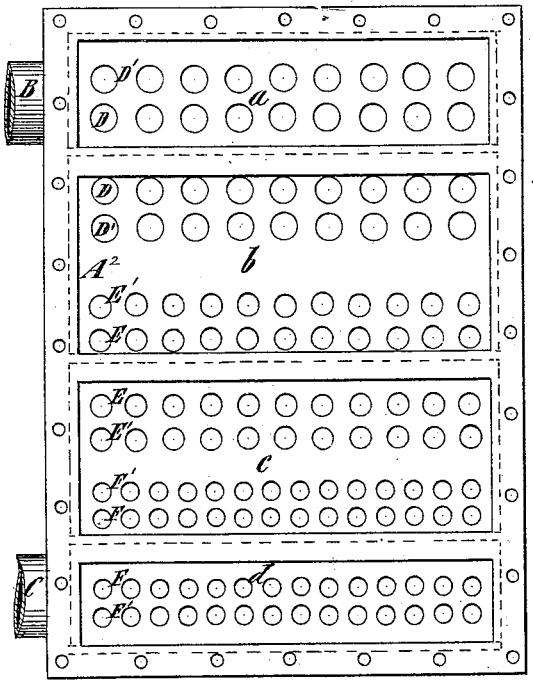
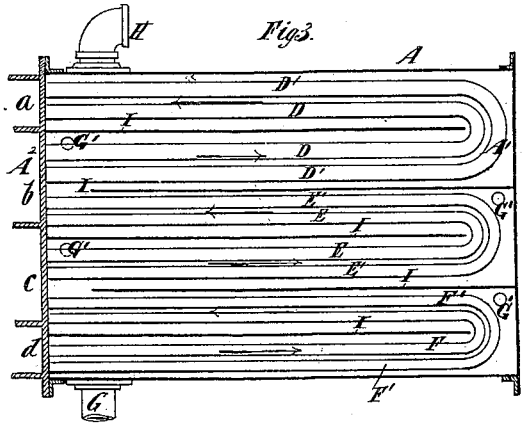


Fig3.



Witnesses;
Geo. Haynes
Ed Blatzmayer

Inventor.
Thomas Gannon
by his Attorneys
Brown & Brown

UNITED STATES PATENT OFFICE.

THOMAS GANNON, OF JERSEY CITY, NEW JERSEY.

CONDENSER OR COOLER.

SPECIFICATION forming part of Letters Patent No. 263,504, dated August 29, 1882.

Application filed June 8, 1881. (No model.)

To all whom it may concern:

Be it known that I, THOMAS GANNON, of Jersey City, in the county of Hudson and State of New Jersey, have invented certain new and useful Improvements in Condensers or Coolers, of which the following is a specification.

The object of my invention is to provide a surface-condenser for steam-engines, stills, and other purposes, or a cooler for beer or other liquid, which shall be very effective in operation, the parts of which are readily accessible for repair, and which, containing a large cooling-surface in a small space, occupies but little room.

The invention consists essentially in the combination, in a condenser or cooler, of a shell or body provided with inlet and outlet pipes for the cooling-water, a head constructed with separate chambers for the vapor to be condensed or the liquid to be cooled, and series of U-shaped tubes arranged in said shell or body, and each having its two ends inserted into different chambers, the tubes of the several series being of decreasing diameter and increasing in number from the inlet for vapor or liquid to be cooled toward the outlet therefor, so as to divide the vapors and condensed fluid or cooled liquid into smaller and a greater number of streams as they come in contact with the coldest water, and thus render the condensing-surface more effective.

The invention also consists in details of construction to be hereinafter described.

In the accompanying drawings, Figure 1 represents a longitudinal section through a condenser or cooler embodying my invention; Fig. 2, represents an end view of the condenser or cooler with the cover of the head in which are the separate chambers removed; and Fig. 3 represents a diagram view of the shell or body of the condenser or cooler, illustrating a modified arrangement of the diaphragms or plates for creating a circuitous passage of the water for condensing.

Similar letters of reference designate corresponding parts in all the figures.

A represents the body or shell of the condenser or cooler, which may consist of an angle-iron frame covered with boiler-plate.

A′ designates a plain head, closing one end thereof, and A^2 designates a hollow upright head, closing the other end thereof, and having itself a removable cover, A^3. The hollow head A^2 is constructed with a number of separate chambers, (here shown as four in number arranged one above another,) and respectively designated *a b c d*.

The vapor to be condensed or the liquid to be cooled enters the chamber *a* through a pipe, B, inserted in the side of the head A^2, and the liquid of condensation or the cooled liquid passes from the chamber *d*, through a pipe, C, also inserted in the side of the head A^2. The vapor or liquid inlet-pipe B and the outlet-pipe C being inserted in the side of the head A^2 do not interfere with the removal of the cover A^3, and the said cover might have hand-holes in it to enable deposit or sediment to be readily removed from the several chambers, *a b c d*.

The several chambers, *a b c d*, are connected with each other by means of three series of U-shaped tubes, D D′, E E′, F F′, which I will now particularly describe. The tubes D, which connect the chamber *a* with the chamber *b*, have a short bend in them, and one end is inserted in the chamber *a* and the other end in the chamber *b*. These are hereinafter termed the "inner tubes" of the series, and as many of them as the width of the body A will permit are arranged side by side, as seen in Fig. 2. The tubes D′ are equal in number to the tubes D, and embrace the same, the bend being of larger radius, and they are hereinafter termed the "outer tubes." Each of the tubes D D′ has opposite the ends which are inserted in the head A^2 a projecting stud or arm, *e*, which fits in a bearing in a cross-bar, *e′*, wherein it will move back and forth as the tube contracts or expands. The tubes D D′ may be inserted and secured in the head A^2 in any suitable manner; but, as here shown, each end is expanded into a socket or thimble, *f*, which passes through a hole in the head and is secured therein by a nut, *g*. The socket or thimble *f* has a shoulder, upon which is placed a packing-ring or gasket, and when clamped against the head by the nut *g* the latter forms a tight joint.

It will be clearly seen that by removing the cover A^3 the nuts *g* are made accessible, and after loosening the nuts and removing the head

A′ any one of the tubes may be taken out for repairs.

Any one of the outer tubes, D′, may be taken out by removing its two nuts, *g*, and without removing or disturbing any of the other tubes, and any one of the inner tubes, D, may be removed by simply removing its adjacent outer tube.

The vapor or liquid entering the chamber *a* through the pipe B passes outward through the upper legs or portions of the tubes D D′, and returns to the chamber *b* through the lower legs or portions of said tubes.

The tubes E E′ F F′ are exactly similar in arrangement and construction to the tubes D D′, and they are therefore shown only in outline, and may be secured in the head A′ in a similar manner to the tubes D D′, or in any other suitable manner. The vapor passes from the chamber *b* through the tubes E E′, and is thence delivered into the chamber *c*, from which it passes through the tubes F F′ to the chamber *d*, and thence away through the outlet-pipe C.

The cold water is supplied to the body or shell A by a pipe, G, and is delivered therefrom through a pipe, H, and one particular feature in the construction of my condenser is that the tubes decrease in diameter toward the outlet of vapor or liquid, the tubes E being smaller than the tubes D, and the tubes F being still smaller than the tubes E. This enables more tubes to be used in the smaller series, and hence divides the vapor or liquid into finer or smaller streams or currents, and makes the condensing-surface more effective. The vapor which is more nearly condensed or the liquid partially cooled is thus brought in contact with the coldest water as it enters the shell or body, and a very effective condensation or cooling is produced.

It will be seen that as the several chambers, *a b c d*, are arranged one above another, the water of condensation or the liquid to be cooled will descend by gravitation through the several series of tubes from each chamber to the one below it.

The shell or body A is divided horizontally by two diaphragms or partition-plates, I, which extend from opposite ends or sides of the shell or body nearly across the same, and by said diaphragms or plates the cooling-water is made to travel in a circuitous course through the condenser, as indicated by the dotted arrows, and serves much more effectively to cool the tubes. The vapor or liquid to be cooled travels in the course indicated by the arrows in full outline and in the opposite direction to that of the water.

In the diagram view, Fig. 3, I have shown a modified arrangement of partition plates or diaphragms I, said plates or diaphragms being so arranged that there will be one between the upper and lower portions of each series of tubes, as well as between the several series of tubes, and this arrangement may in some cases be preferred, as it gives a greater length of travel to the water in passing through the condenser, and therefore is more effective in cooling.

Fig. 3 also shows separate inlet-pipes G′, arranged between plates I I, for injecting the cooling-water simultaneously at different points, and thereby obtaining a more rapid condensation by a repeated addition of cool water to that which is circulating upward.

In some cases, if desired, the vapor or liquid to be cooled might be passed around the tubes and the water or cooling-liquid through the tubes, in which case the pipes B and C would be water or cooling-liquid inlet and outlet pipes for vapor or the liquid to be cooled, and in such case I prefer to construct the condenser with the arrangement of diaphragms or plates I, (shown in Fig. 3,) as the vapor would then be retained in contact with the cold tubes for a longer time.

By my invention I am enabled to make a small condenser or cooler do the same work of a larger one as heretofore constructed, thus economizing space in vessels or other places, as well as reducing the first cost, and the several parts of the condenser or cooler are rendered very accessible for repairs.

One of the important features of my invention is the great length of travel provided for the vapor or for the liquid to be cooled in proportion to the size of the condenser or cooler.

Instead of water, brine or other liquid or solution may be used for cooling in this condenser, and such cooling liquid or solution may be circulated through the condenser and through an ice-machine or cooling apparatus of any suitable kind, so that it may be used over and over again in the condenser.

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

1. The combination, in a condenser or cooler, of a shell or body provided with inlet and outlet pipes for the cooling-water, a head constructed with separate chambers for the vapor to be condensed or liquid to be cooled, and series of U-shaped tubes arranged in said shell or body and each having its two ends inserted into different chambers, the tubes of the several series being of decreasing diameter and increasing in number from the inlet to the outlet, substantially as described.

2. The combination of the shell or body A, the removable head A′, the head A^2, constructed with separate chambers and provided with the removable cover A^3, and the several series of U-shaped tubes through which the several chambers communicate with each other, and which decrease in diameter and increase in number from the inlet for vapor or liquid to be cooled toward the outlet thereof, substantially as herein described.

3. The combination of the shell or body A, containing diaphragms I, the removable head A′, the hollow head A^2, with separate chambers, the several series of tubes through which

the several chambers communicate with each other, and the sockets or thimbles *f*, and nuts *g*, whereby said tubes are secured in the head A^2, substantially as specified.

4. In combination with the partition-plates or diaphragms I I and the pipes D D′, the inlets for cooling-water, arranged between the said plates, substantially as and for the purpose herein described.

THOS. GANNON.

Witnesses:
FREDK. HAYNES,
HENRY T. BROWN.