A direct contact steam condenser in which a housing is provided having at least one inlet in the top portion thereof for receiving steam which is directed downwardly through a plurality of chambers defined by a plurality of partitions in the housing. Each partition is formed by a pair of spaced vertical walls having a plurality of openings extending therethrough arranged in a plurality of spaced vertical rows. Cooling water is introduced into the spaces between each pair of vertical walls thereby it is discharged through the openings into the chambers. A plurality of vertically extending deflector plates are supported by the walls adjacent the rows of openings with each deflector plate extending at an angle to its respective wall and over a portion of the openings in its respective row for deflecting the water in a manner to form a continuous film of water.
DIRECT CONTACT STEAM CONDENSER

BACKGROUND OF THE INVENTION

This invention relates to a direct contact steam condenser, and more particularly, to a condenser in which cooling water is mixed directly with the steam to condense same.

Steam condensers in which the cooling water is directed mixed with the steam to condense the steam are generally known. These condensers ordinarily require the water to be introduced into the mixing chamber at relatively high velocities in order to break the water down into fine droplets to effect the requisite heat transfer between the water and the steam. However, this high velocity discharge decreases the contact time between the water and the steam and therefore reduces the heating efficiency. As a result the condenser must be of a relatively large size to insure the requisite heat transfer. Some designs have attempted to reduce the condenser size by employing a plurality of individual nozzles which discharge the water in the form of a film to achieve the necessary heat transfer without the necessity of forming the fine droplets. However, since a very large number of these individual nozzles are required, these designs are expensive.

SUMMARY OF THE INVENTION

It is, therefore, an object of the present invention to provide a condenser which eliminates the need for both a high velocity discharge of the cooling water and a plurality of individual nozzles for discharging the cooling water.

Toward the fulfillment of this and other objects, the condenser of the present invention comprises a housing having at least one inlet in the top portion thereof for receiving steam, a plurality of partitions disposed in said housing and defining a plurality of chambers for receiving steam from a corresponding inlet in a manner so that the steam passes in a generally vertical direction through said chamber, each of said partitions being formed by a pair of spaced vertical walls having a plurality of openings extending therethrough and arranged in a plurality of spaced vertical rows, means for introducing cooling water into the spaces between each pair of vertical walls whereby it is discharged into said chambers through said openings, and a plurality of vertically extending deflector plates supported by said walls adjacent said rows of openings, respectively, each deflector plate extending at an angle to its respective wall and over a portion of the openings in its respective row for deflecting the water in a manner to form a continuous film of water.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view, partially cutaway, depicting the direct discharge condenser of the present invention;

FIG. 2 is an enlarged partial view of a partition of the condenser of FIG. 1; and

FIG. 3 is a sectional view taken along the line 3—3 of FIG. 2 and depicting the water discharge pattern.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to FIG. 1 of the drawings, the reference numeral 10 refers in general to the condenser of the present invention which comprises a housing 12 having a plurality of inlets 14 formed therein for receiving steam. It is understood that the condenser can form a portion of a power plant in which case the condenser would receive steam from a steam turbine, or the like.

The housing 12 is divided into a plurality of chambers by a plurality of vertically extending partitions, three of which are shown by the reference numeral 16 in FIG. 1.

A partition 16 is shown in detail in FIG. 2 and comprises a pair of spaced walls 18 connected by a pair of end plates and side plates one of each of which is shown by the reference numerals 20 and 21, respectively, to form an enclosure. A plurality of through openings 22 are provided in each of the walls 18 and are arranged into a plurality of vertical rows as shown.

A plurality of vertically extending, continuous deflector plates 24 are mounted on each of the walls immediately adjacent each row of openings 22. The plates 24 extend at approximately a 45° angle with respect to the wall and are positioned to project approximately halfway across each of the holes 22 in their respective rows.

Referring again to FIG. 1, a plurality of conduits 26 extend from an external source into the housing 10 and cooperate with each partition 16 to supply cooling water to each chamber through a plurality of openings (not shown) in the lower end plate of the partition.

A pair of air offtake conduits 28 are provided in the upper portion of the housing 12 and extend through the length thereof. The conduits 28 are perforated along their bottom portions so that they receive air which is separated from the steam in the condensation process and transfer same outwardly from the condenser in a conventional manner.

In operation, cooling water introduced into the conduits 26 under a predetermined pressure is discharged outwardly from the openings 22 in the various partition walls 18. The discharging water is deflected by the deflector plates 24 in the general pattern shown in FIG. 3 to form a plurality of continuous film of water in each chamber. As a result, a highly efficient heat transfer is achieved with the steam passing into the condenser through the inlets 14, while the need for a high velocity cooling water discharge and/or individual nozzles is eliminated.

Of course, it is understood that the condenser of the present invention will be provided with the proper outlet or outlets for discharging the condensate formed, consistent with operation in a steam plant, or other similar arrangement.

Of course, other variations of the specific construction and arrangement of the steam condenser disclosed above can be made by those skilled in the art without departing from the invention as defined in the appended claims.

I claim:

1. An apparatus for condensing steam comprising a housing having at least one chamber for receiving steam, at least one wall disposed in said housing and having a plurality of openings extending therethrough arranged in a plurality of spaced vertical rows, means for introducing cooling water to said openings whereby it is discharged into said chamber through said openings, and a plurality of deflector plates supported by said wall adjacent said rows of openings, respectively,
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3. The apparatus of claim 2 wherein there are a plurality of said partitions to form a plurality of chambers in said housing, said housing having an inlet for each of said chambers.

4. The apparatus of claim 1 wherein the steam passes in a general vertical direction through said housing and wherein each deflector plate extends for the entire length of a corresponding vertical row of openings to deflect the water from each opening in said row.

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