O. H. MUELLER.

COUNTER CURRENT CONDENSER.

APPLICATION FILED JULY 24, 1909.

952,461.

Patented Mar. 22, 1910.

Fig. 1.

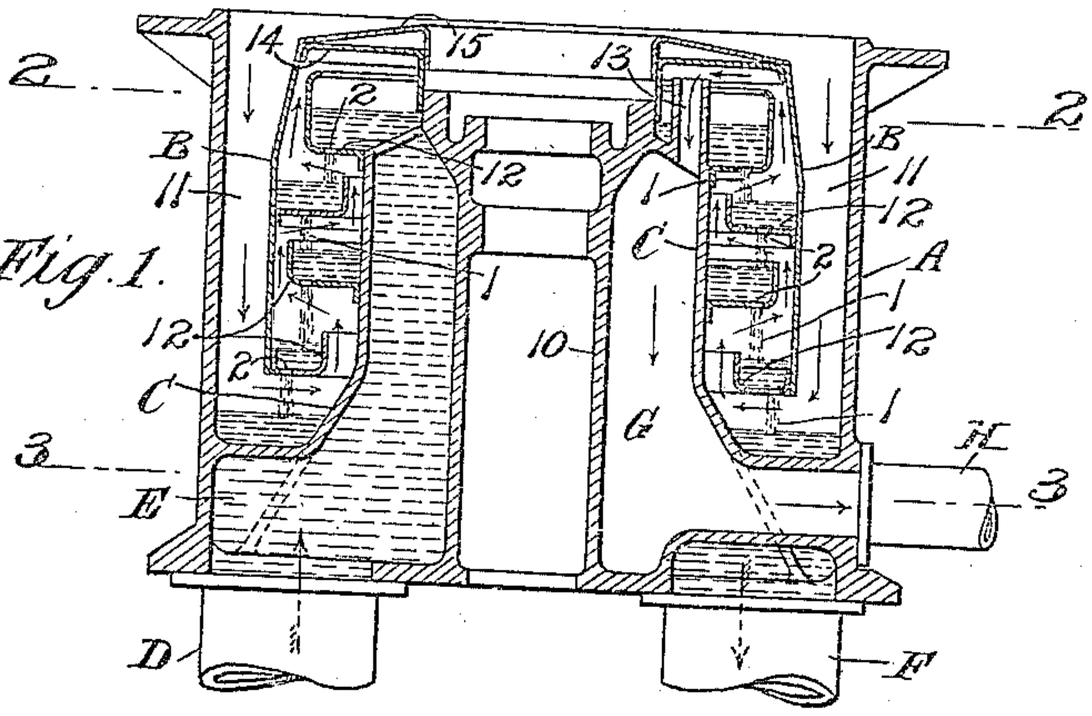


Fig. 2.

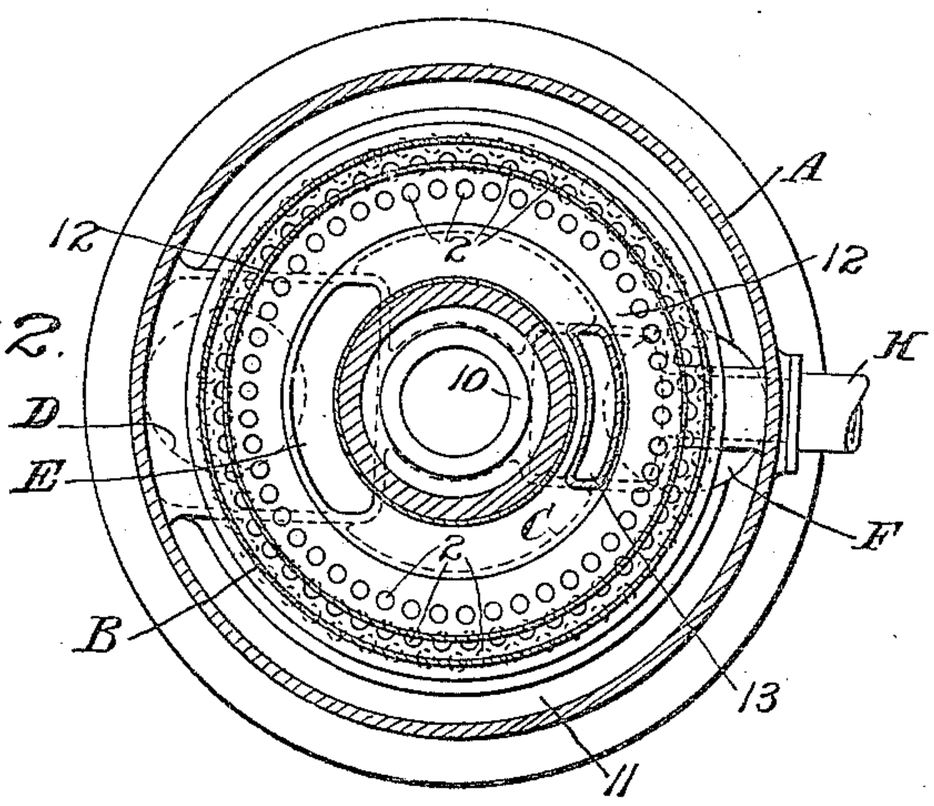
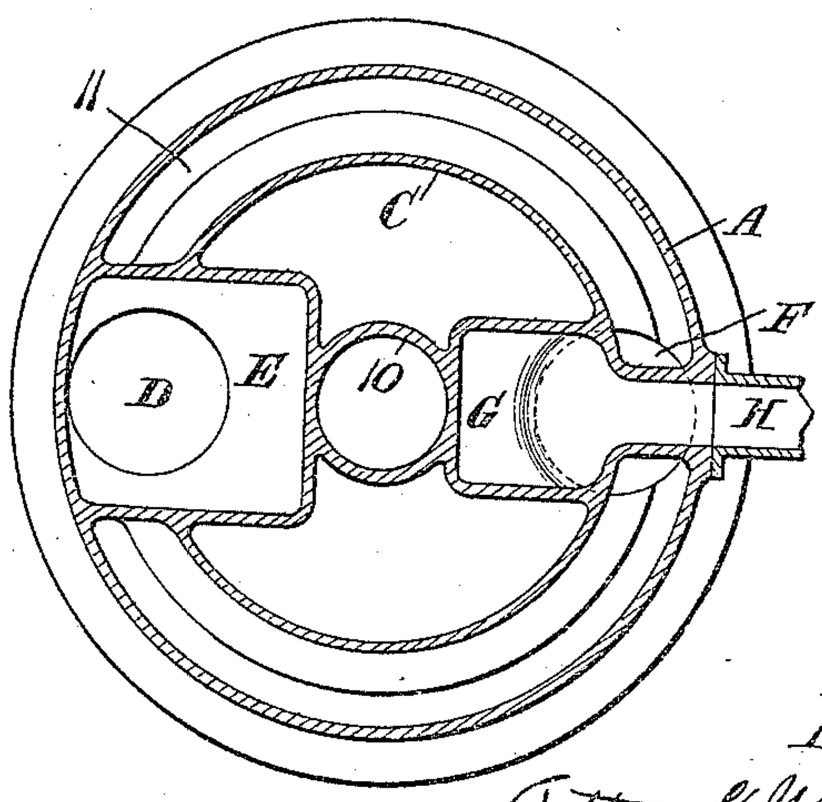


Fig. 3.



Witnesses:
P. T. Tilden
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Inventor:
Otto H. Mueller
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UNITED STATES PATENT OFFICE.

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COUNTER-CURRENT CONDENSER.

952,461. Specification of Letters Patent. Patented Mar. 22, 1910.

Application filed July 24, 1909. Serial No. 509,383.

To all whom it may concern:

Be it known that I, OTTO H. MUELLER, a subject of the German Emperor, residing at Camberwell, county of Kent, England, have invented certain new and useful Improvements in Counter-Current Condensers, fully described and represented in the following specification and the accompanying drawings, forming a part of the same.

This invention relates to jet condensers of that class known as counter current condensers, the especial object of the invention being to provide an improved condenser of that type in which the exhaust steam is admitted to the condenser at the top, and adapted especially for use as a base condenser for turbines. In such constructions, it is important that the total height of the condenser should be as small as possible, and that the injection water entering the condenser and the cooled air withdrawn from the condenser, should not be heated by the exhaust steam. The present invention provides a condenser which secures these results and by which an efficient condensation and high vacuum are obtained with a small amount of condensing water.

In condensers embodying the present invention, a condenser shell is provided in which the exhaust steam enters at the top and passes down in an annular passage between the shell and an inner cylinder and around the bottom of the inner cylinder and upward through jets from water trays, with the air and any uncondensed vapor drawn off from above the trays. The injection water is admitted to the top tray, and the hot discharge water is drawn away from the bottom of the condenser. The top of the inside cylinder is preferably made of two plates with an insulating space between them so as to protect the top tray and air space above it from heating by the exhaust steam entering the condenser. In a turbine base condenser, the casing is formed with the usual central step bearing, which may be provided by a shell within the circle of water trays.

For a full understanding of the invention, a detailed description of a condenser embodying all the features of the same in their preferred form will now be given in connection with the accompanying drawings forming a part of this specification, and the features forming the invention then specifically pointed out in the claims.

In the drawings—Figure 1 is a vertical central section of the condenser; Figs. 2 and 3 are cross sections of the same on, respectively, the lines 2 and 3, Fig. 1.

Referring to the drawings, A is the condenser shell, which is shown as formed for a turbine base condenser, with the central step bearing shell 10 cast therewith. Within the condenser shell A and separated therefrom by an annular space 11 for the exhaust steam, is an inner casing B between which and shell C is formed an annular condensing space, through which the steam passes upward through water jets 1 formed by openings 2 in the bottom of a series of annular inner and outer water trays 12. The injection water enters at the bottom of the condenser through injection pipe D, and passes through chamber E formed between the inner shell C and the central step bearing shell 10, to the top tray, and the discharge water accumulating in the bottom of the condenser is drawn off through discharge pipe F at the bottom of the condenser shell. The injection and discharge pipes D, F are shown as opening downward from the condenser, but they may be arranged at the side of the condenser, low down in the condenser shell. The air is drawn off from the space above the top tray through pipe 13 and chamber G between shell C and the central step bearing shell to air pipe H connected to the usual air pump. Above the top tray is a cover plate 14, and preferably above this a second plate 15, with heat insulating space between them, so as to avoid the direct impingement of the exhaust steam upon cover plate 14, and consequent heating of the air space above the top tray.

The operation of the condenser will be understood from a brief description: The flow of condensing water having been established, the steam entering at the top of the condenser passes through the annular space 11 and around the bottom of the casing B, being thus distributed through the condenser. The steam then passes upward through the water jets, as indicated by the arrows, and substantially as in my United States Letters Patent No. 899,063, dated September 22, 1908, and is thus condensed, the water of condensation and jet water falling

to the bottom of the condenser and being discharged through pipe F. Any air and uncondensed vapor passes over the top tray and downward through pipe 13, chamber G and pipe H to the air pump.

It will be seen that the invention provides a very compact condenser, which is capable of condensing large quantities of steam with a low condenser, reducing largely the vertical dimensions of the structure and the power required for lifting the water. The construction shown also secures a very strong condenser for use as a turbine support, it being possible to cast the casings A, C with the central bearing shell and chambers E, G, in a single piece, as shown, and the bearing shell being efficiently supported and strengthened and the structure tied together by the walls of the chambers and the inner shell C.

It will be understood that the invention is not limited to the exact form or arrangement of parts shown, but that various modifications may be made therein without departing from the invention as defined by the claims.

What I claim is:—

1. In a counter current condenser, the combination of an outer casing open at the top for the admission of exhaust steam, an inner casing separated from the outer casing to form an annular space for the passage of the steam downward, annular water trays within the inner casing provided with openings to form water jets between which the steam passes upward, injection water connections to the top tray, and connections for drawing off air from the upper part of the condenser.

2. In a counter current condenser, the combination of an outer casing open at the top for the admission of exhaust steam, an inner casing separated from the outer casing to form an annular space for the passage of the steam downward, annular water trays within the inner casing provided with openings to form water jets between which the steam passes upward, an injection water chamber and an air chamber formed within the annular trays, said injection chamber connecting with the injection pipe and with the top tray and said air chamber connecting with the air delivery pipe and the space above the trays.

3. In a counter current condenser, the combination of an outer casing open at the top for the admission of exhaust steam, an inner casing separated from the outer casing to form an annular space for the passage of the steam downward, annular water trays within the inner casing provided with openings to form water jets between which the steam passes upward, a bearing shell arranged centrally of the condenser, and an injection water chamber and an air chamber between the bearing shell and the water trays, said injection chamber connecting with the injection pipe and with the top tray and said air chamber connecting with the air delivery pipe and with the space above the trays.

4. In a counter current condenser, the combination of an outer casing open at the top for the admission of exhaust steam, an inner casing separated from the outer casing to form an annular space for the passage of the steam downward, annular water trays within the inner casing provided with openings to form water jets between which the steam passes upward, and means for protecting the space above the trays from heating by the steam entering the condenser.

5. The combination with the outer shell A, of the inner casing B separated from the shell A to form a steam space 11, casing C within casing B, and inner and outer jet trays between casings B and C, substantially as described.

6. The combination with the outer shell A, of the inner casing B separated from the shell A to form a steam space 11, casing C within casing B, inner and outer jet trays between casings B and C, injection water connections from the lower part of the condenser to the top tray, and connections from the space above the trays to an air delivery pipe in the lower part of the condenser, substantially as described.

7. The combination with the outer shell A, of the inner casing B separated from the shell A to form a steam space 11, casing C within casing B, inner and outer jet trays between casings B and C, central bearing shell 10, and chambers E, G between shell 10 and casing C, substantially as described.

In testimony whereof, I have hereunto set my hand, in the presence of two subscribing witnesses.

OTTO H. MUELLER.

Witnesses:
H. D. JAMESON,
R. WILLIAMS.