No. 760,261. PATENTED MAY 17, 1904.

E. SEGER.
CENTRIFUGAL APPARATUS.
APPLICATION FILED OCT. 28, 1903.

NO MODEL. 2 SHEETS—SHEET 1.

Fig: 1.

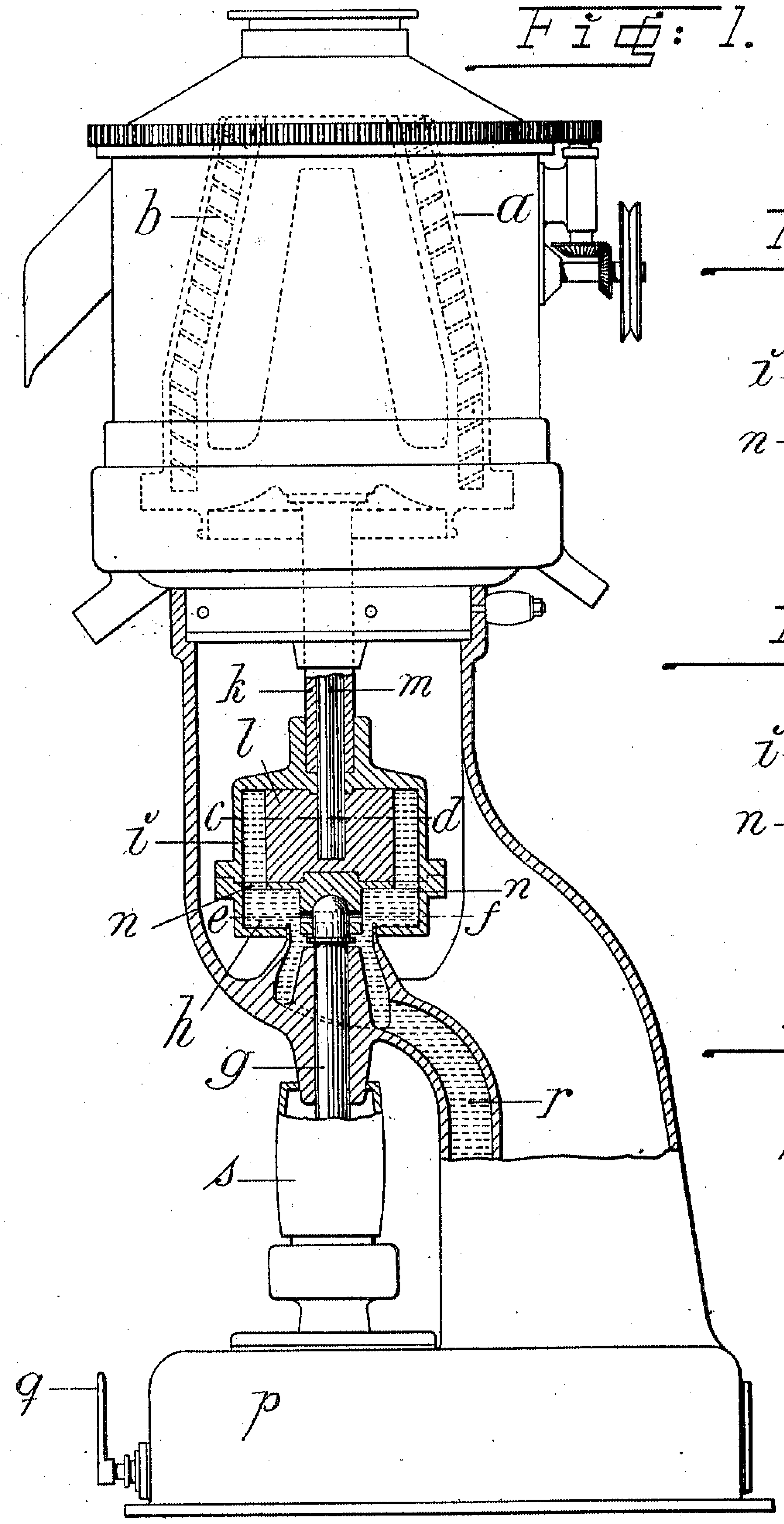


Fig: 2.

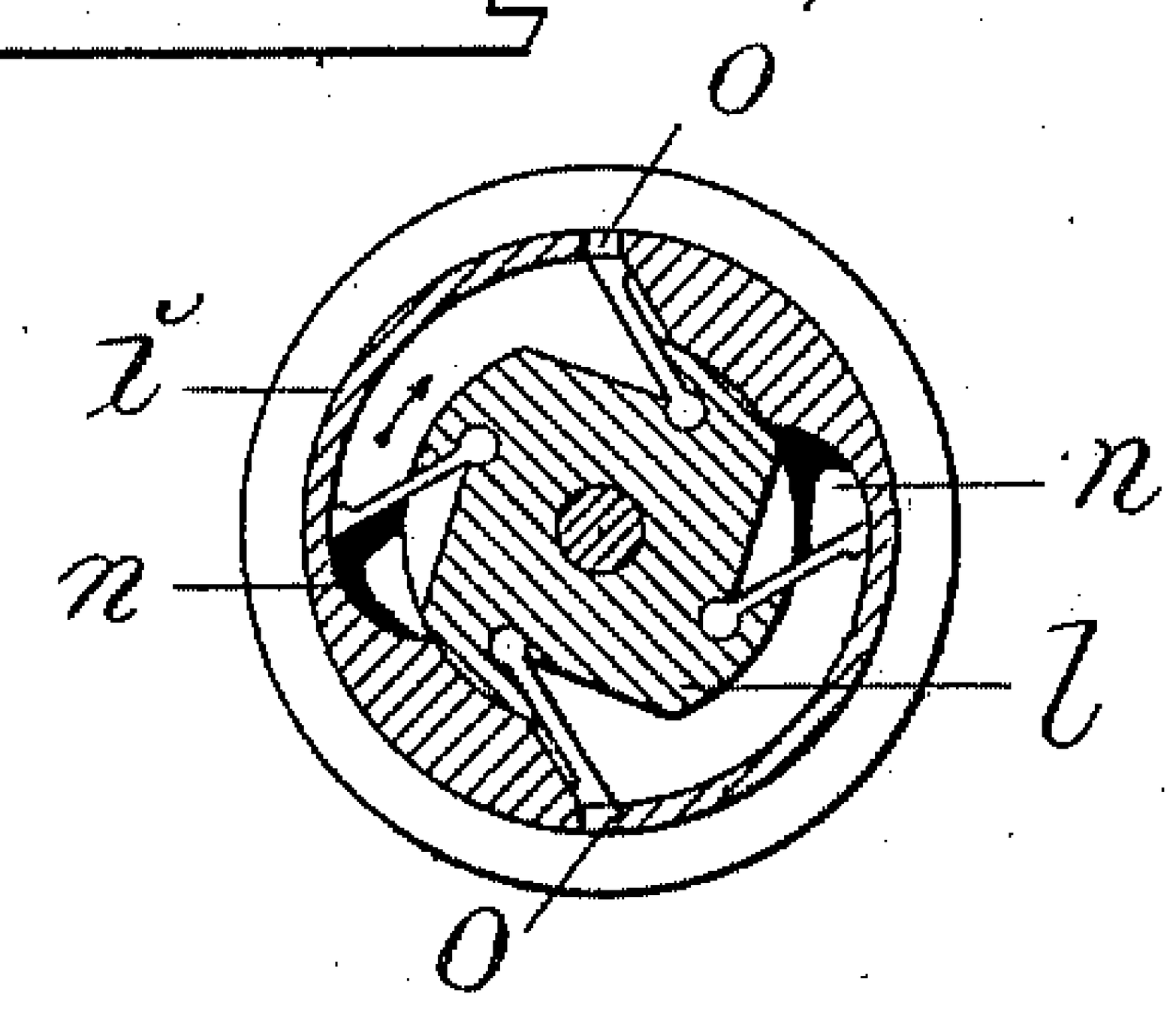


Fig: 3.

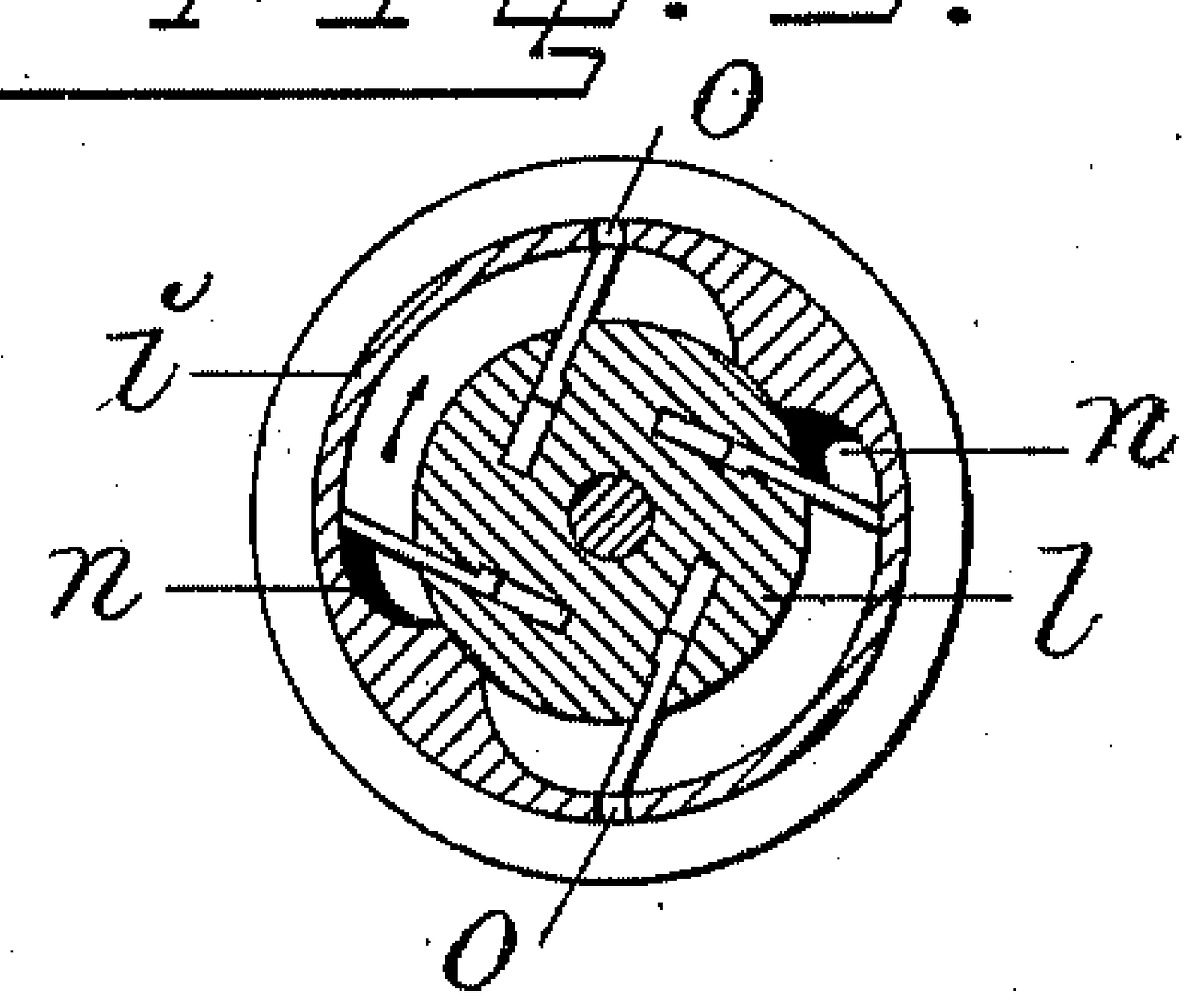
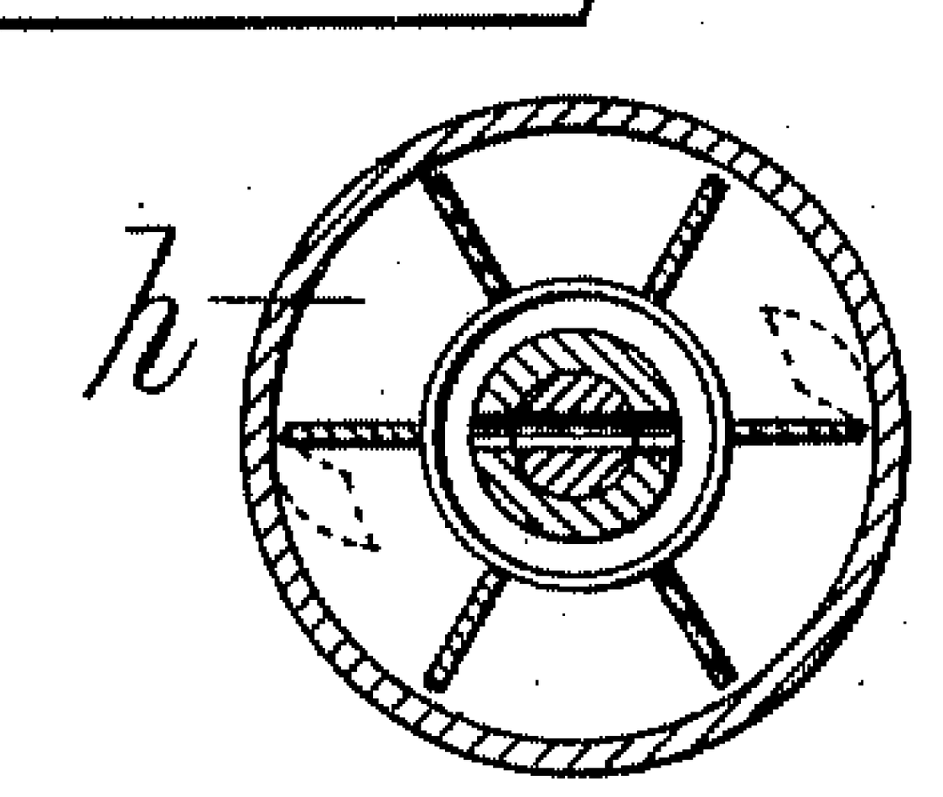


Fig: 4.



Witnesses:
Helen Wechsler.
Christine Keeley

Inventor:
Eberhard Seger,
By H. H. de Vos
Attorney.—

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

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NO MODEL. 2 SHEETS—SHEET 2.

Fig: 5.

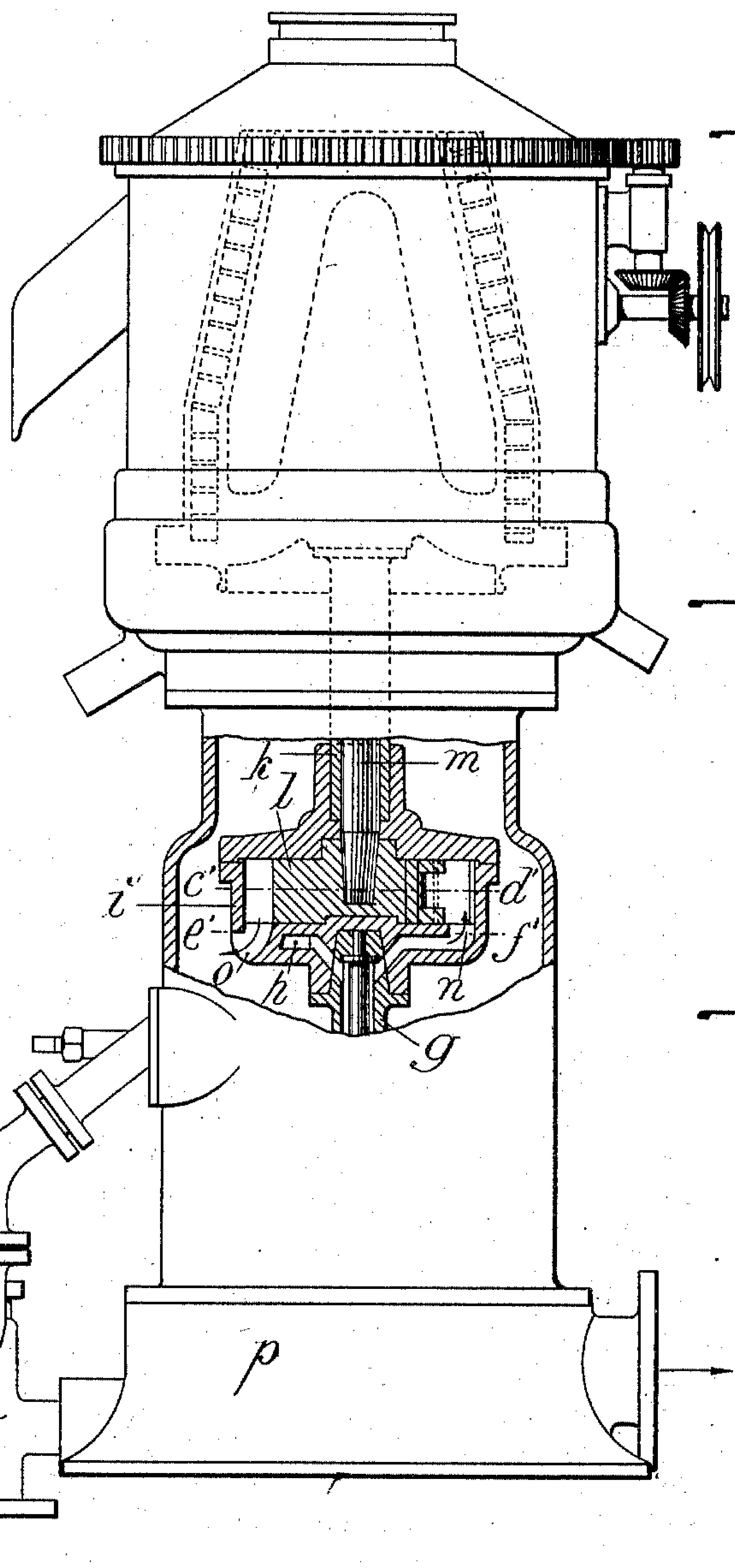


Fig: 6.

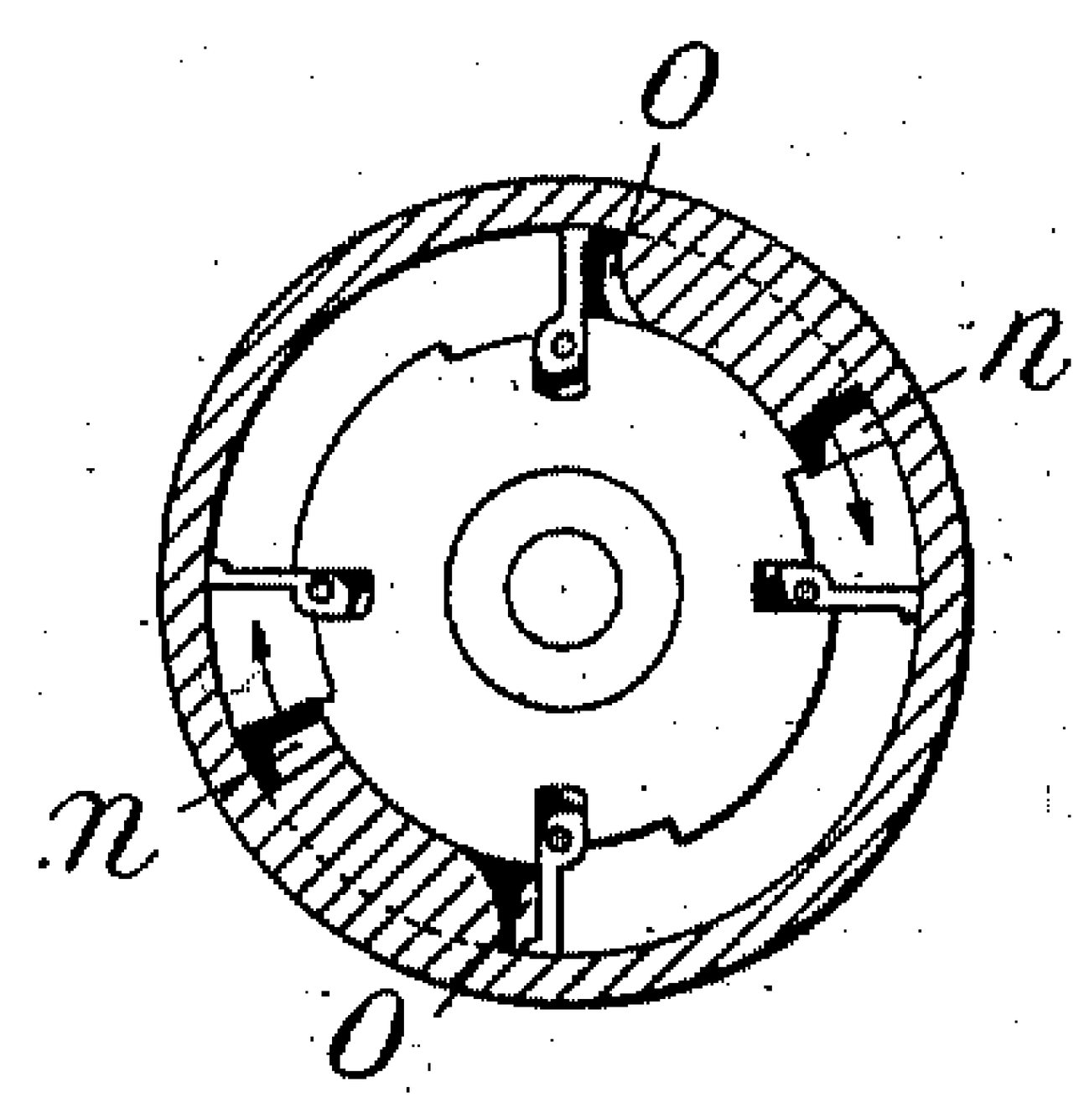


Fig: 7.

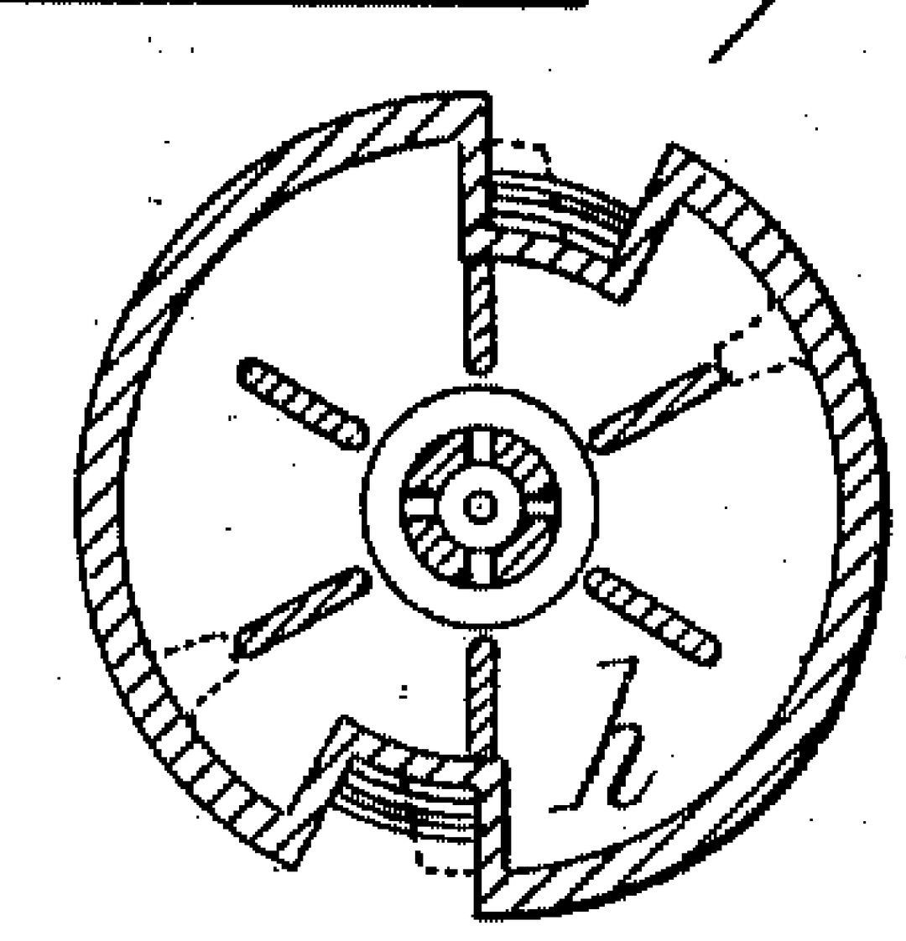
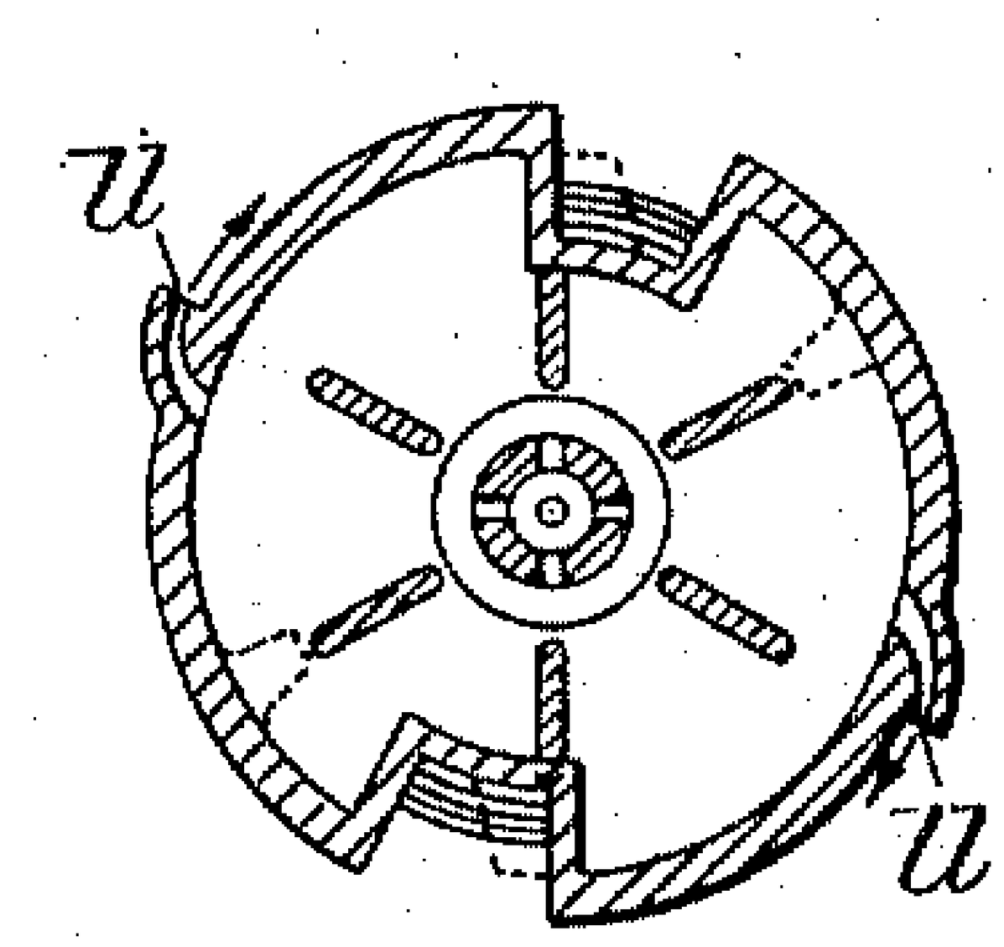


Fig: 8.



Witnesses:
Helen Webster.
Christine Keeley

Inventor:
Eberhard Seger,
By H. H. de Vas
Attorney.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

No. 760,261. Patented May 17, 1904.

UNITED STATES PATENT OFFICE.

EBERHARD SEGER, OF STOCKHOLM, SWEDEN.

CENTRIFUGAL APPARATUS.

SPECIFICATION forming part of Letters Patent No. 760,261, dated May 17, 1904.

Application filed October 28, 1903. Serial No. 178,838. (No model.)

To all whom it may concern:

Be it known that I, EBERHARD SEGER, a subject of the King of Sweden and Norway, residing at Kammakaregatan 40, in the city of Stockholm, in the Kingdom of Sweden, have invented certain new and useful Improvements in Means for Rotating Centrifugal Apparatus, of which the following is a specification.

In centrifugal apparatus for separating solids and liquids which consist of a rotating outer drum surrounding a rotating inner drum provided on its circumference with screw-threads for elevating the solid particles separated it is of importance that these two drums should revolve at different velocities; and the present invention relates to means for producing said difference of velocities.

In the accompanying drawings a centrifugal apparatus provided with two different forms of this means is illustrated in Figures 1 to 4 and in Figs. 5 to 8.

Fig. 1 illustrates a partial longitudinal section of the apparatus with one form of driving means; and Figs. 2, 3, and 4, respectively, are horizontal sections on lines *c d* and *e f*, Fig. 1, Figs. 2 and 3, however, showing different forms of the revolving center piece and its vanes or floats. Fig. 5 is a partial longitudinal section of a centrifugal apparatus provided with the other form of driving means; and Figs. 6 and 7 are horizontal sections on lines *c' d'* and *e' f'*, Fig. 5, respectively. Fig. 8 illustrates the same section as Fig. 7, though slightly modified.

a is the outer centrifugal drum; *b*, the inner one, provided with the screw-thread. The driving means consists of a kind of rotary hydraulic motor the driving fluid of which—advantageously a mixture of water and oil—obtains an increased working pressure through the action of the centrifugal force.

The two forms illustrated in Figs. 1 and 5, respectively, differ only in the manner of introducing the driving fluid to the driving means, said fluid in the centrifugal apparatus shown in Fig. 1 being contained in the base *p* of the framework and forced to the motor by means of a centrifugal pump mounted on the driving-shaft, (but not shown in the drawings,) while in the apparatus illustrated in Fig. 5 the fluid is forced to the motor by means of an externally-located pump. The drum *a* of the former apparatus, moreover, is driven by a belt-pulley *s*, mounted on the driving-shaft secured to the drum, while the outer drum of the latter centrifugal apparatus (in Fig. 5) is driven either by means of a turbine mounted on its driving-shaft and actuated by the driving fluid or by a reaction-wheel, Fig. 8.

The driving means proper consists in both cases of a casing *i*, secured to the upper end of the driving-shaft *g*, the interior of said casing being divided near the bottom by radial partitions or vanes, Figs. 4, 7, 8, and having for its object to receive the driving fluid and set it in rotation. This casing embraces the tubular shaft *k* of the outer drum *a* and is secured to said shaft, which surrounds the shaft *m* of the inner threaded drum *b*. The shaft *m* carries at its lower end the rotary center piece *l*, located in the casing and provided with a number of floats (four in the drawings) the inner ends of which are either pivoted, Figs. 2, 6, or adapted to slide in slots in the casing, Fig. 3. The casing *i* proper is provided with cam-shaped projections, (two in the drawings,) so shaped and arranged that the center piece *l* bears on them and divides the casing in a number of chambers (two in the drawings) entirely separated from each other and each at the bottom above the partitions or vanes provided with an inlet *n* from the part of the interior of the casing where the vanes are situated and with an outlet *o* either in the side wall of the casing, Figs. 2, 3, or in its bottom, Figs. 5, 6.

In the modified arrangement shown in Fig. 8 the casing *i* is provided on its circumference with one or more discharge apertures or nozzles *u*, so located as to cause the discharging pressure fluid to rotate the casing, and consequently the outer centrifugal drum.

The driving fluid in the centrifugal apparatus shown in Fig. 1 is forced to the interior of the casing *i* from the base *p* by means of a centrifugal pump, mounted on the driving-shaft *g*, and through the pipe *r*. The supply of fluid to the centrifugal pump may be controlled by turning the valve-handle *q*. In

the centrifugal apparatus shown in Fig. 5, on the other hand, the driving fluid is forced to the motor by a pump located outside the apparatus and is introduced into a valve-chamber *v*, whence it is conducted through the hollow shaft *g* to the lower part of the casing *i* and to the vanes. The outer drum is here rotated not by a belt, as in Fig. 1, but either by means of a turbine mounted on the shaft *g* and driven by pressure fluid supplied by the pipe *v'* or by means of the turbine-like action of the casing *i* when the liquid is forced through the apertures *u* of the latter, (the modification shown in Fig. 8.)

When in Fig. 1 the centrifugal apparatus is brought in rotation by means of the belt-pulley *s*, the shaft *g*, casing *i*, shaft *k*, and the outer drum *a* are caused to revolve, while the centrifugal pump simultaneously forces up liquid into the interior of the casing *i*. This liquid being set in a rotating motion by the vanes in the casing *i* is forced, owing to the action of the centrifugal force, at a high pressure through the apertures *n* in the two chambers of the casing *i* and brings the center piece in motion in consequence of the pressure on the floats of the latter, to be subsequently discharged into the base of the frame through the apertures *o* when these have been uncovered by the floats. The rotation of the center piece is transmitted through the shaft *m* to the inner drum *b*.

The centrifugal apparatus illustrated in Fig. 5 is set in motion when the external pump is started, the pressure fluid partly bringing the turbine in motion, thus revolving the centrifugal apparatus, and partly being forced through the hollow shaft and motor, to be set in rotation by the vanes of the latter, and thus through the action of the centrifugal force, as in the apparatus according to Fig. 1, obtain an increased pressure, and finally flow out through the apertures *n*. In the modified arrangement of Fig. 8 the liquid rises through the shaft *g*, a portion of it flowing out through the apertures *u* and setting the casing *i*, together with the centrifugal apparatus, in rotation, while the other portion of liquid passes the same way as that previously described.

From what has been said it may be evident that the outer drum *a* and the inner threaded drum *b* will always rotate in the same direction and at a comparatively great velocity, which, however, owing to the contrivances described, will be different for the respective drums, since the liquid acting on the vanes of the motor, owing to its pressure, will give a different motion to the motor than the surrounding casing possesses. The ratio of velocities of the two drums may be varied by controlling the supply of liquid by means of the valve-handle *q*, Fig. 1, or the valve *v*, Fig. 5.

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—

1. In a centrifugal apparatus for separating solids and liquids and consisting of an outer drum and an inner drum provided with external screw-threads, means for rotating the drums at different velocities, consisting in a casing *i*, secured to the tubular shaft *k* of the outer drum *a* and to driving-shaft *g* and divided in direction of its height in two compartments, the upper one of which contains a central rotary piece *l* with movable floats and secured to the shaft *m* of the inner drum, while in the lower compartment are secured radial vanes, said casing communicating with a receptacle for a driving liquid.

2. In a centrifugal apparatus for separating solids and liquids and consisting of an outer drum and an inner drum provided with external screw-threads, means for rotating the drums at different velocities, consisting in a casing *i* secured to the tubular shaft *k* of the outer drum *a* and to the driving-shaft *g* and divided in direction of its height in two compartments, the upper one of which contains a central rotary piece *l* with movable floats and secured to the shaft *m* of the inner drum, while in the lower compartment are secured radial vanes, said casing communicating with a receptacle for liquid.

3. In an apparatus of the character described, the combination with a centrifugal apparatus comprising an outer and inner drum, means for rotating the drums simultaneously at different velocities, consisting of a casing, said casing being connected with the outer drum, and being divided into an upper and lower compartment, a central rotary member mounted within the upper compartment of the casing and being connected to the inner drum, rotary vanes mounted in the lower compartment, a driving-shaft for the casing and means for introducing a driving liquid to said casing, substantially as described.

4. In an apparatus of the character described, the combination with the outer and inner drum of a centrifugal apparatus, of means for rotating the drums at different velocities comprising a casing connected to the outer drum, a driving-shaft secured to the said casing, upper and lower compartments formed in the casing, a rotary member mounted in the upper compartment operatively connected to the inner drum, vanes mounted in the lower compartment and means for introducing a driving liquid to the casing, substantially as described.

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

EBERHARD SEGER.

Witnesses:
H. TELANDER,
T. RISBERG.