H. M. GOODMAN.

CENTRIFUGAL SEPARATOR.

APPLICATION FILED NOV. 30, 1908.

949,227. Patented Feb. 15, 1910.

2 SHEETS—SHEET 1.

Fig. 1.

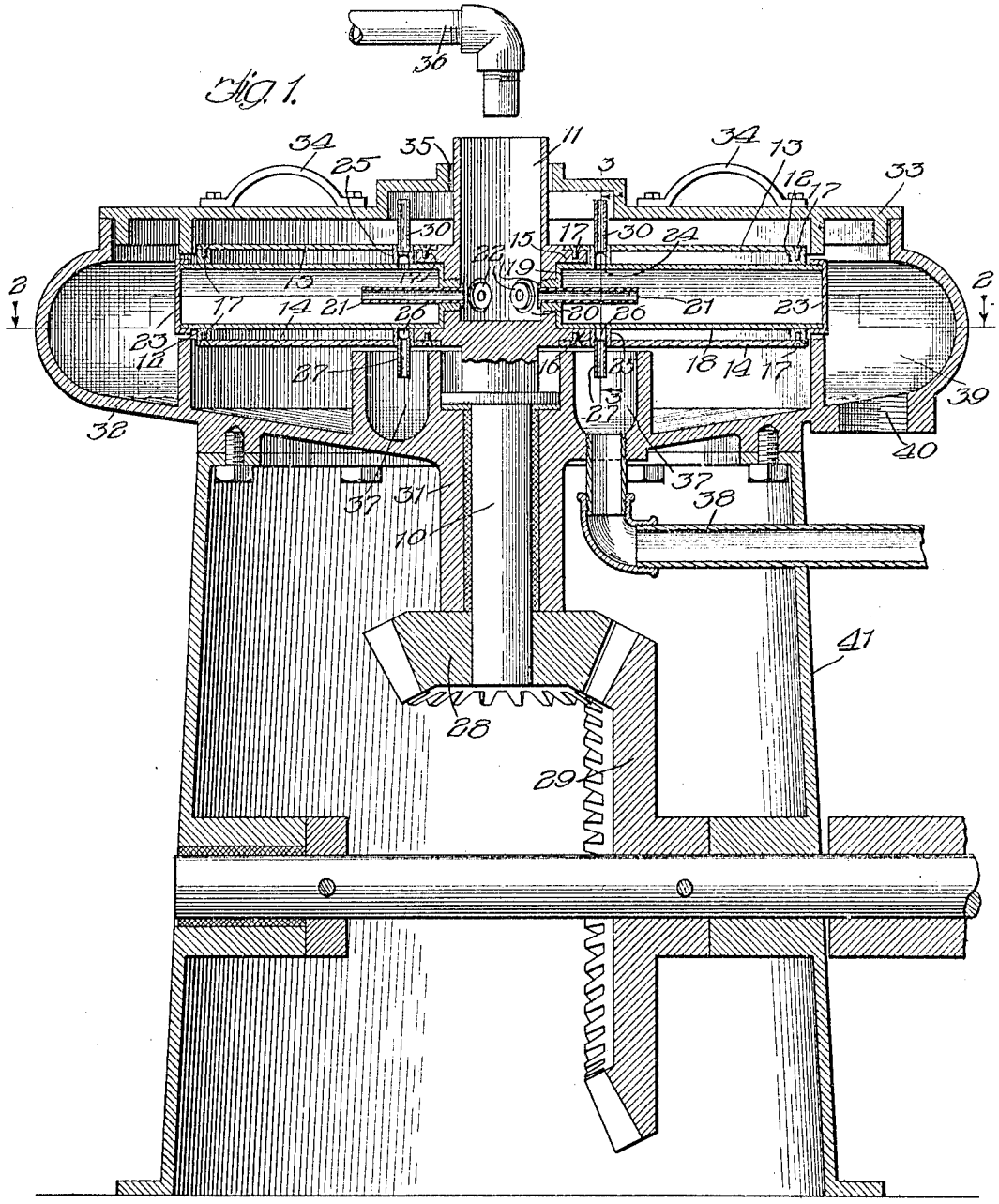
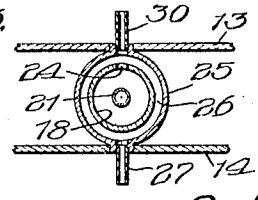


Fig. 3.



Witnesses:
Jno. H. Nelson jr.
J. F. Jochum Jr.

Inventor:
H. M. Goodman
By Brown & Hopkins
Attys

H. M. GOODMAN.

CENTRIFUGAL SEPARATOR.

APPLICATION FILED NOV. 30, 1908.

949,227. Patented Feb. 15, 1910.

2 SHEETS—SHEET 2.

Fig. 2.

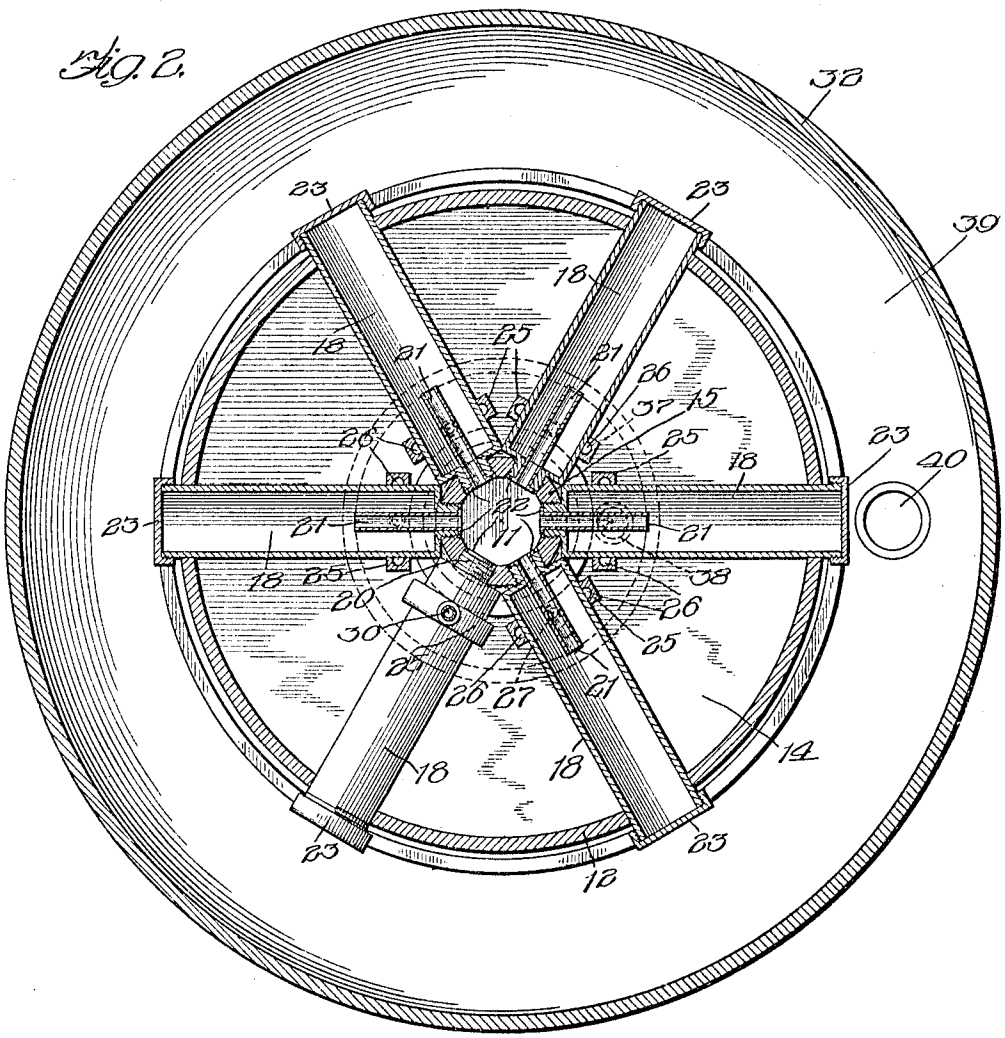
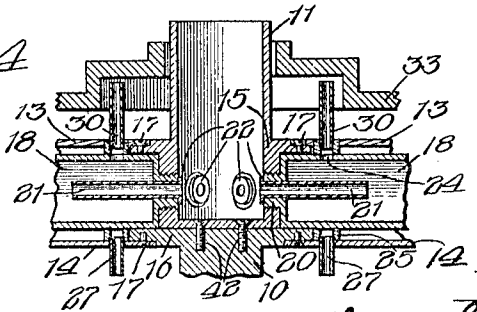


Fig. 4.



Witnesses:
Geo. H. Nelson Jr.
J. N. Jochums Jr.

Inventor:
H. M. Goodman
By Brown & Hopkins
Attys

UNITED STATES PATENT OFFICE.

HENRY M. GOODMAN, OF LOUISVILLE, KENTUCKY.

CENTRIFUGAL SEPARATOR.

949,227. Specification of Letters Patent. Patented Feb. 15, 1910.

Application filed November 30, 1908. Serial No. 465,065.

To all whom it may concern:

Be it known that I, HENRY M. GOODMAN, a citizen of the United States, residing at Louisville, county of Jefferson, and State of Kentucky, have invented certain new and useful Improvements in Centrifugal Separators, of which the following is a specification.

In my application for United States Letters Patent Serial No. 428,771, filed April 23, 1908, in the United States Patent Office, there is shown and described an improved centrifugal separating apparatus for clarifying liquids by separating the solid matters therefrom to produce a clear solution and in which there is provided a plurality of horizontally disposed bodily rotating separating chambers having closed ends, the liquid to be separated being fed into the chambers through one end thereof and from a supply chamber. The liquid, after the solid matters are separated therefrom, passes out of the chambers through an opening in the top thereof into discharge tubes adjacent the ends of the chambers through which the solution is fed to the separating chambers. It has been discovered that there is sometimes a tendency of the outlet tubes or pipes to have a siphonic action on the solution within the chambers, which materially interferes with the centrifugal action of the machine in the removal of sedimentary matters from the solution and it is the primary object of the present invention to provide improved means for overcoming the tendency of such siphonic action of the tubes.

A further object is to provide improved means for assembling and supporting the various parts of the mechanism.

A further object is to provide an improved device of this character which will be simple, durable and cheap in construction and effective and efficient in operation.

To the attainment of these ends and the accomplishment of other new and useful objects, as will appear, the invention consists in the features of novelty in the construction, combination and arrangement of the several parts hereinafter more fully described and claimed and shown in the accompanying drawings illustrating an embodiment of the invention, and in which—

Figure 1 is a longitudinal sectional view of an improved device of this character constructed in accordance with the principles of this invention. Fig. 2 is an enlarged detail sectional view taken on line 2—2 of Fig. 1. Fig. 3 is a detail sectional view taken on line 3—3 of Fig. 1. Fig. 4 is an enlarged detail sectional view of a modified form of the invention.

Referring more particularly to the drawings and in the present exemplification of the invention, the numeral 10 designates an upright shaft, one extremity of which is hollowed out or shaped to form a supply receptacle 11 for the solution to be separated. Surrounding the shaft 10, preferably adjacent the receptacle or chamber 11, is an annular ring-shaped member 12 which may be of any desired width and diameter. This ring may be supported and secured for rotation with the shaft 10 in any desired or suitable manner, preferably by means of two plates or members 13 and 14 preferably in the form of disks which are provided with central registering apertures through which the upper portion of the shaft 10 passes, and the shaft 10 is provided with spaced peripheral flanges 15, 16, against which the edges of the respective disks 13, 14, adjacent the central aperture rest. The peripheries of the disks 13, 14 are adapted to rest against the respective edges of the annular member 12 and both of the disks are secured against displacement in any desired or suitable manner preferably by means of fastening devices such as bolts or screws 17 which pass through the disks 13, 14, and into the flanges 15, 16 and the edges of the member 12.

The member 12 is provided with a plurality of apertures through which separating chambers 18 project. These separating chambers 18 may be of any desired configuration but are preferably cylindrical and are provided with a closed end 19 projecting from which is a threaded extension 20 located preferably at the diametric center thereof and which extension is provided with an aperture forming communication with the interior of the chamber 18. This closed end of the chamber 18 is secured to the shaft 10 for rotation therewith and between the disks 13, 14, in any desired or suitable manner, preferably by means of the threaded extension 20 thereof engaging in a suitable aperture in the wall of the receptacle or chamber 11 so that the chamber 18 will have communication with the receptacle or chamber 11 through the aperture in the extension. A supply tube 21 provided with a flanged extremity 22 is inserted within the aperture in

the extension 20 so that the flange 22 which is arranged at the one end of the tube will engage the face of the extension 20 adjacent the chamber or receptacle 11. The tube is of such a diameter and length as to substantially fill the opening in the extension and to project for some distance into the chamber and is held out of engagement with the walls of the chamber by means of the extension 20. The opposite end of the chamber 18 is preferably open and is provided with a suitable closure 23, preferably in the form of a cap, which is adapted to have a threaded engagement with the periphery of the chamber. Any number of these chambers 18 may be provided according to the capacity of the machine and in the present exemplification of the invention, six of such chambers are shown, each of which is supported in the same manner and is provided with a supply tube 21 having communication with the chamber or receptacle 11. Each of the chambers is provided with an outlet opening 24, which is located at the inner end of the chamber or the end adjacent the receptacle or chamber 11 and at the top of the chamber so that the liquid which enters the chamber and from which the solid matters have been separated, will be allowed to accumulate in the chamber until the latter is practically full, at which time the liquid will pass out of the chamber through the opening in the top thereof.

Surrounding the chamber 18 is an annular chamber 25, which is provided with a groove or channel 26 opening through the inner edge of the member. This member may be of any desired diameter and is adapted to be sleeved upon the end of the chamber so that the groove or channel 26 therein will stand astride of and have communication with the outlet opening 24 of the respective chamber. This member 25 may be secured in place in any desired or suitable manner, preferably by being shrunk onto the chamber.

A discharge outlet pipe 27 is secured to the annular member 25 so as to have communication with the groove or channel therein and this discharge outlet pipe is preferably located at and depends from the bottom of the chamber so that when the liquid passes out of the chamber and fills the groove or channel in the member, it will flow to the bottom of the member to be discharged through the outlet pipe 27.

In operation and as the shaft 10 is rotated through the medium of the gears 28, 29, which latter may be driven in any desired or suitable manner, the solution will be fed from the chamber or receptacle 11 into the chambers 18 through the pipes 21, where it will be acted upon by centrifugal force generated by the bodily rotation of the chambers 18. The solid matters will be thrown toward the outlet ends of the chambers and against the closure 23 while the liquids will flow toward the inlet ends of the chambers and pass out of the openings 24 in the manner set forth. This continual flow of the liquid through the outlets of the chambers tends to cause the discharge tubes to create a siphonic action upon the liquids, which, if not broken, will cause the contents of the chambers 18 to flow out without having the solid matters satisfactorily separated therefrom. Any suitable means may be provided for preventing this siphonic action and for this purpose a tube or pipe 30 may be provided for each of the chambers and this tubular member has communication with the atmosphere and with the chambers 18 in any suitable manner but preferably has communication with the groove or channel 26 in the ring 25, which tubes will admit air at the top of the chambers. These tubes may be located in any desired position most convenient to admit the air but in such a position that the free end thereof will stand above the level of the top of the liquid or solution in the supply receptacle or chamber 11.

All of the above described parts are secured to and supported for rotation with the shaft 10 and the shaft is mounted in a suitable bearing 31, surrounding which is a suitable container or receptacle 32, within which the chambers 18 are adapted to revolve, and a suitable closure 33 may be provided for the container or receptacle, which latter may itself be provided with handles 34 by means of which it may be placed upon or removed from the container. The closure 33 is provided with a suitable aperture 35 into which the receptacle or chamber 11 projects and the solution or liquid to be separated may be supplied to the receptacle or chamber 11 in any desired or suitable manner and for this purpose there is shown a supply pipe or nozzle 36.

The receptacle or container 32 is provided with an open annular receptacle 37 which surrounds the bearing 31 and into which the discharge pipes 27 project so that the liquid passing out of the chambers 18 will be discharged into the receptacle 37, from which they may be conveyed by means of a suitable outlet pipe 38. The container is also provided with an annular receptacle 39 adjacent which the outlet extremities of the chambers 18 move, so that when the solid or sedimentary matters have been separated from the solution, the machine may be stopped, after which the closures 23 may be removed from the chambers, and when removed the machine may be again started so that the centrifugal force then generated will cause the solid matters to be ejected from the chambers into the receptacle 39, from which they may be conveyed to a suit-

able point of use or consumption through a discharge outlet 40.

If desired, a suitable casing 41 may be provided for inclosing the gearing and which also forms a support for the container or receptacle 32, together with the operating parts of the machine.

If desired, the receptacle or chamber 11 may be constructed separately from the shaft 10, as shown in Fig. 4 of the drawings in which event the flange 16 will be arranged at the upper part of the shaft and the flange 15 will be formed integral with the receptacle or chamber 11 and the latter may be secured to the end of the shaft in any desired or suitable manner, preferably by means of fastening devices such as screws, bolts or the like 42, which pass through the bottom of the receptacle or chamber and into the extremity of the shaft 10.

Obviously the bottoms of the receptacles 37, 39 will be arranged to induce a flow of the materials discharged therein toward the respective discharge or outlet openings.

The parts may be assembled in any suitable manner but preferably by first attaching the separating chambers to the receiving chamber and then placing the upper disk or member 13 into position, after which the lower disk or member is moved into position and both are then securely fastened by the fastening devices 17 to the flanges 15, 16, and to the edges of the member 12, the latter being previously adjusted into the proper position by permitting the outer ends of the chambers 18 to pass through the respective apertures therein. After the parts are thus assembled the closures 23 may be placed in position and the machine will then be ready for use.

In order that the invention might be fully understood, the details of the foregoing embodiment thereof have been thus specifically described but

What is claimed as new is—

1. A centrifugal separating machine, including a rotatable closed chamber, means for feeding the material to be separated into the chamber, said chamber being provided with a discharge outlet, and means for preventing the discharge outlet from siphoning the liquid from the chamber.

2. A centrifugal separating machine including a rotatable closed chamber, means for feeding the material to be separated into the chamber, said chamber being provided with an outlet opening in the top thereof, a discharge pipe having communication with the outlet opening, and means for overcoming the siphonic action of said discharge pipe.

3. A centrifugal separating machine including a rotatable chamber having a closed and an open end, said closed end being provided with a discharge outlet, means for feeding the material into the chamber through the closed end thereof, means for rotating the chamber, a closure for the open end of the chamber for retaining the separated material within the chamber, the said outlet being adapted to permit the liquid to escape adjacent the said closed end of the chamber, and means for preventing siphonic action upon the liquid in the chamber.

4. A centrifugal separating machine including a rotatable chamber having a closed and an open end, said closed end being provided with a discharge outlet, means for feeding the material into the chamber through the closed end thereof, means for rotating the chamber, a closure for the open end of the chamber for retaining the separated material within the chamber, the said outlet being adapted to permit the liquid to escape adjacent the said closed end of the chamber, and a tubular member having continually open communication with the atmosphere and the chamber for supplying air to the chamber to overcome siphonic action upon the liquid in the chamber.

5. A centrifugal separating machine including a rotatable horizontally disposed chamber having an open and a closed end, said chamber being provided with a discharge opening at the closed end and above the center thereof, means for feeding the material into the chamber through the closed end, means for rotating the chamber, a closure for the open end of the chamber for retaining the separated material in the chamber, the said outlet being adapted to permit the liquid to escape through the said closed end of the chamber when the materials have been separated therefrom, and means whereby outside air may be continually admitted into the chamber through the said outlet to prevent siphonic action of the liquid.

6. A centrifugal separating machine including a rotatable horizontally disposed chamber having an open and a closed end, said chamber being provided with a discharge opening at the closed end and above the center thereof, means for feeding the material into the chamber through the closed end, means for rotating the chamber, a closure for the open end of the chamber for retaining the separated material in the chamber, the said outlet being adapted to permit the liquid to escape through the said closed end of the chamber when the materials have been separated therefrom, and a tubular member having communication with the outlet opening and also having continuous open communication with the atmosphere whereby air may be admitted to the chamber to prevent siphonic action of the liquid.

7. A centrifugal separating machine including a rotatable horizontally disposed

closed chamber, said chamber being provided with a discharge outlet in the top thereof adjacent one end, means for feeding the material to be separated into the chamber, an annular member surrounding the chamber and being provided with a passage communicating with the discharge outlet of the chamber, said passage being provided with a discharge outlet remote from the outlet of the chamber, means for rotating the chamber, and means for continually admitting outside air into the said passage to prevent siphonic action of the liquid.

8. A centrifugal separating machine, including a rotatable horizontally disposed closed chamber, said chamber being provided with a discharge outlet in the top thereof adjacent one end, means for feeding the material to be separated into the chamber, an annular member having an open chamber therein, said member surrounding the first said chamber with its respective chamber communicating with the said discharge outlet, the chamber in the said annular member being also provided with a discharge outlet remote from the outlet of the first said chamber, means for rotating the chamber, and means for continually admitting outside air into the chamber in the annular member, said means comprising a tubular member having communication with the atmosphere and with the last said chamber at a point remote from the respective discharge outlet.

9. A centrifugal separating machine, including a rotatable horizontally disposed closed chamber, said chamber being provided with a discharge outlet in the top thereof adjacent one end, means for feeding the material to be separated into the chamber, an annular member having an open chamber therein, said member surrounding the first said chamber with its respective chamber communicating with the said discharge outlet, the chamber in the said annular member being also provided with a discharge outlet remote from the outlet of the first said chamber, means for rotating the chamber, means for continually admitting outside air into the chamber in the annular member, said means comprising a tubular member having communication with the atmosphere and with the last said chamber at a point remote from the respective discharge outlet, and means whereby the separated material may be removed from the cylinder.

10. A centrifugal separating machine including a rotatable chamber having a closed end and an open end, means for feeding the material into the chamber through the closed end, comprising a tubular member extending into the chamber through the closed end, a closure for the open end of the chamber, means for rotating the chamber, said chamber being provided with a discharge outlet adjacent the inlet end thereof, a discharge pipe having communication with the outlet for conveying the liquid from the chamber, and means for preventing siphonic action of the liquid, comprising a tubular member having continuous open communication with the atmosphere and with the chamber for admitting air thereinto.

11. A centrifugal separating machine including an upright shaft, a supply receptacle rotatable with the shaft, a horizontally disposed chamber having a closed and an open end, means for securing the said chamber to the wall of the receptacle, said means including a tubular projection extending from the closed end of the chamber and into an aperture in the wall of the receptacle, said projection having communication with the receptacle and chamber, means for supporting the free end of the chamber and for holding the same against removal, a closure for the open end of the chamber, said chamber being provided with a discharge outlet at the inlet end thereof, and means for preventing siphonic action of the liquid.

12. A centrifugal separating machine, including an upright shaft, a supply receptacle rotatable with the shaft, a horizontally disposed chamber having a closed and an open end, means for securing the said chamber to the wall of the receptacle, said means including a tubular projection extending from the closed end of the chamber and into an aperture in the wall of the receptacle, a tubular member extending through the tubular projection and into the chamber, said tubular member having communication with the receptacle and chamber, means for supporting the free end of the chamber and for holding the same against removal, a closure for the open end of the chamber, said chamber being provided with a discharge outlet at the inlet end thereof, and means for preventing siphonic action of the liquid.

13. A centrifugal separating machine, including an upright shaft, a supply receptacle rotatable with the shaft, a horizontally disposed chamber having a closed and an open end, means for securing the said chamber to the wall of the receptacle, said means including a tubular projection extending from the closed end of the chamber and into an aperture in the wall of the receptacle, a tubular member extending through the tubular projection, one extremity thereof being provided with a flange engaging the extremity of the projection, the other extremity extending into the chamber beyond the adjacent end wall thereof, means for supporting the free end of the chamber and for holding the same against removal, a closure for the open end of the chamber, said chamber being provided with a discharge outlet at the inlet end thereof, and means for preventing siphonic action of the liquid.

14. A centrifugal separating machine including an upright shaft, a supply receptacle rotatable with the shaft, a horizontally disposed chamber having a closed and an open end, means for securing the said chamber to the wall of the receptacle comprising a tubular projection extending from the closed end of the chamber and into an aperture in the wall of the receptacle, said projection having communication with the receptacle and chamber, means for supporting the free end of the chamber and for holding the same against removal, a closure for the open end of the chamber, said chamber being provided with a discharge outlet at the inlet end thereof, and means for preventing siphonic action of the liquid comprising a tubular member having communication with the chamber and also having continuous open communication with the atmosphere at a point above the level of the liquid in the supply receptacle.

15. A centrifugal separating machine including a solution container, a plurality of precipitate receptacles having a closed end and each being provided with a projection extending therefrom and having a passage therethrough communicating with the respective receptacles, said projections engaging the wall of the container for supporting one end of the respective receptacle and for establishing communication between the container and the receptacles, an annular member surrounding the container and spaced therefrom, the outer extremities of the receptacles projecting through the member, spaced supports adjacent the inner ends of the receptacles, a pair of spaced members engaging the edges of the annular member and the respective supports, and means for securing the members to said edges and to the supports for securing the parts together to support the outer ends of the said receptacles.

16. A centrifugal separating machine, including a solution retainer, a plurality of precipitate receptacles having a closed end and each being provided with a projection extending therefrom and having a passage therethrough communicating with the respective receptacles, said projections engaging the wall of the container for supporting one end of the respective receptacle and for establishing communication between the container and the receptacles, an annular member surrounding the container and spaced therefrom, the outer extremities of the receptacles projecting through the member, spaced supports adjacent the inner ends of the receptacles, a pair of spaced members engaging the edges of the annular member and the respective supports, means for securing the member to said edges and to the supports for securing the parts together to support the outer ends of the said receptacles, said outer ends being open, and closures for the outer ends of the receptacles removably engaging said receptacles beyond the annular member.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, on this 21st day of November A. D. 1908.

H. M. GOODMAN.

Witnesses:
EMMA G. VAN METER,
M. J. DEMARRE.