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J. BLIZARD

2,389,130

SEPARATOR

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Fig. 1.

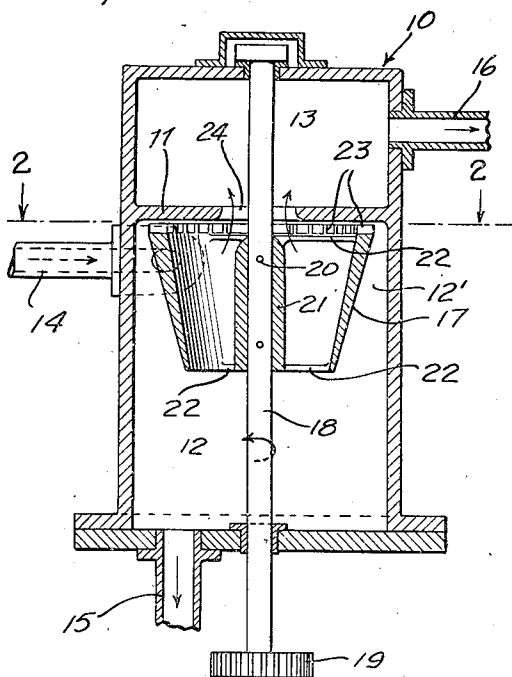


Fig. 2.

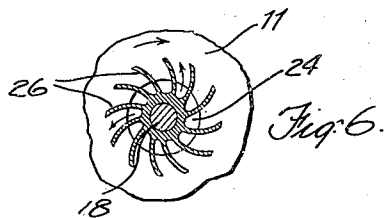
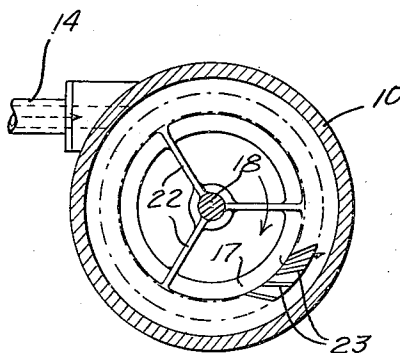


Fig. 3.

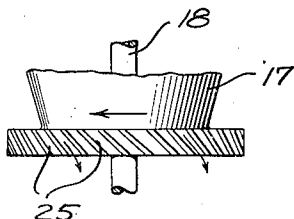
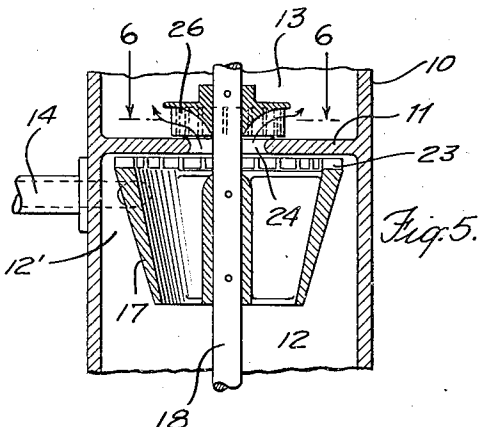
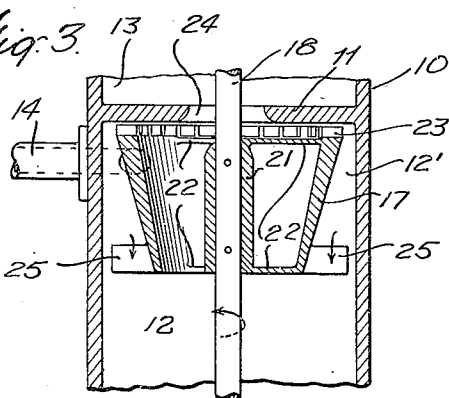


Fig. 4.

INVENTOR
JOHN BLIZARD.
BY *W. H. H. H. H. H.*
ATTORNEY

UNITED STATES PATENT OFFICE

2,389,130

SEPARATOR

John Blizzard, Garden City, N. Y., assignor to
Foster Wheeler Corporation, New York, N. Y.,
a corporation of New York

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5 Claims. (Cl. 183—77)

This invention relates to separators and more particularly pertains to the mechanical separation of substances of different specific gravities from mixtures thereof.

The invention will be disclosed as embodied in apparatus for the separation of steam and water from a mixture of the same, but it will be understood that the invention is not limited thereto but is capable of application generally to the separation of substances of different specific gravities from mixtures of the same.

The invention will be understood from the following description when considered in connection with the accompanying drawing forming a part thereof, and in which:

Fig. 1 is a more or less diagrammatic, vertical sectional view of steam and water separating apparatus embodying the invention;

Fig. 2 is a transverse sectional view taken on line 2—2 of Fig. 1;

Fig. 3 is a view similar to Fig. 1 showing another form of the invention;

Fig. 4 is an elevation of part of the apparatus shown in Fig. 3;

Fig. 5 is a view similar to Fig. 1, showing a further form of the invention, and

Fig. 6 is a transverse sectional view taken on line 6—6 of Fig. 5.

Like characters of reference refer to the same or to similar parts throughout the several views.

Referring to the drawing, reference character 10 designates a stationary housing having a transverse partition 11 which separates the housing into an inlet chamber 12 and an outlet chamber 13. A mixture of steam and water is introduced into the apparatus through a conduit 14, the inner end of which discharges tangentially into the upper part of the chamber 12. Chamber 12 has an outlet 15 in its lower portion for separated water, and chamber 13 has an outlet 16 for separated steam. A rotatable separating member 17 is mounted in the upper part of the inlet chamber 12, on a vertical shaft 18 having bearings in the upper and lower walls of the housing 10. Shaft 18 has a gear 19 at its lower end, as shown, through which the shaft is rotated, during operation of the separating apparatus, in a clockwise direction viewed from the upper end of the apparatus. Separating member 17 is fixed to the shaft 18 by any suitable means, such as the pins 20 which pass through the hub 21 of the member and the shaft. Supporting arms 22 extend between the hub 21 and the annulus of the separating member, at the lower end thereof and adjacent the upper end.

As shown, the inner and outer walls of the member 17 flare upwardly and outwardly but they may be parallel to the axis about which the member rotates, if desired. The outer wall of the member 17 is spaced from the inner wall of the chamber 12 to provide an annular inlet portion 12' for the chamber 12. The upper end of the member 17 is disposed closely adjacent the lower wall of the partition 11 and is provided with vanes 23. The partition 11 has a restricted central outlet opening 24 which is smaller in its largest diameter than the inner diameter of the upper end of the member 17.

In operation, the steam and water mixture enters the upper part of portion 12' of the inlet chamber 12 through conduit 14, and moves in a spiral path downwardly therethrough, causing the separation of some of the water by centrifugal action. The separated water will fall to the bottom of the chamber 12 or run down the vertical wall thereof, and the steam and remaining entrained water will make an abrupt change in direction of flow in the chamber 12, thereby separating out more entrained water which also will fall to the bottom of the chamber, and will pass into the lower or inlet end of the separating member 17 and will flow upwardly therein. Due to the rotation of the member 17 and the whirling movement of the steam and water mixture therein, the water will be thrown to the wall of the member and will move up the outwardly flaring wall to the upper end of the member 17, where it will flow outwardly through the passages between the vanes 23 with a small quantity or "fraction" of steam, and will be thrown against the wall of the chamber 12, down which the water will flow to the bottom of the chamber, to be withdrawn through outlet 15. The steam will flow upwardly through separating member 17 and out the upper or outlet end thereof, and will pass through restricted outlet opening 24 into outlet chamber 13 and will be withdrawn through outlet conduit 16. The water flowing from the upper end of separating member 17 will prevent the flow of steam and water mixture through the relatively small space between the member 17 and the partition 11 from the upper end of portion 12' of the chamber 12 to the interior of the member 17. Vanes 23 will cause the separated water to pass continuously through the small space at the upper end of member 17.

The form of the invention shown in Figs. 3 and 4, is the same as that shown in Figs. 1 and 2, excepting that vanes 25 are disposed on the lower outer wall of the rotating separating member 17

to augment the whirl of the mixture flowing downwardly through the annular portion 12' of the inlet chamber 12. This increase in the velocity of the mixture will increase the separation of the water from the mixture.

The form of the invention shown in Figs. 5 and 6 is the same as the form shown in Figs. 1 and 2, with the exception of the vanes 26 which are fixed to the shaft 18 above the partition 11 and the restricted opening 24 therein, in the path of flow of the steam leaving the separating member 17, to cause the separated steam to do work in propelling the shaft. After the separating apparatus is operating, it may be desirable to drive the shaft 18 and the separating member 17 entirely through the vanes 26, in which event the drive through the gear 19 will be discontinued. It will be understood that the vanes 26 may be used with the vanes 25, if desired.

The embodiments of the invention selected for illustration are preferred forms and changes may be made in the form, location and relative arrangement of the several parts of the apparatus disclosed without departing from the principles of the invention. For example, any suitable means other than the gear 19 shown, may be employed to drive the shaft 18 and the rotating separating member 17, and the inlet conduit 14 may discharge otherwise than tangentially into the inlet chamber 12. Moreover, the separated steam may be conducted directly from the apparatus through the restricted opening 24, thereby eliminating the outlet chamber 13. In view thereof, it will be understood that the invention is not to be limited excepting by the scope of the appended claims.

What is claimed is:

1. Apparatus for the separation of substances of different specific gravities comprising a housing having a substantially circular chamber with upper and lower ends and outlet openings in the upper and lower portions thereof, a separating member within the chamber and spaced from the side wall thereof to provide a substantially annular inlet portion for the chamber, the separating member having a tubular portion with an inlet at the end thereof nearest the lower end of the housing and an outlet at the end thereof nearest the upper end of said housing; said outlet extending adjacent the periphery of the inner wall of the chamber and adjacent the central portion of said member, the inlet of the member and the outlet thereof adjacent the periphery of the inner wall of the chamber being in communication with the chamber and the outlet adjacent the central portion of the member being in communication with the chamber outlet opening, the inner wall of the separating member having an approximately circular transverse cross-sectional configuration, said inner wall flaring outwardly from the inlet to the outlet end of the member, means for rotating the separating member about its longitudinal axis, and a conduit having its discharge end connected with the annular inlet portion of the chamber between the opposite ends of the separating member and adjacent the outlet end of the member.

2. Apparatus for the separation of substances of different specific gravities comprising a housing having a substantially circular chamber with upper and lower ends and outlet openings in the upper and lower portions thereof, a separating member within the chamber and spaced from the side wall thereof to provide a substantially

annular inlet portion for the chamber, the separating member having a tubular portion with an inlet at the end thereof nearest the lower end of the housing and an outlet at the end thereof nearest the upper end of said housing, said outlet extending adjacent the periphery of the inner wall of the chamber and adjacent the central portion of said member, the inlet of the member and the outlet thereof adjacent the periphery of the inner wall of the chamber being in communication with the chamber and the outlet adjacent the central portion of the member being in communication with the chamber outlet opening, the inner wall of the separating member having an approximately circular transverse cross-sectional configuration, said inner wall flaring outwardly from the inlet to the outlet end of the member, means for rotating the separating member about its longitudinal axis, and a conduit having its discharge end connected with the annular inlet portion of the chamber tangentially thereof between the opposite ends of the separating member and adjacent the outlet end of said member.

3. Apparatus for the separation of substances of different specific gravities comprising a housing having a substantially circular chamber with upper and lower end walls and an outlet in the lower portion of the chamber and in said upper end wall, a separating member within said chamber and spaced from the wall thereof to provide a substantially annular inlet portion for the chamber, the separating member having a tubular portion with inlet and outlet openings at its ends and with an inner wall having an approximately circular transverse cross-sectional configuration, said inner wall flaring outwardly from the inlet to the outlet end of the member, the outlet end of the member being closely adjacent the upper end wall of the chamber, a plurality of spaced vanes on the outlet end of the member between said outlet end and the upper end wall of the chamber, the vanes extending toward the side wall of the chamber, said upper end wall having an outlet opening therein smaller than the outlet end of the separating member and disposed substantially coaxially of said member, means for rotating the separating member about its longitudinal axis, and a conduit having its discharge end connected with the annular inlet portion of the chamber between the opposite ends of the separating member and adjacent the outlet end of the member.

4. Apparatus for the separation of substances of different specific gravities comprising a housing having a substantially circular chamber with upper and lower ends and outlet openings in the upper and lower portions thereof, a separating member within the chamber and spaced from the side wall thereof to provide a substantially annular inlet portion for the chamber, the separating member having a tubular portion with an inlet at the end thereof nearest the lower end of the housing and an outlet at the end thereof nearest the upper end of said housing, said outlet extending adjacent the periphery of the inner wall of the chamber and adjacent the central portion of said member, the inlet of the member and the outlet thereof adjacent the periphery of the inner wall of the chamber being in communication with the chamber and the outlet adjacent the central portion of the member being in communication with the chamber outlet opening, the inner wall of the separating member having an approximately circular transverse cross-sectional configuration, said inner wall

flaring outwardly from the inlet to the outlet end of the member, vanes on the lower portion of the separating member extending into said annular portion, means for rotating the separating member about its longitudinal axis, and a conduit having its discharge end connected with the annular inlet portion of the chamber between the opposite ends of the separating member and adjacent the outlet end of said member.

5. Apparatus for the separation of substances of different specific gravities comprising a housing having a substantially circular chamber with upper and lower ends and outlet openings in the upper and lower portions thereof, a separating member within the chamber and spaced from the side wall thereof to provide a substantially annular inlet portion for the chamber, the separating member having a tubular portion with an inlet at the end thereof nearest the lower end of the housing and an outlet at the end thereof nearest the upper end of said housing, said outlet extending adjacent the periphery of the inner

6 wall of the chamber and adjacent the central portion of said member, the inlet of the member and the outlet thereof adjacent the periphery of the inner wall of the chamber being in communication with the chamber and the outlet adjacent the central portion of the member being in communication with the chamber outlet opening, the inner wall of the separating member having an approximately circular transverse cross-sectional configuration, said inner wall flaring outwardly from the inlet to the outlet end of the member, a conduit having its discharge end connected with the annular inlet portion of the chamber between the opposite ends of the separating member and adjacent the outlet end of said member, and means fixed with relation to the axis of the separating member and in the path of flow of the substance of lighter specific gravity flowing from the separating member to impart rotary movement to the member.

JOHN BLIZARD.