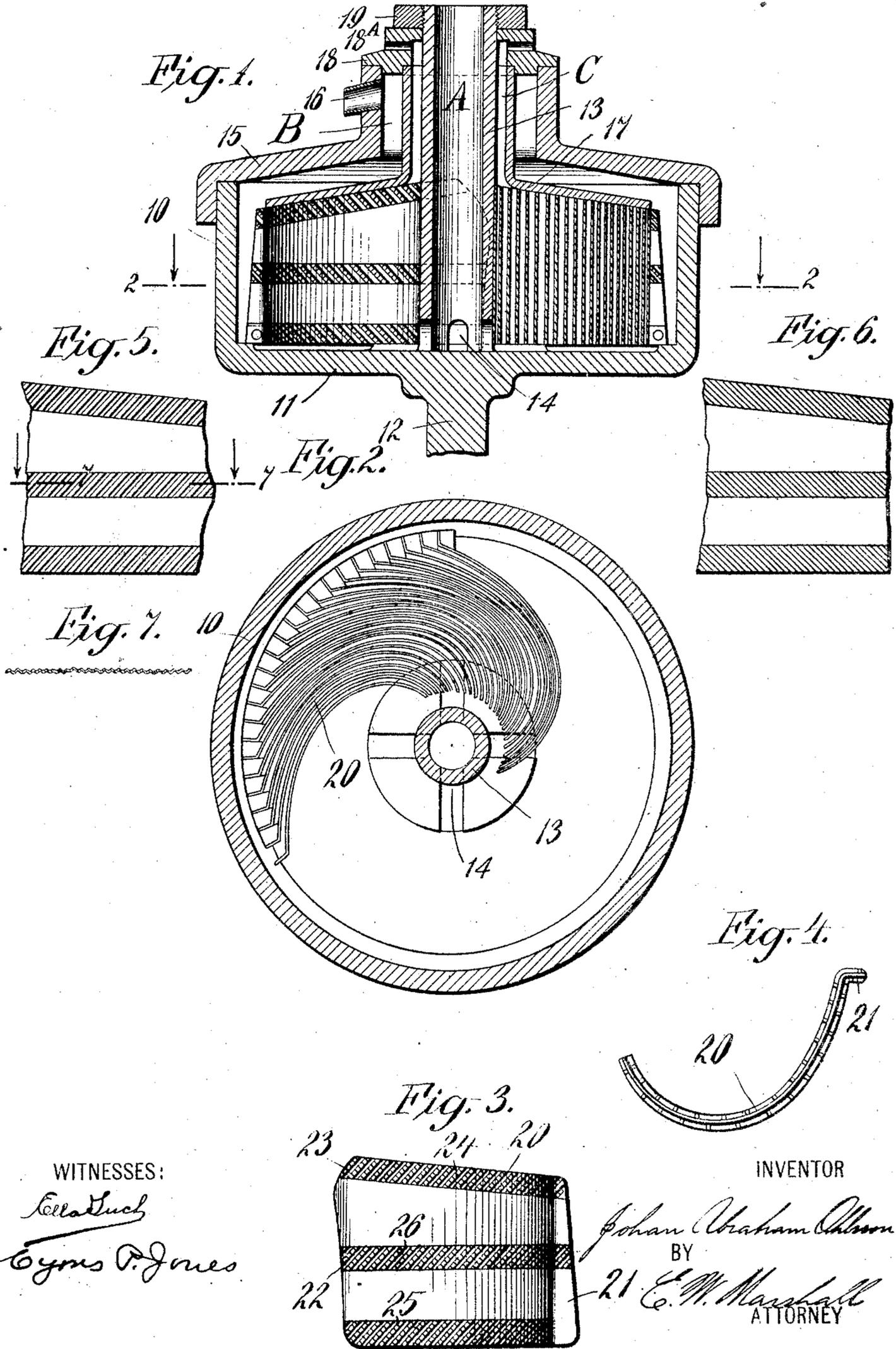


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 LINER FOR CENTRIFUGAL SEPARATORS.  
 APPLICATION FILED AUG. 3, 1907.

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# UNITED STATES PATENT OFFICE.

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## LINER FOR CENTRIFUGAL SEPARATORS.

No. 929,697.

Specification of Letters Patent.

Patented Aug. 3, 1909.

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To all whom it may concern:

Be it known that I, JOHAN ABRAHAM OHLSSON, a subject of the King of Sweden, and a resident of the city of New York, in the county of New York and State of New York, United States of America, have invented certain new and useful Improvements in Liners for Centrifugal Separators, of which the following is a specification.

My invention relates to liners for centrifugal separators and consists in the design and construction of liners for apparatus for the separation of the constituents of liquids under the action of centrifugal force.

I will describe my invention in the following specification and point out the novel features thereof in claims.

Referring to the drawings, Figure 1 is a sectional side elevation of a simple form of centrifugal liquid separator with my improved liners applied thereto. Fig. 2 is a sectional plan view of the same through the line 2—2 of Fig. 1. Fig. 3 is a side elevation and Fig. 4 a plan view of one of my improved liner blades. Figs. 5 and 6 are side elevations of portions of liner blades made according to a modification of my invention, and Fig. 7 is a sectional plan view of a liner of the form of construction illustrated in these Figs. 5 and 6, the section in this view being taken through the line 7—7 of Fig. 5.

Like characters of reference designate corresponding parts in all of the figures.

10 designates a cylindrical separator bowl closed at the bottom by a base 11 from which depends a spindle or shaft 12 by means of which the bowl may be rotated about its vertical axis. A hollow core 13, which may be integral with the bowl, extends upward to a height somewhat greater than that of the sides of the bowl. The lower end of this core is provided with openings 14 which form connecting passages between the inside of the core and the bowl proper.

15 is the top or cover of the bowl which is arranged to fit tightly over the upper portion of the sides of the latter and which is provided near its upper portion with an outlet passage 16.

20 designates a liner blade or plate which I will particularly describe hereinafter. A plurality of these blades is placed within the bowl 10 between its central core and the side walls. The base 11 of the bowl upon which these blades rest is constructed as shown to

support the blades near the central core and also near the side walls, but are so arranged that no obstruction is formed to the flow of fluid below the blades.

Above the series of liner blades a collar 17, which is shaped to conform to the tops of the blades, is placed. A clamping collar 18 is placed above the core 13 and above the collar 17, and in this clamping collar 18 one or more holes 18<sup>A</sup> are drilled. A lock-nut 19, upon the upper end of the core 13 which is threaded as shown, serves the purpose of clamping together the various parts above described and holding them securely in place.

Centrifugal liquid separators of the general type above described are in common use and are well known. It is the purpose of the present invention to improve upon the liners of such separators in a simple and inexpensive manner. To this end I have invented a novel liner which is made up of a plurality of blades. The blades are constructed of thin sheet aluminum or other suitable metal. They are curved as shown in Figs. 2 and 4 and are arranged to lie in close proximity to each other when placed within the separator bowl 10. At their outer ends they are bent at an angle to form projecting portions 21. These projecting portions are tapered inward from the bottom as shown in Fig. 3. This figure also shows at 22 that the inner end of each blade is tapered inward from the top and that its upper corner is rounded off as shown at 23. The surfaces of these blades are smooth, except at the portions designated at 24, 25 and 26, at which portions three ribbed bands pass across the blades on both of its sides near its upper and lower edges and at an intermediate position between the edges. These portions of the blades which form the bands are so constructed that they form a series of oblique parallel ribs with intervening spaces between the ribs. These ribs which are on the convex side of the blades are inclined from right to left upward as represented by solid lines, and those on the concave side of the blades are inclined in the opposite direction as represented by dotted lines. The ribs preferably project above the surface of the blade a small amount and the intervening spaces may be even with the surfaces or may be made slightly depressed below them. In this form of my invention I prefer to have

the intervening spaces between the ribs even with the plain surfaces so that the blades may be made as thin as practicable. As many of these liner blades of the shape and construction above described as the space will conveniently allow are placed in the separator bowl 10 between its side walls and the hollow core 13 and are held therein in the manner previously described. Because of their peculiar shape these blades, at all points except the end portion 21, intersect radii from the axis of the bowl. The portions 21 are provided for the purpose of holding the ends of the blade at the proper distance from the side walls of the bowl.

In operating this apparatus the separator bowl is rapidly rotated, and the liquid to be separated into its constituent elements is admitted through the center A of the hollow core 13. It may flow freely under the liner blades and as it passes between them, it is subjected through their rotation to the action of centrifugal force. This causes the heavier components to be thrown outward toward the side walls of the bowl and at the same time the lighter elements or components are forced inward toward the core. As the liquid rises through the liner it thus becomes broken up into its heavier components which pass up through the passage B and out through the opening 16, and its lighter components pass up through the passage C and out through the holes 18<sup>A</sup>.

It has been found that if the liquid is divided up into a large number of thin strata or laminae while being subjected to the action of centrifugal force, the effectiveness of the operation is increased, and in some cases the thinner these laminae the greater will be the efficiency of the apparatus. By the use of my improved liner the greatest efficiency is obtained. The various blades are closely packed together in the manner described and are only held apart by the small projecting ribs on the convex surfaces of one blade resting against the ribs on the concave surface of the next adjacent blade. As these ribs are inclined in opposite directions they cross each other and thus form substantial means of separating the blades with sufficient strength to withstand the great internal pressure to which the blades are subjected. The smooth surfaces between the bands of inclined ribs are held apart in this manner but a few-thousandths of an inch, and in the spaces formed between these smooth surfaces a greater part of the separation takes place. As the intervening spaces between the ribs on the concave surface of the blades are inclined upward toward the side walls of the bowl they form passages for the upward and outward flow of the heavier components of the liquid, while the spaces between the ribs on the convex surfaces are inclined in the opposite direction so that they form passages

for the upward and inward flow of the lighter components. These oppositely inclined passages also tend to set up eddies in the liquid in the spaces between the smooth surfaces and thereby assist in the separation of the liquid.

In the modification illustrated in Figs. 5, 6 and 7, the blades are made of the same general shape with smooth surfaces crossed by bands of ribs and depressions, but in this case the banded portions of the blades are composed of corrugations as may be clearly seen in Fig. 7, and these corrugations are inclined to the vertical axis. As these corrugations necessarily make the incline of the ribs in the same direction on both sides of the blades I construct these blades in pairs with the corrugations on one of the blades inclined in one direction as is illustrated in Fig. 5, and the inclines on the other blade of the same pair in the opposite direction as is shown in Fig. 6. In placing these blades within the separator bowl I alternate the blades so that the corrugations on each blade will cross those on the next adjacent blades. The operation of the apparatus when supplied with this form of liner is similar to that already described.

What I claim is—

1. A centrifugal separator liner comprising a plurality of blades, each of said blades having a smooth surface, and a transversely disposed band of inclined ribs across said surface. 95
2. A centrifugal separator liner comprising a plurality of blades, each of said blades having a smooth surface, and transversely disposed bands of inclined ribs crossing said surface longitudinally. 100
3. A centrifugal separator liner comprising a plurality of blades, each of said blades having a smooth surface on both of its sides, and a transversely disposed band of ribs crossing both of said surfaces, the ribs being set obliquely across the band. 105
4. A centrifugal separator liner comprising a plurality of blades, said blades having a smooth surface on both of their sides, and a band of inclined projecting ribs crossing both of said surfaces longitudinally, the ribs on one of said surfaces being inclined in the opposite direction to the incline of the ribs on the other surface. 110
5. A centrifugal separator liner comprising a plurality of blades, said blades having a smooth surface on both of their sides, three projecting ribbed bands on each side of said blades, one of the bands crossing the surface near its upper edge, another of the bands crossing the surface near its lower edge, and the third of said bands crossing the surface intermediate the other two bands. 115
6. A centrifugal separator liner comprising a plurality of blades, said blades having a smooth surface on both of their sides, three 120

bands of inclined projecting ribs on each side of said blades crossing the blades longitudinally, one of the bands crossing the surface near its upper edge, another of the bands crossing the surface near its lower edge, and the third of said bands crossing the surface intermediate the other two bands, the ribs of the bands on one side of said blades being inclined in the opposite direction to the incline of the ribs on the other surface.

7. A centrifugal liner comprising a plurality of curved blades arranged with the convex surfaces of each blade facing the concave surface of the next adjacent blade, each of said blades having a smooth surface on both of its sides and a band of inclined projecting ribs crossing both of said surfaces longitudinally, the ribs on one side being inclined in the opposite direction to the incline of the ribs on the adjacent side of the next blade.

8. In a centrifugal separator, a rotatable separator bowl, a plurality of curved liner blades within said bowl, each of said blades having a smooth surface, and a transversely disposed band of inclined projecting ribs crossing said surfaces longitudinally, said projecting ribs constituting means for holding the blades a fixed distance apart.

9. In a centrifugal separator, a rotatable separator bowl, a plurality of curved liner blades vertically disposed within the bowl, said blades having smooth surfaces upon both of their sides, and bands of inclined ribs projecting from said surfaces, the ribs on one side being inclined in the opposite

direction to the incline of the ribs on the adjacent side of the next blade and arranged to contact therewith to hold the blades a fixed distance apart.

10. In a centrifugal separator, a rotatable separator bowl, a plurality of curved liner blades vertically disposed within the bowl, said blades having smooth surfaces upon both their concave and convex sides, and bands of inclined ribs projecting from said surfaces, the ribs on the concave side of the blades being inclined upward and outward, and the ribs on the convex side of the blades being inclined upward and inward.

11. In a centrifugal separator, a rotatable separator bowl, a plurality of curved liner blades vertically disposed within the bowl, each of said blades having smooth surfaces upon both of its sides, three bands of inclined projecting ribs on each side of said blade crossing the blade longitudinally, one of the bands crossing the surface near its upper edge, another of said bands crossing the surface near its lower edge and the third of said bands crossing the surface intermediate the two bands, the ribs on one side being inclined in the opposite direction to the incline of the ribs on the adjacent side of the next blade, and being arranged to contact therewith to hold the blades a fixed distance apart.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

**JOHAN ABRAHAM OHLSSON.**

Witnesses:

**ELLA TUCH,  
ERNEST W. MARSHALL.**