No. 750,668.

PATENTED JAN. 26, 1904.

A. LIEDBECK.

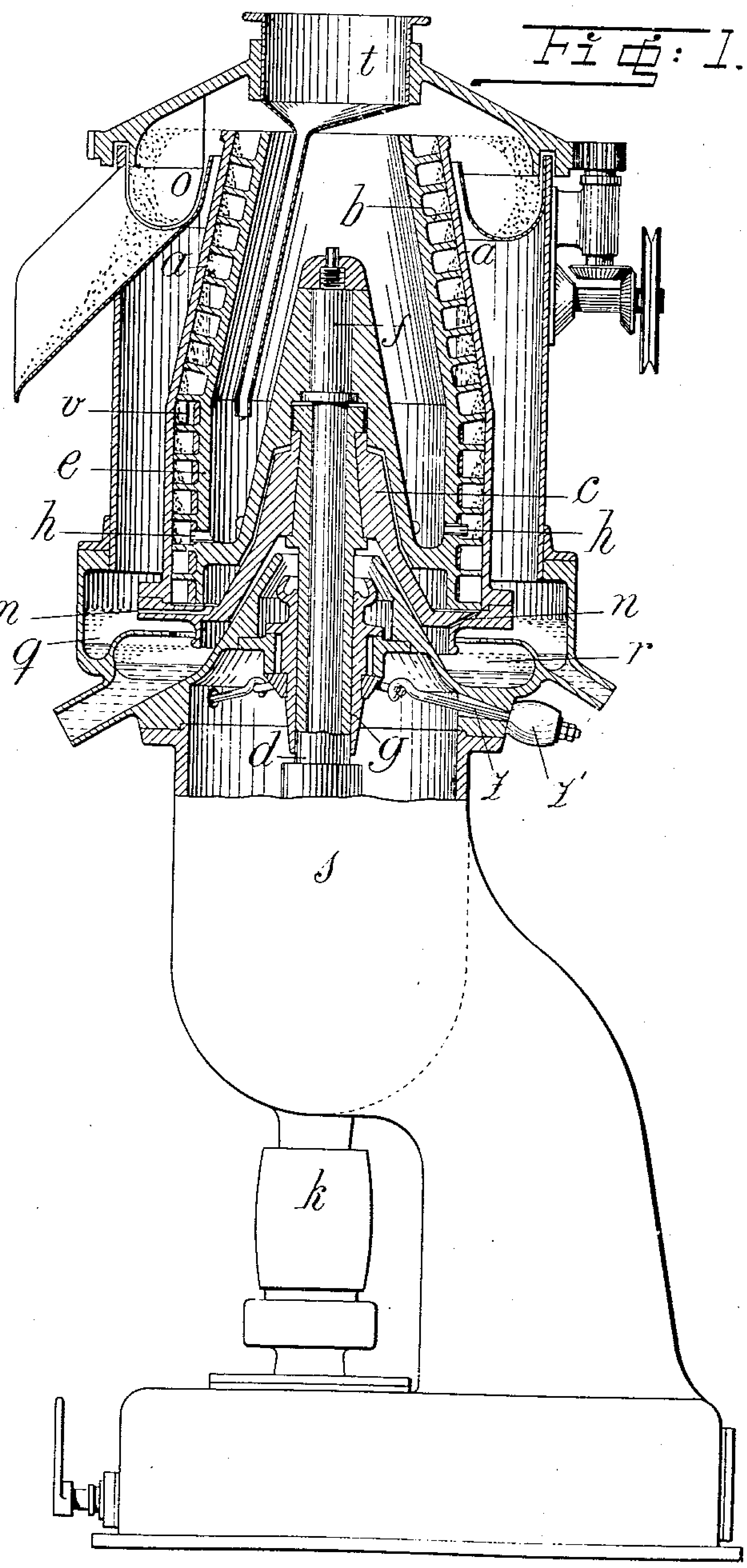
CENTRIFUGAL APPARATUS.

APPLICATION FILED OCT. 27, 1903.

NO MODEL.

2 SHEETS—SHEET 1.

Fig: 1.



Witnesses:
Helen Wechsler.
Christine Keeley

Inventor:
Alarik Liedbeck,
By H. A. de Vos
Attorney.

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NO MODEL. 2 SHEETS—SHEET 2.

Fig: 2.

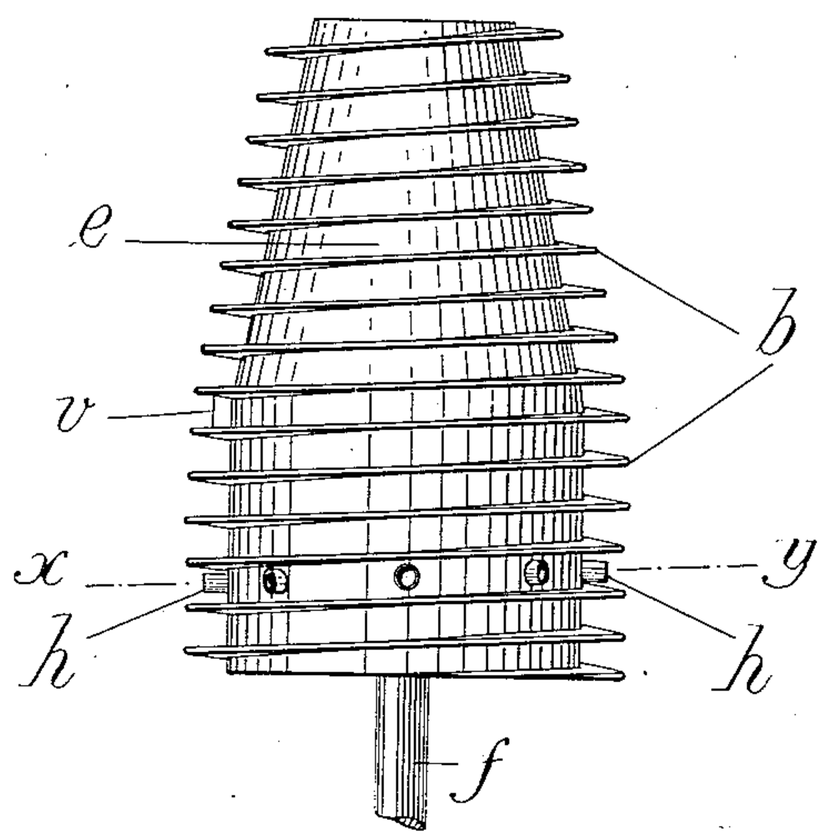
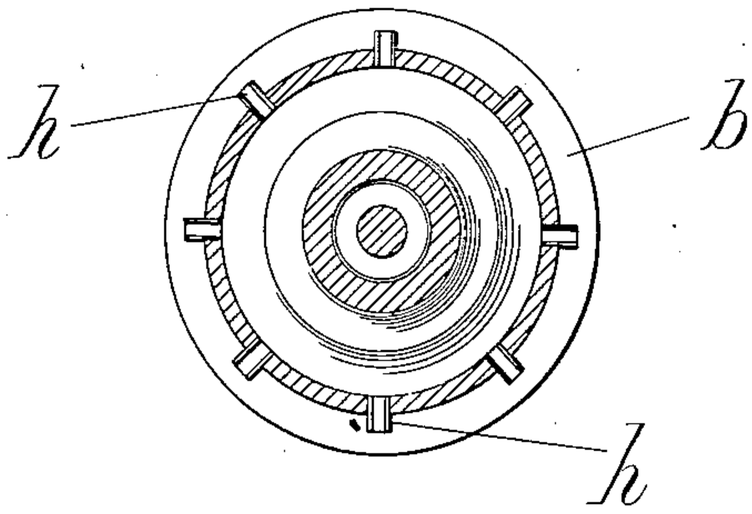


Fig: 3.



Witnesses:
Helen Heckler.
Christine Kueley

Inventor:
Alarik Liedbeck,
By H. A. de Vos
Attorney.

No. 750,668. Patented January 26, 1904.

UNITED STATES PATENT OFFICE.

ALARIK LIEDBECK, OF STOCKHOLM, SWEDEN.

CENTRIFUGAL APPARATUS.

SPECIFICATION forming part of Letters Patent No. 750,668, dated January 26, 1904.

Application filed October 27, 1903. Serial No. 178,701. (No model.)

To all whom it may concern:

Be it known that I, ALARIK LIEDBECK, a subject of the King of Sweden and Norway, residing at Strandvägen 43, in the city of Stockholm, in the Kingdom of Sweden, have invented certain new and useful Improvements in Centrifugal Apparatus for Separating Solids and Liquids, of which the following is a specification.

My invention relates to a centrifugal apparatus for separating the solid and liquid constituents out of a mixture of both.

In the accompanying drawings such a centrifugal apparatus is illustrated in a partial vertical section in Figure 1. Fig. 2 illustrates an elevation of a separating-drum to be used in the apparatus; and Fig. 3 is a plan view of said drum in a section on the line *x y*, Fig. 2.

The centrifugal apparatus consists of a drum *a*, which is cylindrical at its lower end and tapering at the top (or which may be tapering in its entire height) and which is provided with a bottom *c*, forming the hub of and united with a central tubular shaft *d*. Said shaft is journaled in the frame *s* and provided with a pulley *k* or other means for revolving the drum from some convenient source of energy. The shaft *d* surrounds another shaft *f*, secured to an internal drum *e*, along the outer side of which runs a screw *b*, the threads of which fit more or less accurately to the inner side of the outer drum *a*. Nozzles *h* are inserted near the bottom in the wall of the internal drum *e* and protrude slightly from the outside of said drum between the threads. In the bottom *c* of the drum *a* is arranged a discharge-passage, or as in the present case two such passages *m n*, the inner orifices of which are situated at different distances from the axis of the drum and terminate one in a stationary vessel *q* and the other in a similar vessel *r*. At the upper edge of the drum is located a stationary receiver *o* for the solid particles separated.

g is a bearing for the shaft *d*, which bearing during the rotation is balanced, for instance, by means of links *z* and rubber buffers *z'*, arranged between the frame *s* and the outer ends of the links. Over the mouth of the drum is located a container *t*, from which the mixture to be treated is fed down into the drum *e*. In the thread or threads of the screw *b* a plate or partition *v* is inserted, which reaches to the bottom of the thread and prevents the lighter liquid collected there from rising higher.

The drum *a* is brought into a rotating movement by means of the pulley, and simultaneously the drum *e* is rotated at a different velocity by some suitable means, so that the two drums run at unequal speeds.

The mixture of solid and liquid particles fed down to the interior of the drum *e* from the container *t* is ejected by the influence of the centrifugal force through the nozzles *h* between the threads of the screw *b*. The heavier solid particles being here separated from the liquid and congregating at the inner side of the outer drum *a*, as indicated in Fig. 1, are conveyed by the rotating screw to the upper edge of this drum and, further, to the receiver *o*. In the course of this movement, and more especially at the tapering part of the drum, the liquid particles adhering to the solid particles are quickly drained off, so that the mass passing into the receiver *o* will be very dry. The liquid separated, if consisting of a mixture of two liquids, so arranges itself that the heavier one extends nearer the periphery of the drum in a layer, the thickness of which will be determined by the location of the orifice of the passage *n* in the drum, through which passage the said liquid discharges into the vessel *r*. The lighter liquid, on the other hand, collects inside of the heavier layer of liquid or at the bottom of the screw-threads and is discharged into the vessel *q* through the passage *m*. The partition *v*, mentioned above to be inserted in the threads, is intended to prevent or impede the upward movement of the lighter liquid.

I am aware that centrifugal apparatus for separating liquids and solids are previously known, but that in these the separation is effected by straining off the liquid during the centrifugal process through a perforated wall or filter arranged in the drum, which separation evidently cannot be very complete, while at the same time such a procedure does not admit of a separation of the liquid constitu-

ents themselves if a compound liquid be treated. In the present centrifugal apparatus both the liquids, if several of different specific gravities be dealt with, and the solid are separated, the latter being lifted by the screw out of the liquid and conveyed upward to be drained of accompanying liquid at the upper portion of the drum. The upwardly-contracting shape of the drum and the screw is essential to the present apparatus, since only hereby an almost complete separation of the liquid and solid particles can be accomplished.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is—

In a centrifugal apparatus for separating solids and liquids, the combination of an upwardly-tapering outer drum *a*, an inner drum *e*, having on its outside one or more screw-threads *b* fitting closely to the inner side of the outer drum, discharge-apertures *h* arranged near the bottom of the inner drum, between the threads, and outlets *m*, *n* for liquid, located in the bottom of the outer drum at different distances from the center, all for the purpose that the space between the outer and inner drums may form a vessel or separating-chamber where the mixture will be subjected to the action of the centrifugal force for a comparatively long period and the separation consequently become as complete as possible.

In witness whereof I have hereunto set my hand in presence of two witnesses.

ALARIK LIEDBECK.

Witnesses:
H. TELANDER,
T. RISBERG.