No. 815,363. PATENTED MAR. 20, 1906

G. TER MEER.

CENTRIFUGAL MACHINE.

APPLICATION FILED FEB. 10, 1905.

3 SHEETS—SHEET 1.

Fig. 1.

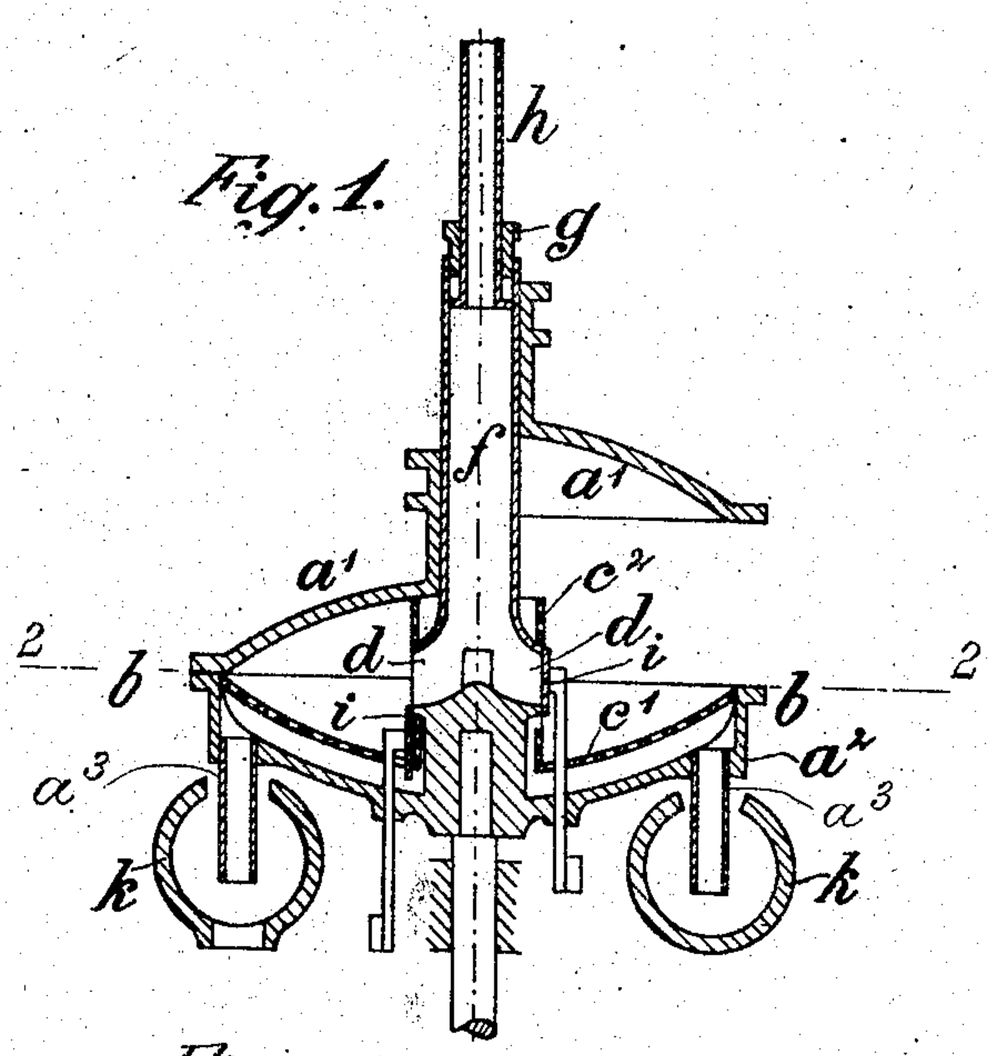
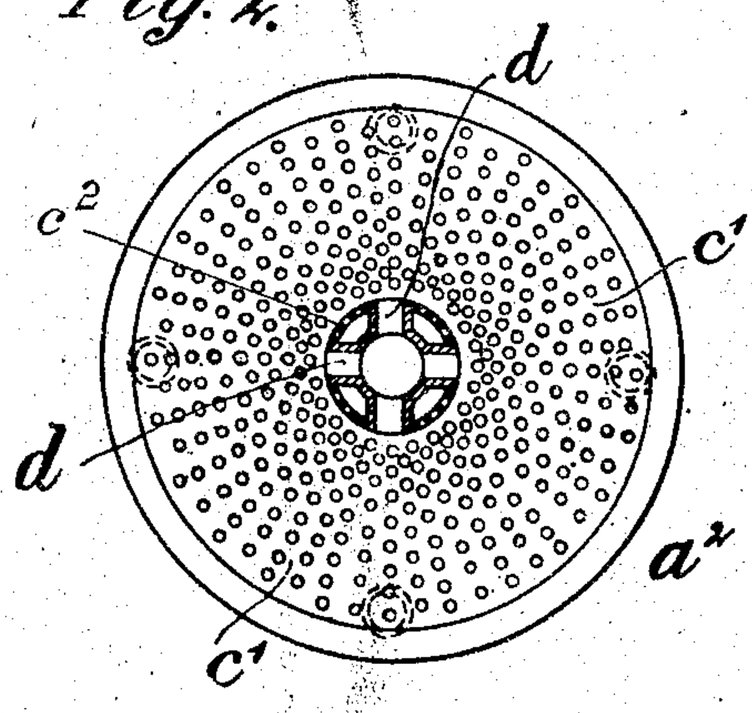


Fig. 2.



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3 SHEETS—SHEET 2

Fig. 3.

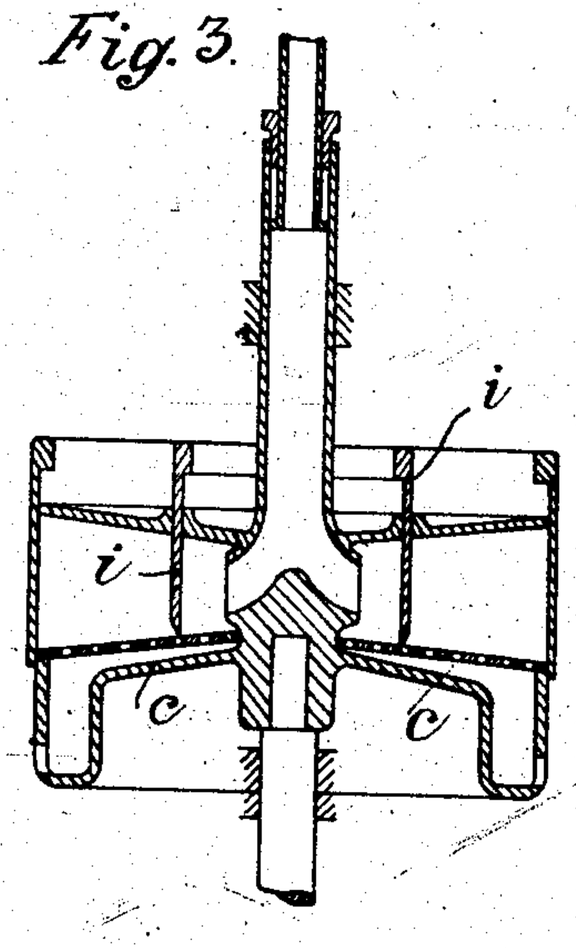
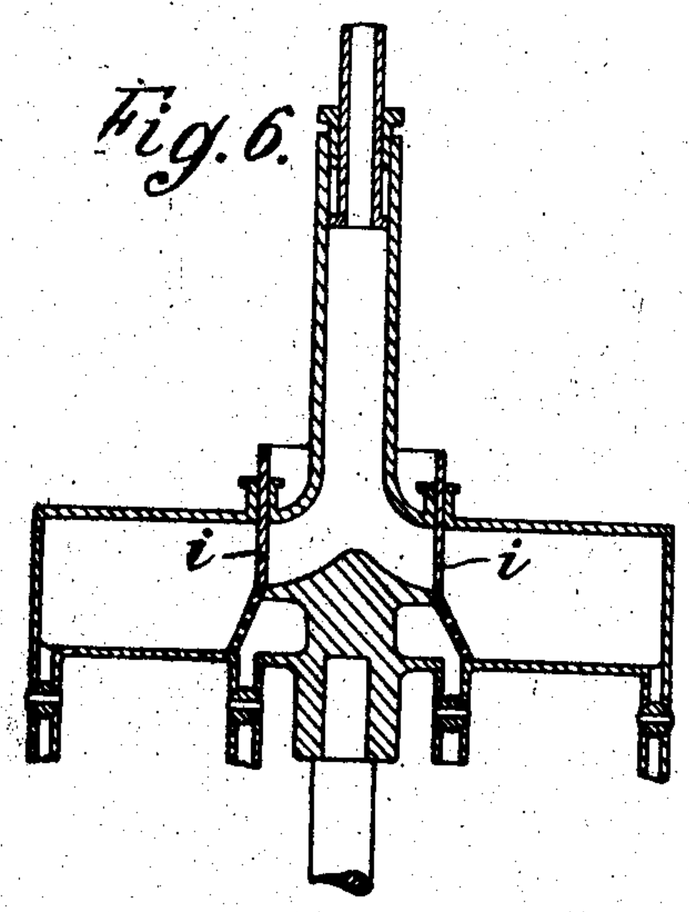


Fig. 6.



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3 SHEETS—SHEET 3.

Fig. 4.

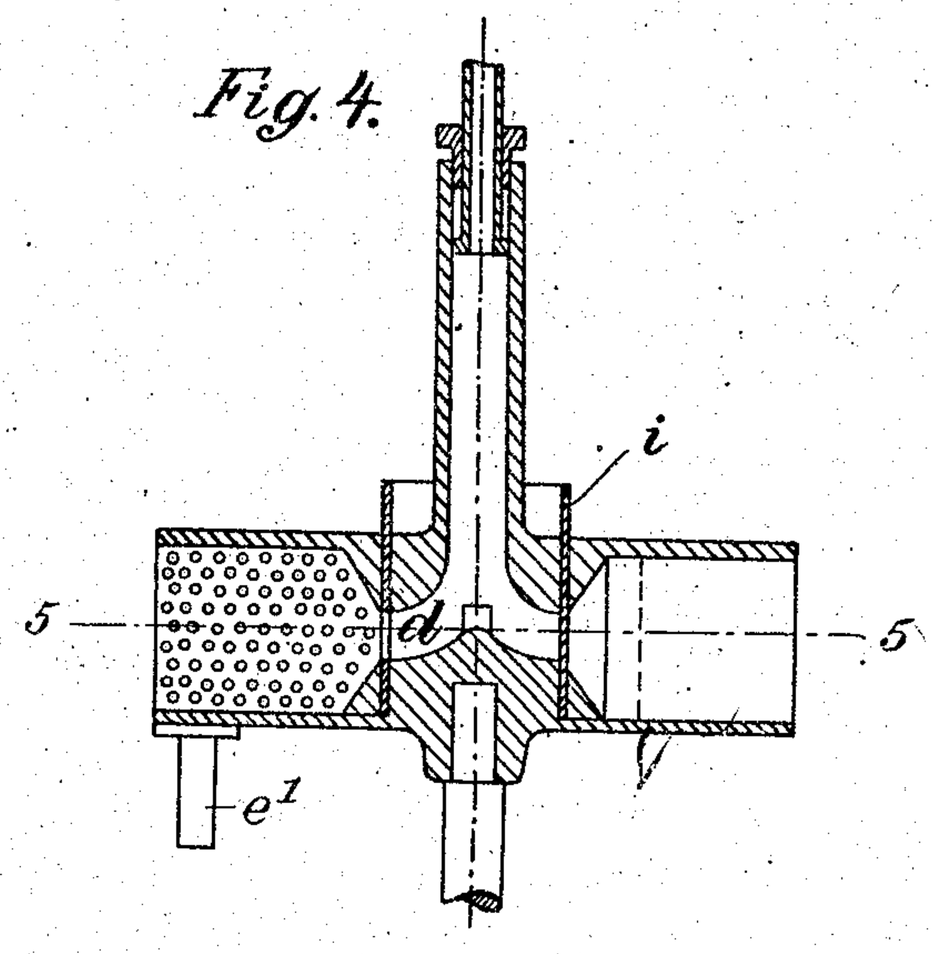
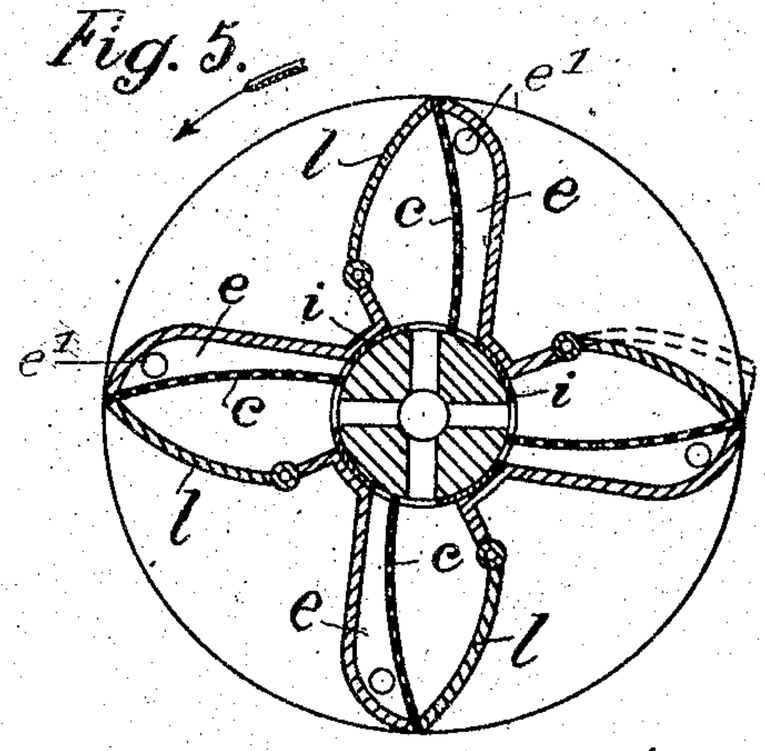


Fig. 5.



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UNITED STATES PATENT OFFICE.

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CENTRIFUGAL MACHINE.

No. 815,363. Specification of Letters Patent. Patented March 20, 1906.

Application filed February 10, 1906. Serial No. 245,015.

To all whom it may concern:

Be it known that I, GUSTAV TER MEER, a citizen of Germany, residing at Hanover, Germany, have invented new and useful Improvements in or Relating to Centrifugal Machines, of which the following is a specification.

The object of this invention is to improve the action of centrifugal machines used for separating solid bodies from liquid bodies or bodies mixed with liquid to a large extent or for separating from each other liquids of different specific gravity.

The improvements relate chiefly to such centrifugal machines in which it is desired to obtain continuous working and where periodical filling or emptying of the drum can be effected without stopping the machine.

In the accompanying drawings, Figure 1 is a vertical central section of a centrifugal machine embodying my invention; Fig. 2, a horizontal section on line 2 2, Fig. 1; Fig. 3, a vertical section of a modification; Fig. 4, a similar section of a further modification; Fig. 5, a horizontal section on line 5 5, Fig. 4; and Fig. 6 a vertical section of a still further modification.

The centrifugal machine shown in Figs. 1 and 2 comprises mainly a hollow body a' a^2, divided in the center. The cover a' of this hollow body is vertically adjustable and on being moved upward allows sufficient space for the passage of the dried material. When the machine is closed, the two cups are pressed against each other in such manner that the liquid cannot pass at the outer edge *b*. The bottom cup is covered with a perforated surface or sieve c' either completely or only at the part situated near the center. Another perforated surface c^2 is arranged cylindrically or conically round the center of the centrifugal drum. The position of the last-named perforated surface depends on the nature of the material to be treated. It is arranged so that at a chosen distance from the center of the spindle and at a given speed a sufficiently dry product is obtained at the perforated surface c^2. The liquid passing through the perforated surfaces is discharged in the well-known manner through circumferentially-arranged pipes or canals a^3 and collected in an annular chamber *k*. The perforated central surface c^2, which in Fig. 1 is arranged cylindrically, is provided with inlet-openings *d* for the material to be treated. These openings can be simultaneously closed by an annular valve *i*, slidable upon the lower expanded section of inlet-pipe *f*. The central inlet-pipe *f* is provided at the top with a stuffing-box *g*, which tightly incloses the pipe *h*, leading from the main reservoir arranged above the machine. The inlet-pipe *f* is centered within drum a' a^2, and its laterally-extending discharge-ports *d* are controlled by the valves or gates *i*, slidable within the drum.

Fig. 3 shows a construction in which the outer centrifugal drum comprises two conical surfaces with their apices facing each other. This is done for the purpose of reducing the quantity of material situated toward the interior which has been dried to a sufficient extent, but not so thoroughly as the material situated farther out. In this way the proportion of less perfectly dried material is reduced, so that the total result is a better one. The perforated surface is arranged in the lower portion of the centrifugal machine and extends behind the closing device right up to the solid central partition. The outer circumference of the centrifugal drum is either closed in a water-tight manner by means of a vertically-adjustable cylindrical casing or opened for discharging the dried material, as may be required. The separation of the insufficiently-dried material from the sufficiently-dried one is effected by means of a vertically-adjustable annular valve *i* with a sharp bottom edge, the inside diameter of the said valve depending on the nature of the material to be treated.

Figs. 4 and 5 show a centrifugal apparatus with single chambers arranged in the form of a cross. Each chamber is provided with a perforated surface *c*, which here, for instance, is arranged at the back relatively to the direction of rotation of the centrifugal apparatus. The remaining limiting-surface of the chambers are constituted by solid walls, but can also be constituted by filter-surfaces. Behind the vertical filter-surfaces *c* are arranged collecting-chambers *e* for the liquid separated, which is discharged by means of pipes e'. Periodical closing and opening of the chambers is effected by a valve *l*, the closing of the inlet-openings by a rotary valve-plug *i*. The perforated wall *c* extends up to the rear vertical closing-wall of the chambers, there being thus no clearance or space in which raw material could collect and remain unaffected by the treatment.

Fig. 6 shows an apparatus suitable for sepa-

rating liquids of different specific gravities. The centrifugal body, which, as in the preceding constructions, can comprise a closed annular body of various cross-section or a star-shaped body with variously-shaped chambers, is provided at the back near the axis with a perforated or filter surface in accordance with the principle already repeatedly described. The introduction and the expulsion of the liquid is again effected under pressure.

The working of centrifugal machines according to this invention is as follows: Raw material is supplied to the centrifugal machine under pressure, which varies according to the material to be dried, and can be raised to several atmospheres. The raw material entering the centrifugal chambers is thrown outward by centrifugal force, and this results in separation, the heavier particles having the tendency to fly toward the circumference of the centrifugal chamber, while the lighter liquid particles are forced backward. Wherever this liquid going backward and sidewise strikes perforated walls, it passes through them and into discharge-conduit. Of the portions of the material already dried the portions in front situated nearer to the circumference are compressed by the particles following and also by mechanical pressure, and thus forced to give off more liquid. This pressure can be assisted by making the chamber in which the material is pressed of a wedge shape. The longer the centrifugal process goes on and the more the centrifugal chamber is filled with solid material the smaller will be the action of centrifugal force, for it decreases in proportion to the square of the peripheral speed. In order to get the centrifugal apparatus entirely filled up and even the parts situated near the center dried to the utmost possible extent, the head of liquid on the centrifugal machine is allowed to remain during the whole process, so that accordingly the parts situated closest to the center are forced outward by the said liquid-pressure and by centrifugal force. When the centrifugal apparatus is completely filled with dried material, the head of liquid on the machine is taken off the dried material by closing the inner closing device provided for the purpose and the latter ejected by opening the outer outlet. After the outlet has been closed again and properly packed the process begins afresh.

It is preferable to make the centrifugal chamber of such shape as to get the greatest possible compression of the material, and consequently the best possible drying action by forcing the material into wedge-shaped or conical surfaces. The perforated surfaces are preferably arranged so that the dried material rubs against them when it is being ejected. These surfaces are thus to a certain extent scrubbed and cleaned from any solid particles that might adhere to them, so that their liability to choke is prevented. With perforated surfaces arranged radially or near the axis there is no great tendency to choke, as the material to be dried does not get pressed against the said surfaces with such force as in centrifugal machines of ordinary construction in which the perforated surfaces are arranged at the outermost circumference of the machine and where the dried material naturally presses with the whole force of the centrifugal force against the openings of the filtering-surfaces. According to the nature of the raw material to be treated the limiting-walls, whether completely or partially provided with perforated surfaces or constituted altogether by solid surfaces, can be arranged in various ways, and in the same way the shape and the angle of inclination of the sieve-chambers must be adapted to the nature of the raw material.

The working of the centrifugal machine for liquids is the same as for material consisting of liquid and solid matter.

The length of the periods between the filling and the discharging of the centrifugal machines depends on the nature of the raw material under treatment.

What I claim is—

A centrifugal machine provided with a drum, a strainer, a centered inlet-pipe having a series of inlet-openings, and an annular valve surrounding said pipe and adapted to simultaneously close said openings, substantially as specified.

Signed by me at Hanover, Germany, this 30th day of January, 1905.

GUSTAV TER MEER.

Witnesses:

LEONORE RASCH,

ANNA DIPPEL.