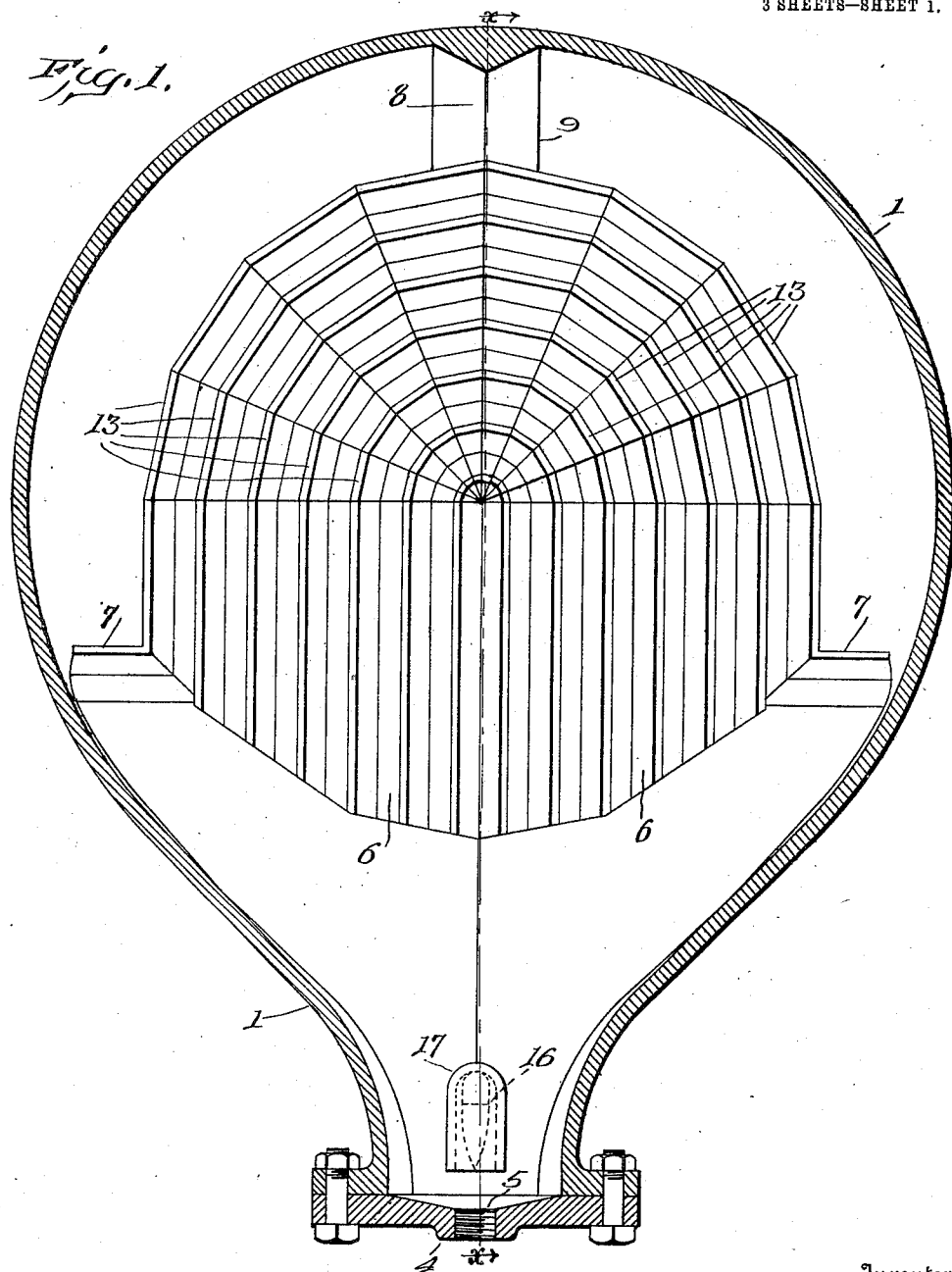


E. D. PACKARD.
STEAM SEPARATOR.
APPLICATION FILED APR. 11, 1908.

1,019,350.

Patented Mar. 5, 1912.

3 SHEETS—SHEET 1.



Witnesses

G. Howard Walmsley.
Edward H. Reed

Inventor
Edwin D. Packard,

By *H. A. Toulmin,*

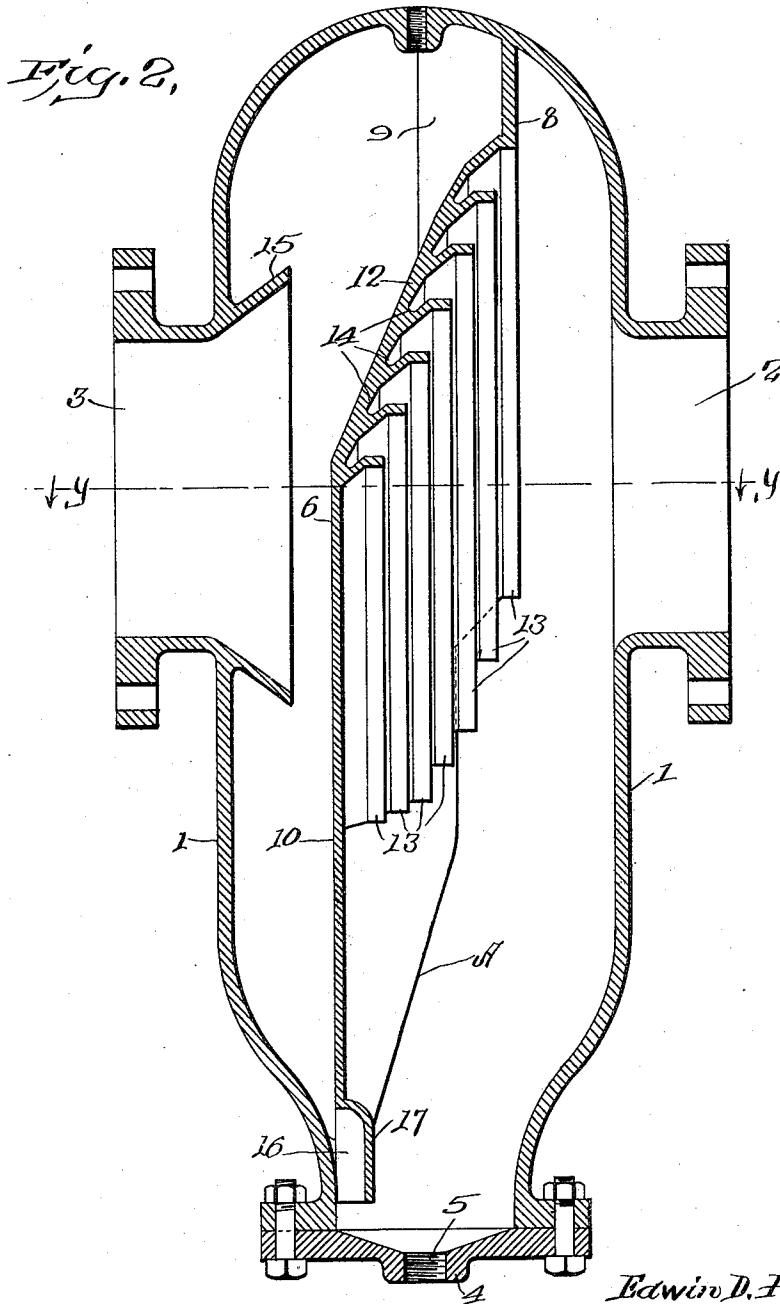
Attorney

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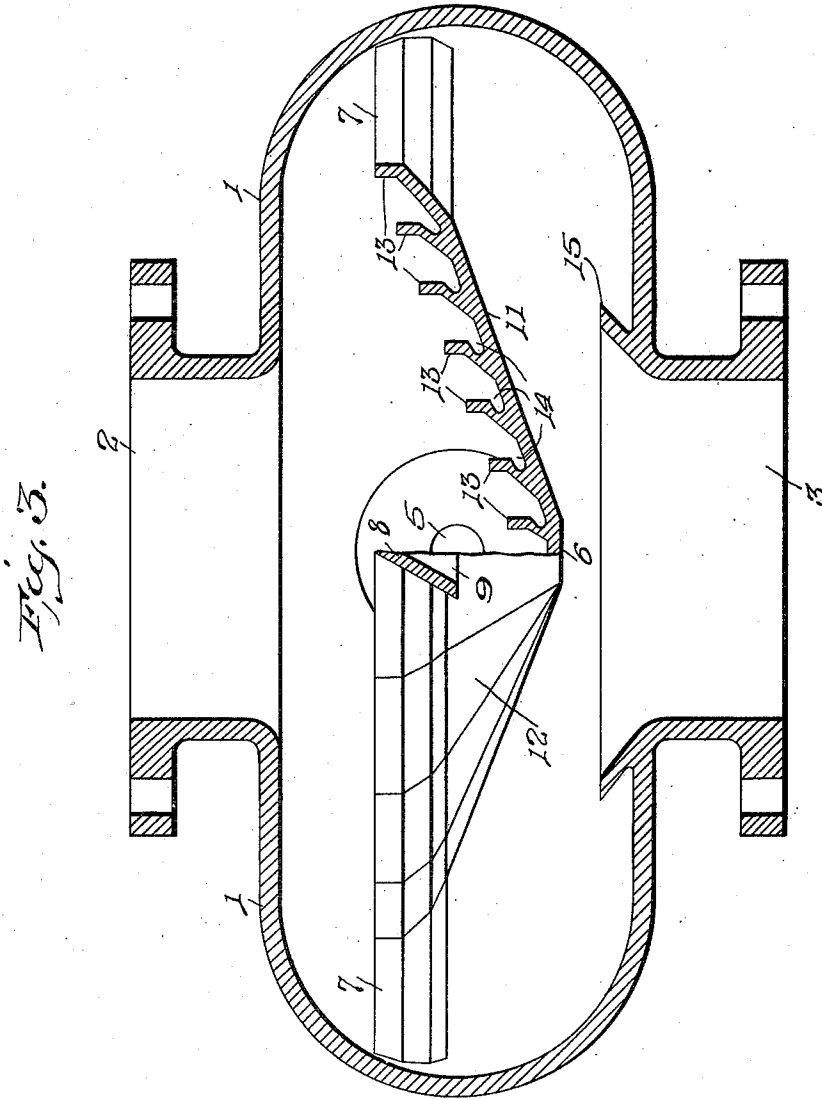
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3 SHEETS—SHEET 3.



Inventor
Edwin D. Packard,

Witnesses

G. Howard Walmsley.
Edward L. Reed

By *H. A. Pauline,*
Attorney

UNITED STATES PATENT OFFICE.

EDWIN D. PACKARD, OF MARION, OHIO.

STEAM-SEPARATOR.

1,019,350.

Specification of Letters Patent.

Patented Mar. 5, 1912.

Application filed April 11, 1908. Serial No. 426,487.

To all whom it may concern:

Be it known that I, EDWIN D. PACKARD, a citizen of the United States, residing at Marion, in the county of Marion and State of Ohio, have invented certain new and useful Improvements in Steam-Separators, of which the following is a specification, reference being had therein to the accompanying drawings.

The present invention relates to steam separators of the kind employed for separating oil and other foreign matter from exhaust steam and for separating the products of condensation from live steam.

The object of the invention is primarily to provide a separator of this character which will separate from the steam the maximum amount of foreign matter and which will occupy a minimum amount of space; further, to provide an improved baffle plate against which the steam impinges as it enters the separator, which will conduct the foreign material which has been separated from the steam out of the path thereof, thus preventing the steam from again taking it up and carrying it beyond the baffle plate; to provide means for further separating any particles of foreign matter which may still be held in suspension when the steam passes beyond the baffle plate; and further, to so construct the baffle plate and to so arrange the ribs thereon as to expedite the removal of the foreign matter from the baffle plate and also to reduce the amount of metal contained in the baffle plate and to facilitate the casting of the same.

With these objects in view my invention consists in certain novel features of construction hereinafter to be described, and then more particularly pointed out in the claims.

In the accompanying drawings, Figure 1 is a vertical section showing the baffle plate in front elevation; Fig. 2 is a vertical section, taken on the line *x x* of Fig. 1; and Fig. 3 is a transverse section, taken on the line *y y* of Fig. 2 showing a top plan view of a portion of the baffle plate.

In these drawings I have illustrated one embodiment of my invention, in which the casing is indicated by the reference numeral 1 and is provided with the usual inlet and outlet openings 2 and 3, respectively, and with a removable bottom plate 4 in which is formed an outlet opening 5. This casing may be of any suitable construction, but is

preferably cast in a single piece, and, as here shown, is substantially circular in a section taken transversely to the flow of steam to the inlet and is of an elongated oval form in a section taken at right angles to the first-mentioned section. Obviously, this construction is capable of very wide variation to adapt the casing to various conditions. The baffle plate 6 is mounted within the casing 1 and extends transversely of or at an angle to the direction of flow of the incoming steam. In shape, this baffle plate corresponds substantially to the contour of the casing, the upper portion of the same being of less diameter than said casing and leaving a space between the casing and the baffle plate, while the lower portion is provided with an outwardly extending portion or projection 7 adapted to engage the outer walls of the casing and support the baffle plate therein. The space lying between the reduced upper portion of the baffle plate and the circumferential wall of the casing above the projection 7 forms the passage through which the steam escapes around the baffle plate. This upper portion of the baffle plate is also provided with a connection 8, extending between the same and the wall of the casing, which serves to further strengthen the baffle plate to withstand steam under a high pressure. This connection I prefer to make in the form of a wedge having its sides 9 diverging in the direction of flow of the steam.

The baffle plate may be of any suitable construction, that here shown consisting of a body portion 10 supported in the lower part of the casing, extending substantially vertical and having its side portions extending forwardly from a central vertical portion and at an angle one to the other, as shown at 11, and having its upper curved portion extending forwardly at an angle to the vertical portion, as shown at 12. This upper portion being curved down to a point where it joins the vertical portion provides a concave baffle plate, the upper portion of which is dish-shaped and the lower portion vertical and the hollow or concave side of which is exposed to the incoming steam. The forward edges of this lower portion of the baffle plate fit closely against the walls of the casing, the baffle plate being in some instances formed integral with the casing, and are preferably inclined rearwardly and downwardly in such a manner as to cause

the same to extend from a point in front of the vertical plane taken through the center of the oval casing to a point in the rear thereof, as shown at A in Fig. 2. Consequently, the diameters of the upper and lower portions of this lower portion of the baffle plate are less than the greatest diameters of the oval casing taken in the same horizontal planes, respectively, as shown in Fig. 1.

Mounted on the concave side of the baffle plate are a series of projections or ribs 13 extending outwardly therefrom and preferably arranged substantially in alinement with the direction of flow of the steam as it enters the casing. As here shown, the ribs or projections are substantially U-shaped, having their upper portions conforming substantially to the contour of half of a polygonal figure, here shown as half of a sixteen sided figure, and their lower portions or legs extending downwardly to a point below the path of the incoming steam and preferably some distance above the bottom of the baffle plate. In the present instance, these legs or lower portions of the ribs are shown as terminating at points equidistant from the center of the baffle plate and removed from the center of the baffle plate a distance equal to the radius of the upper portion of the outermost of said ribs, that is, a distance from the center to one of the angles of said outermost rib. The center of the baffle plate is preferably arranged as here shown, where it lies in substantial alinement with the centers of the inlet and outlet. The several ribs are of equal width, and, as they are arranged concentrically along the inclined surface of the concave baffle plate, the innermost rib being at the greatest distance from the inlet, each succeeding rib projects beyond the outer edge of the preceding rib, thus causing the baffle plate to extend forwardly toward the inlet opening step by step. Each of the ribs 13 is provided on its outer surface with a suitable channel 14 which may be formed in any suitable manner, that here shown being formed by inclining the rearward portion of each rib to the inner face of the inclined portions of the baffle plate, thus forming at the point of connection of the rib and baffle plate a groove or channel leading to the lower portion of the baffle plate and so arranged as to be out of the path of the incoming steam.

While I have herein described the specific form of baffle plate and the particular arrangement of the ribs thereon, it will be obvious that both the construction of the plate and the arrangement and form of the ribs thereon can be varied without departing from the spirit of my invention.

The outlet opening 3 is provided at its inner end with an inwardly flaring flange 15

which serves to form a guard to prevent the passage of foreign matter which may trickle down the walls of the casing through the outlet opening and which further serves to provide an enlarged mouth for the outlet opening and thus facilitate the escape of the steam therethrough. That portion of the chamber, formed by the casing, which lies in the rear of the baffle plate is provided with a hooded channel 16 which permits the foreign matter accumulated therein to escape through the outlet passage, the hood 17 of the channel serving to prevent the impact of the incoming steam from driving back the foreign matter contained within the channel 16.

The operation of the separator will be readily understood from the foregoing description and is, briefly, as follows:—The steam passing through the inlet opening impinges against the baffle plate, and, as the foreign matter coming in contact with the baffle plate will rebound at an angle exactly opposite to that at which it impinges the baffle plate, it will be seen that the inclined surface of the baffle plate will cause the rebounding foreign matter to be thrown into the channels 14, whence it is carried in a direction opposite to the flow of the steam and moves out of the path thereof so that there is no possibility of it again being taken up by the steam and carried beyond the baffle plate. The lower portion of the baffle plate being free from obstruction affords less surface over which the downwardly moving foreign matter may spread itself and thus causes the same to accumulate in larger quantities, the increased weight of which and the reduced amount of resistance offered to the same greatly expedite the removal of the foreign matter from the surface of the baffle plate and out of the path of the incoming steam. The inclination of the baffle plate also serves to cause the steam to be forced backward after it impinges the baffle plate before it can escape around the edge of the same, thus causing it to come successively in contact with the several projections or ribs 13 and to be thrown against the wall of the casing before it can escape beyond the baffle plate, thus serving to effectually remove the foreign matter therefrom, and, as the steam passes around the edge of the baffle plate, the wedge 8 divides or splits the current of steam into two parts and causes the foreign matter contained therein to be thrown against the walls of the casing in the rear of the baffle plate, and in this way what little foreign matter has remained suspended in the steam when it has passed the projections on the baffle plate is removed therefrom. As this matter trickles down the rear wall of the casing, it is prevented from passing through the outlet opening with the outgoing steam by means of the

inclined flange 15 which surrounds the inner end of the outlet and forms a trough or channel which effectually prevents the entrance of the foreign matter into the outlet opening. This inclined flange also forms a flared mouth which greatly facilitates the escape of the steam from the casing.

Thus, it will be seen that I have provided a steam separator which is of simple construction, which combines means for separating the foreign matter from the steam and which greatly increases the area of the baffle plate without materially increasing the size of the separator as a whole; further, that I have provided an improved baffle plate having ribs or projections approaching the inlet opening step by step, against which the incoming steam impinges and which serves to remove the greater portion of the foreign matter therefrom; that the several ribs of this baffle plate are provided with channels or conduits which serve to conduct the foreign matter, which has been separated from the steam, out of the path thereof and into the lower portion of the casing; further, that these ribs terminating above the bottom of the baffle plate, leave the lower portion thereof without obstruction, thus greatly expediting the removal of the foreign matter; that I have provided an auxiliary separator in the form of the wedge 8 which deflects the steam against the sides of the casing after it has passed the baffle plate, thus separating therefrom any particles of foreign matter which may have remained suspended in the same after it has passed the baffle plate; and further, that I have provided a baffle plate of such a construction as to greatly facilitate the casting thereof and to reduce the weight of the material contained thereon, thereby reducing the cost of manufacturing the same.

I wish it to be understood that I do not desire to be limited to the exact details of construction shown and described, for ob-

vious modifications will occur to a person skilled in the art.

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

1. A steam separator comprising a casing having an inlet and an outlet, a baffle plate mounted within said casing and having its sides converging away from said inlet and provided with a series of substantially U-shaped ribs arranged concentrically on the faces of said converging sides adjacent to said inlet and extending at an acute angle to said baffle plate to form channels at their points of connection therewith.

2. A steam separator comprising a casing having an inlet and an outlet, a baffle plate mounted within said casing and having a series of substantially U-shaped ribs concentrically arranged thereon, each succeeding rib extending beyond the outer edge of the preceding rib, and a wedge-shaped member connecting the upper end of said baffle plate to said casing and adapted to direct the steam against the sides of said casing.

3. A steam separator comprising a casing having an inlet and an outlet, a concave baffle plate mounted within said casing, having portions of its edges secured to the inner walls of said casing and having the upper portion of its edges spaced away from the walls of said casing, a series of ribs secured to the concave face of said baffle plate, and a wedge-shaped deflector mounted between the upper edge of said baffle plate and the wall of said casing, said deflector being arranged with its sides diverging in the direction of flow of the steam.

In testimony whereof, I affix my signature in presence of two witnesses.

EDWIN D. PACKARD.

Witnesses:

L. D. ZACHMAN,
J. H. WETMORE.