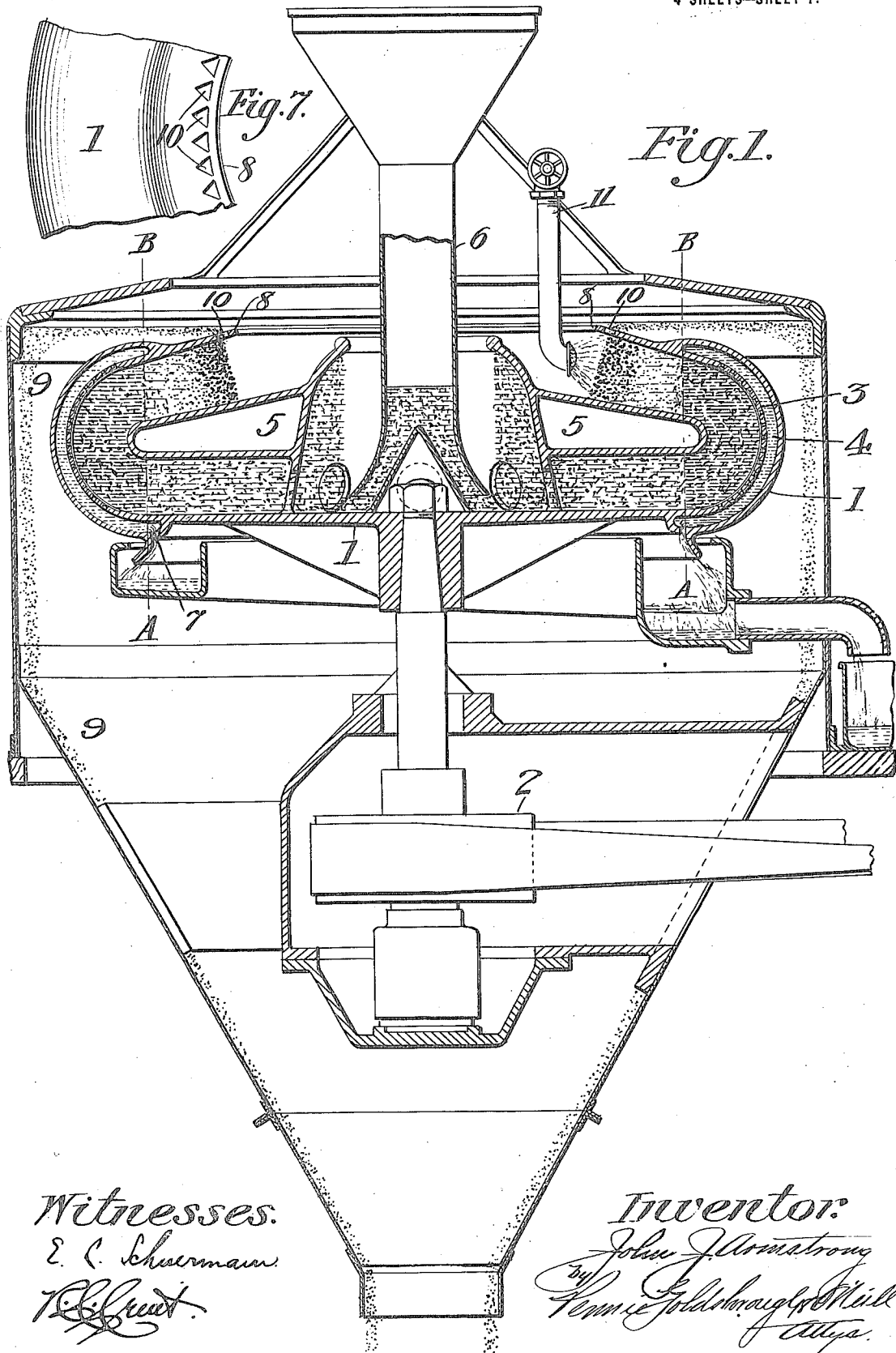


J. J. ARMSTRONG.
CONTINUOUS DISCHARGE CENTRIFUGAL MACHINE.
APPLICATION FILED JAN. 31, 1913.

1,153,367.

Patented Sept. 14, 1915.

4 SHEETS—SHEET 1.



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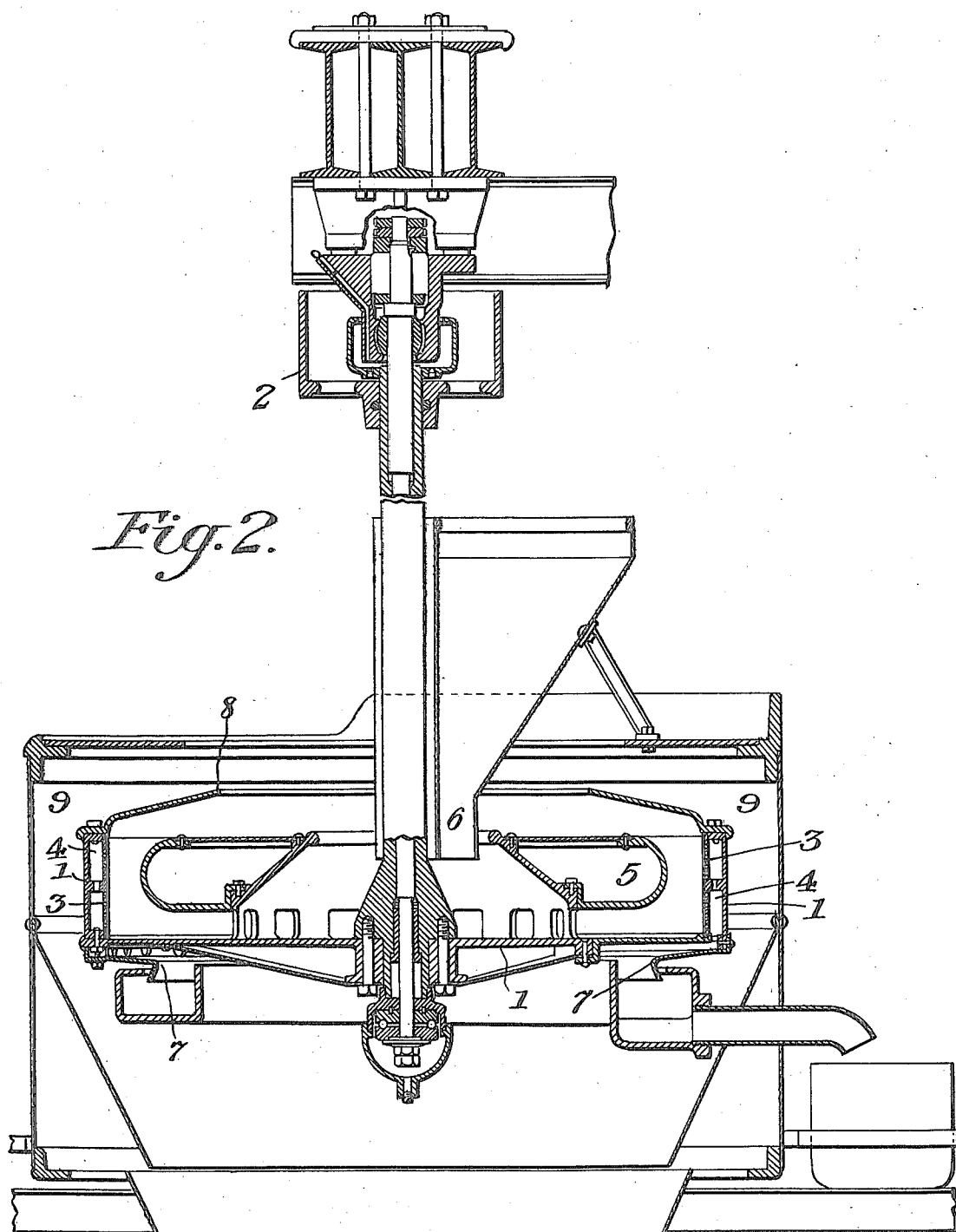


Fig. 2.

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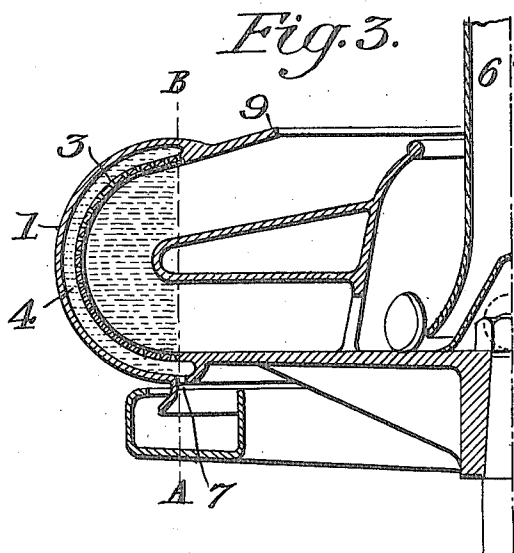


Fig. 8.

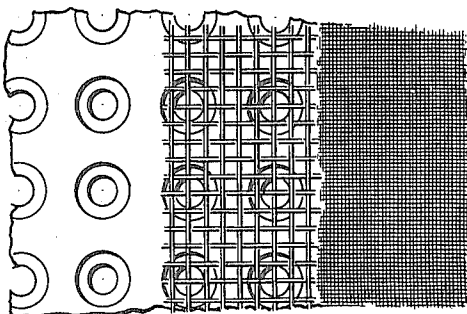


Fig. 4.

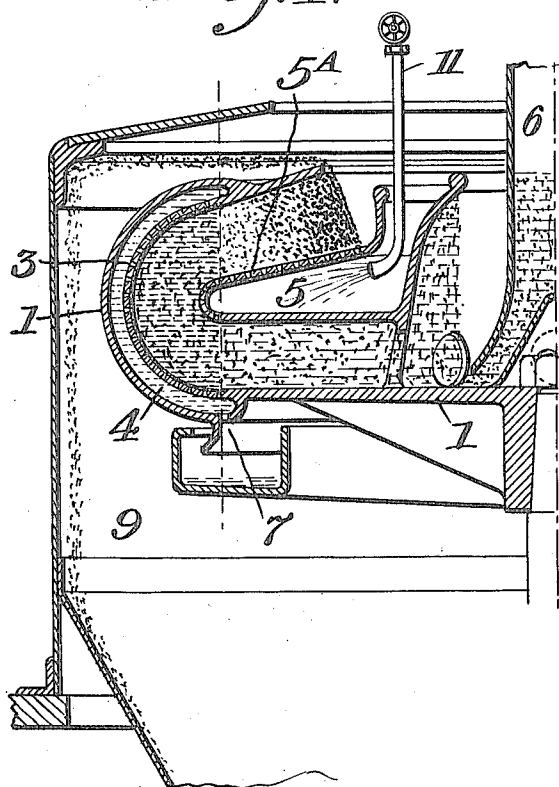
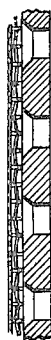


Fig. 9.



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4 SHEETS—SHEET 4.

Fig. 6.

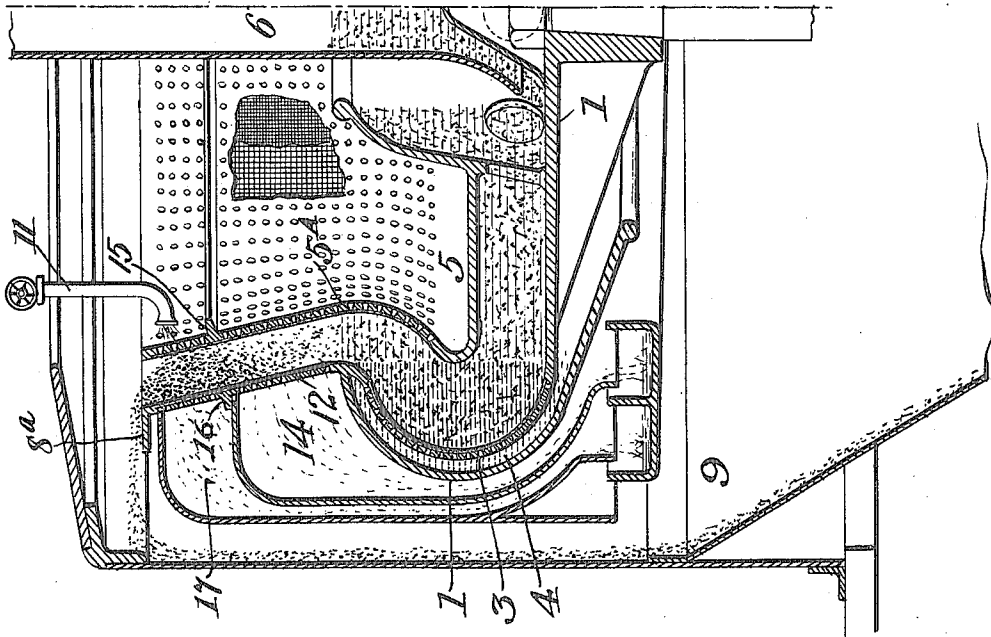
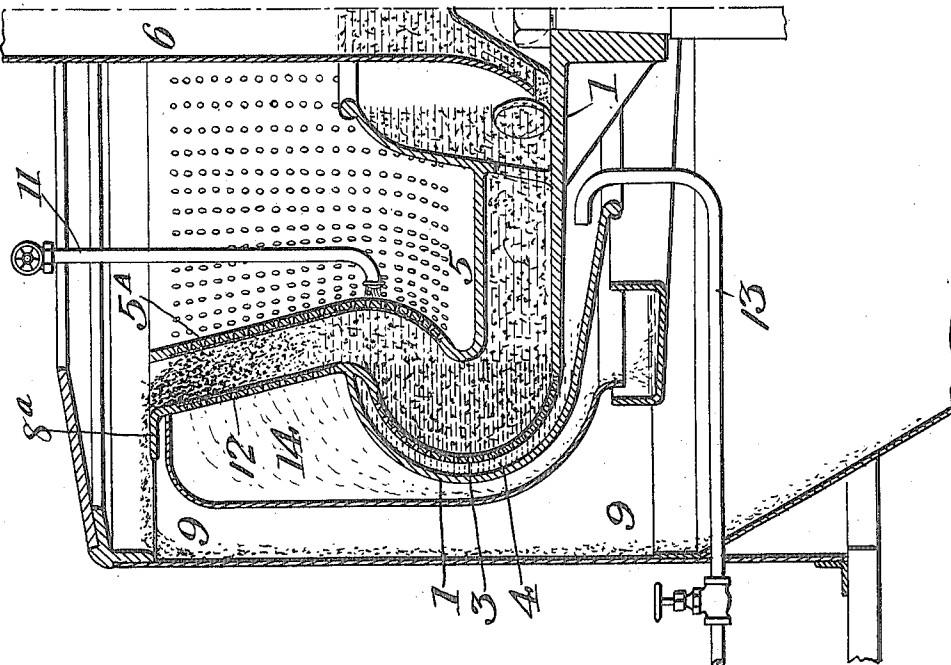


Fig. 5.



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UNITED STATES PATENT OFFICE.

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CONTINUOUS-DISCHARGE CENTRIFUGAL MACHINE.

1,153,367.

Specification of Letters Patent.

Patented Sept. 14, 1915.

Application filed January 31, 1913. Serial No. 745,358.

To all whom it may concern:

Be it known that I, JOHN JAMES ARMSTRONG, a citizen of the United States, residing at Honolulu, in the county of Honolulu and Territory of Hawaii, have invented certain new and useful Improvements in Continuous-Discharge Centrifugal Machines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to continuous discharge centrifugal machines for filtering or separating solid matter, insoluble or soluble, from fluids or liquids of different specific gravity, and is particularly adapted for separating molasses or syrup from massecuite or concentrated granular sugar solutions.

The object of my invention is to produce a centrifugal machine to which the material to be treated is continuously fed, and in which the separate discharge of the constituent solids and liquid parts takes place continuously.

In that type of centrifugal having a drum or basket with a perforated outer wall, and in which the liquid constituents of the charge are drained off through said perforations and the solids discharged over its top, the perforations sooner or later become clogged, and cakes or lumps are formed within the basket, so that the operation of this type of machine is continuous only for a time.

My invention contemplates a centrifugal machine having an annular chamber formed between the outer imperforate wall of the revoluble basket and the perforated wall or screen, a deflecting plate or casting within the basket, and an outlet from said chamber preferably nearer the center of the machine than the outer periphery of the said deflector, the upper end of the perforated wall or screen being provided with a lip extending toward the axis of the machine. The material to be treated is continuously fed into the revolving basket near its center, where the velocity is low, and is then thrown outwardly with increasing velocity under the deflector and against the perforated wall or screen. The lighter material, such as molasses, passes through the screen until the annular chamber becomes filled, whereupon the lighter material mixes with the heavier material within that portion of the basket

outside of a vertical line passing through the outlet of the annular chamber. This heavier material is thus kept in a state of lubrication by the liquid or lighter material and is forced upward and inward toward the point of discharge (the lip above mentioned) by the incoming additional material to be treated fed to the machine. While the heavy together with the entrained lighter material is thus forced upward and inside of the vertical line above mentioned, the separation of the lighter from the heavier materials takes place, the lighter passing backwardly and outwardly thereby forcing an equivalent quantity out of the annular chamber through its outlet, while the heavier material continues inwardly and constantly becoming drier is ultimately discharged over the lip. These conditions as described continue without the clogging of the screen, as it is always kept lubricated by the construction contemplated, so that the separation of the liquid from the solid constituents is effected in a continuous manner, as herein- after will more fully appear.

In the accompanying drawings, forming a part of this specification, in which similar characters of reference indicate similar parts throughout the several views, Figure 1 represents in sectional elevation an under driven centrifugal machine embodying my invention. Fig. 2 shows a similar view of a top driven centrifugal embodying my invention. Fig. 3 is a sectional elevation of half of a basket illustrating the condition when the machine has been started and filled with a liquid until just previous to the time when the discharge of same begins. Fig. 4 is a sectional elevation of half of a centrifugal showing a modification of Fig. 1 in which the upper surface and the outer periphery of the deflecting casting is perforated. Fig. 5 illustrates the adaptation of my invention to machines of the inverted cone type. Fig. 6 is a modification of Fig. 5. Fig. 7 is a detail showing in plan a portion of the basket shown in Fig. 1 provided with openings in the discharge lip. Figs. 8 and 9 are details illustrating in plan and in section respectively the screening medium.

Referring to the drawings, the basket 1, revolved by a belt applied to the pulley 2, is provided with a perforate wall or screen 3 inside of the imperforate outer wall of the basket 1 so as to form an annular chamber 4 between same. The screen 3 may be

curved as shown in Figs. 1, 3, 4, 5 and 6, or may be straight and vertical as shown in Fig. 2. A deflecting plate or casting 5 is provided inside of the basket 1 as shown. The charge is fed to the basket 1 through a pipe 6 at or near the center of the machine, where the velocity is low, and is then thrown outward with increasing velocity under the deflecting plate or casting 5. The chamber 4 is provided with an outlet 7 preferably slightly nearer the center of the machine than the outer periphery of the deflector 5. The upper end of the perforate wall or screen 3 is provided with a lip 8 extending toward the axis of the machine, over which lip the solids are discharged into the tub 9, as shown in Fig. 4. If desired a series of holes 10 may be provided in the lip 8 through which the solids are discharged, as shown in Figs. 1 and 7.

In operation, the lighter material, such as molasses for example, passes through the screen 3 until it fills the annular chamber 4 and backing up mixes with the heavier material within the basket 1 in the bend outside of a vertical line A—B drawn through the outer edge of the outlet 7. Were the machine operated with liquid alone, such as water for example, the liquid would fill the annular chamber 4 and fill up the bend inside of the screen 3 and outside of the vertical line A—B, as shown in Fig. 3. Any additional liquid fed through the pipe 6 would force an equal quantity out of the annular chamber 4 through its outlet 7. With a charge of heavier material, however, the lighter or liquid constituents only pass through the screen 3 into the annular chamber 4 and the heavier or solid constituents are retained by the screen 3 and are kept lubricated by the liquid or lighter material without separation while outside of the line A—B. The incoming additional material fed through the pipe 6 now forces the material outside of the line A—B upward and inward toward the discharge lip 8. It is only after being forced inward and upward inside of the line A—B that separation of the lighter from the heavier constituents takes place, the lighter passes outward through the screen 3 and forces an equivalent quantity from the annular chamber 4 through its outlet 7, while the heavier constituents pass inward and constantly become drier as they proceed, due to the progressive separation from the liquid constituents, until they are discharged either through the openings 10 or over the lip 8 as preferred. In making the turn around the outer periphery of the deflector 5, it will be noted that the material under treatment is always kept lubricated, so to speak, and that no separation will take place, so that the screen 3 does not become clogged as the material does not do thereon.

In the modification shown in Fig. 4 the outer periphery and upper surface of the deflector 5 are provided with a screening medium 5^a, for example such as is shown in Figs. 8 and 9. The object of the screening medium 5^a is two-fold; first, any liquid expelled from the material under treatment through the screen 5^a will find its way back again into the material in the bend outside of the line A—B, and serve to further lubricate same should the material under treatment become dry or devoid of liquid; and second, it permits of the use of a liquid spray through a pipe 11 for applying additional liquid through screen 5^a.

The principles involved in my invention may be applied to machines of the inverted cone type, as illustrated in Figs. 5 and 6. The screen 5^a of the deflector 5 is bent upward and outward and then becomes the inner inverted cone. The lip 8^a is carried upward and outward and is provided with a screen 12 and then becomes the outer inverted cone. Liquid may be introduced in the annular chamber 4 by means of the pipe 13, as is shown in Fig. 5, to force the liquid in said chamber back through the screen 3 and into the material within said screen, which action tends to keep the screen 3 open and clear at all times. It is obvious that this liquid fed through the pipe 13 may be applied continuously or intermittently as required. The outlet 7 is omitted in this case, and the lighter material passes up and is discharged out through the screen 12 into the chamber 14, while the heavier materials are discharged over the lip 8 into the tub 9. Fig. 6 shows a modification of that shown in Fig. 5, which construction is desirable for keeping separate what is technically known as green syrup from wash syrup. In some operations, especially in beet sugar factories, after the sugar has been purged of the entrained molasses or syrup, it is further washed while in the machine with clear water or other liquid. The screen 12 is divided into upper and lower sections by an external annular rib 16. All of the raw or green syrup passes through the lower division of the screen 12 into the chamber 14, while the wash syrup passes through the upper division of the screen 12 into the chamber 17. The screen 5^a is divided by an internal annular rib 15. The sugar is washed just previous to its discharge over the lip 8 by water through the pipe 11 and through the screen 5^a above the rib 15. These syrups are thus separated for independent treatment later on, which as before mentioned is desirable in certain processes.

When the invention is used as a centrifugal filter or clarifier to take the place of sand, bag or other filters, the operation may be as follows: For sand filtering, the juice

or material to be filtered is mixed in the proper portions in a mixer, generally placed above the machine, and is then fed through the machine and treated in a manner exactly similar to that described for sugar solutions. In separating the mechanical impurities, such as mud, etc., from raw mill or refinery juice, we proceed as with sand except that kieselguhr or diatomaceous earth is used in place of sand, which is mixed with the juice in proper proportions before entering the machine. While passing through the machine the clear juice or juices will be thrown off in the place of the syrup described hereinbefore, while the mechanical impurities, muds, etc., will be separated and discharged from the machine together with the kieselguhr, etc., in the same manner as sugar is in the sugar centrifugals.

20 I claim:

1. A centrifugal machine for separating liquids and solids, comprising a chamber adapted to throw the material to be treated to the periphery thereof by centrifugal force, a bend in said chamber at the peripheral portion thereof, the outer wall of the peripheral bend being perforated, a casing forming with the outer perforated wall an annular chamber to collect the liquid forced through the perforations of said wall and to back up the liquid in the bend to facilitate the passage of the solid particles there-through, and a discharge chamber to conduct away the solid particles forced around said bend.

2. A centrifugal machine for separating liquids and solids, comprising a chamber adapted to throw the material to be treated to the periphery thereof by centrifugal force, a bend in said chamber at the peripheral portion thereof, the outer wall of the peripheral bend being perforated, a casing forming with the outer perforated wall an annular chamber to collect the liquid forced through the perforations of said wall, an outlet for the liquid so forced through said perforations so situated with respect to the outer wall of the bend as to cause a body of

liquid to be retained in the bend to facilitate the passage of the solid particles around the bend, and a discharge chamber to conduct away the solid particles forced around the bend.

3. A centrifugal machine for separating liquids and solids, comprising a chamber adapted to throw the material to be treated to the periphery thereof by centrifugal force, a bend in said chamber at the peripheral portion thereof in which the liquid collects, a discharge chamber to discharge the solid particles forced around the bend, and means to discharge only the liquid in excess of that which is required to fill said bend.

4. A centrifugal machine for separating liquids and solids, comprising a chamber adapted to throw the material to be treated to the periphery thereof by centrifugal force, a bend in said chamber at the peripheral portion thereof, a discharge chamber extending toward the axis of the machine and adapted to discharge the solid particles forced around said bend, and means to discharge only the liquid in excess of that required to fill said bend.

5. A centrifugal machine for separating liquids and solids, comprising a chamber adapted to throw the material to be treated to the periphery thereof by centrifugal force, a bend in said chamber at the peripheral portion thereof, a discharge chamber extending toward the axis of the machine and adapted to discharge the solid particles forced around said bend, the outer wall of the chamber at the bend being perforated, a casing forming with said outer wall an annular chamber to retain the liquid passing through the perforations of said outer wall, and means to discharge only the liquid in excess of that required to fill the bend.

In testimony whereof I affix my signature, in presence of two witnesses.

JOHN JAMES ARMSTRONG.

Witnesses:

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JAMES F. BERRY, Jr.