

No. 747,604.

PATENTED DEC. 22, 1903.

M. GÜTTNER & R. BAEGER.

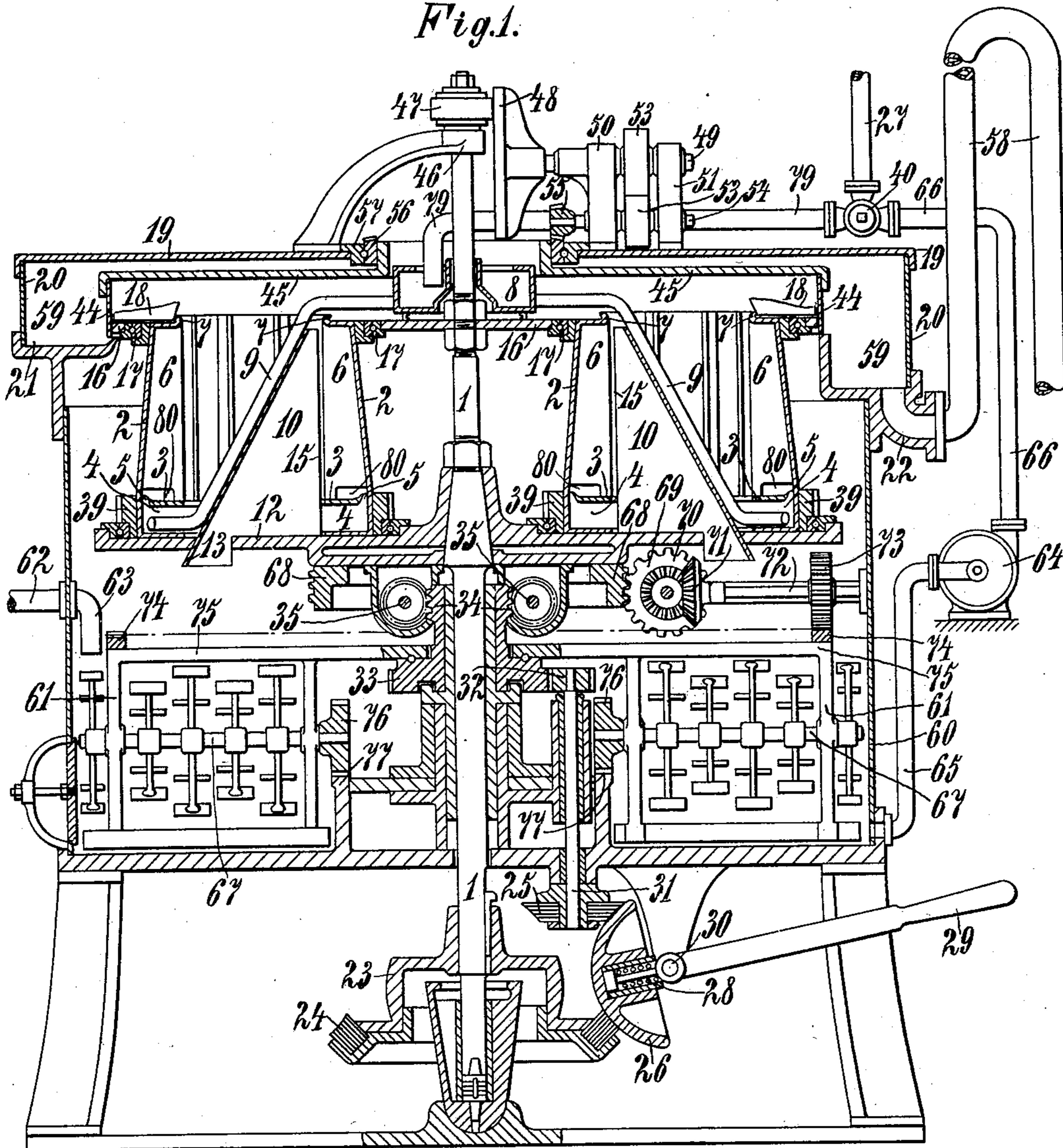
CENTRIFUGAL MACHINE.

APPLICATION FILED SEPT. 3, 1903.

NO MODEL.

3 SHEETS—SHEET 1.

Fig. 1.



Witnesses.

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L. Waldman.

Inventors.

Max Güttner
Richard Baeger
by J. Singer
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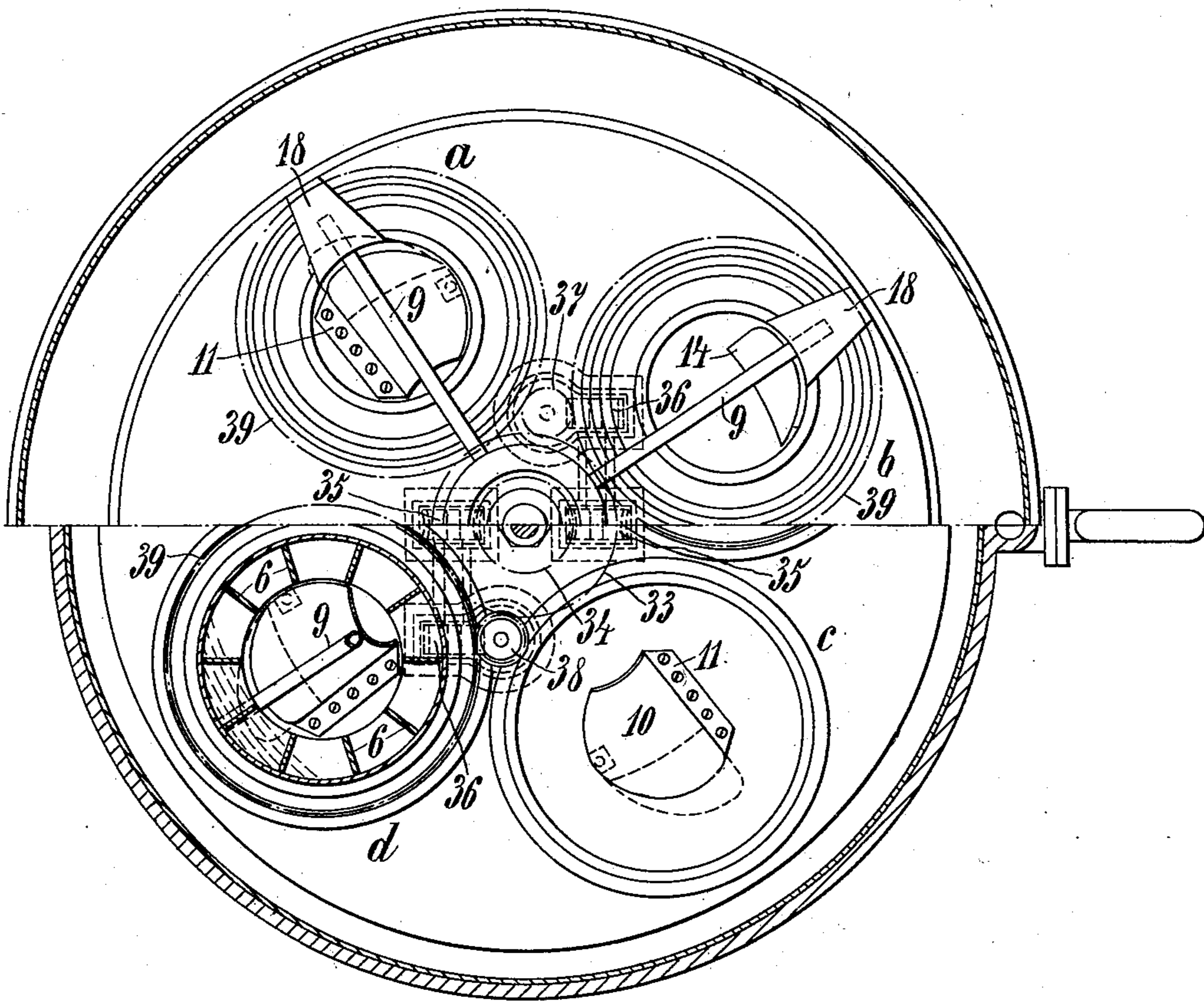
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3 SHEETS—SHEET 2.

Fig. 2.



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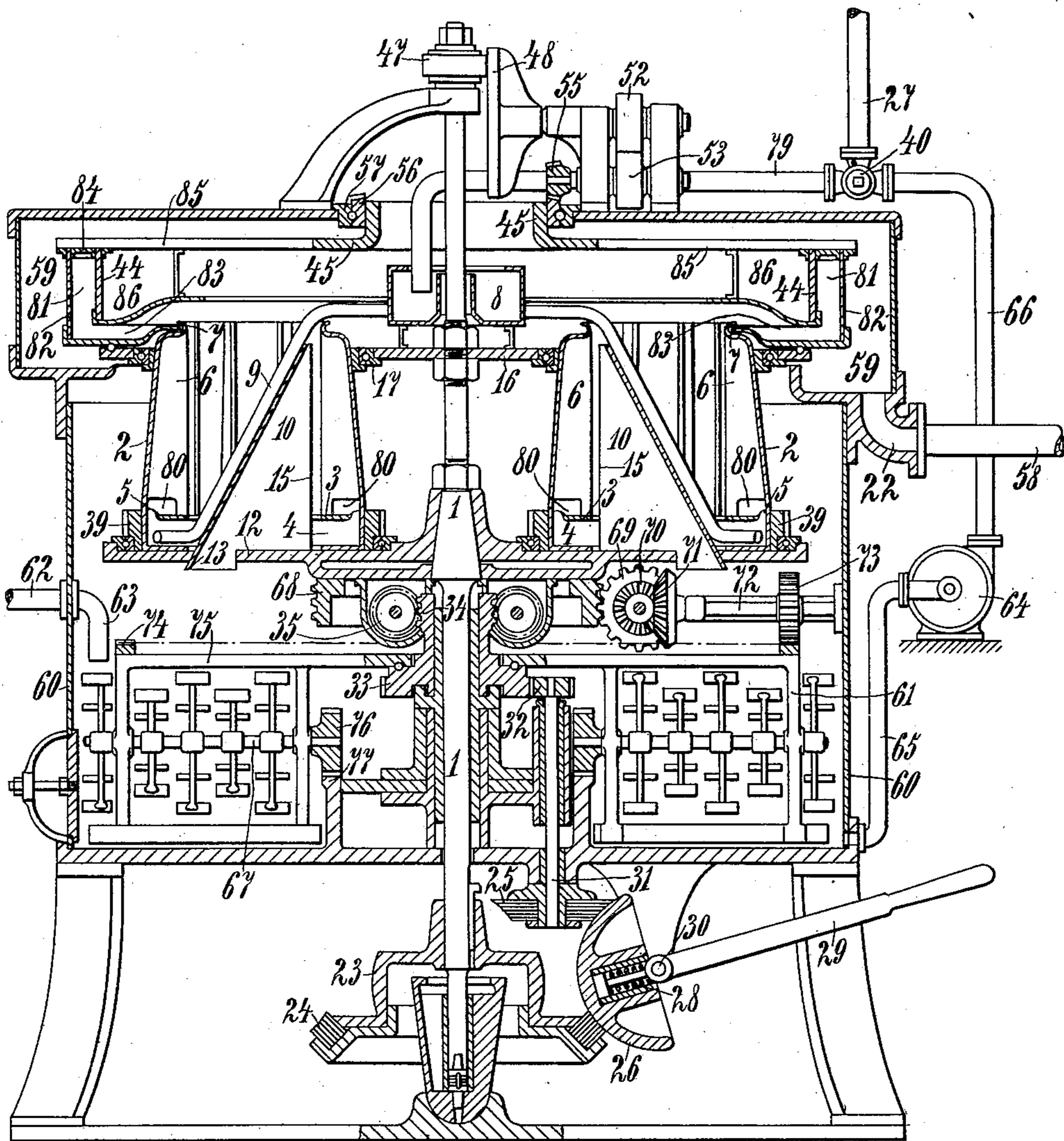
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NO MODEL.

3 SHEETS—SHEET 3.

Fig. 3.



Witnesses.

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UNITED STATES PATENT OFFICE.

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CENTRIFUGAL MACHINE.

SPECIFICATION forming part of Letters Patent No. 747,604, dated December 22, 1903.

Application filed September 3, 1903. Serial No. 171,777. (No model.)

To all whom it may concern:

Be it known that we, MAX GÜTTNER, residing and having my post-office address at Limbacherstrasse 41, Chemnitz, Saxony, and
5 RICHARD BAEGER, residing and having my post-office address at Ehrenberg, near Altenburg, Germany, subjects of the German Emperor, have invented a certain new and useful Centrifugal Machine, of which the following is a specification.

This invention relates to an apparatus of such art as clearly described in our Patent No. 730,114, its object being to separate liquids from solid matter; and it more particularly relates both to the special arrangement
15 of the plates serving for scooping out the liquid to be clarified and to arrangements for filtering the clarified liquid leaving the separator.

In the accompanying drawings, Figure 1 is a vertical longitudinal section of the apparatus, while Fig. 2 represents a plan view and partial transverse section thereof. Fig. 3 shows a vertical longitudinal section of the
25 apparatus with a modification of the filtering apparatus arranged thereon.

Round the vertical shaft 1, journaled in any suitable known manner, revolves a series of planetary centrifugal baskets 2, of non-perforated sheet metal. These baskets are preferably conical, with the narrow parts upward, while the broader lower part is divided by a horizontal circular disk 3 from the upper part, so that the lower annular chamber
35 4 is in communication with the upper space by means of an aperture 5 running along the conical wall. The space above the disk 3 is divided by scoop-plates 6 into a number of radial chambers. The edges of the various
40 scoop plates 6 directed toward the interior of the basket engage under the inside edges of the circular disks 3 and at the top bear against the upwardly-bent rim 7 of the cover-ring. From a separating drum 8, arranged concentrically to shaft 1, a feed-pipe 9 leads into each of the baskets and opens at its lower end into the annular hollow space 4 of said baskets. The parts 8 and 9 take part in the rotary movement of the shaft 1, and the baskets 2 revolve round the pipes 9.

In addition to the pipe 9 a peculiar-shaped

receiving-pan or catching-plate 10 is arranged inside each basket. This pan has generally a trough-shaped form and is rigidly fixed to the revolving disk 12, Fig. 1, by means of its horizontal edge 11, Fig. 2, and projects with its downwardly-lengthened part 13 through an aperture 14 in said rotary disk 12. One edge 15 of the pan 10 is vertical, and therefore parallel, to the drum-shaft 1. In Fig. 2 four baskets are shown separately, so that the pans are clearly seen, *a* showing a basket and pan complete in plan view. In *b* the pan is removed; but the basket is completely shown, the opening 14 in the revolving disk 12 being
65 visible, with the extension 13 of the pan projecting through it. At *c* only the pan 10 is shown, the basket being completely removed. The mode of fixing the pan on the rotary disk by means of the riveted or screwed edge 11 is clearly shown. Finally, in *d* the basket 2 and the pan 10 are shown in horizontal section, so that the scoop-plates 6 are clearly visible. The latter, Figs. 1, 2, are provided below with an aperture 80, respectively, thus
75 setting up communication between the scoop-chambers.

The separating-baskets are so mounted on ball-bearings 17 in the disk 12 and cover-plate 16 that they can perform a planetary motion as free from friction as possible.

At the upper revolving disk 16 of each of the four baskets funnel-like discharges 18 are arranged as seen in Fig. 1, but also at *b* in Fig. 2. These funnels extend toward the annular filter-cloth 44. By means of the latter communication between the baskets and the receptacle 59, fixed firmly to the machine-frame, is established, which receptacle is closed above by the horizontal cover 19 and at the sides by the cylindrical plate 20 and terminates at the bottom in an inclined plane, with its highest point at 21, Fig. 1, sloping off all round to the lowest point, where the discharge-pipe 22 is situated. The liquid
95 thrown out of the funnel 18 is therefore forced through the filter-cloth 44 by centrifugal force, passes into receptacle 59, and is discharged through pipe 22.

While the movement of the apparatus or parts firmly fixed on the main shaft 1 is effected in the manner already known—viz.,

by a belt running upon a pulley 23—the planetary movement of the baskets 2 is accomplished by the following mechanism: To the lower edge of pulley 23 a leather or like ring 24 is attached, which works in conjunction with the friction-cone 25, also composed of leather or like disks, and the hemispherical friction wheel or disk 26. The latter is adapted to rotate round the axle 30 of a lever 29, and a spring 28, arranged in the same axial direction, presses the disk 26 against both the ring 24 and cone 25. The lever 29 can be rotated round center 30 into other positions, so that the ratio of transmission between the cone 25 and ring 24 can be varied. The toothed wheel 32, mounted on the vertical shaft 31 of the cone 25, meshes with the spur-wheel 33, Fig. 1. Rigidly connected with the latter is the worm 34, (see also Fig. 2,) meshing with the two worm-wheels 35. These wheels are again rigidly connected on a common shaft with worm-wheels 36, Fig. 2, which on their part mesh with the worm-wheels 37. As these latter, with the spur-wheels 38, Fig. 2, are mounted on a common shaft and wheels 38 engage racks or spur-gears 39, arranged on the baskets 2, it will be seen that the rotary motion of pulley 23 is transmitted at the speed desired to the baskets by means of the adjustable friction-gearing 24 26 25. The annular filter-cloth 44, adapted to separate the few solid parts which should still exist in the beer-wort or other liquid passing out at the top of the baskets, can either be given the same speed round the main shaft as the baskets or a slower or faster speed, as desired. On throwing out the beer-wort it is preferable to give the filter-cloth a substantially slower rotation round the main shaft, so as to prevent frothing as much as possible. For this purpose the main shaft 1 is carried upward to the bearing 46 and is provided with the driving-wheel 47 at the top, which transmits the motion of the main shaft to disk 48 on shaft 49. The latter is carried in the bearings 50 51 and transmits its rotary motion by means of gear-wheel 52 to gear-wheel 53 on shaft 54, also carried by the bearings 50 51. By means of toothed wheel 55 on said shaft 54 the rack 56 is rotated, said rack being seated on ring 57 and firmly connected with the neck-shaped portion of the cover 45. To the latter the interchangeable filtering-cloth 44 is attached. By giving the gear-wheels 47 48 52 53, which are preferably friction-wheels, suitable proportions the cover 45, with the filter-cloth, can be rotated at a certain speed, according to the revolutions of the main shaft, and slower than the baskets.

Directly below the baskets on the rigid machine-frame a sprinkling vat or tun 60, for the reception of the malt residuum thrown out of the baskets, is situated. This vat 60 is provided with a stirring apparatus 61. The malt residuum thrown from the baskets into the vat is then lixiviated with hot water introduced through conduit 62 and nozzle 63 and

suitably treated by the blades of the stirring apparatus.

The rotation of the stirring apparatus 61 and the blade-shafts 67 is preferably effected from the main shaft 1, as follows: The part 12, rotating with the main shaft, is rigidly connected with the worm 68, which transmits its movement to the worm-wheel 69 and through the bevel-gears 70 and 71 to shaft 72, gear-wheel 73, and rack 74. This rack is rigidly connected with the arms 75 of the stirring apparatus, and the latter therefore rotates slowly round the main shaft by the rotation of the wheel 73, and wheels 76 of the blade-shafts 67 rotate on the fixed rack 77, thus effecting the rotation of the blades, and consequently stirring of the husks.

The working of the above-described machine is as follows: The raw material to be separated—for instance, brewers' mash—is conducted through conduits 27 79 into the separating-drum 8 by suitable operation of the three-way cock 40 and then further through the pipes 9 into the annular spaces 4 of the separating-baskets 2. While the apparatus now rotates rapidly round the main shaft 1, the lever 29 is so manipulated that the baskets 2 have not yet commenced the movement around their own axes. The mash introduced at 4 into the four baskets under the influence of centrifugal force accumulates at the zone of each basket farthest from the shaft 1. In basket *d*, Fig. 2, this mass is indicated by dotted lines. According to hydrostatic laws the liquid will acquire a cylindrical surface the vertical axis of which is in shaft 1. When the liquid has risen so much in the separate baskets, as indicated at *d*, Fig. 4, it will commence to overflow at the edge 7, Fig. 1, and penetrates the circular filter-cloth 44. At this moment the planetary motion is applied to the baskets by operating-lever 29. In the meantime the operation progresses. Under the influence of centrifugal force the heavy ingredients of the mash—that is, the husks, starch, flour, and the like—settle down on the circumference of the baskets—that is, on the radial scoop-plates 6—and are pressed against the latter. Thereby the liquid separated from the solid parts may escape into the neighboring chamber through the openings 80 of the scoop-plates 6, Fig. 1, and join the liquid clarifying therein. Fresh mash is continually introduced into the chamber through pipes 9 and the annular apertures 5, while the clarified wort passes through filter-cloth 44 in a continuous stream into space 59. As most of the solid substances—particularly the husks—are retained in the baskets and only those solid parts which, like albumen, possess the same specific weight as the wort remain in the latter—that is to say, are passed with it against the filter-cloth 44—it results that only a proportionally small quantity of solid matter will reach the filtration, and a choking of the filter-cloth within reasonable

time need not be feared. As the rotation of the separating-baskets 2 progresses the husks thrown out are gradually passed round and approach the lower edge 15 of the pans 10 and on account of the centrifugal force finally slide down the plates 6, Fig. 2, into the pans and thence into the vat. Owing to the flowing of fresh substance into the scoop-chambers, a certain agitation or current is produced in the substance already subjected to the separating process. This defect is, however, removed by the undivided space 4, running round the inner circumference of the baskets. This space 4 is in communication with the chambers by the apertures 5. Consequently the substances introduced into this circular chamber through supply-pipes 9 are divided or conveyed into the separate chambers through the apertures 5 without substantially disturbing the liquid already in said chambers. As soon as the throwing out of the main wort is terminated the pump 64 is operated and the husks pumped through conduits 65 66 79 into the separating-drum 8 after suitably manipulating the three-way cock 40 and from said drum passed through the tubes 9 into the spaces 4 of baskets 2, whereupon the throwing out of the husks is effected in the same manner as the mash already described.

To prevent excessive difference of pressure inside the filter-cloth 44, and consequently the beer-wort from being forced at too great a speed through said cloth, the wort-outlet pipe 58 should be formed as a siphon-pipe, as shown in Fig. 1. This pipe 58 is firmly connected at its lower end with the discharge-pipe 22 of the receptacle 59 and in proportion causes a corresponding counter-pressure in said receptacle. In this manner an intense frothing of the wort through reduction of pressure can be prevented in the simplest manner.

The construction of the filtering apparatus arranged on the separator, as shown in Fig. 3, differs from that represented in Fig. 1, inasmuch as the clarified liquid leaving the basket and still containing soilings is pressed through the annular filtering-cloth 44 from without inward in a direction opposite to that of the centrifugal force, the soilings collecting on the exterior surface of the filtering-cloth thereby being continually removed by the centrifugal force. As shown in Fig. 3, the receptacle 81 is closed above by the annular partition 84 at the exterior side by the fixed annular partition and at the inner side by means of filtering-cloth 44. This receptacle 81 is connected to the separating-baskets 2 or with their scoop-chambers by means of the annular passage 83. The rotation of the receptacle 81 and the filtering-cloth 44 may be attained in the same way as with the filtering-cloth 44 in Fig. 1, above described. For this purpose the main shaft 1 transmits its motion to the rack 56 by means of the gear-wheels 47, 48, 52, 53, and 55, said rack 56 being seated on the ring 57 and fixed to the neck-shaped

part 45. The latter by means of arms 85 is connected to the annular receptacle 81. The clarified liquid expelled from the baskets 7, Fig. 3, passes through the annular passage 83 and gets into the revolving receptacle 81, where it is pressed against the wall of the latter under the influence of centrifugal force produced by its rotation. As the liquid cannot escape from the receptacle 81 above, the latter soon will be completely filled up by the liquid continuously separated from the baskets. According as this supply of liquid continues it is forced through the filtering-cloth 44 from without inward. During such operation the liquid passes the filtering-cloth in a direction contrary to that of the centrifugal force, so that it arrives in the chamber 86 only with a moderate speed, the liquid leaving back such fine matter as may be still contained therein on the exterior circumference of the filtering-cloth. Consequently by means of the centrifugal force a counter-pressure is produced in the chamber 86, which prevents a frothing of the clarified liquid, as such, for instance, would be the case with beer-worts, and presses the liquid against the inner surface of the filtering-cloth 44 till it gets into the chamber 59 over the top annular partition 84 of the receptacle 81. From here the liquid is conducted away through nozzle 22 and conduit 58. The soilings settling down upon the outer surface of the filter-cloth 44 are continuously removed from it by the centrifugal force and thrown against the solid partition 82, so that even after long use said cloth remains completely clean.

Having now fully described our invention, we declare that what we claim is—

1. In a centrifugal separator for continually separating mixed liquid and solid constituents the combination with a plurality of separating-baskets revoluble together around a common axis, and each basket being also revoluble around its own axis, of scoop-plates arranged within each separating-basket and forming chambers or spaces therein, said baskets being provided with apertures at the foot of the scoop-plates connecting the scoop-chambers of the separating-baskets respectively, substantially as described.

2. In a centrifugal separator for continually separating mixed liquid and solid constituents the combination with a plurality of separating-baskets revoluble together around a common axis, and each basket being also revoluble around its own axis, of scoop-plates arranged within each separating-basket fixed to the inner circumference thereof and forming chambers or spaces therein said baskets being provided with apertures at the foot of the scoop-plates connecting the scoop-chambers of the separating-baskets respectively, substantially as described.

3. In a centrifugal separator for continually separating mixed liquid and solid constituents the combination with a plurality of separating-baskets revoluble together around

a common axis, and each basket being also revoluble around its own axis, of scoop-plates radially arranged within each separating-basket and forming chambers or spaces therein, said baskets being provided with apertures at the foot of the scoop-plates connecting the scoop-chambers of the separating-baskets respectively, substantially as described.

4. In a centrifugal separator for continually separating mixed liquid and solid constituents the combination with a plurality of separating-baskets revoluble together around a common axis, of scoop-plates arranged within each separating-basket and forming chambers or spaces therein, said baskets being provided with apertures at the foot of the scoop-plates and a filter-cloth revoluble around said axis for filtering the clarified liquid discharged from the separating-baskets, substantially as described.

5. In a centrifugal separator for continually separating mixed liquid and solid constituents the combination with a plurality of separating-baskets revoluble together around a common axis, of scoop-plates arranged within each separating-basket and forming chambers or spaces therein, said baskets being provided with apertures at the foot of the scoop-plates and a filter-cloth revoluble around said axis for filtering the clarified liquid discharged from the separating-baskets with means for changing the speed of rotation of said filter-cloth, substantially as described.

6. In a centrifugal separator for continually separating mixed liquid and solid constituents the combination with a plurality of separating-baskets revoluble together around a common axis, and each basket being also revoluble around its own axis, of scoop-plates arranged within each separating-basket and forming chambers or spaces therein, said baskets being provided with apertures at the foot of the scoop-plates and a filter-cloth revoluble around said axis with means for changing the speed of rotation of said filter-cloth, a closed receptacle for receiving the liquid discharged from the separating-baskets concentrically arranged around said axis, said receptacle having a sloping bottom, and a discharge-pipe connected to said sloping bottom, substantially as described and for the purpose set forth.

7. In a centrifugal separator for continually separating mixed liquid and solid constituents the combination with a plurality of separating-baskets revoluble together around a common axis, and each basket being also revoluble around its own axis, of scoop-plates arranged within each separating-basket and forming chambers or spaces therein, said baskets being provided with apertures at the foot of the scoop-plates and a filter-cloth revoluble around said axis with means for changing the speed of rotation of said filter-cloth, and a closed receptacle for receiving the liquid discharged from the separating-baskets concentrically arranged around said axis, said recep-

tacle having a sloping bottom and a discharge-pipe connected to said sloping bottom consisting of a siphon-pipe substantially as described and for the purpose set forth.

8. In a centrifugal separator for continually separating mixed liquid and solid constituents the combination with a plurality of separating-baskets revoluble together around a common axis, and each basket being also revoluble around its own axis, of scoop-plates arranged within each separating-basket and forming chambers or spaces therein, said baskets being provided with apertures at the foot of the scoop-plates and a stirring apparatus arranged directly under the separating-baskets for reception of the husks discharged from the latter, substantially as described.

9. In a centrifugal separator for continually separating mixed liquid and solid constituents the combination with a plurality of separating-baskets revoluble together around a common axis, and each basket being also revoluble around its own axis, of scoop-plates arranged within each separating-basket and forming chambers or spaces therein, said baskets being provided with apertures at the foot of the scoop-plates and a filter-cloth revoluble around said axis with means for changing the speed of rotation of said filter-cloth, a closed receptacle for receiving the liquid discharged from the separating-baskets concentrically arranged around said axis, said receptacle having a sloping bottom, and a discharge-pipe connected to said sloping bottom and a stirring apparatus arranged directly under the separating-baskets for reception of the husks discharged from the latter with means for rotating said stirring apparatus from said common axis, substantially as and for the purpose set forth.

10. In a centrifugal separator for continually separating mixed liquid and solid constituents the combination with a plurality of separating-baskets revoluble together around a common axis, and each basket being also revoluble around its own axis, of scoop-plates arranged within each separating-basket and forming chambers or spaces therein, said baskets being provided with apertures at the foot of the scoop-plates and a stirring apparatus arranged directly under the separating-baskets for reception of the husks discharged from the latter with means for continuously transporting said husks from the stirring apparatus into the separating-baskets, substantially as and for the purpose set forth.

11. In a centrifugal separator for continually separating mixed liquid and solid constituents the combination with a plurality of separating-baskets revoluble together around a common axis, and each basket being also revoluble around its own axis, of scoop-plates arranged within each separating-basket and forming chambers or spaces therein, said baskets being provided with apertures at the foot of the scoop-plates and a stirring apparatus arranged directly under the separating-

baskets for reception of the husks discharged from the latter, a distributing-drum arranged around the vertical main shaft of the centrifugal separator, distributing-pipes leading to said separating-baskets, of a pump, a pipe connecting said pump with the interior of said stirring apparatus and conduits for connecting the pump with said distributing-drum, substantially as and for the purpose set forth.

12. In a centrifugal separator for continually separating mixed liquid and solid constituents the combination with a plurality of separating-baskets revoluble together around a common axis, and each basket being also revoluble around its own axis, of scoop-plates arranged within each separating-basket and forming chambers or spaces therein, said baskets being provided with apertures at the foot of the scoop-plates, an annular space revoluble around the vertical main shaft of the centrifugal separator shut off at its top and exterior side and communicating at its lower end with said separating-baskets, a filter-cloth arranged concentrically to the said main shaft and forming the inner partition of said annular space, a closed receptacle for receiving the liquid discharged from said separating-baskets through said filter-cloth, said receptacle having a sloping bottom and a discharge-pipe connected to said sloping bottom, substantially as and for the purpose set forth.

13. In a centrifugal separator for continu-

ally separating mixed liquid and solid constituents the combination with a plurality of separating-baskets revoluble together around a common axis, and each basket being also revoluble around its own axis, of scoop-plates arranged within each separating-basket and forming chambers or spaces therein, said baskets being provided with apertures at the foot of the scoop-plates, an annular space revoluble around the vertical main shaft of the centrifugal separator shut off at its top and exterior side and communicating at its lower end with said separating-baskets, a filter-cloth arranged concentrically to the said main shaft and forming the inner partition of said annular space, a closed receptacle for receiving the liquid discharged from said separating-baskets through said filter-cloth, said receptacle having a sloping bottom and a discharge-pipe connected to said sloping bottom and a stirring apparatus arranged directly under said separating-baskets with means for continuously transporting the husks from the stirring apparatus into said separating-baskets, substantially as and for the purpose set forth.

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