(No Model.) 2 Sheets—Sheet 1.

N. G. WILLIAMS.

CENTRIFUGAL SEPARATOR.

No. 540,528. Patented June 4, 1895.

Fig. 1.

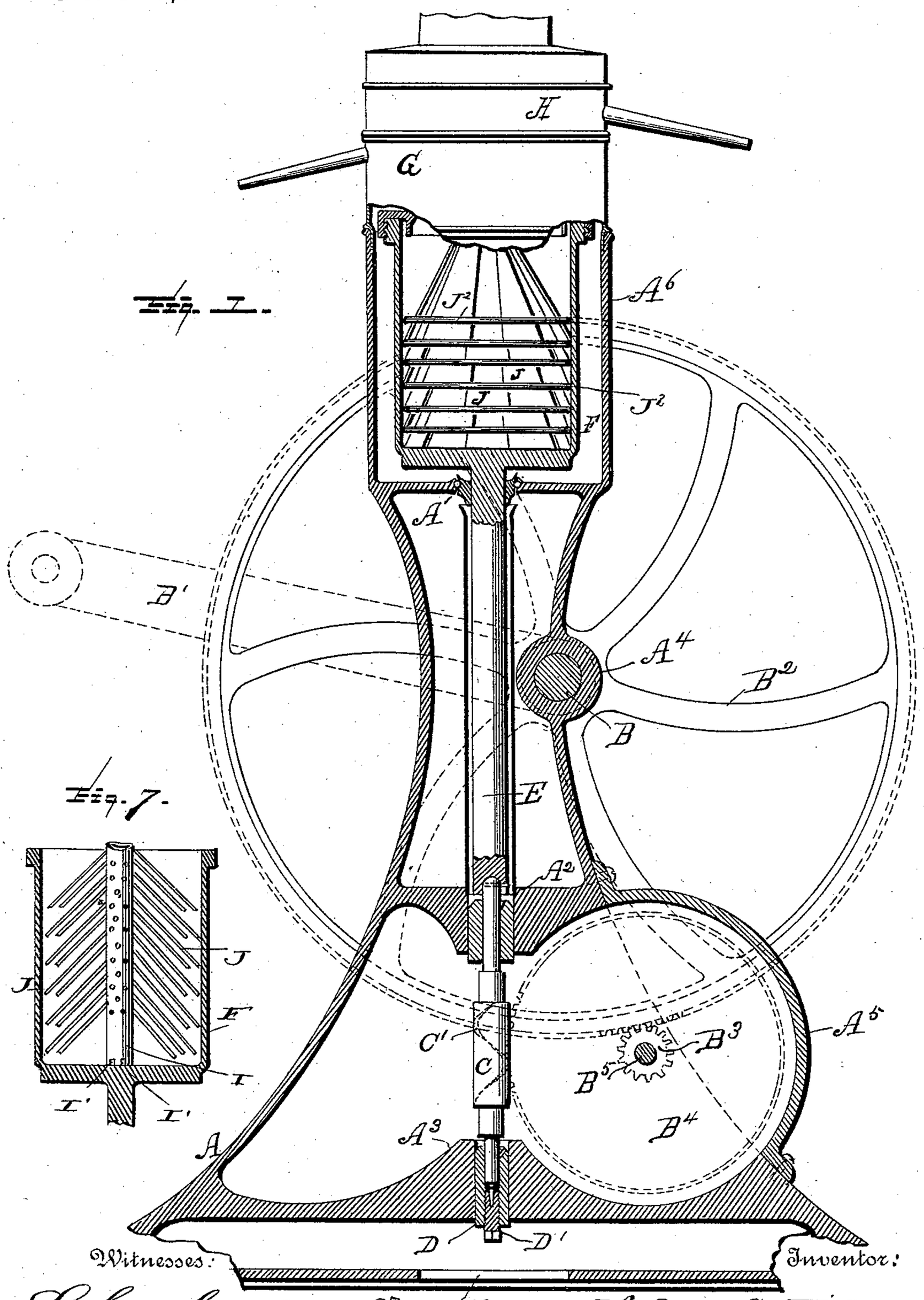


Fig. 7.

Witnesses:
L. C. Hills.
E. A. Bond

Inventor:
Nathan G. Williams
By E. B. Stocking
Attorney

(No Model.) 2 Sheets—Sheet 2.

N. G. WILLIAMS.

CENTRIFUGAL SEPARATOR.

No. 540,528. Patented June 4, 1895.

Fig. 3.

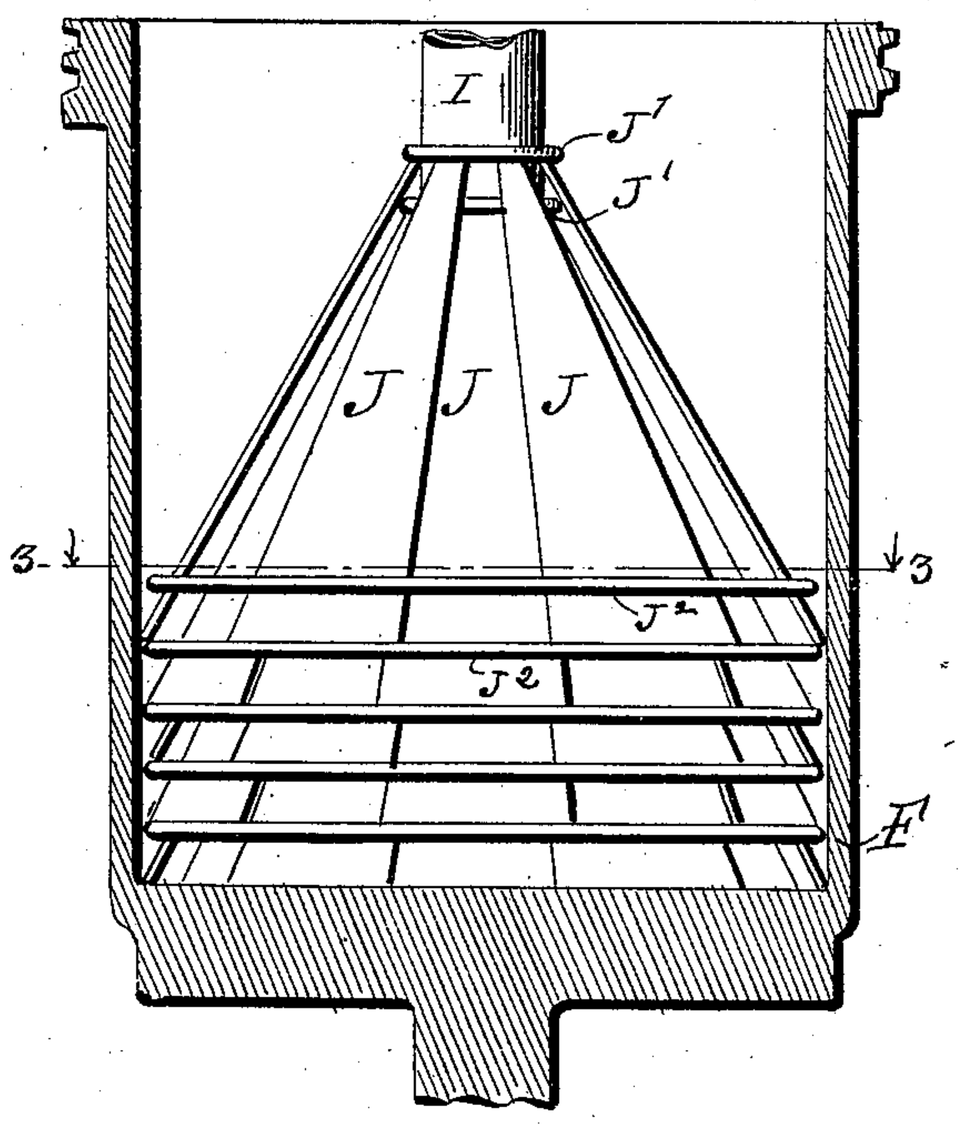


Fig. 4.

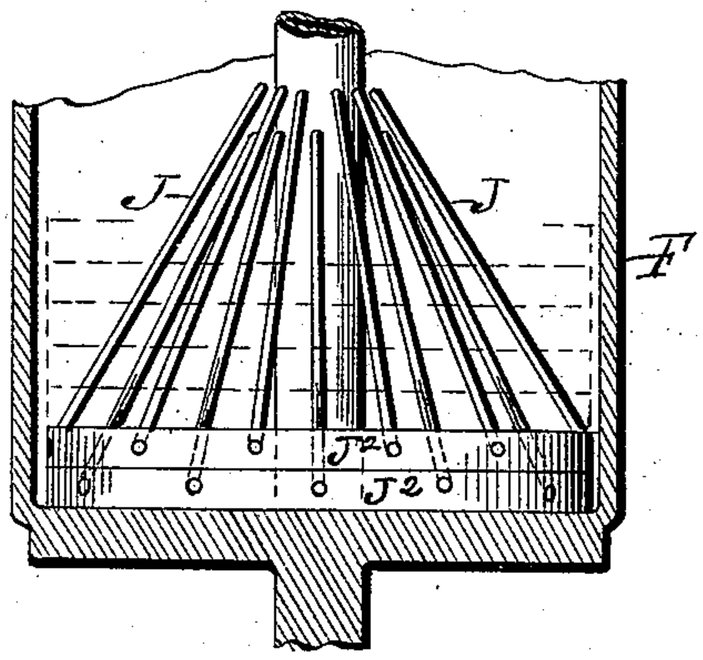


Fig. 5.

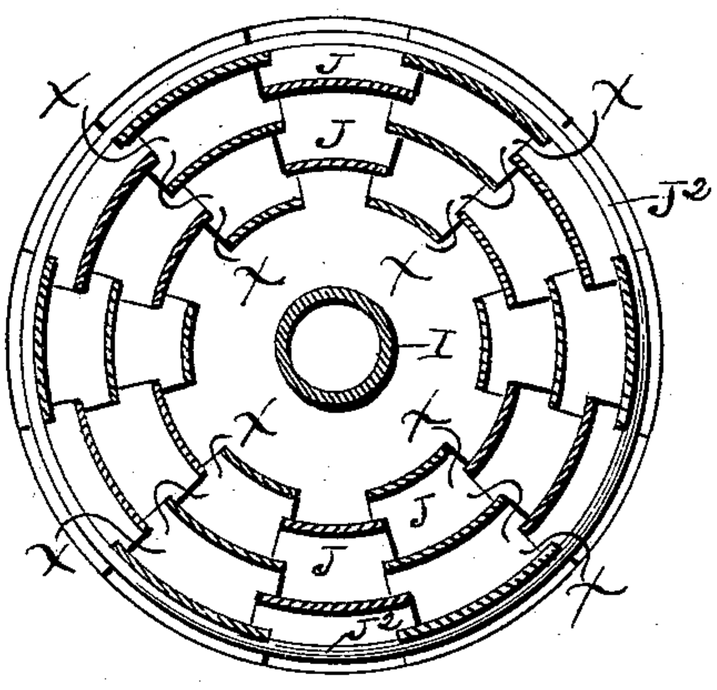


Fig. 5.

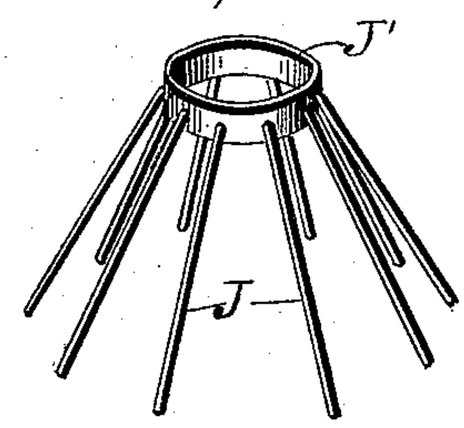
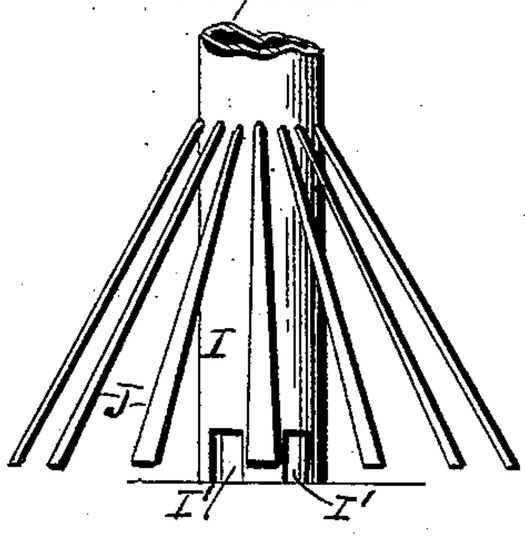


Fig. 6.



Witnesses :

L. C. Hills.

E. A. Bond

Inventor :

Nathan G. Williams,

By E. B. Stocking

Attorney

UNITED STATES PATENT OFFICE.

NATHAN G. WILLIAMS, OF BELLOWS FALLS, VERMONT.

CENTRIFUGAL SEPARATOR.

SPECIFICATION forming part of Letters Patent No. 540,528, dated June 4, 1895.

Application filed August 24, 1893. Serial No. 483,927. (No model.)

To all whom it may concern:

Be it known that I, NATHAN G. WILLIAMS, a citizen of the United States, residing at Bellows Falls, in the county of Windham, State of Vermont, have invented certain new and useful Improvements in Centrifugal Separators, of which the following is a specification, reference being had therein to the accompanying drawings.

This invention relates to centrifugal machines and although herein described as applied to the separation of cream from milk it may be employed for separating the constituent elements of other substances.

Among the objects of the invention are to provide means for causing a tortuous flow of the lighter and heavier constituents toward and from the center of the bowl during their passage therethrough, and to accomplish this result by a simple, strong and easily cleansed structure.

Other objects of the invention will appear in the following description and the novel features thereof will be particularly pointed out in the claims.

In the drawings, Figure 1 represents a substantially central vertical section, with portions in elevation, of a centrifugal machine embodying my invention. Fig. 2 is a similar section of the bowl with an elevation of a series of skeleton frames arranged therein. Fig. 3 is a horizontal section on the line 3 3 of Fig. 2 of the skeleton frames, looking in the direction of the arrows in Fig. 2. Fig. 4 is a sectional view of a bowl with skeleton frames therein formed of rods. Figs. 5, 6, and 7 are modified arrangements of the skeleton frames shown in Figs. 1 and 4.

Like letters refer to like parts in all the figures.

A represents a casting constituting the framework of the machine and it is provided with a neck-bearing A', a middle-bearing A^2 and a foot or step bearing A^3 for the spindle which carries the bowl of the machine. The frame is also provided with a bearing A^4 for the crank-shaft B to which the crank B', or it may be a belt-pulley, is secured and upon said shaft B is also mounted a master-gear B^2 which meshes with a pinion B^3 united to or formed upon a side-gear B^4 both of which are mounted upon a shaft B^5 suitably borne by the frame. The side gear is adapted to cooperate with a spiral fin or thread C' formed on the lower section C of the bowl spindle. This section of the spindle is seated in a step D, and, by means of the bolt D', said spindle section and parts thereon may be vertically adjusted. A steel pin, and if desired, a ball-bearing may be interposed between the bolt D' and the foot of the spindle section C. The bowl spindle proper E is connected in the usual manner by a radial pin with the spindle section C as clearly shown in Fig. 1. A removable gear-cover A^5 is provided for the side gear and pinion B^4, B^5 respectively.

The frame A terminates at the top in a bowl-casing A^6 and with the exception of the cap A^5, the whole may be formed in one casting with or without a diaphragm A^7 at the base. When such a diaphragm is made a part of the frame an opening A^8 is formed therein to give access to the foot bearing of the spindle. It is apparent that when motion is given to the gearing a rapid rotation of the bowl is produced.

The bowl F. may be of any desired form as also may be the skimming milk and cream receiving and discharging pans G and H which are surmounted on the bowl case. As my invention in this instance has no dependence upon these parts, and they being of usual construction, no further description thereof is necessary.

At the center of the bowl F is a milk supply tube I having openings I' at its lower end through which the milk passes from the tube into the bowl. I use in connection with this tube a series of rods, bars or plates J arranged so as to cause the constituent elements of the liquid being operated upon to take a tortuous course both radially and vertically within the bowl. Each opening, rod, bar or plate of a septum is so located with reference to those of an adjacent septum as to occupy a space between them in vertical planes and above or below them in horizontal planes. This location of the openings, rods, bars or plates is perhaps more clearly seen in Figs. 2 and 3, where the bars or plates of one septum or circular series occupy or cover the spaces between the bars or plates of the next adjacent septum or circular series. Now it will be apparent that as the lighter constituent moves toward the

center of the bowl and as the heavier constituent moves from the center, each is forced to take a tortuous course represented by the curved lines *x x* in Fig. 3. In passing from the bottom to the top of the bowl these openings, rods, bars or plates produce a similar course in the flow. The same operation would take place if the milk were supplied at the top instead of at the bottom. The inward inclination of the septums in the openings or of the rods, bars or plates serves as an additional function to that of producing a tortuous course. It tends to retard the movement of liquid through the bowl and gives greater effectiveness to the action of centrifugal force and this upon finally divided portions of the liquid being operated upon. The strongest tendency of the heavier constituents is to move radially from the center. This forces it against the inner and inwardly-inclined surfaces of the rods, bars or plates which impedes its flow until the lighter particles are freed or rescued from the strongly-moving current of the heavier constituent in its urgent flow from the center toward the wall of the bowl. Herein lies an essential difference in effectiveness over complete diaphragms either horizontal or inclined.

In that form of septum comprising rods, bars or plates J they may be projected from the tube I by various mechanical constructions. They may be seated in the tube as shown in Fig. 7 or in rings J′ as shown in Fig. 5 and each series or frame of rods, bars or plates held upon the tube by surrounding the tube by the rings J′, the rings resting one upon the other if desired. The outer ends of the rods, bars or plates may be supported in rings J^2 and these may be arranged one upon the other as shown by full lines and as indicated by dotted lines in Fig. 4 where they rest upon the bottom of the bowl and approach or it may be abut against the wall of the bowl. Rings J′, J^2 may be arranged at or near both ends of the rods, bars or plates J as shown in Fig. 2 and said rods or bars may be formed of sheet or other material as desired and may be of uniform size in cross section or flared as shown. For convenience in cleansing it is well to form each series of bars, rods or plates as a skeleton frame such as is shown in Fig. 5 singly and in Figs. 2 and 4 collectively. The entire series or frames may be permanently or separably connected with each other, but as before stated for cleansing purposes each frame may be independent of the others. The entire series of frames constitute in fact a series of conical septums having openings, each septum being spaced from the adjacent septum.

Where, in the appended claims, I refer to "separated parts" I wish to be understood as meaning rods, plates or bars, or their equivalent.

What I claim is—

1. An element of a centrifugal machine, comprising a circular series of inclined spaced rods projecting inwardly with relation to its supply tube, substantially as specified.

2. A centrifugal bowl provided with a supply tube and two circular series of rods projecting inwardly with relation to its supply tube, the rods in each series being alternately arranged with relation to those of an adjacent series, substantially as specified.

3. A septum for a centrifugal machine, comprising a ring and a circular series of separated inclined rods, substantially as specified.

4. A septum for a centrifugal machine comprising rings and a circular series of separated rods inclinedly held thereby, substantially as specified.

5. A septum for a centrifugal machine, comprising rings, a series of separated parts as inclined rods, plates or bars secured to said rings one of the rings being of less diameter than the other, substantially as specified.

6. The combination with the bowl and the feed tube of a centrifugal machine and a series of septums each comprising a ring and inclinedly secured separated parts each of said septums being separable from the other, substantially as specified.

7. The combination with the bowl of a centrifugal machine, of a plurality of separable, circularly-disposed, series of separated inclined and circularly-arranged rods, substantially as specified.

8. The combination with the rotary bowl of a centrifugal machine, of a plurality of septums formed of circularly-separated inclined rods, the rods of each septum being located between those of the adjacent septum, substantially as specified.

9. The combination with the rotary bowl of a centrifugal machine, of a plurality of circularly-disposed series of inclined circularly-separated rods the rods of each circular series being located between and overlapping those of the adjacent series, substantially as specified.

10. The combination with the rotary bowl of a centrifugal machine, of a circularly-disposed series of circularly-spaced, inclined rods and means for supporting the same within said bowl, substantially as specified.

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

NATHAN G. WILLIAMS.

Witnesses:
NATHANIEL W. SMITH,
HENRY E. CHILD.