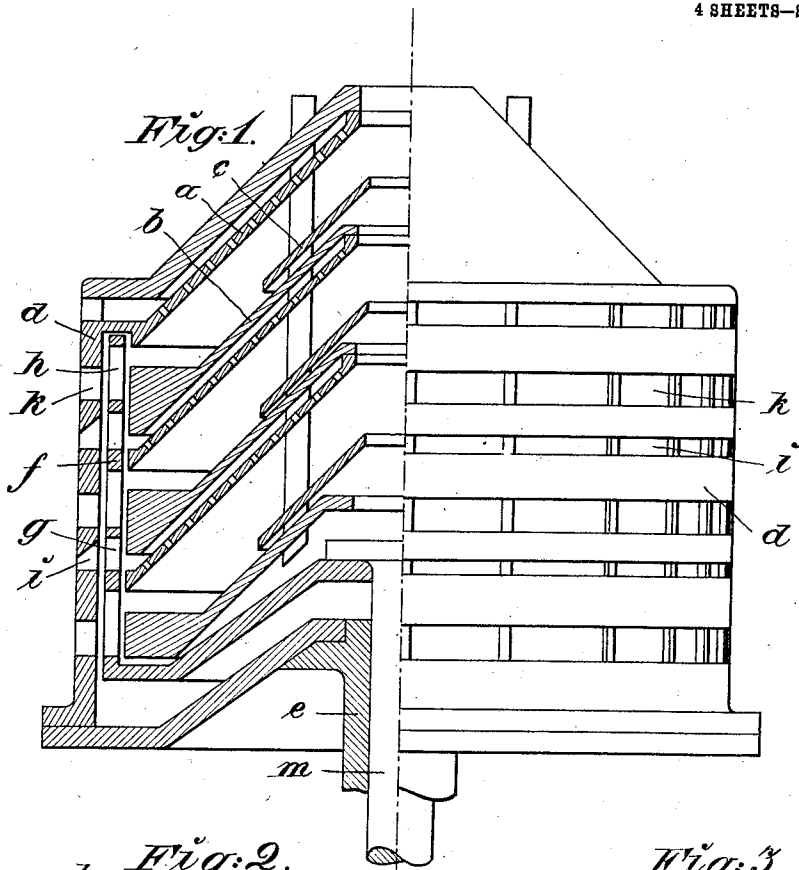
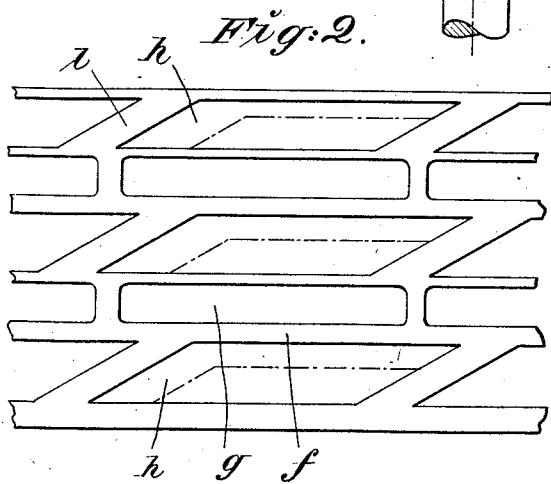
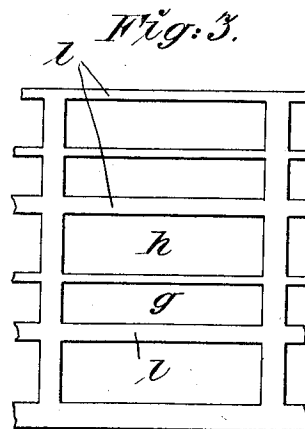


No. 852,666.

PATENTED MAY 7, 1907.

B. LJUNGSTRÖM.
CENTRIFUGAL MACHINE.
APPLICATION FILED JULY 26, 1906.

4 SHEETS—SHEET 1.



Witnesses:

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Inventor:

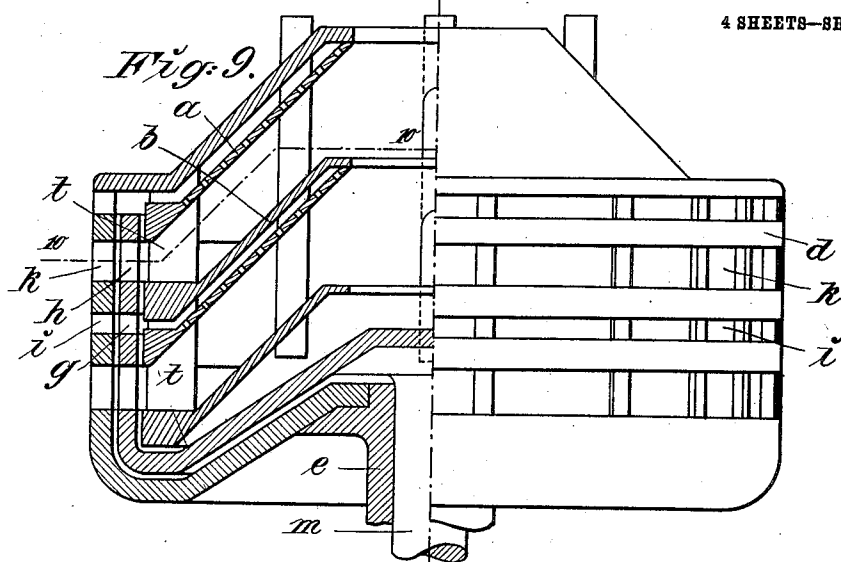
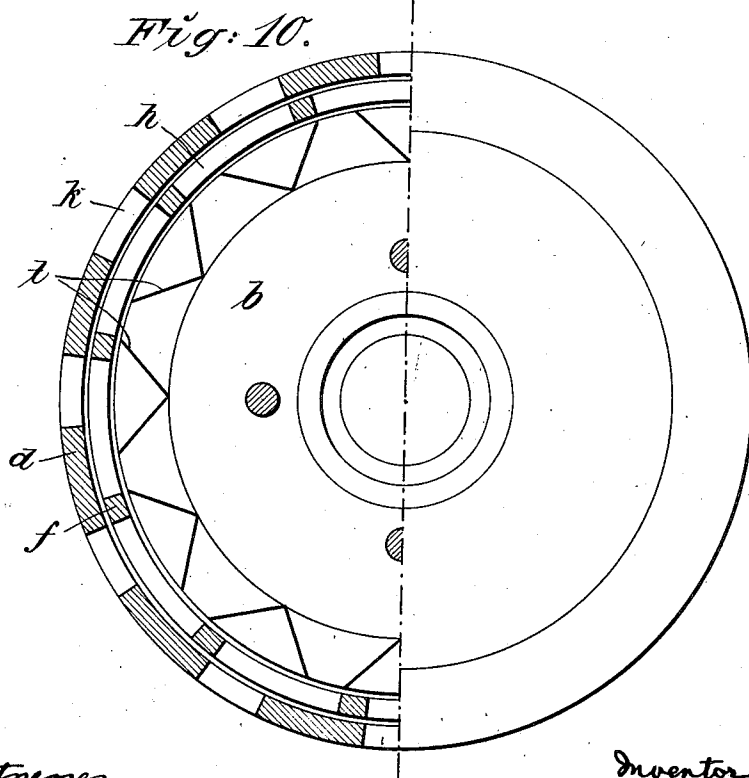
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4 SHEETS—SHEET 4.



Witnesses
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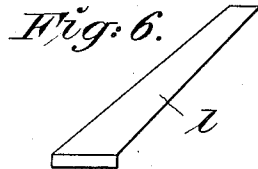
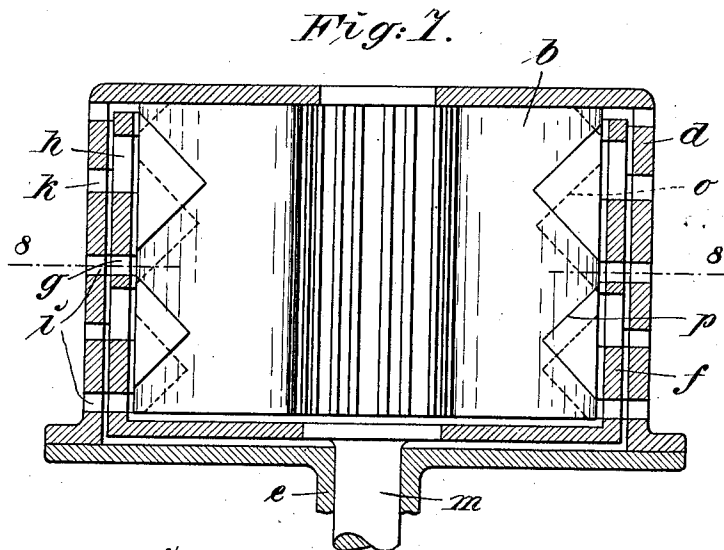
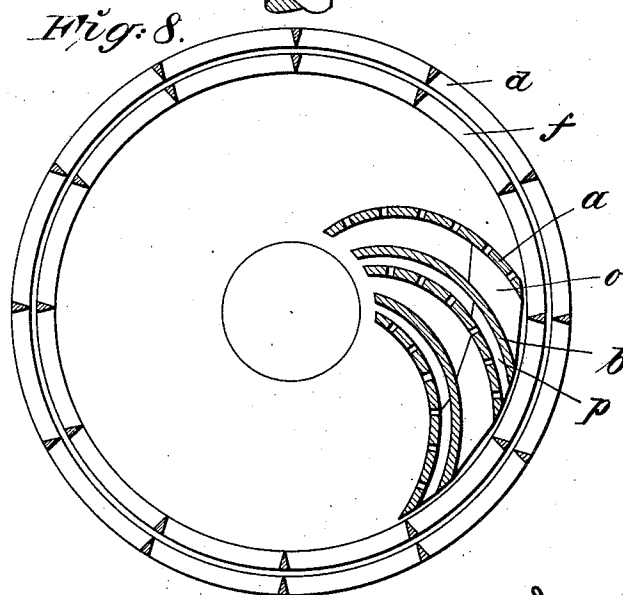
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4 SHEETS—SHEET 3.



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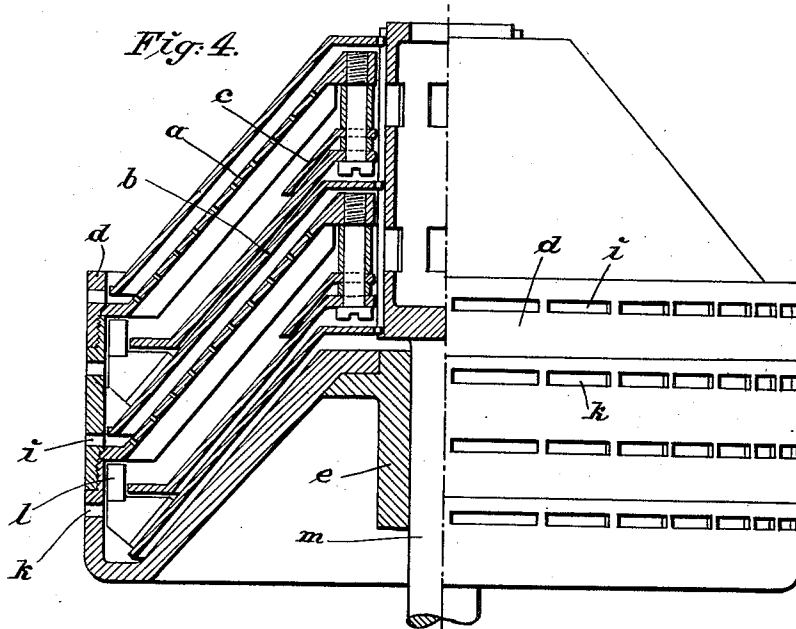
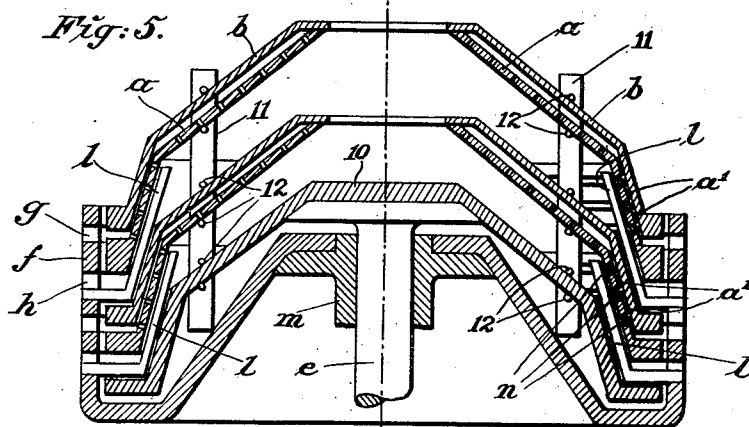
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4 SHEETS—SHEET 2.



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UNITED STATES PATENT OFFICE.

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CENTRIFUGAL MACHINE.

No. 852,666.

Specification of Letters Patent.

Patented May 7, 1907.

Application filed July 26, 1906. Serial No. 327,885.

To all whom it may concern:

Be it known that I, BIRGER LJUNGSTRÖM, a subject of the King of Sweden, residing at Flemingzatan, Stockholm, Sweden, have invented certain new and useful Improvements in Continuously-Operative Centrifugal Machines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to letters or figures of reference marked thereon, which form a part of this specification.

This invention relates to improvements in centrifugal machines for separating liquids from solids (for instance sugar crystals from molasses or crystals of any kind whatever from water or other liquids) with the aid of a series of curved or conical perforated plates between which the mass to be treated is caused to pass.

The purpose of the invention is to regulate the speed with which the mass passes through the machine, in order that the drying or separating process is not unduly curtailed by reason of the velocity which the mass acquires. It has hitherto been usual to retard the passage of the mass by means of curved or constricted delivery-conduits, but the latter are liable to become choked in such a manner as to render the machine temporarily inoperative. To obviate this disadvantage scrapers have been placed in the delivery conduits, but in this case only a single plate was used. If the number of plates is increased, in order to increase the efficiency of the machine constructional difficulties must be overcome to allow of conveniently operating scrapers arranged in the manner indicated.

The present invention substantially consists in using in combination with a plurality of plates a perforated drum provided with scrapers and adapted to be revolved at a speed differing from the speed of the plates or to be moved in a direction differing from the direction in which the plates are moved.

The scrapers may consist of those portions of the drum which are located between the perforations, or may be directly or indirectly connected to the drum in such a manner as to project into the discharge-apertures.

Several forms of construction of the im-

proved apparatus are illustrated by way of example in the annexed drawing.

In the drawings: Figure 1 is a side view, partially in section, of a centrifugal machine, embodying my invention in one form. Figs. 2 and 3 are detail views of portions of the machine of Fig. 1. Fig. 4 is a side view, partially in section, of a centrifugal machine, embodying my invention in another form. Fig. 5, left hand portion, is a partial sectional view of a centrifugal machine, embodying my invention and Fig. 5, right hand, is another form of embodiment of my invention. Fig. 6 is a detail view of scraper of Fig. 5. Fig. 7 is a vertical section of a centrifugal machine embodying another form of my invention. Fig. 8 is a section on line 8—8, Fig. 7. Fig. 9 is a side view, partially in section, of a centrifugal machine, showing another embodiment of my invention. Fig. 10 is a section on line 10—10, Fig. 9.

Fig. 1 is a side-view, partly in section, of a centrifugal machine comprising three superimposed, conical, perforated plates *a*, above each of which is arranged an unperforated conical plate *b*, the purpose of the plates *b* being to conduct the separated liquid to the circumference of the machine, and to prevent the re-mixing thereof with the solid constituents. Smaller conical plates *c* are arranged in such a manner as to form annular ducts for the introduction of air or the like for the purpose of assisting the drying process. The parts described are connected to an external drum *d* adapted to be revolved by means of a shaft *e*. Between the drum *d* and the outer edges of the plates *a* there is arranged a perforated drum *f* adapted to be revolved by means of a shaft *m*. A portion of this drum is shown in Fig. 2 in detail. The shafts *e* and *m* are driven at different speeds by means of mechanism not illustrated. The drum *f* is provided with apertures *g* for the passage of the liquid, and with apertures *h* for the passage of the solid constituents, and the external drum *d* is provided with corresponding apertures *i* and *k*. The parts *l* (see Fig. 2) between the apertures *h* are inclined and form the scrapers.

During the working of the machine the solid particles of the mass treated slide outward along the under surfaces of the plates *a* and pass through the apertures *h*, whereupon

they are thrown against the inner surface of the drum *d*. The inclined scrapers *l* then act upon the said solid particles and force them downward toward the adjacent apertures *k*.

5 The shape of the apertures *h* may be modified as indicated in Fig. 2 by dotted lines, that is to say the quadrangular parts limited on two sides by dotted lines may be filled up. The action described can also be modified in
10 such a manner that instead of driving the shafts *e* and *m* at different speeds relative vertical movement is imparted to the said shafts by vertically reciprocating one of them. In that case the apertures *h* and *g*
15 may be shaped and arranged as shown in Fig. 3, the scrapers being formed by the horizontal parts *l*.

In the construction illustrated in Fig. 4 the perforated drum *f* adapted to be revolved by
20 means of the shaft *m* is adjacent the inner edges of the conical plates, and fixed to the plates *b*, the latter being provided with inclined scrapers *l* near the outer circumference of the machine.

25 In the construction illustrated in Fig. 5 the plates *a* and *b* are bent in such a manner that the spaces between the outer portions of the said plates are narrower than the spaces between the inner portions. By this means
30 the outward passage of the mass is retarded. Scrapers *l* fixed to an external drum *f* extend into the narrower spaces through which the solid constituents pass; the choking of the delivery apertures is thus prevented. An additional
35 modification is illustrated on the right-hand side of Fig. 5, the plates *a* being provided with annular apertures for the passage of rings *n* fixed to the scrapers *l*, so that when the shafts *e* and *m* are revolved at different
40 speeds the rings *n* prevent the choking of the spaces through which the liquid flows.

In the construction shown on both sides of Fig. 5, the shaft *e* is secured to frame 10. To this frame is secured the uprights 11, preferably
45 cylindrical in form. Through orifices in the plates *a* and *b* these uprights pass. Above and below each set of plates *a* and *b* is the pin 12 to hold them in proper position and spaced apart with reference to the several
50 pairs of plates. In the right hand side of this figure, in addition to this construction above described, the annular parts of each plate *a* is secured to its corresponding plate *b* by means of stays *a'* so the portions of plate *a*
55 do not change their position inside the bowl.

Fig. 6 is a detail-view of a scraper *l*.

60 Figs. 7 and 8 illustrate a centrifugal machine comprising curved vertical plates arranged side by side in spiral lines about a central axis, Fig. 7 being a vertical section and Fig. 8 a horizontal section on the line 8—8
65 of Fig. 7, with certain parts omitted. Perforated plates *a* and unperforated plates *b* are arranged alternately in such a manner as to produce alternate ducts for the passage of

liquids and solids, plates *o* and *p* being fixed between the plates for the purpose of guiding the said liquids and solids to apertures *g* and *h* respectively, provided in the circumference
70 of the drum *f* which contains the plates and is revolved by the shaft *m*. The drum *f* is surrounded by the drum *d* provided with apertures *i* and *k* and adapted to be revolved by means of the shaft *e*. The apertures *g*
75 and *h* are in this case preferably shaped and arranged as illustrated in Fig. 2.

Figs. 9 and 10 illustrate a modification of the machine shown in Figs. 1 and 2. Fig. 9 being a side-view, half in section, and Fig. 10
80 a plan-view, half in section on the line 10—10 of Fig. 9. In this case the arrangement is such that the scrapers do not act on the solid particles in the direction of the axis but in the direction of the circumference.

Plates *t* are fixed between adjacent plates
85 *a* and *b* in such a manner that the solid particles can only pass out of the machine at certain parts of the circumference. The apertures in the drum *f* are in this case substantially similar to those illustrated in
90 Fig. 3.

Having now particularly described and ascertained the nature of the said invention and in what manner the same is to be performed, I declare that what I claim is:—
95

1. In a centrifugal machine for separating liquid constituents from a solid mass, in combination, a bowl having separate outlets for the solids and liquids, alternate perforated and unperforated plates in said bowl, a perforated drum having a movement relative to the bowl and scrapers operated by said drum coacting with the discharge of the solid constituents.
100

2. In a centrifugal machine for separating
105 liquid constituents from a solid mass, in combination, a bowl having separate outlets for the solids and liquids, alternate perforated and unperforated plates in said bowl, means to restrict the flow of the material treated to the outlet, a perforated drum having a movement relative to the bowl, and scrapers operated by said drum.
110

3. In a centrifugal machine for separating
115 liquid constituents from a solid mass, in combination, a bowl having separate outlets for the solids and liquids, alternate perforated and unperforated plates in said bowl, guide plates to guide the separate constituents to their respective outlets, a perforated drum
120 having a movement relative to the bowl and scrapers operated by said drum coacting with the discharge of the solid constituents.

4. In a centrifugal machine for separating
125 liquid constituents from a solid mass, in combination, a bowl having separate outlets for the solids and liquids, alternate perforated and unperforated plates in said bowl, a perforated drum having a movement relative to the bowl and scrapers operated by said drum
130

coacting with the discharge of the solid constituents, the perforations in the drum being of greater extent than the corresponding discharge apertures between the plates.

5 5. In a centrifugal machine for separating liquid constituents from a solid mass, in combination, a bowl having separate outlets for the solids and liquids, alternate perforated and unperforated plates in said bowl, a perforated drum having a movement relative to
10 the bowl and scrapers operated by said drum coacting with the discharge of the solid constituents, the plates being alternately arranged one above the other and the discharge orifice apertures for liquid and solid
15 constituents being correspondingly arranged.

6. In a centrifugal machine for separating liquid constituents from a solid mass, in combination, a bowl having separate outlets for the solids and liquids, alternate perforated and unperforated plates in said bowl, a perforated drum having a movement relative to
20 the bowl, and scrapers operated by said drum

coacting with the discharge of the solid constituents, the arrangement being such that
25 the apertures for the discharge of the solid constituents are out of radial alinement with the discharge apertures between the plates.

7. In a centrifugal machine for separating liquid constituents from a solid mass, in combination, a bowl provided with outlets for
30 the liquid and solid constituents, a plurality of alternate perforated and unperforated plates, a perforated drum connected to said unperforated plates, scrapers connected to
35 said plates, said scrapers coacting with the discharge of the solid constituents, and means to give a relative movement between said bowl and said drum.

In testimony, that I claim the foregoing as
40 my invention, I have signed my name in presence of two subscribing witnesses.

BIRGER LJUNGSTRÖM.

Witnesses:

CARL FRIBERG,

HJALMAR ZETLERSTRÖM.