

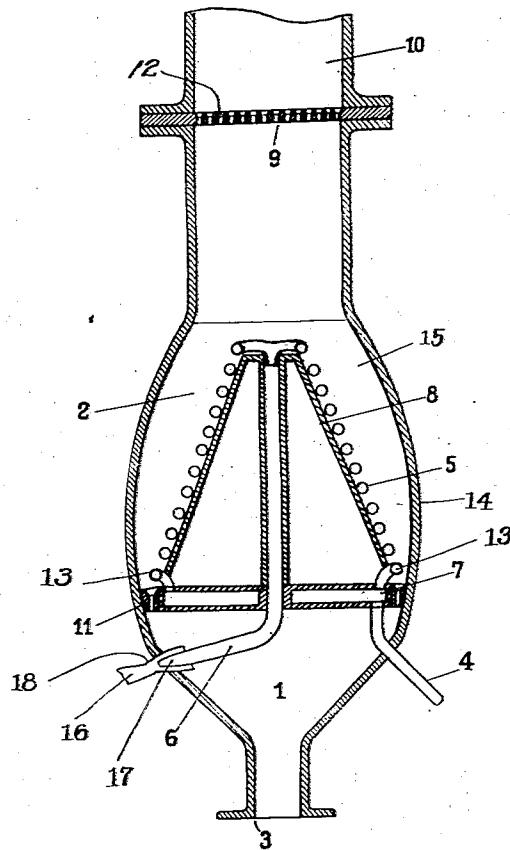
Nov. 15, 1927.

C. METZGER ET AL

CONDENSER

Filed Jan. 12, 1922

1,649,482



Inventors:
Carl Metzger.
Ewald Lüttschen.
By Emory, Booth, Janney & Wemyss, Attys.

UNITED STATES PATENT OFFICE.

CARL METZGER AND EWALD LUETSCHEN, OF MUNICH, GERMANY.

CONDENSER.

Application filed January 12, 1922, Serial No. 528,675, and in Germany January 25, 1921.

The present invention relates to vapour condensing apparatus such as steam condensers of the countercurrent flow type such for example as described in the specification of our British Patent No. 163,970. The operation of a condenser is dependent upon the rate of passage or transfer of heat and this is greatest at the first instant of meeting of two heat-carrying media separated by an intermediate wall for the purpose of interchange of heat. The transfer of heat in counter-current apparatus is thus better than in cross-current or parallel-current apparatus. In barometric or jet condensers the vacuum and consequently the efficiency of the condenser is improved in accordance with the height of fall of the drops. With the present invention the advantages of a barometric condenser are obtained without the inconvenience of its length.

According to the present invention a condenser of the type referred to is characterized by the feature that a nozzle plate is inserted in front of the condenser in order to convert the pressure energy of the exhaust steam into kinetic energy. The casing of the condenser may be formed integrally as a heat reflector and a black body of suitable shape may be located within the casing and the cooling liquid may be conducted through a pipe mounted in or on the surface of the black body so that the pipe is exposed to the incoming jets of steam, heat rays from the black body, and reflected heat rays from the casing.

The rate of transfer of heat is thus increased owing to the increased velocity of the exhaust steam, a smaller cooling surface is thus necessary, and this has the effect of increasing the speed of flow of the cooling water for the same pressure and of further improving the rate of transfer of heat. This improved rate of transfer of heat enables an apparatus of given capacity to be constructed in a very much smaller space than heretofore.

The heat absorbing and transferring body has a hollow base and is so mounted in the casing that the base divides the said casing with an upper chamber and a lower chamber. The base projects like a flange around the

lower part of the heat absorbing body and nozzle like apertures are formed in this flange around the entire periphery of the body. The upper and lower spaces of the casing are connected with one another merely by means of these nozzle apertures. The lower part of the casing is connected with a water pump for drawing off the condensate. Moreover, the lower space can be evacuated by employing the outgoing cooling water to operate as an ejector. The lower part of the black body is formed into a water space into which the cooling water flows so as to impart its initial temperature to the outgoing condensate and so prevent the reforming of steam.

One form of the invention is illustrated in the accompanying drawing which shows a steam condenser constructed in accordance with the invention.

In the lower part 1, a vacuum is obtained by the ejector effect of the discharged cooling water, and by means of the condensate pump. The exhaust steam in the supply pipe 10 endeavours to pass to 1; it, however, has to pass through the nozzle plate 9. This nozzle plate is formed of a good heat conducting material, for example copper, and is formed with apertures serving as nozzles. The number and size of the apertures are determined by the amount of steam to be dealt with. Since in the eduction chamber 1 a partial vacuum prevails, the exhaust steam in passing through the nozzles will have its pressure energy transformed into kinetic energy and will impinge on coils 5 and the conical hollow body 8 with a very considerably greater velocity. 5 and 8 are heat absorbers. In 5, cooling water flows at high speed. 8 is a black body, made, for example, of cast iron or steel having a roughened external surface which is given a black finish whereby it will more readily absorb heat; this blackened body 8 is shaped in the form of a cone which may be either solid or hollow. The pipe 5 may either be sunk in a groove formed in the surface of the black body if the latter is solid, or may be on the surface as shown in the drawing. The black body will thus absorb heat readily and give it up to the pipe 5 or radiate it to the re-

reflecting surface 2, from which the heat is reflected on to 5 and so on.

The casing 2 is a nonconductor of heat and has a heat reflecting lining, and may be made, for example, of earthenware or porcelain, with a glazed internal surface. The internal shape of casing 2 is so arranged that the heat rays reflected back come into contact with the black body.

The cooling water enters at 4, flows through passage 7 and the pipe 5 which is located around the body 8, and then the cooling water passes out through the pipe 6. 6 is constructed in a suitable manner as an ejector 17, in order to induce by means of the outgoing cooling water an evacuation of air and vapor from the lower part 1 of the casing and an acceleration of the condensate from the upper part 2 of the casing to the lower part 1 thereof.

We are aware that it has previously been proposed to use the cooling water from a surface condenser to withdraw air from the condenser by passing it through an ejector.

This acceleration is increased by connecting the space 2 with the space 1 by means of apertures forming nozzles 11 so that an appreciable difference of pressure is maintained between the upper and lower parts of the casing. By reason of this arrangement different pressures prevail in the container. Below the nozzle plate 9, there is a reduction in pressure, owing to the steam being condensed upon coming into contact with the cooling coils 5. The condensate formed thereby fills the nozzles 11 and owing to the suction of the pump and of the ejector 17, it is drawn into the lower part 1 of the casing, since a reduced pressure prevails there.

The lower part of the black body is formed into a passage or chamber 7 and cooling water passes through it before entering pipe 5 so that the lowest temperature of the cooling water is imparted to the lower part of the chamber adjacent to the space 1, and reforming of the condensate into steam is prevented, thus maintaining the vacuum as high as possible. The outlet 3 is connected to a pump to draw out the condensate and air.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be used, we declare that what we claim is:—

1. In a condenser of the class described, in combination, a casing; and condensing means within said casing, said casing being provided with a reflecting surface upon its inner face.

2. In a condenser of the class described, in combination, a casing; a reflecting surface provided on the inner face of said casing; a black, heat absorbing and radiating member within said casing; cooling means within said casing; means to direct the medium to be cooled against said cooling means in

the form of jets, said cooling means being so located within the casing as to receive the heat rays radiated from said black member and those reflected from the reflecting surface of said casing.

3. A condenser comprising a casing, a blackened body located in the casing, means for circulating a cooling medium at the surface of the blackened body for cooling it, and jet-forming means for increasing the velocity of the steam and projecting it into contact with the blackened body, the cooling medium and the steam flowing in substantially opposite directions.

4. A condenser as claimed in claim 3, in which the interior of the casing around the blackened body is polished for reflecting heat rays onto the blackened body.

5. A condenser as claimed in claim 3, in which the cooling medium, as it leaves the condenser, removes uncondensed gas and vapor by ejector action.

6. A condenser comprising in combination a casing, means provided with jet-like apertures, dividing the casing into two parts, a cooling member, having means for circulating a cooling medium therethrough, a nozzle plate for delivering steam against the cooling member, and an ejector operated by the cooling medium, for removing air and vapor from the other part of the casing.

7. A condenser comprising in combination a casing, a cooling member of generally conical shape therein, having means for circulating a cooling medium adjacent its outer surface, means for bringing steam into contact with the cooling member, the steam initially meeting the cooling member at the smaller end thereof, and means for leading away the condensate.

8. A condenser comprising in combination a casing, a cooling member of generally conical shape therein, including means for circulating cooling medium adjacent its surface, means for delivering steam against said cooling member, the cooling medium and the steam traveling in substantially opposite directions, and eduction means for uncondensed gas and condensate.

9. A condenser comprising in combination a casing, a cooling member of generally conical shape therein, including means for circulating a cooling medium therethrough, means for bringing steam into contact with the cooling member, the steam initially meeting the cooling member at the smaller end thereof, the cooling medium and the steam traveling in substantially opposite directions, a partition member in the casing adjacent the larger end of the cooling member defining an eduction chamber, and means for evacuating uncondensed gas and condensate from said eduction chamber.

10. A condenser as claimed in claim 9, having a nozzle member for breaking up the

steam into jets moving at high speed, which jets are projected against the cooling member.

11. The combination as claimed in claim 9, the cooling member being blackened for causing it to absorb heat.

12. The combination as claimed in claim 9,

the interior of the casing being polished for causing it to reflect heat rays onto the cooling member.

In testimony whereof they herewith affix their signatures.

CARL METZGER.

EWALD LUETSCHEN.

10