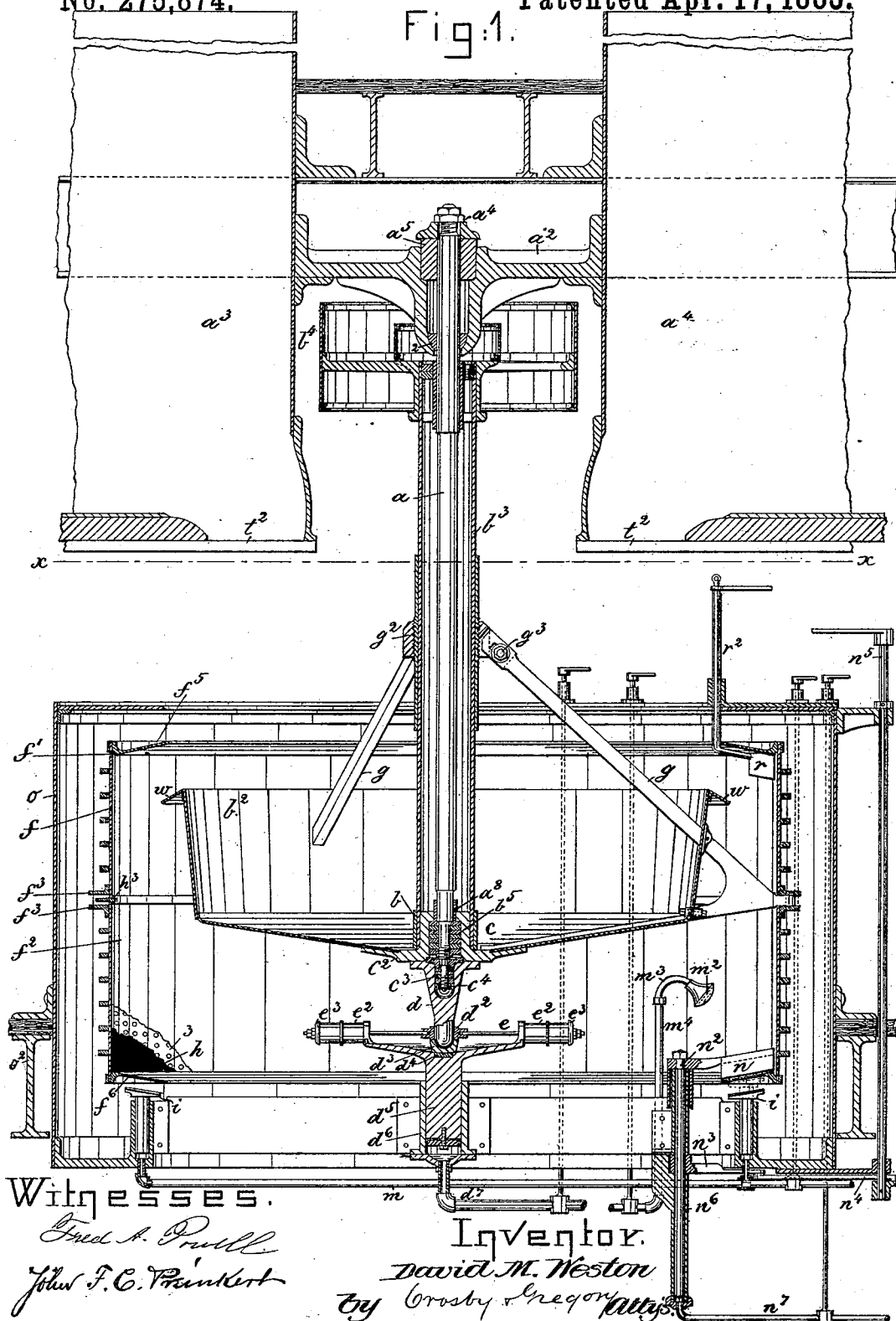


D. M. WESTON.
CENTRIFUGAL MACHINE.

No. 275,874.

Patented Apr. 17, 1883.

Fig. 1.



Witnesses.

Frederick A. Prull
John F. C. Prinkert

Inventor.

David M. Weston
by *Grosby & Gregory* Attys.

D. M. WESTON.
CENTRIFUGAL MACHINE.

No. 275,874.

Patented Apr. 17, 1883.

Fig:2.

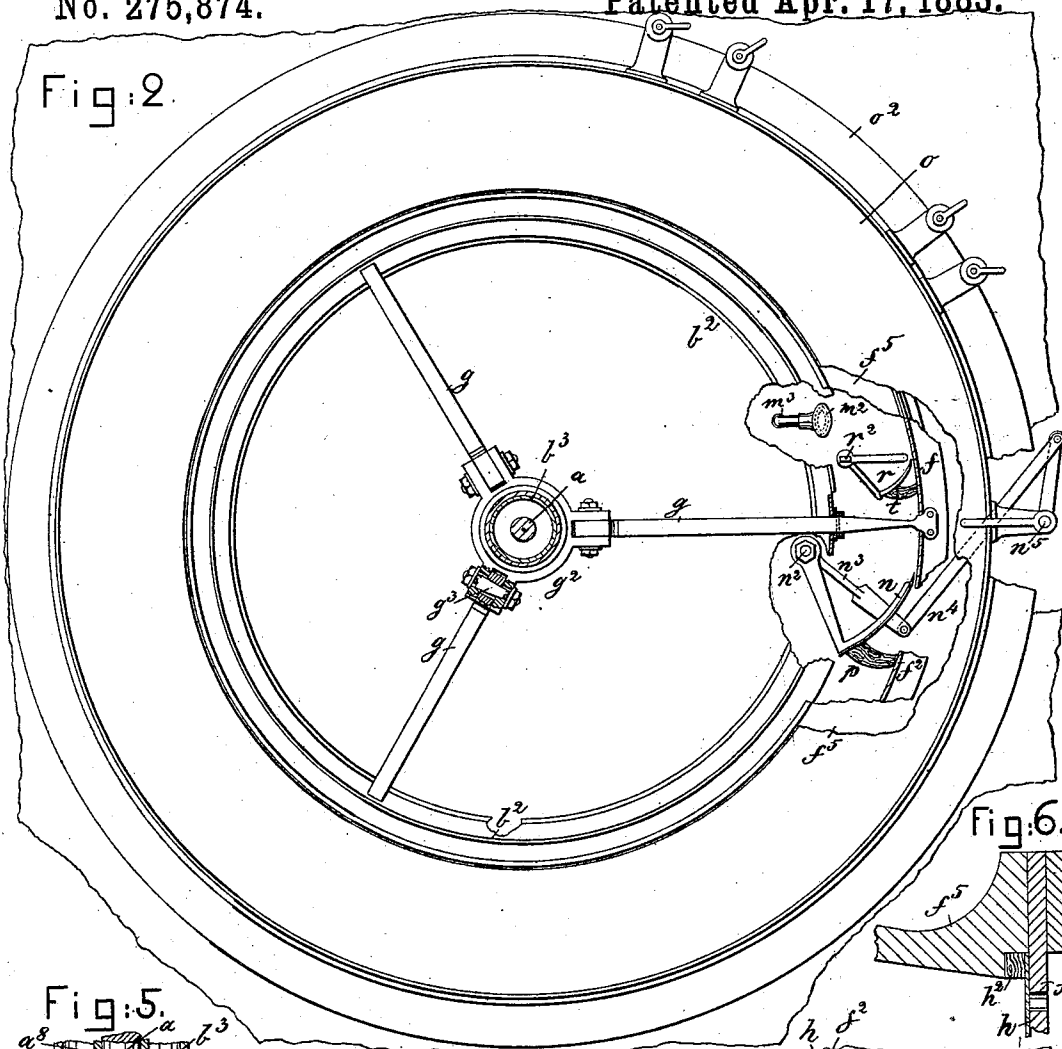


Fig:5.

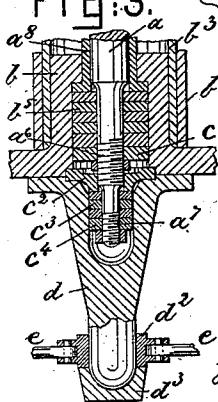


Fig:3.

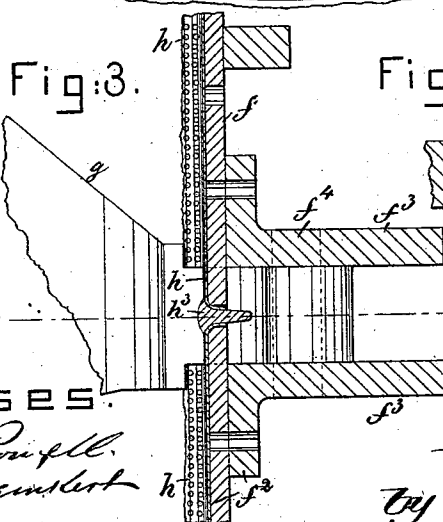


Fig:4.

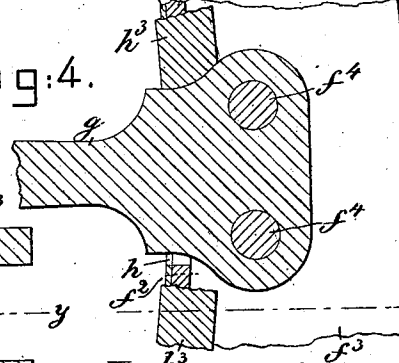
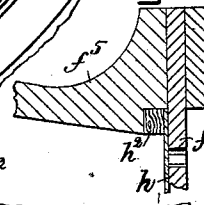


Fig:6.



Witnesses.

Fred A. Puffer.
John F. C. Prindle

Inventor.

David M. Weston

by Crosby & Quincy Attys.

UNITED STATES PATENT OFFICE.

DAVID M. WESTON, OF BOSTON, MASSACHUSETTS.

CENTRIFUGAL MACHINE.

SPECIFICATION forming part of Letters Patent No. 275,874, dated April 17, 1883.

Application filed May 20, 1882. (No model.)

To all whom it may concern :

Be it known that I, DAVID M. WESTON, of Boston, Suffolk county, State of Massachusetts, have invented an Improvement in Centrifugal Machines and Method of Charging and Discharging the Same, of which the following description, in connection with the accompanying drawings, is a specification.

In the manufacture of sugar the saccharine mass to be treated in the centrifugal machine is taken from the vacuum-pan after being crystallized, it then containing a sufficient amount of sirup to enable the mass to flow slowly from is kept agitated while it is being delivered from the vacuum-pan into a mixer or tank, where it the mixer into and worked off from the centrifugal machine.

In the usual methods of manufacture the saccharine mass is delivered directly from the mixer into the cylinder of the centrifugal machine, it having a bottom and perforated sides, the said bottom sometimes having a central outlet covered by a valve for the discharge of the sugar.

In this class of machine the sugar wall has been built by driving the sugar upward from the bottom of the cylinder toward its top by centrifugal force; but such method of forming the wall has serious objections, because of the limited height of wall which can be made, for as soon as the cylinder is started the sirup in the cylinder begins to leave the sugar, and before the cylinder has attained a speed sufficient to overcome the gravitation of the load the sugar becomes sufficiently dried, owing to the absence of the sirup discharged during the preliminary slow movements of the cylinder, that by the time the cylinder attains its high speed the sugar has become so dry as to cease to flow and refuses to rise or be driven up toward and against the upper flange of the cylinder, and consequently a sugar wall is formed, which, not only being thicker at the base than at its top, is also irregularly formed, and results in material waste of sugar during the process of washing. When the sugar wall is of unequal thickness, as described, it also varies very considerably in color, being darker at the bottom. This irregular wall also varies very considerably in thickness at opposite

points of the cylinder, toward the top, owing to some portion of the charge in the cylinder being slightly more fluid than other portions. This unequal deposit of sugar on the walls of the cylinder results very unfavorably in the operation of the machine, because of unequal loading and consequent vibration of the machine.

In my study and experiment to overcome difficulties inherent in the present form of centrifugal machines, and to reduce as much as possible the labor required in the manufacture of sugar, and at the same time increase the capacity of centrifugal machines and the quality of the work done by them, I have devised a centrifugal machine—the subject of this application—in which the bottom of the cylinder is left open, as will be described, and in which the “saccharine mass,” or “charge,” as I shall call it, to be purged in the cylinder is first delivered into a “charger” located within the cylinder and having its upper end below the level of the flange of the top of the cylinder. This charger—a solid or impervious pan having flaring sides—has the same number of revolutions as the cylinder, and, as herein shown, is driven by the same shaft. The charge to be purged is first introduced into the charger at a consistency as thick as practicable without preventing it from flowing properly.

In operation, the charger having been charged while the machine is stationary, power is applied gently, but the charge is not delivered into the moving cylinder surrounding the charger until the speed of the machine is sufficiently rapid to lift the charge in the charger over its top, when the charge is thrown out radially and uniformly in great volume across the space between the charger and cylinder and against the inner wall of the cylinder, which wall is perforated as usual, and travels at a greater velocity owing to its larger diameter. Having retained the sirup in the charge until the machine has reached a speed sufficiently great to immediately spread the charge evenly and perfectly on the perforated wall of the cylinder when brought in contact with it, the said charge is suddenly discharged on the said wall in great volume, and as it spreads readily works downward, aided

by gravitation, so that by commencing the sugar wall at or near the top of the cylinder and working downward by gravity, aided by centrifugal action, it is practical to make a sugar wall of almost any depth and of uniform thickness. In this plan, with a cylinder of a given size, it is practicable with very much less labor to more than double its capacity as compared with other centrifugal machines, and this without increase of power.

In this my improved machine and by my method the practical size of the machine is not, as heretofore, limited. In centrifugal machines heretofore made the cylinder has been connected at one end with the spindle; but in this my improved machine the cylinder is carried by radial arms attached to the spindle, the said arms being connected with the cylinder between its bottom and top, thus allowing free access to the interior of the cylinder at bottom and top, the overhung portion of the cylinder more or less counterbalancing the underhung portion, that depending upon whether or not the connection of the said arms with the cylinder is more or less central. In practice I prefer nearly a central connection, to thus equalize strains and enable the structure to be built as light as practicable, which is of very great advantage in high-speed centrifugal machines. In connection with the cylinder left open at the bottom, I have provided a plow or scoop, which attacks the sugar wall at its base at the bottom of the cylinder, the said plow being introduced into the cylinder from its bottom rather than from its top, as in Patent No. 236,389, January 4, 1881, heretofore granted to me. The deeper and heavier the soft sugar wall the more certain it is to fall by disturbance at its bottom or base, and the cylinder being always open at its bottom, the sugar wall disturbed at its base by the plow will, owing to its great weight, fall readily clear of the machine, thus avoiding the complication of valves, which as heretofore practiced had to be opened and closed, and to be kept clean and smooth on their seats. I have also made improvements in the step-bearing for the spindle, and in the sprinkler, which will be fully described and claimed.

Figure 1 represents in vertical section a centrifugal machine embodying my improvements. In the said figure I show but a portion of its lining in black, and have omitted over most of the said cylinder the usual perforations made in it, to thus avoid confusion in the drawings, for in practice the perforations are quite small. Fig. 2 is a horizontal section of Fig. 1 on the dotted line *x x*, a portion of the charger and cylinder being broken out at one side to show the plow and sprinkler within it. Fig. 3 is an enlarged detail, showing the connection of the arms with the cylinder and the method of joining the two sections of the cylinder, and also the annular gibs for securing the edges of the cylinder-lining. Fig. 4 is a section of Fig. 3 on the dotted line *y y*. Fig. 5 is a detail of the lower end of the spindle, and Fig. 6 is a detail

showing the method of securing the lining of the cylinder at the flanges.

The spindle *a* is herein shown as suspended from a spider, *a*², suitably attached between two "mixers" or "tanks," *a*³ *a*⁴, of usual construction, secured to the building. The spindle *a* is held at its upper end by a nut, *a*⁴, and suitable washer in a rubber spring, *a*⁵, and a ball and socket, 2. The lower end of the spindle *a* is provided with screw-threaded portions *a*⁶ *a*⁷ of two different diameters, and is reduced to receive upon it the loose bushing *a*⁸, interposed between the spindle and the hub *b* of the charger *b*². The hub *b* is also connected with the hollow shaft *b*³, which, extended upward, has secured to it the driving-pulley *b*⁴, and also the top bushing or bearing for the spindle *a*, which it will be seen is stationary, while the hollow shaft and charger revolve about it.

The hub of the charger is recessed or chambered, as shown in the drawings, to receive a series of loose metal disks or washers, *b*⁵, upon which the bushing *a*⁸ rests as the machine travels. The hub having been placed on the spindle *a*, as shown in the drawings, and the said disks *b*⁵ having been applied, the nut *c* is turned upon the screw-threaded portion *a*⁶ of the spindle, so that the said nut receives its portion of the weight of the charger and its connected parts.

The nut *c* having been applied, a second bushing, *c*², and series of washers *c*³ are applied to the spindle, and the bushing *c*² is held pressed against its seat made in the lower end of the hub by a nut, *c*⁴. The lower end of the spindle, with its attached parts, is placed within a chambered foot-piece, *d*, suitably shaped and secured to the said hub *b*, so as to contain oil, which latter may stand in the hollow shaft to its top. The lower end of this foot-piece *d* is extended through a small collar, *d*², and into a foot-step, *d*³, which latter rests upon a steel block, *d*⁴, set into a piston, *d*⁵, fitted into a cylinder, *d*⁶, adapted to be raised or lowered by steam or other fluid introduced under the said piston through a pipe, *d*⁷. The portion of this piston upon which the foot-step rests and over which it is to move laterally as the machine centers itself, is drawn to a curve of less radius than the curve in which the spindle *a* swings about its ball-joint 2, so that the foot-step, as it is moved laterally, is obliged to ride up an incline and lift the structure, or else depress the piston *d*⁵ against its initial pressure.

The piston described opposes a definite amount of resistance to the movement of the foot-step and spindle, and tends to hold the step and spindle at a fixed point while revolving slowly and the sugar wall is being discharged. In connection with this piston or step, and connected with the collar *d*², are employed a series of rods, *e*, having heads held between springs *e*² *e*³, which offer an increased resistance at any attempt of the foot-step to leave the plate *d*⁴ or the spindle to move from its axial center.

The charger *b*² is an impervious metal pan

having flaring sides, and connected at its bottom with the hub *b*. The cylinder is preferably made in two sections, *f*¹, *f*², each provided with a flange, *f*³, adapted to be bolted together by suitable bolts, *f*⁴, (see dotted lines, Fig. 3,) and the said flanges are separated sufficiently to receive between them the radial arms *g*, extended through the flaring walls of the charger and connected with the hub *g*², or it may be the hollow shaft *b*³. These arms *g*, at their upper ends, are attached to the said hub or shaft by a tapered key, *g*³, (shown in Fig. 2,) by which the said arms may be lengthened or shortened separately, and they support the weight of and revolve the cylinder as often as the charger is revolved.

The arms *g*, which serve as the only supports for the cylinder, and connected with it between its ends, in no way affect to retard the descent of the sugar wall when the latter is disturbed by the plow to be described. This sugar wall is not hard and solid like loaf-sugar, but is always a wet and soft wall, which will frequently fall as the machine is stopped, and even before the wall is disturbed by the plow. In other centrifugal machines known to me the flange forming the lower end of the cylinder has been connected from side to side across the bottom of the cylinder, leaving a series of openings in the bottom thereof, making it much more difficult to discharge the sugar wall than when one large opening is provided, as in this present invention.

The entire cylinder-shell is in practice perforated, as usual, and is partially indicated at 3, Fig. 1, and each section of the cylinder has a suitable or usual perforated lining, *h*. (Shown in Fig. 3 and partially in Fig. 1 in black; but the perforations in the lining are omitted from the drawings in Fig. 1.)

The cylinder has a top flange, *f*⁵, and a bottom flange, *f*⁶, which define the thickness of the sugar wall. Each flange, near its junction with the body of the cylinder, has an annular recess, *f*⁷, (see Fig. 1,) to receive one edge of the lining *h*, the said groove being in practice sufficiently large to receive a flexible washer or hoop, *h*², preferably of wood, (see detail, Fig. 6,) by which to retain the said edge in place and protect it. Where the two edges of the cylinder and lining come together or meet I employ wedge-shaped segmental gibs *h*³, which are driven into the gap between the adjacent ends of the two parts of the cylinder-sections, the lining being thus bent about the said ends by the gibs, as shown in Fig. 3.

To arrest the movement of the cylinder when desired, there are two or more brakes, *i*, having pistons, or otherwise constructed so as to be operated simultaneously by steam, air, or other fluid introduced through pipe *m*, having in it a suitable valve, the said brakes having their faces pressed upward against the under side of the flange *f*⁶.

If it be desired to wash the sugar wall before the same is broken down, it may be done by water or other usual liquid discharged

through the sprinkler *m*², herein shown as attached to a flexible pipe, *m*³, connected with a stand-pipe, *m*⁴, suitably supplied with water or other liquid under pressure. The flexible portion *m*³ of the pipe will stand in a more or less vertical position, according to the degree of fluid-pressure therein, and consequently by varying such pressure the sprinkler may be made to discharge water or liquid upon different portions of the sugar wall. The sugar wall having been formed and the speed of the machine reduced, the plow *n* is turned so as to enter the sugar wall above the flange *f*⁶, as in Fig. 1. This plow is carried by a piston, *n*², placed in a cylinder, *n*⁶, joined with a pipe, *n*², suitably connected with a steam or water supply, the said piston, as it is moved upward, causing the plow to travel upward and gradually act upon the sugar wall. It is not usually necessary to move the plow *n* upward, for ordinarily as soon as the base of the wall is broken the wall above it will fall. The piston *n*² has splined to it an arm, *n*³, connected by link *n*⁴ with an arm of a rock-shaft, *n*⁵, having a suitable handle by which to turn it so as to place the plow in position to act upon the sugar wall or to remain idle within the central part of the cylinder. The cylinder is inclosed within the usual curb, *o*, suitably supported on brackets connected with the floor. The plow *n* has connected with it a wooden scraper, *p*, to scrape and clean the lining of the cylinder, for the plow, being of metal, will preferably not touch the lining *h*.

I have shown a second plow, *r*, near the top of the cylinder, the said plow being carried by a shaft, *r*², so that it may be turned into or out of working position. In Figs. 1 and 2 it is shown in working position, and it will have a wooden scraper, *t*, to run against and clean the lining *h* above the arms *g*. While the sugar wall is being removed from the machine, the cylinder then being moved at slow speed, the operator may be filling the charger, so that the purging process may be continuous. The saccharine mass as drawn from the gate *t*² of the mixer, one or more, the said mass being as thick as practicable and yet flow, is fed into the charger *b*² and suitably charged, the machine is started slowly, and as the speed of the machine becomes sufficient to overcome the gravity of the load and lift the charge the same is quickly discharged in large volume uniformly around the entire periphery of the charger, over its top, and across the space between it and the interior of the cylinder, against which the charge is thrown near its top, the sugar quickly spreading and descending under the combined action of centrifugal force and gravity, the sirup passing through the lining and cylinder-wall, leaving the sugar in the condition of a vertical wall of uniform thickness and of any desired depth, for the depth of the wall is not by this plan limited, as in centrifugal machines where the sugar wall is thrown up from the cylinder against its own gravitation by centrifugal action. The

wall so formed may be washed if considered necessary, and thereafter the plow n will be put into position to attack the base of the sugar wall and demolish it, when the portion 5 of the sugar wall above it will drop by gravity and pass freely through the open bottom of the cylinder, there being nothing at the bottom of the cylinder to impede the fall of the sugar.

I have described my apparatus as operating 10 upon sugar; but I do not intend to limit my invention for use with sugar only; but my improved mechanical organization and method may be employed with good results in connection with any substances commonly treated in 15 centrifugal machines.

As so far described I have omitted all reference to the extended flange w of the charger, as in some instances I shall omit the same altogether therefrom. In some classes of work, 20 however, the flange aids in causing the delivery of the charge into the space bounded at bottom and top by the flanges of the cylinder and prevents the dropping of the material from the charger through the center of the machine 25 within the circle bounded by the lower flange.

I claim—

1. The rotating cylinder provided with flanges at bottom and top and completely open 30 between the inner edges of the said flanges at bottom and top, combined with the rotating spindle and with arms connecting the spindle with the cylinder between its ends, substantially as described.

2. In a centrifugal machine, the revolving 35 cylinder, combined with the impervious pan-shaped charger located within it, to receive the saccharine mass, hold it, and when the machine is in motion discharge the said mass out over the top of the charger against the wall of the 40 cylinder, substantially as described.

3. In a centrifugal machine, a rotating shaft and the connecting central impervious pan-shaped charger, combined with an outer perforated cylinder and with arms to unite the said 45 charger with the cylinder between its ends, as described, so as to rotate the charger and cylinder in unison, as and for the purpose set forth.

4. In a centrifugal machine, a hollow perforated cylinder supported only between its ends, 50 and having flanges at each end, the central portions of which are left entirely open and unobstructed, to facilitate the discharge of the sugar wall from the cylinder, combined with means to revolve the cylinder, substantially as 55 described.

5. The shaft a , having two screw-threaded portions near its lower end, and the two bushings a^b and c^2 , combined with the two nuts c and c^1 , and with two sets or series of intermediate loose disks or washers, substantially as 60 described.

6. The shaft a , the foot-piece d , and the foot-step, combined with the piston to support the foot-step, the surface of the said piston being 65 curved in the arc of a circle of less radius than the length of the spindle, substantially as and for the purpose described.

7. The spindle and foot-step, combined with the piston and steam or other fluid containing pipe connected therewith, to enable the said 70 piston to be elevated at the desired time to center the spindle, as set forth.

8. The spindle, its foot-step, and the movable piston on which it rests, combined with the rod e and springs to offer increased resistance 75 to the lateral movement of the foot-step and spindle, as set forth.

9. In a centrifugal machine, the shaft b^3 and the cylinder composed of two or more sections, combined with the arms g , by which the said 80 sections are connected with the said shaft, substantially as described.

10. The cylinder and its flexible pipe, combined with a pipe, m^1 , containing water or liquor under pressure, whereby, by variations 85 of pressure of the water or liquor, the said pipe and sprinkler may be elevated or depressed, substantially as and for the purpose described.

11. In a centrifugal machine, the cylinder, its lining h , and its flanges $f^5 f^6$, grooved as 90 described, combined with the packing or holding ring or strip h^2 , to operate substantially as described.

12. The two sections $f^2 f^3$ of the rotating cylinder and the lining h , combined with the 95 segmental wedged-shaped gibs inserted between the contiguous ends of the said cylinder to hold the said lining in place, substantially as described.

13. In a centrifugal machine, the cylinder 100 having its lower end open or unobstructed at its center, combined with a plow adapted to be entered into the sugar wall, and with means to operate the said plow through the bottom of the cylinder, substantially as described. 105

14. In a centrifugal machine, the combination, with the cylinder and its flange, of brakes and pistons connected therewith and adapted 110 to be operated by steam or other fluid-pressure, substantially as described.

15. That improvement in the art or method of purging sugar which consists in supplying the charge into an impervious charger while 115 at rest and occupying a central position with relation to the cylinder, and discharging the same from the charger in volume into the cylinder over the top of the charger after it has had its speed raised sufficiently to force the material outward over the top of the said 120 charger, thereby immediately spreading the charge to form a wall, substantially as and for the purpose set forth.

16. That improvement in the art or method of purging sugar which consists in supplying the charger of the machine with a charge while 125 the machine is stationary, giving the charger a considerable degree of centrifugal motion while yet retaining the charge therein, and then by an increase of speed delivering the said charge over the top of the charger to the 130 revolving cylinder against its sides and above its bottom flange, the cylinder having at that time had its speed raised sufficiently to spread the sugar wall as described, whereby the said

1 wall may be quickly spread by the joint action
of centrifugal force and of gravity, substan-
tially as set forth.

5 17. The charger, impervious, arranged with-
in the cylinder and provided with an outwardly-
extended flange, combined with the connected
cylinder, into which the charger in motion de-
livers its charge, substantially as described.

10 18. One or more mixers having gates, com-
bined with the cylinder and its centrally-located
pan-shaped charger to receive the charge while
the charger and cylinder are stationary, and

adapted, when the charger and cylinder are in
motion, to discharge the charge over the top
of the charger against the inner wall of the 15
cylinder, as and for the purpose described.

In testimony whereof I have signed my name
to this specification in the presence of two sub-
scribing witnesses.

DAVID M. WESTON.

Witnesses:

G. W. GREGORY,
W. H. SIGSTON.