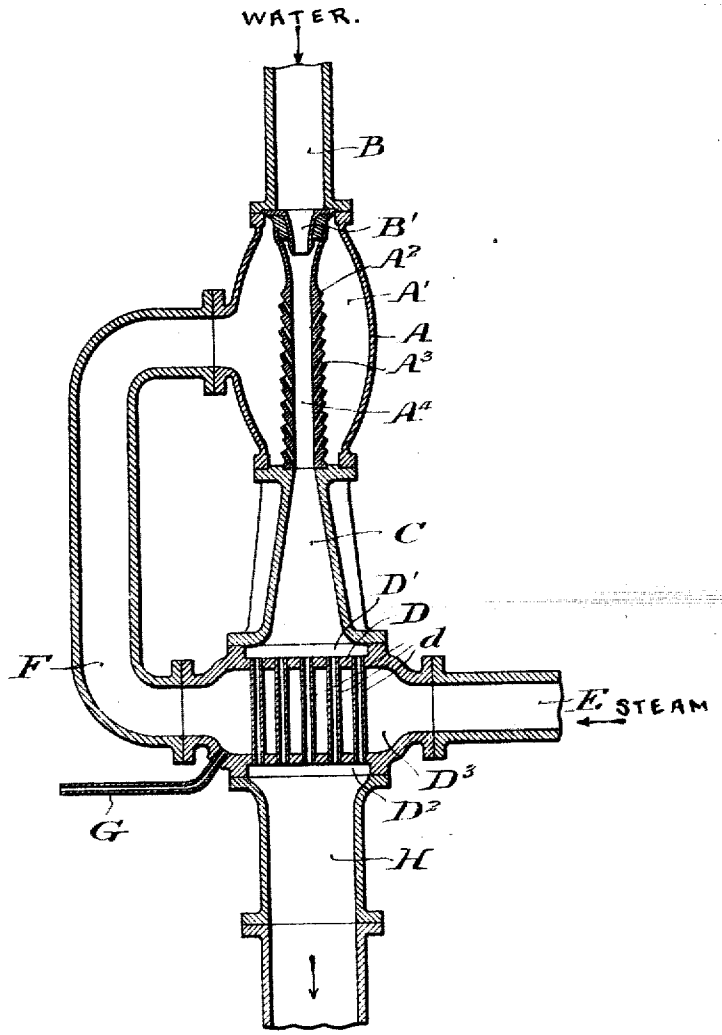
A. W. FISCHER.

APPARATUS FOR CONDENSING STEAM.

APPLICATION FILED OCT. 25, 1913.

1,284,080.

Patented Nov. 5, 1918.



WITNESSES

Daniel Webster Jr.

INVENTOR

Adalbert W. Fischer

BY Francis D. Chambers

his ATTORNEY

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

ADALBERT W. FISCHER, OF PHILADELPHIA, PENNSYLVANIA.

APPARATUS FOR CONDENSING STEAM.

1,284,080. Specification of Letters Patent. Patented Nov. 5, 1918.

Application filed October 25, 1913. Serial No. 797,151.

To all whom it may concern:

Be it known that I, ADALBERT W. FISCHER a subject of the Emperor of Germany, residing in the city and county of Philadelphia, in the State of Pennsylvania, have invented certain new and useful Improvements in Apparatus for Condensing Steam, of which the following is a true and exact description, reference being had to the accompanying drawings, which form a part thereof.

My present invention consists in an apparatus for condensing steam adapted for use in condensing the exhaust steam from steam engines, turbines and the like.

The primary object of the invention is the joint utilization of jet and surface condensers with a view of reducing the bulk and cost of the necessary apparatus, and of obtaining certain advantages ordinarily obtainable exclusively with one or the other type of condenser, without encountering certain corresponding objections or difficulties. More specifically my invention may be said to consist in part in a novel and useful method of condensing steam which enables me to use simple, compact and efficient condensing apparatus, and in part in the apparatus by means of which by improved method is carried on.

In carrying out my invention I employ a jet condenser of common type which serves as the main condensing device, and also operates to create and maintain the desired vacuum. In conjunction with this jet condenser I employ a surface condenser receiving as its cooling water the mixture of condensate and partially heated cooling water discharged from the water outlet of the jet condenser, to condense a portion of the steam passing to the condensing apparatus. Preferably, I pass the steam through the condensing space of the surface condenser and deliver the uncondensed residue thereof to the steam inlet of the jet condenser. By proceeding in this manner I am enabled to effectively utilize the remaining heat absorbing capacity of the water discharged from the jet condenser, which in practice is considerable when the jet condenser serves as the means for establishing and maintaining the vacuum, since under such conditions the temperature of the water discharged from the jet condenser must in practice be considerably below the temperature of the steam at the vacuum which is maintained. In the practical use of the condensing apparatus the jet condenser is relied upon to perform the major portion of the condensing operation, and the apparatus as a whole is characterized by the typically small bulk of jet condensing apparatus as compared with the large bulk of surface condensing apparatus. The surface condensing portion of the apparatus enables me to increase the efficiency of the apparatus by reducing the amount of cooling water required. Furthermore, in the combination of apparatus it is unnecessary to provide any separate air pump, such as is ordinarily required in connection with a surface condenser.

The various features of novelty which characterize my invention are pointed out with particularity in the claims annexed to and forming a part of this specification. For a better understanding of the invention, however, and of the advantages possessed by it, reference should be had to the accompanying drawing and descriptive matter in which I have illustrated and described a preferred and novel form of apparatus by means of which my novel method of condensing steam may be carried on.

The one figure of the drawing is a sectional elevation of a preferred construction embodying my invention.

In the drawing, A represents a jet condenser of common type formed with a mixing nozzle A^2 passing through the steam inlet chamber A′ of the jet condenser and formed with a plurality of inclined inlet ports A^3 leading to the interior of the mixing nozzle A^2 from the steam space. The mixing nozzle receives the cooling water through the supply pipe B and expanding nozzle B′, and delivers cooling water, condensate and air admixed therewith into the usual recompressing discharge nozzle C. The latter discharges into the water inlet chamber D′ of a surface condenser the water outlet chamber D^2 of which is connected to the discharge pipe H running to the cooling tower or other receiver for the condensate and heated cooling water discharged from the condensing apparatus. The water inlet and outlet compartments D′ and D^2 are connected by the usual tubes *d* traversing

the steam space D^3 of the surface condenser. The steam to be condensed by the apparatus is admitted to the steam space of the surface condenser through the steam supply pipe E and the uncondensed residue, which, in practice will be considerably more than half of the steam supplied to the surface condenser, passes from the steam space D^3 of the surface condenser to the steam inlet chamber A′ of the jet condenser through the pipe F. The water of condensation forming in the surface condenser is withdrawn through the pipe G, which may be connected to an ordinary condensate pump. With the apparatus described, however, the condensate pump need not be a mixed air and water pump, as the air and other non-condensable gases or vapors entering the steam condensing space D^3 are swept out of the latter into the jet condenser which discharges them along with the condensate and cooling water.

In order to obtain substantial advantages from the use of the surface condenser in the combination described, the surface condenser need be but a small fraction in bulk of a surface condenser capable of condensing all of the steam passing to the condensing apparatus through the pipe E, and the surface condenser may advantageously be directly connected between the recompressing nozzle C of the jet condenser and the discharge pipe H of the apparatus, as shown in the drawing.

While in accordance with the provisions of the statutes I have illustrated and described the best form of my invention now known to me, it will be apparent to those skilled in the art that changes may be made in the form of apparatus disclosed without departing from the spirit of my invention, and that under some conditions certain features of my invention may be used to advantage without a corresponding use of other features.

Having now described my invention, what I claim as new and desire to secure by Letters Patent, is:

1. Steam condensing apparatus comprising a jet condenser having the usual expanding, mixing and recompressing nozzles and steam inlet chamber, and in combination therewith a surface condenser having a steam space and a cooling water space, the latter comprising tubes in line with and comparable in aggregate cross sectional area with the cross sectional area of said recompressing nozzle and receiving the discharge from the latter, and connections for passing the steam to be condensed by the apparatus into the steam space of said surface condenser and for passing the uncondensed residue from said steam space into the steam inlet chamber of the jet condenser.

2. Steam condensing apparatus comprising a jet condenser having the usual expanding, mixing and recompressing nozzles and steam inlet chamber, and in combination therewith a surface condenser comprising a steam space traversed by cooling water tubes and tube sheets into which the ends of said tubes are connected, said tubes extending parallel to the axis of said recompressing nozzle, one of said tube sheets extending across and closely adjacent to the enlarged end of said recompressing nozzle and being approximately of the same area as the cross sectional area of the larger end of said recompressing nozzle whereby the water discharged through said recompressing nozzle from the jet condenser will pass directly into said tubes, and connections for passing the steam to be condensed by the apparatus into the steam space of said surface condenser and for passing the uncondensed residue from said steam space to the steam inlet chamber of the jet condenser.

ADALBERT W. FISCHER.

Witnesses:
J. B. SLEATZER,
SIMON W. SNYDER.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."