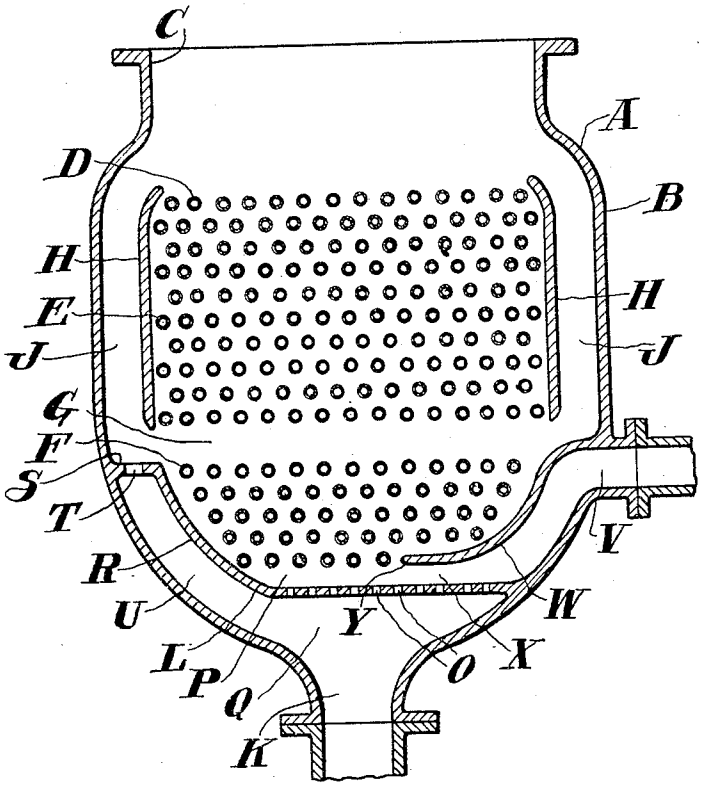
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CONDENSER

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CONDENSER

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This invention relates to condensers, but more particularly to surface condensers in which tubes are arranged in a group or groups and transversely of the steam flow so that the steam intended to be condensed will come into direct contact with the surfaces of the tubes.

One object of the invention is to restore to the condensate a portion of the heat lost during the process of condensation of the steam, and another object is to reduce the volume of the air and uncondensible gases by bringing these elements into intimate contact with the condensate in a region in a condenser in which the condensate has reached its lowest temperature.

Other objects will be in part obvious and in part pointed out hereinafter.

The figure in the drawing is a transverse sectional elevation of a condenser constructed in accordance with the practice of the invention.

Referring more particularly to the drawing, A designates a condenser comprising a casing B at the top of which is an inlet opening C through which the steam intended to be condensed may enter the casing B.

The condenser A is provided with water conveying tubes D arranged transversely of the steam flow and in a plurality of groups, in this instance two groups E and F. In the arrangement shown the group E is disposed near the inlet opening C and the group F beneath the group E and spaced therefrom to form a steam lane G through which steam may flow to the group F.

In order to assure an adequate distribution of steam to the several groups, the casing B is provided with inner walls H which preferably lie closely to the sides of the group E and are spaced from the wall of the casing B to form passages J through which steam may be by-passed from a point above the group of tubes E to the steam lane G.

In accordance with the present invention, means are provided for re-heating the condensate immediately prior to its issuance from the condenser through an outlet opening K which may be in communication with suitable pumping apparatus (not shown) for removing the condensate from the condenser. The means provided for this purpose comprises a wall L which may lie directly beneath the tube group F and is provided with a series of perforations O to divide the condensate into a plurality of streams during its course from the condensing compartment P into a condensate compartment Q adjacent the outlet opening K.

The wall L has an integral inclined or curved portion R which terminates at its uppermost end in substantially the same plane as the uppermost row of tubes of the group F and is connected at this end to the wall of the casing B by means of a lateral wall S which lies across the outlet opening of one of the passages J.

In the wall S is an opening or openings T through which steam may enter the conduit U between the inclined portion R of the wall L and the wall of the casing. Such steam flowing through the conduit U will pass into the condensate compartment Q where it will intermingle with the streams of condensate issuing from the perforations O and will be condensed thereby. In this way the heat of the steam will be transferred to the condensate and thus a portion of the heat lost by the condensate during the process of condensation will be regained prior to the delivery of the condensate to the boilers.

Preferably the condenser is provided with a separate outlet opening V for conveying air and uncondensible gases from the condenser. The outlet opening V in this instance is associated directly with the condensing compartment P and may be in communication with suitable evacuating apparatus (not shown), such as a steam jet or vacuum pump for evacuating the air and gases. In the present instances such air and gases are directed to the outlet opening V by a baffle W corresponding in curvature substantially to that of the adjacent portion of the casing B and a portion of the baffle W overlies a portion of the wall L, thus forming a restricted space X through which the air and gases enter the outlet opening V. The free end or edge Y of the wall S preferably lies in the same transverse plane as the lowermost tubes of the group F so that the air and gases will be

drawn through the condensate at a portion of the condensing compartment in which the condensate reaches its minimum temperature. Due to this arrangement the volume of air and gases will be greatly reduced prior to its evacuation from the condenser.

In the operation of the condenser, steam entering the inlet opening C will flow against the cooled surfaces of the tubes in the group E and will be condensed thereby. At the same time a portion of the steam will be by-passed through the passages J into the steam lane G and will then flow through the tube group F whereby it will be condensed. The condensate from both the groups E and F will flow on the wall L and thence pass through the perforations O into the condensate compartment Q. The condensate is thus divided into a plurality of separate streams with air spaces between them.

At the same time live steam will enter the conduit U through the opening T and will be directed transversely of the direction of flow of the condensate through the perforations O. By its intimate contact with the condensate issuing from the perforations the heat of the steam will be transferred to the condensate and in this way increase the temperature thereof prior to its removal from the condensate compartment Q. The air and uncondensible gases of the stream utilized for reheating the condensate will be drawn through the perforations O and will be removed from the condenser together with the air and gases in the condensing compartment P.

I claim:

1. A condenser, comprising a casing having an inlet opening for steam and an outlet opening for condensate, cooling tubes in the casing divided into groups, passages in the casing for by-passing steam around one group of tubes to another group, a wall beneath the tubes having perforations to divide the condensate into streams and arranged to form a conduit, and an opening in the wall to admit steam from a passage into the conduit for heating the condensate issuing from the perforations.

2. A condenser, comprising a casing having an inlet for steam, a wall dividing the casing into a condensing compartment and a condensate compartment and having perforations for conveying condensate from the condensing compartment to the condensate compartment, said wall having an inclined portion spaced from the casing to form a conduit, an outlet in the casing for the condensate compartment, a plurality of tube groups in the condensing compartment, passages for by-passing steam around one group of tubes to another group, and an opening in the wall to admit steam from one passage into the conduit and the condensate compartment for heating the condensate issuing from the perforations.

3. A condenser, comprising a casing having an inlet for steam, a wall dividing the casing into a condensing compartment and a condensate compartment and having perforations for conveying condensate from the condensing compartment to the condensate compartment, said wall having an inclined portion spaced from the casing to form a conduit, an outlet in the casing for the condensate compartment, a plurality of tube groups in the condensing compartment, passages for by-passing steam around one group of tubes to another group, an opening in the wall to admit steam from one passage into the conduit and the condensate compartment for heating the condensate issuing from the perforations, and an outlet opening in the casing associated with one compartment for conveying air and uncondensible gases from both compartments.

4. A condenser, comprising a casing having an inlet for steam, a wall dividing the casing into a condensing compartment and a condensate compartment and having perforations for conveying condensate from the condensing compartment to the condensate compartment, said wall having an inclined portion spaced from the casing to form a conduit, an outlet in the casing for the condensate compartment, a plurality of tube groups in the condensing compartment, passages for by-passing steam around one group of tubes to another group, an opening in the wall to admit steam from one passage into the conduit and the condensate compartment for heating the condensate issuing from the perforations, and an outlet opening in the casing and associated with the condensing compartment for conveying air and uncondensible gases from both compartments.

5. A condenser comprising a casing having an inlet opening for steam and an outlet opening for condensate, cooling tubes in the casing divided into upper and lower groups, a conduit in the casing to convey a portion of the steam around the upper group and release it into a passage between the groups, and a second conduit in the casing to convey part of the steam from said passage between the groups around the lower group and release it under the lower group for heating condensate flowing from the casing.

6. A condenser comprising a casing having an inlet opening for steam and an outlet opening for condensate, cooling tubes in the casing divided into upper and lower groups, a conduit in the casing to convey a portion of the steam around the upper group and release it into a passage between the groups, a perforated plate beneath the lower group to divide the condensate into streams, and a second conduit to convey part of the steam from said passage between the groups around

the lower group and release it under said perforated plate.

7. A condenser comprising a casing having an inlet opening for steam and an outlet opening for condensate, cooling tubes in the casing divided into groups, passages for by-passing steam around one group of tubes to another group, a wall beneath the tubes having perforations to divide the condensate into streams and arranged to form a conduit, and an opening in the wall to admit steam from a passage into the conduit for heating condensate issuing from the perforations.

In testimony whereof I have signed this specification.

PAUL A. BANCEL.