

(No Model.)

R. W. DUGAN.
STEAM CONDENSER AND PURIFIER.

No. 485,004.

Patented Oct. 25, 1892.

Fig. 1.

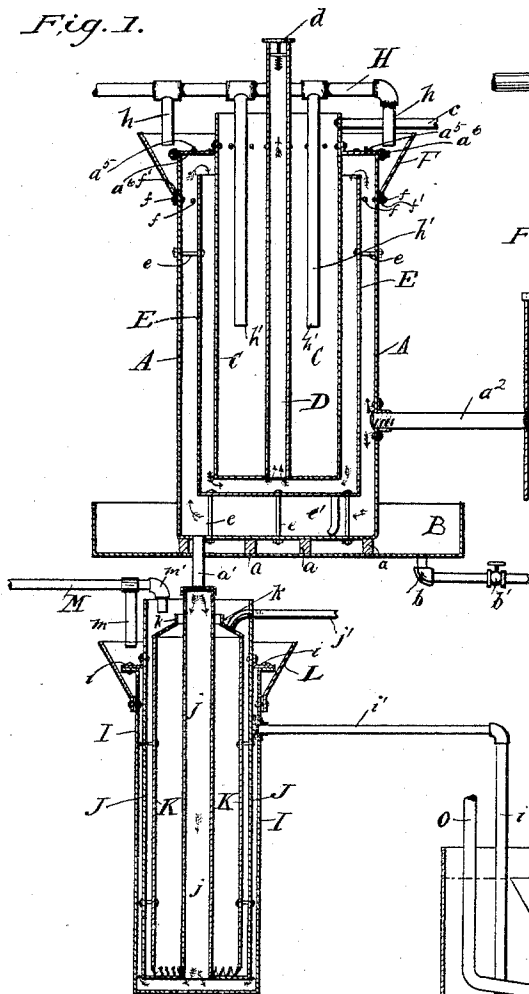
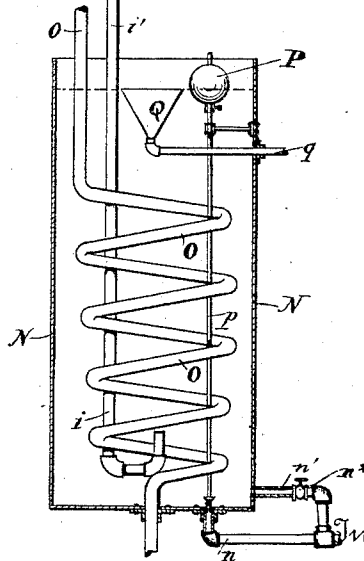
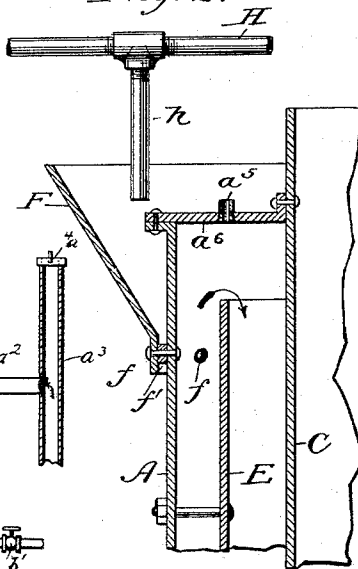


Fig. 2.



Witnesses

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UNITED STATES PATENT OFFICE.

REES W. DUGAN, OF COVINGTON, KENTUCKY.

STEAM CONDENSER AND PURIFIER.

SPECIFICATION forming part of Letters Patent No. 485,004, dated October 25, 1892.

Application filed June 20, 1891. Serial No. 396,990. (No model.)

To all whom it may concern:

Be it known that I, REES W. DUGAN, a citizen of the United States, and a resident of Covington, in the county of Kenton and State of Kentucky, have invented certain new and useful Improvements in Steam Condensers and Purifiers, of which the following is a specification.

My invention relates to an improved means to condense steam and at the same time remove the impurities from the vapor and also the water after condensation.

The invention is especially adapted for ice-machines for the purpose of furnishing pure water for making ice, and while it is especially applicable for use with compression-machines it is also applicable to absorption-machines, and the steam used may be either live steam from the boiler or waste steam from the engine.

I have found by experience that ice as usually made from condensed steam furnished from the boiler has a bitter unpleasant taste and that this is caused by the gases driven off in the process of evaporation. The main object of my invention is to free the vapor from these noxious gases before condensation. It is also known that ice obtained from the escape-steam from the engine-cylinder becomes impregnated with the lubricant, which discolors the ice.

Another object of my invention is to remove these impurities from the water after condensation.

Another object of my invention is to partially cool the water before it leaves the apparatus. Its object is, finally, to combine these several advantages in a simple compact device.

These objects I attain by the means illustrated in the accompanying drawings, in connection with which the invention will be fully described, and then particularly referred to and pointed out in the claims.

Figure 1 is a central vertical sectional view of a device embodying my invention. The several parts are shown in their relative positions, but the supporting-frame, which may be of any approved form, is omitted. Fig. 2 is a similar view of a portion of the upper part of the condenser upon a greatly-enlarged scale.

The device consists of three main parts, which I term the "condenser," the "cooler," and "fore cooler."

Referring first to the upper portion of the figure, which is the condenser, A is a closed cylinder, which rests upon blocks or feet *a* within a basin B. Centrally within the cylinder A is secured a cylinder C, closed at the bottom, except a central perforation, through which a tube D passes. This tube extends some distance above the open top of the cylinder C and is fitted at its upper end with a spring-pressed relief-valve *d*.

E is a cylindrical vessel arranged intermediate the vessels or cylinders A and C, closed at the bottom and open at the top, and is held in position by stay-bolts *e*, which support it above the bottom of the cylinder A and between the cylinders A and C. Discharge-pipe *e'* is fitted in the bottom of cylinder E to discharge the water condensed from the waste steam into the bottom of cylinder A, from which it passes to the cooler through pipe *a'*. Around the top of cylinder A is secured funnel F. This is secured to cylinder A by bolts *f* and intervening washers or collars *f'*, so that the cooling-water discharged into the funnel through branch pipe *h*, leading from cold-water pipe H, is caused to trickle down in a thin sheet around the cylinder A and into the basin B, from which it is carried off through the waste-pipe *b*, which is fitted with a cock *b'*, in order that the discharge from the basin may be so regulated that the water is kept around the bottom of the cylinder A. Leading from the cold-water pipe H are two branch pipes *h'*, which discharge into the cylinder C, and leading from the vessel C is a discharge-pipe *c*.

Steam is admitted to cylinder A through pipe *a*², which connects with a pipe *a*³, leading from either a cylinder of an engine when waste steam is to be used or from a boiler when live steam is to be used. The pipe *a*² connects with the cylinder at a point some distance below the end of the vertical steam-supply pipe *a*³. At the upper end of this pipe is a small perforation or a small tube *a*⁴. The flanged head *a*⁵ of the cylinder A, which supports the inner cylinder C, is also provided with several small perforations or tubes, as shown at *a*⁶. The purpose of providing per-

forations or escapes in the upper end of pipe a^3 and cylinder-head a^5 is to allow the escape of gases which are driven off by the evaporation of the water before condensation. The operation of this part of the device is as follows: Steam being admitted to the space between the cylinders A and E passes around the space between said cylinders and thence down through the chamber formed by the cylinders E and C. The condensed water passes from the cylinder E through pipe e' into the bottom of the vessel A. So much of the steam as is condensed in the outer vessel also falls to the bottom of the vessel A, and the water condensed passes from the vessel A through the pipe a' into the cooler beneath, which will now be described.

The cooler consists of an outer closed cylindrical vessel I, within which is fitted an open-top cylindrical vessel J, which is supported within the vessel I by the flanged head i of vessel I. The vessel J is centrally fitted with a pipe j , which opens through its bottom into the vessel I. The pipe a' connects with the upper end of this central pipe j .

K is a cylinder of smaller size than the cylinder J. The bottom edge of this cylinder is notched or serrated and rests upon the bottom of the cylinder J. The upper end of the cylinder K is contracted, the top being inclined to meet a diminished neck k . The cylinder K rests upon the bottom of the cylinder J and is arranged concentric with it and the pipe j . Around the top of the cylinder I is fitted a funnel L, which is stayed at a little distance from the cylinder, the same as is the funnel F. The condensed water from the condenser passes down through the pipe j into the outer cylinder I, from which it is discharged through the pipe i' to the fore cooler. The cooling-water passes from the pipe M through the branch m into funnel L, from which it trickles in a thin sheet down and around the cylinder I, keeping it cool. The water from the branch m' falls upon the top of the cylinder K, trickles down and around the outside of it, thence passes through the notched base, thence up and around the pipe j , and is discharged through pipe j' . The condensed water as it passes from the cylinder I through pipe i' is cool enough for ordinary use, and if live steam is used it may be carried directly through pipe i' to the vessels to be converted into ice; but it is economical to further reduce the temperature and at the same time increase the temperature of the return ammonia. For this purpose the pipe i' is carried down into the fore cooler, which I will now describe, first, in relation to its use when live steam is condensed, and afterward the appliance connected to the fore cooler to eliminate the lubricant from the condensed water when the waste steam from the engine-cylinder is used.

The fore cooler consists of a cylindrical vessel N, through which the ammonia-pipe O passes, said pipe being formed in a coil with-

in the vessel. The lower part of the vessel is provided with a discharge-pipe n , controlled by a valve operated by float P, which is connected to the valve by rod p . The float is adjustable upon the rod by means of a set-screw, so that the water-level in the vessel N may be regulated. I have also provided a discharge-pipe n' and controlled by a cock n^2 , by which the tank may be emptied when desired. The pipe n' may be made to connect with pipe n .

In compression-machines the fore cooler is interposed between the refrigerator and the pump, but in absorption-machines it is interposed between the refrigerator and absorber.

When waste steam is to be employed, I have provided the fore cooler with means for carrying off the lubricant or other matter lighter than water that may pass into it. The means accomplishing this purpose consists of a funnel-shaped vessel Q, which I call a "cold skimmer." This is supported upon a union at the end of a discharge-pipe q , which passes through the side of the tank N. The float P is so adjusted upon its rod p that the water-level in tank N is intermittently brought above and below the mouth of the skimmer Q to avoid waste of water. If it is found that the impurities accumulate rapidly upon the water in tank N, a cock may be placed in pipe n to limit the discharge until the water gets some distance above the mouth of the skimmer. The impurities will then be carried off rapidly through the skimmer and out through pipe q .

The condenser, cooler, and fore cooler are preferably made out of galvanized iron, copper, or other metal non-corrodible by the action of steam or water.

It is obvious to those skilled in the art that many mechanical variations may be made without departing from the spirit or scope of my invention. Hence I would have it understood that I do not limit myself to the precise details of construction shown and described.

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

1. In a condenser, the combination of the closed steam-vessel A, provided with a perforated cover, the water-vessel C, centrally secured therein, the steam-pipe D, centrally within said water-vessel and provided with relief-valve d , the intermediate open-top vessel E, having discharge-pipe e' , the funnel F, surrounding the upper portion of the steam-vessel A, the steam-pipe leading to vessel A, and discharge-pipe a' , leading from the steam-vessel and water-pipe H and having branches discharging into the water-vessel C and funnel F, substantially as shown and described.

2. The combination of the closed steam-vessel supported within and above the bottom of the pan B and having its top perforated at a^6 , the steam-pipe leading to said vessel, a discharge-pipe leading therefrom through bottom of pan B, the water-vessel C, centrally secured within the steam-vessel, having steam-

pipe D through it and discharge-pipe *c* leading from its upper portion, the open-top vessel E, and stay-bolts *e*, securing it between the vessels A and C, and a discharge *e'*, leading from bottom of vessel E, and the water-pipe H, having branches discharging into the vessel C and funnel, substantially as shown and described.

3. In a device for condensing and purifying water, the combination of the outer vessel having a perforated top, a cold-water vessel suspended therein and having a steam-opening through it, water-pipes discharging into said inner vessel, an overflow-pipe leading therefrom, a steam-pipe leading into the outer vessel, and a water-discharge pipe leading therefrom, substantially as shown and described.

4. The combination, substantially as hereinbefore set forth, of a condenser, a cooler, a discharge-pipe leading from the condenser to the cooler, said cooler consisting of an outer closed vessel I, an inner vessel J, closed at the bottom and having a central pipe *j*, connecting at the top with the discharge-pipe from the condenser and opening into the outer vessel I, the jacket K, surrounding said pipe, having a contracted top and serrated or notched base resting on the bottom of the vessel J, a funnel L, surrounding the top of the vessel I, the discharge-pipe *i'*, leading from the upper portion of the vessel I, the discharge-pipe *j'*, leading from the top of the jacket K and through the vessel J, and the water-pipe M, having branches discharging into the funnel L and vessel J.

5. In a condenser for ice-machines, the combination, substantially as hereinbefore set forth, of the steam-condensing vessel, a central vessel secured therein for the cooling liquid and having a central pipe passing through it and provided with a relief-valve at its upper end, a funnel surrounding the upper portion of said steam-vessel to cause the cooling liquid to pass down and around the outside of the steam-vessel and the intervening vessel to cause the steam to pass first in contact with the outer vessel and thence around the

inner cooling-vessel, the cooler consisting of an outer closed vessel, the vessel for the cooling liquid secured within it and having a central pipe connecting the condenser and outer cooling-vessel, the funnel surrounding the outer part of the outer vessel, and water-pipes discharging into the funnel and said inner vessel, the jacket K, surrounding the central pipe within the vessel J, having a contracted top and notched base, the discharge-pipe *j'*, leading from the top of the jacket, the fore cooler consisting of the vessel N, the pipe *i'* to conduct the discharged water from the cooler to near the bottom of the fore cooler, the ammonia-pipe O, leading from the ice-machine through the bottom of the vessel N and coiled within said vessel, the discharge-pipe leading from bottom of vessel N, and a valve controlling said discharge and controlled by a float P, substantially as shown and described.

6. The combination, substantially as hereinbefore set forth, of a boiler, a condenser, a cooler, and a fore cooler, substantially as shown and described.

7. In a device for condensing and purifying water, the combination of the steam-condensing vessel, a steam-supply pipe for said vessel, a branch steam-pipe connecting the steam-supply pipe below the top of both vessel and supply-pipe, an opening or nipple at the top of said supply-pipe for the escape of the gases driven off in the process of evaporation, means, such as shown, for cooling and condensing steam in said vessel, and a discharge-pipe for the condensed water, substantially as hereinbefore set forth.

8. In a device for condensing and purifying water, the combination of the condenser, the steam-supply pipe *a*³, having its top end perforated at *a*⁴, and the branch pipe *a*², connecting the steam-supply pipe and condenser below the top of each, substantially as shown and described.

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Witnesses:

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