R. SUCZEK.

CONDENSING APPARATUS.

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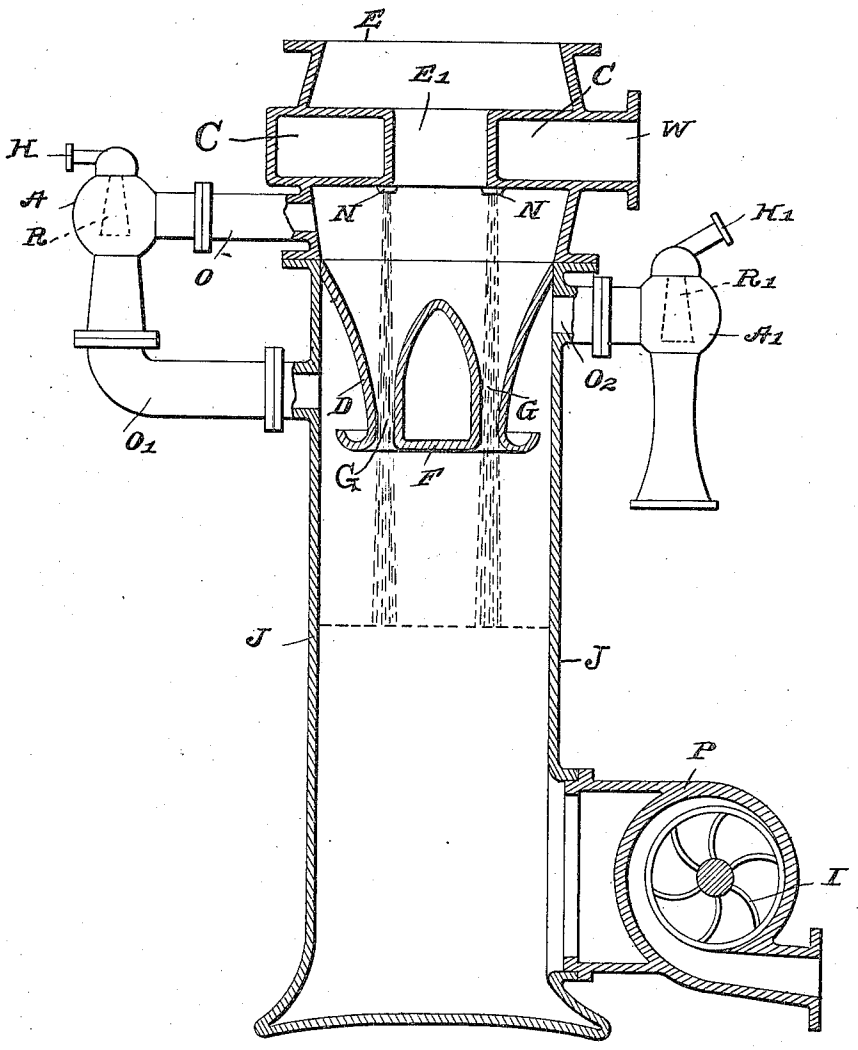
1,260,593. Patented Mar. 26, 1918.



Inventor
Robert Suczek
by Cornelius D. Ehret
his Attorney

UNITED STATES PATENT OFFICE.

ROBERT SUCZEK, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR TO C. H. WHEELER MANUFACTURING COMPANY, OF PHILADELPHIA, PENNSYLVANIA, A CORPORATION OF PENNSYLVANIA.

CONDENSING APPARATUS.

1,260,593. Specification of Letters Patent. Patented Mar. 26, 1918.

Application filed March 8, 1917. Serial No. 153,454.

To all whom it may concern:

Be it known that I, ROBERT SUCZEK, a subject of the Emperor of Austria-Hungary, residing in the city of Philadelphia, county of Philadelphia, and State of Pennsylvania, have invented certain new and useful Improvements in Condensing Apparatus, of which the following is a specification.

My invention relates to jet condenser apparatus wherein, as well understood in the art, cooling water comes into direct contact with steam or other vapor which is to be condensed.

It is the object of my invention to provide jet condenser apparatus in which the actual submergence of the removal pump may be lessened and thereby reduce the height of the apparatus, without, however, reducing the efficiency of the operation of the removal pump; or with a given submergence I am enabled to increase the efficiency of the removal pump. To this end I establish separate chambers within the jet condenser which are sealed from each other during operation by the injection water, and remove air from the first chamber and increase its pressure and deliver it into the second chamber, whereby there exists upon the water therein to be removed by the removal pump a higher pressure than customary and higher than the vacuum maintained in the system; and from the second chamber the air is removed and raised to atmospheric pressure or other suitable pressure.

For an illustration of one of the various forms my invention may take, reference may be had to the accompanying drawing.

Referring to the drawing, J is the jet condenser body receiving steam or other vapor to be condensed through the opening E. The cooling water is admitted through the opening W into the distributing chamber C, from which it has egress through the nozzles or openings N arranged in a circular series. Beneath these nozzles is the diffuser or cone D having disposed at its center the core member F so shaped and so positioned with respect to the diffuser D as to produce an annular nozzle or diffuser passage G in alinement with the nozzles or openings N. At the bottom of the body J is provided the centrifugal removal pump P whose impeller I remains submerged beneath the water collected in the bottom of the body J.

From the condensing chamber above the diffuser D is an outlet O for air or non-condensable gases which delivers to an air removing pump of any suitable type, as for example, a steam operated ejector A having the steam nozzle R receiving steam through the steam inlet H. The pump or ejector A delivers through the connection O^1 into the second chamber into which the diffuser D discharges.

Through the connection O^2 air or non-condensable gas is delivered to any suitable type of air removing pump, for example, a second steam operated ejector A^1 having the nozzle R^1 receiving steam through the steam connection H^1, this second ejector delivering against atmospheric pressure, or any other desired pressure.

The operation is as follows:

The steam entering at E passes through the central opening E^1 and comes into contact with the jets of cooling water emitted from the nozzles or openings N and is condensed, the combined condensate and cooling water being delivered through the alined annular diffuser passage G, completely filling the same and forming a seal between the upper and lower chambers.

The water is collected in the bottom of the body J and is removed by the centrifugal pump P.

The ejector A withdraws air or gas from the upper chamber, in which it is desirable to maintain an absolute pressure of two inches or less, referred to 30 inch mercury barometer. The removed gas is raised in pressure and delivered into the lower or second chamber in which any suitable higher absolute pressure is maintained. And the second ejector A^1 withdraws the air or gas from the second chamber and raises it to atmospheric pressure or any other desired pressure.

There is maintained in the second or lower chamber an absolute pressure higher than customary in this type of apparatus; and this excess of pressure is exerted upon the upper surface of the water in the bottom of the body J, with the result that while the actual water level may not be changed, there is greater pressure exerted on the suction side of the impeller I of the pump P, greatly assisting the pump P to remove the collected water.

The effect of this construction is there-

fore to cause the pump P to operate more efficiently with a given submergence; or the actual submergence may be reduced because of this excess of pressure in the lower or second chamber, and there follows in such case the beneficial result of reducing the height of the apparatus.

Where a steam actuated ejector A is employed, the motive steam thereof is condensed in the lower chamber, the condensate mingling with the water therein, and the second pump A^1 is required in such case to remove only air, or gas or uncondensable vapors.

What I claim is:

1. The combination in a jet condenser, of a condensing chamber and a water collecting chamber, a diffuser forming a connection between said chambers and maintaining them independent when conducting cooling water, and means for extracting elastic fluid from said condensing chamber and delivering it at higher pressure into the elastic fluid above the liquid in said collecting chamber through a passage independent of said diffuser.

2. The combination in a jet condenser, of a condensing chamber and a water collecting chamber, a diffuser forming a connection between said chambers and maintaining them independent when conducting cooling water, means for extracting elastic fluid from said condensing chamber and delivering it at higher pressure into the elastic fluid above the liquid in said collecting chamber through a passage independent of said diffuser, and means for removing air or gas from said collecting chamber and raising it to higher pressure.

3. The combination in a jet condenser, of a condensing chamber and a water collecting chamber, a diffuser forming a connection between said chambers and maintaining them independent when conducting cooling water, and an ejector whose suction inlet communicates with said condensing chamber and whose outlet communicates with the air space above the water in said collecting chamber.

4. The combination in a jet condenser, of a condensing chamber and a water collecting chamber, a diffuser forming a connection between said chambers and maintaining them independent when conducting cooling water, an ejector whose suction inlet communicates with said condensing chamber and whose outlet communicates with the air space above the water in said collecting chamber, and an ejector whose suction inlet communicates with the air space in said collecting chamber.

5. The combination in a jet condenser, of a condensing chamber and a water collecting chamber, a diffuser forming a connection between said chambers and maintaining them independent when conducting cooling water, and a steam actuated ejector whose suction inlet communicates with said condensing chamber and whose outlet communicates with the air space above the water in said collecting chamber.

6. Condensing apparatus comprising condensing and collecting chambers, a passage connecting said chambers, means for producing flow of liquid through said passage and thereby sealing said chambers from each other, and means for increasing the pressure of gas above the liquid in said collecting chamber comprising means for extracting elastic fluid from said condensing chamber and delivering it at higher pressure to said collecting chamber through a passage independent of said first named passage.

7. The combination in a condenser, of independent condensing and water collecting chambers, and means for increasing the pressure in said collecting chamber comprising an ejector removing elastic fluid from said condensing chamber and delivering it at higher pressure into the elastic fluid above the liquid in said collecting chamber.

8. The combination in a condenser, of independent condensing and water collecting chambers, means for increasing the pressure in said collecting chamber comprising an ejector removing elastic fluid from said condensing chamber and delivering it at higher pressure into the elastic fluid above the liquid in said collecting chamber, and means for removing elastic fluid from said collecting chamber.

9. The combination with a condenser having condensing and liquid collecting chambers, of a passage connecting said chambers, means for producing liquid flow through said passage maintaining said chambers independent, a centrifugal pump impeller whose suction inlet communicates with said collecting chamber below the level of the liquid therein, and means for extracting elastic fluid from said condensing chamber and delivering it at higher pressure into the elastic fluid above the liquid in said collecting chamber through a passage independent of said first named passage.

10. The combination with a condenser having condensing and collecting chambers, of a passage connecting said chambers, means for producing liquid flow through said passage maintaining said chambers independent, plural stage ejector apparatus for removing elastic fluid from said condensing chamber, the air space in said collecting chamber forming a connection between stages of said ejector apparatus.

11. The combination with a condenser having condensing and collecting chambers, of a passage connecting said chambers, means for producing liquid flow through said passage maintaining said chambers in-

dependent, a centrifugal pump impeller whose suction inlet communicates with said collecting chamber below the level of the liquid therein, plural stage ejector apparatus for removing elastic fluid from said condensing chamber, said collecting chamber forming a connection between stages of said ejector apparatus.

12. The combination with a condenser having condensing and collecting chambers, of a passage forming a connection between said chambers, means for producing liquid flow through said passage maintaining said chambers independent, a centrifugal pump impeller whose suction inlet communicates with said collecting chamber below the level of the liquid therein, and means for producing above the liquid in said collecting chamber an elastic fluid pressure less than atmospheric pressure and greater than the pressure in said condensing chamber comprising an ejector whose suction inlet communicates with said condensing chamber and whose outlet communicates with said collecting chamber.

In testimony whereof I have hereunto affixed my signature this 7th day of March, 1917.

ROBERT SUCZEK.