No. 887,081. PATENTED MAY 12 1908.

W. M. FLEMING.

CONDENSER.

APPLICATION FILED MAY 4, 1907.

Fig. 2.

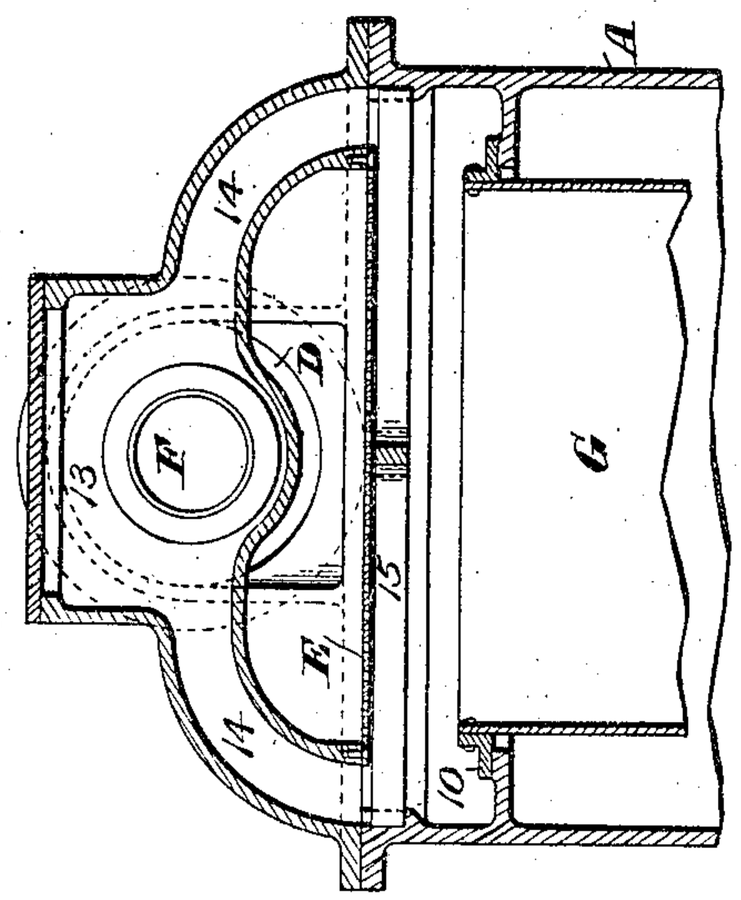


Fig. 3.

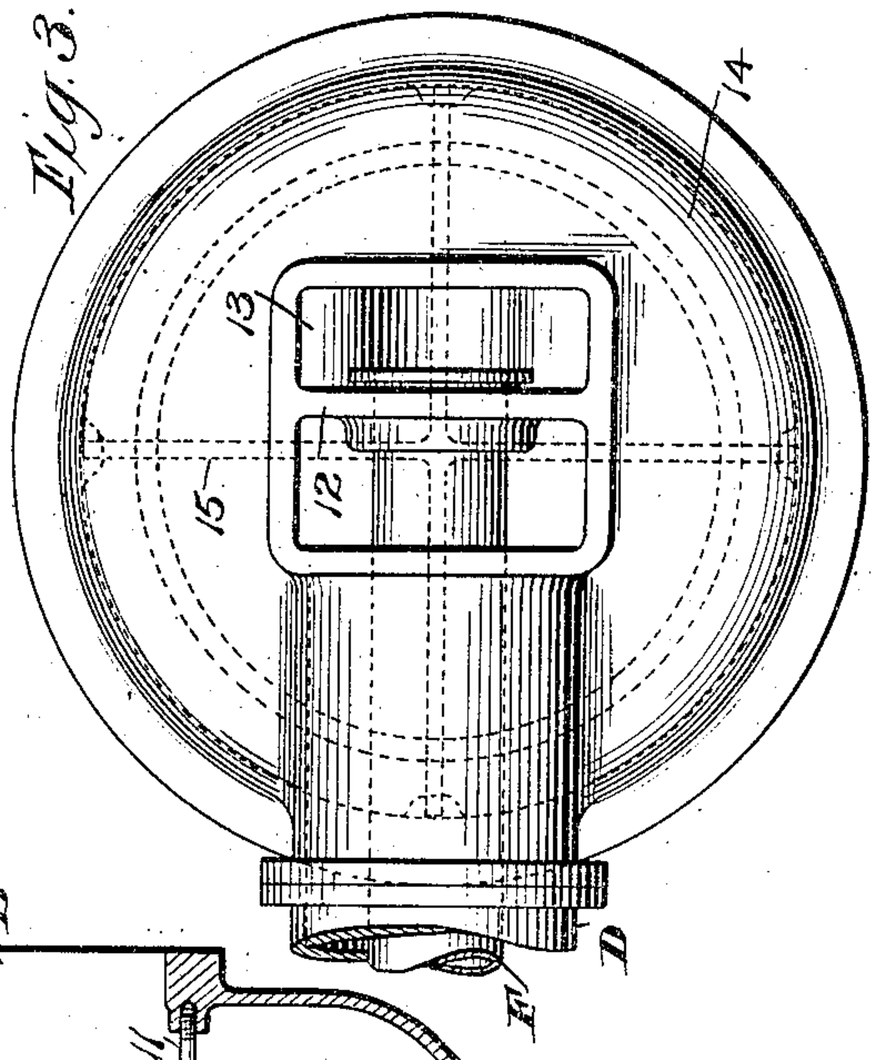
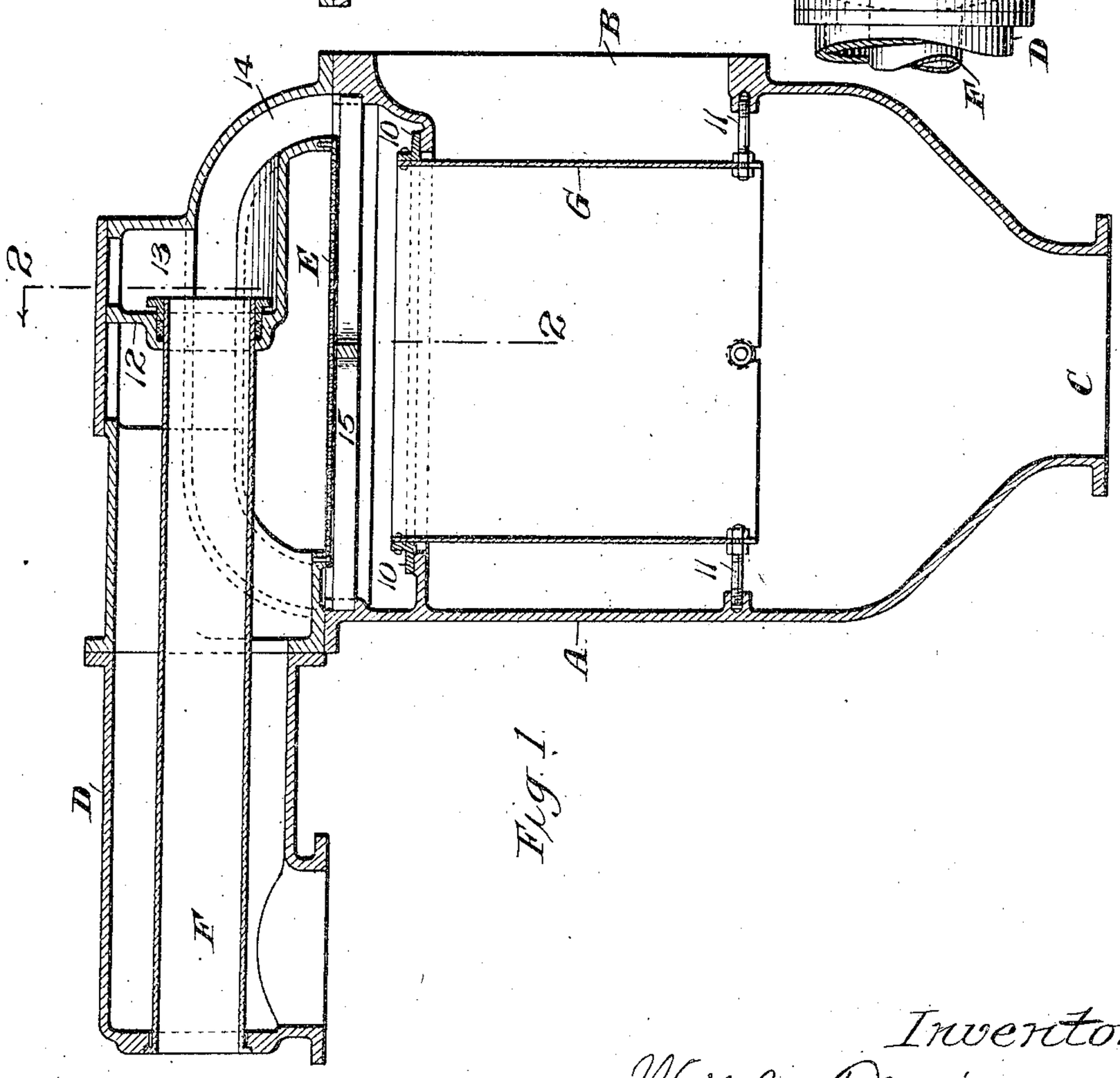


Fig. 1.



Attest:

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UNITED STATES PATENT OFFICE.

WILLS M. FLEMING, OF HOLYOKE, MASSACHUSETTS, ASSIGNOR TO INTERNATIONAL STEAM PUMP COMPANY, OF NEW YORK, N. Y., A CORPORATION OF NEW JERSEY.

CONDENSER.

No. 887,081. Specification of Letters Patent. Patented May 12, 1908.

Application filed May 4, 1907. Serial No. 371,779.

To all whom it may concern:

Be it known that I, WILLS M. FLEMING, a citizen of the United States, residing at Holyoke, county of Hampden, and State of Massachusetts, have invented certain new and useful Improvements in 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 object of the invention being to provide an improved condenser that shall secure a high vacuum with a small amount of condensing water, and further to provide an improved construction for taking off and cooling the air.

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. Fig. 2 is a cross section of the same on the line 2 of Fig. 1. Fig. 3 is a plan view of the condenser with the cover removed.

Referring to the drawings, A is the condensing chamber, B the exhaust steam inlet, C the discharge outlet, D the injection or condensing water pipe from which the injection or condensing water is sprayed into the condensing chamber through spray plate E above the chamber, and F is the air pipe through which air is drawn off from the top of the condenser above the spray plate, this air pipe F extending through the injection pipe D, so as to be surrounded and cooled by the incoming cold condensing water, thus forming an efficient air cooler and supplementary condenser for cooling the air and condensing any condensable vapor that may be carried with the air.

Within the condensing chamber A and opposite the exhaust steam inlet D is a sleeve G open at top and bottom, which may be supported within the condensing chamber in any suitable manner, but is shown as carried by flanges 10 at the top and held in place by bolts 11 at the bottom. The inner end of the air pipe F is supported in a partition 12 which divides the air chamber 13 from the condensing water space, and this air chamber 13 is connected with the upper part of the condensing chamber by large annular passage 14 surrounding the spray plate E except where the injection pipe opens to the space above the spray pipe. The air and water chambers above the condensing chamber are preferably formed by a removable top casting on the condenser with the spray plate E removable from the casting and supported on a grid 15 above the condensing chamber.

The injection or condensing water with the condensed steam are carried away from the discharge outlet C, either by means of a suitable pump or by a barometric tube, and the air and noncondensable vapors are drawn off through tube F by a suitable dry air pump, as usual in this class of condensers.

The operation of the condenser is as follows:—A flow of condensing water having been established, the steam entering at B is distributed around the sleeve G and, as the space about the top of the sleeve is closed by the flanges 10, the steam passes downward over the lower end of the sleeve and strikes the drops of condensing water falling from the spray plate through the sleeve G, the velocity of the steam thus being imparted to the water and securing a certain amount of injector action on the water while the steam is partially condensed. Whatever steam is not thus condensed in the lower part of the condensing chamber, and the air and noncondensable vapors, turn upward and rise through the sleeve G against the descending spray of condensing water, the steam and condensing water moving in opposite directions and thus being in contact for a considerable length of time, so that the best possible condensing action is secured. The air and noncondensable vapors pass upward through the annular passage 14 and air chamber 13 and out to the air pump through air cooler F, which cooler reduces the volume of the air and vapors by lowering their temperature, and precipitates further any condensable vapor that may be carried to the cooler F, so that the air pump receives dry air in small volume.

A very efficient condensing action is secured with the sleeve G arranged as shown, and a very high vacuum may be secured with a small amount of condensing water, so that the condenser is well adapted for steam turbine work. The arrangement of the sleeve

and spray plate permits a large spray plate to be used, so that the perforations may be very small and the water be minutely subdivided, so as to expose the largest possible surface to the steam. This large spray plate, also, is advantageous in that the apparatus will still operate efficiently although some portion of the spray plate becomes clogged.

The construction and arrangement of the air removing devices and air cooler is important. The air is taken off at the top of the condenser above the spray plate, so that moisture is largely separated from the air before it enters the cooler F, and there is no danger of taking over a slug of water into the dry air pump in case of partial flooding of the condenser. The arrangement of the annular air passage around the spray plate gives a large opening area, thus securing a reduced velocity of the air and vapors passing through it, this also aiding in preventing moisture being carried over by the air. It is found in practice that the single air tube F in the construction shown is efficient in securing the desired air cooling and supplementary condensing, no expensive tube cooler being required, although it will be understood that such a tube cooler within the condensing water pipe may be used, if desired in any case.

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

What I claim is:—

1. A counter current condenser having a vertical sleeve in the condensing chamber open at the bottom to the steam to be condensed and through which the condensing water passes downward and a steam inlet admitting steam to the condensing chamber above the bottom of the sleeve.

2. A counter current condenser having a spray above the condensing chamber and a vertical sleeve below the spray open at the bottom to the steam to be condensed and a steam inlet admitting steam to the condensing chamber above the bottom of the sleeve.

3. A counter current condenser having a spray above the condensing chamber, a vertical sleeve below the spray open at the bottom to the steam to be condensed, a steam inlet admitting steam to the condensing chamber above the bottom of the sleeve, and an air pump connection from the condensing chamber above the sleeve.

4. A counter current condenser having a spray above the condensing chamber, a vertical sleeve below the spray open at the bottom to the steam to be condensed, a steam inlet admitting steam to the condensing chamber above the bottom of the sleeve, an air pump connection from the condensing chamber above the sleeve, and an air cooler within the condensing water pipe through which the air passes on its way to the air pump.

5. A counter current condenser having a vertical sleeve, a condensing water spray above the sleeve, and a steam chamber surrounding the sleeve closed at the top about the sleeve and open to the bottom of the sleeve and a steam inlet admitting steam to the chamber above the bottom of the sleeve.

6. A counter current condenser having a vertical sleeve, a condensing water spray above the sleeve, and a steam chamber surrounding the sleeve and a steam inlet admitting steam to the chamber above the bottom of the sleeve closed at the top about the sleeve and open at the bottom to the sleeve, in combination with an air pump connection from the space above the sleeve.

7. The combination with the condensing chamber, of the spray plate E above the chamber, sleeve G below the spray, steam inlet B above the bottom of the sleeve, annular passage 14 surrounding the spray plate, and an air pipe connected with said passage.

8. The combination with the condensing chamber, of the spray plate E above the chamber, annular passage 14 surrounding the spray plate, and an air cooler within the condensing water pipe connected with said passage.

9. The combination with the condensing chamber, of the spray plate above the chamber, annular passage 14 surrounding the spray plate, condensing water pipe D connected with the space above the spray plate, and air cooler F within the condensing water pipe connected to passage 14.

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

WILLS M. FLEMING.

Witnesses:
H. M. CHASE,
C. H. HILLS.