Oct. 25, 1927. 1,646,556

S. S. PECK

STRAINER FOR SUGAR JUICES AND THE LIKE

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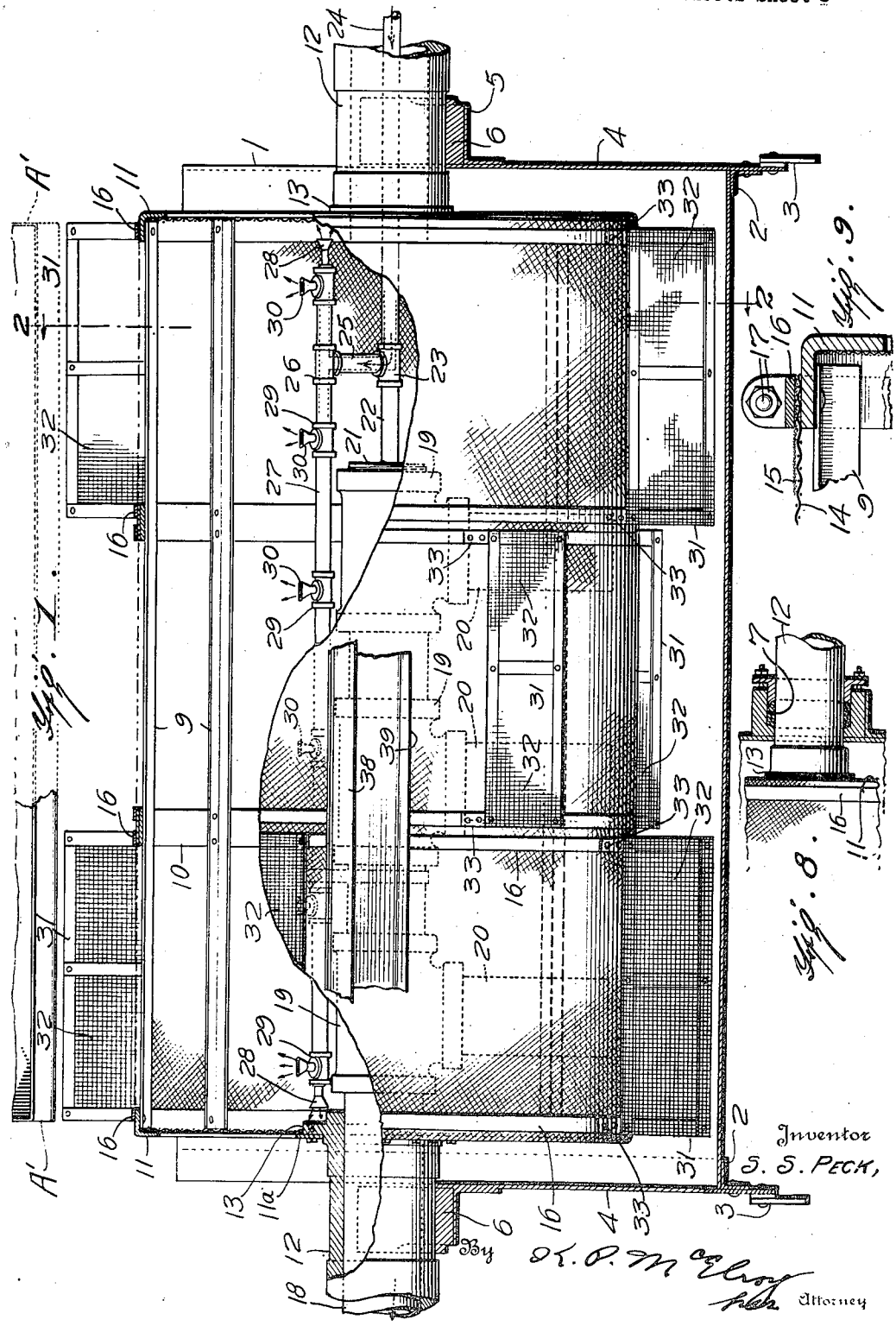


Fig. 1.

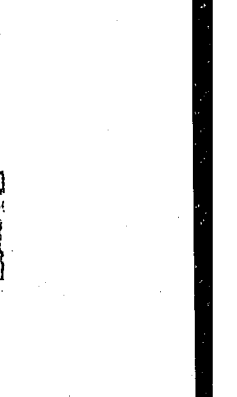


Fig. 9.

Fig. 8.

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STRAINER FOR SUGAR JUICES AND THE LIKE

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Fig. 2.

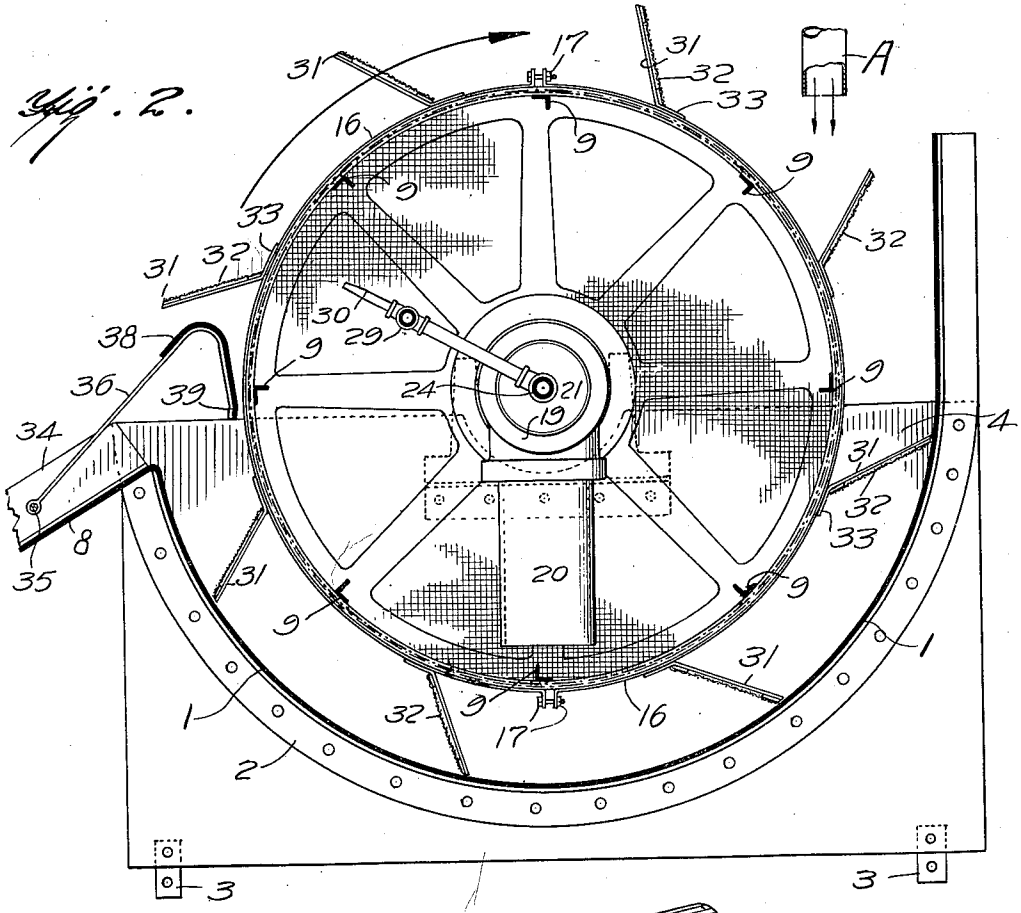


Fig. 3.

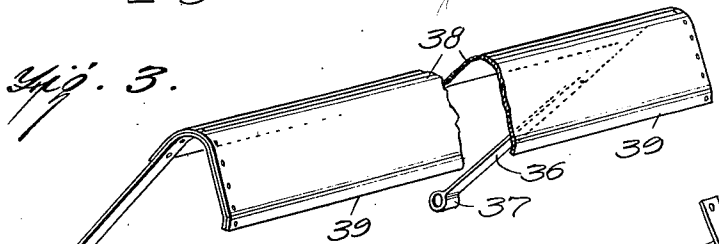
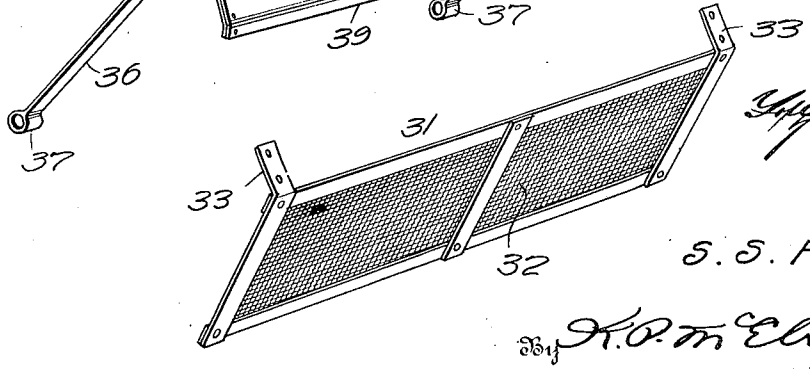


Fig. 4.



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STRAINER FOR SUGAR JUICES AND THE LIKE

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Fig. 5.

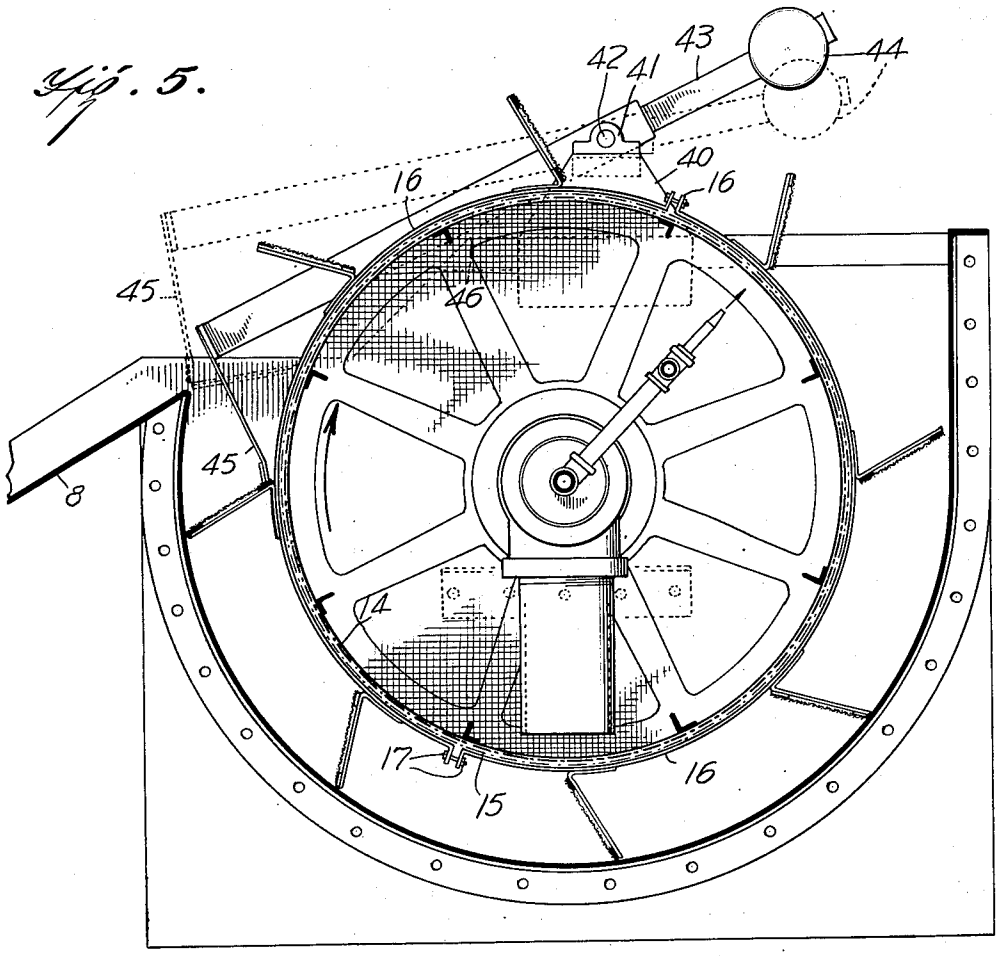


Fig. 7.

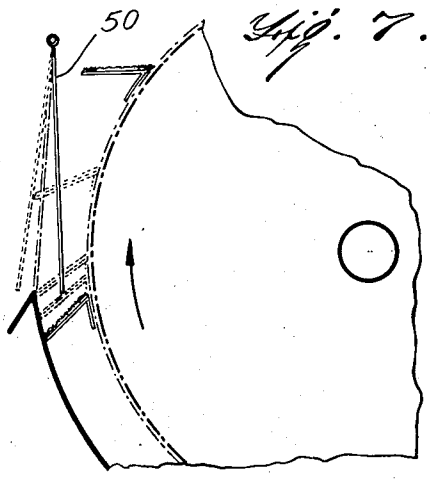
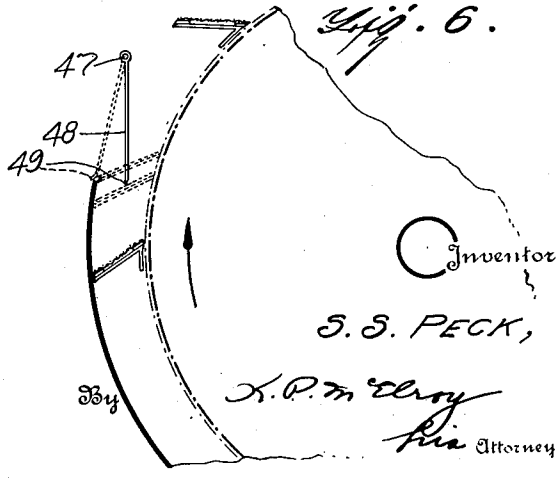


Fig. 6.



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STRAINER FOR SUGAR JUICES AND THE LIKE

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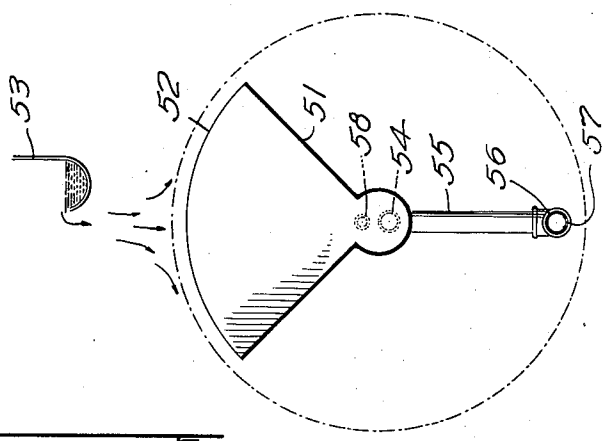


Fig. 11.

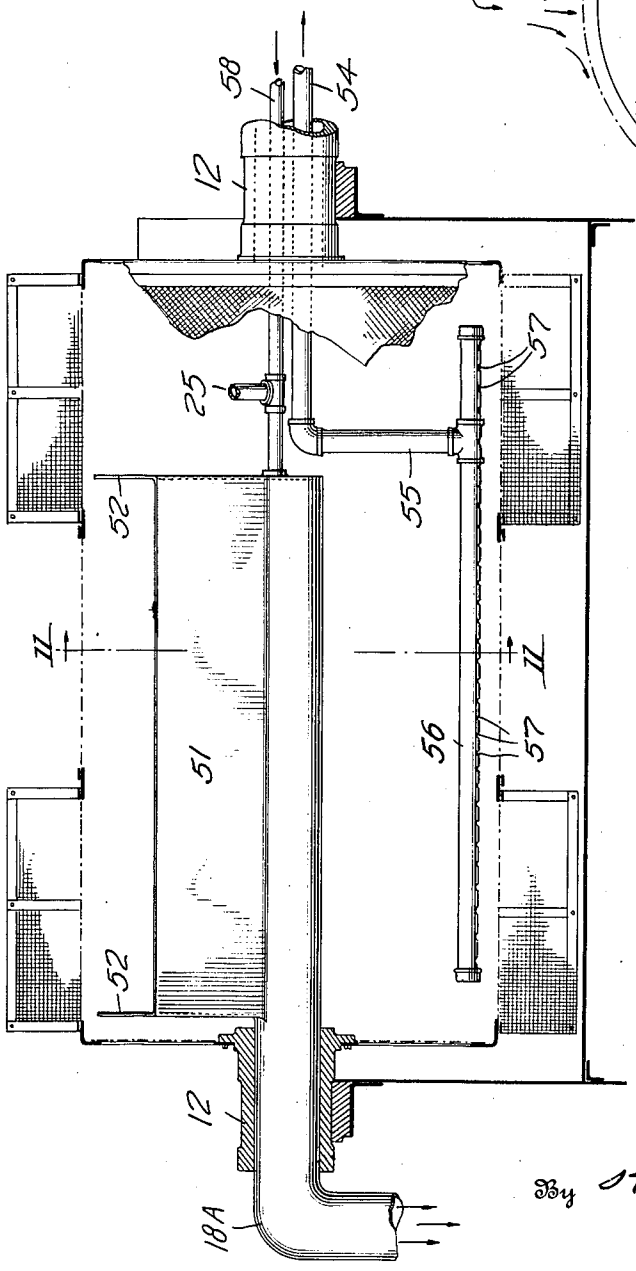


Fig. 10.

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UNITED STATES PATENT OFFICE.

SAMUEL STODOLE PECK, OF HONOLULU, TERRITORY OF HAWAII.

STRAINER FOR SUGAR JUICES AND THE LIKE.

Application filed September 27, 1922. Serial No. 590,966.

This invention relates to strainers for sugar juices and the like; and it comprises a receptacle, a revoluble foraminous drum in the receptacle, means such as paddles or the like on the drum and arranged to carry solid matter from the receptacle to scraping devices, scraping devices arranged to scrape solid matter off the paddles and means for drawing juices through and into the foraminous drum and from said drum to an outside point, together, advantageously, with pressure operating devices arranged to cleanse the surface of the drum continuously or from time to time; all as more fully hereinafter set forth and as claimed.

While useful for filtering and straining liquids from any source, the present invention is particularly useful in a sugar mill. In the usual mill practice, sugar juice strainers are made of perforated metal with relatively few openings to the square inch (usually from 225 to 400), the holes being circular and being from .039 to .027 inch in diameter. The juice is delivered on top of such strainers directly from the mill, and the "cush-cush" strained off is scraped by flights or paddles—slat-like devices drawn over the surface of the strainer by a chain. Perforated metal screens are necessary, since there must be a smooth surface over which the scrapers may operate and a coarse mesh screen only can be used since the metal screen must be not only of proper thickness but of requisite strength to withstand the continuous scraping action of the scrapers. Woven wire screening would be better to use for the screen than perforated metal sheets, since for a given size of hole opening the total screening area would be greater than in the case of perforated plates and the mesh could of course be regulated by the gage of the wire used; but because of the constant scraping action on the screens of the type to which reference has been made, wire gauze or woven wire screens cannot be successfully used.

One of the objects of my invention is the provision of a device of the type described in which woven wire screens can be used for the screening surface and in which very fine mesh screening may be employed. Because of the peculiar arrangement and construction of my screens, as hereinafter set forth, I have been able to use 100 mesh metal screen, that is, screen with 10,000 openings to the square inch and in operation I have been able to remove a far greater proportion of "cush-cush" and suspended matter than has been hitherto possible with known types of screening devices. The advantages set forth are accomplished through the arrangement whereby the surface of the revolving drum is used primarily for filtration and straining and whereby the scraping action to remove filtered material is limited to the paddle-like devices which pick up the solid matters from the bottom of the receptacle and present them to the scrapers. In other words, the scrapers do not operate upon the filtering device directly.

Other objects of my invention are the provision of a rigid and compact screen device and one which is extremely simple in operation and inexpensive in construction.

In the accompanying drawings showing several forms of a specific embodiment of my invention and in the several views of which similar reference numerals designate corresponding parts,

Fig. 1 is a front elevation, partly in section, showing the complete strainer with the suction pump omitted;

Fig. 2 is a vertical section along line 2—2 of Fig. 1, looking in the direction of the arrows;

Fig. 3 is a detail perspective of one form of scraper which may be used with my strainer;

Fig. 4 is a detail perspective of one form of paddle arm and "cush-cush" lifter;

Fig. 5 is a vertical transverse section through another form of strainer showing particularly a modified form of scraper-operating device;

Figs. 6 and 7 are segmental transverse sectional views showing modified forms of scraping devices;

Fig. 8 shows a fragmentary view of the end of the tank;

Fig. 9 is the detail section of an end showing the method of attaching the screens;

Fig. 10 is a longitudinal vertical section, parts being shown in elevation, of a slightly modified form of the invention, and

Fig. 11 is a section along line 11—11 of Fig. 10 looking in the direction of the arrows.

Referring to the drawings, reference numeral 1 indicates an open topped tank preferably constructed of sheet iron or steel, the sides and bottom being riveted by means of the angle irons 2 and provided with the clips 3 for attachment to suitable supports in a

convenient place in the sugar mill. The end walls 4 of the tank are provided with the brackets 5 holding the bearing blocks 6 for support of the hollow shaft of the screening drum hereinafter described. When the device is to be operated on the siphon principle, to be described, the brackets 5 and the bearing blocks 6 are substituted by a suitable stuffing box of any known construction. The stuffing box is shown in Fig. 8 and is designated by reference numeral 7. When the screening device is to be operated on the siphon principle, the walls of the tank should extend substantially above the top of the center draw-off pipe (to be described and as shown in Fig. 5); but when pump suction is relied upon, this is not necessary.

At one side the tank is provided with chute 8 for the reception of the "cush-cush" and filtered suspended matter which is scraped off the paddles, as hereinafter described.

The revoluble screen or drum may be made of a plurality of longitudinal angle irons 9, the metal hoops 10 riveted thereto and the flanged end plates 11 much in the form of a wheel. These plates 11 are provided with a hub 11^a and the longitudinal irons 9 are riveted to the flanges of these plates. The trunnions 12 operating on the bearing blocks 6 (or through the stuffing box 7) are flanged as at 13 and the hubs of the end plates fit with their faces against the faces of these flanges and the end plates are riveted or bolted in position. The screen for the ends of the drum is attached in any convenient manner as by rivets or the like, over these end plates, while the screen for the periphery of the drum is attached by means of the hoops 10, and at the extremities by means of the flanges of the end plates 11. I usually first attach the wire cloth 14 and over this I place the finer screen layer 15. These two layers are held in place by means of semi-circular straps 16 provided with upturned portions and bolted together with bolts and nuts 17.

Mounted in the trunnion 12 is the suction or siphon pipe 18 on the left-hand end (Fig. 1), around which the trunnion 12 revolves and this pipe 18 carries the T 19 to which is attached the depending pipe 20 extending inside the screen and towards the bottom thereof. It is to be understood that the pipe 18, T 19 and depending pipe 20 are stationary. As many of the T's 19 and depending pipes 20 as may be deemed necessary are used. I have shown three. The right-hand T is provided with a plug 21 into which is screwed the supporting rod 22. Attached to the supporting rod 22 is the small T 23 connecting the inlet steam or air pipe 24 with the upright pipe 25, which in turn, by means of the T 26, connects the pipe 24 with the line 27. This line 27 is provided at each end with a nozzle 28, arranged with the flared ends to direct steam or air against the end walls of the screening, and along its length the line 27 is provided with a plurality of T connections 29 carrying the flared nozzles 30 adapted to direct the steam or air against the screen and to remove adhering matter. These nozzles 30 are advantageously pointed in the direction shown in Fig. 5.

Mounted upon the straps 16 at intervals are the frames 31, which, together with the wire gauze 32 or metal perforated plates, as desired, constitute the paddles which revolve with the screen and which lift the solid matter from the bottom of the tank and in proximity to the chute 8. These paddles are bolted to the strap by means of the arms 33. I advantageously stagger these paddles along the length of the revolving drum. The two end paddles are in alignment, while the center ones are out of alignment with the end ones.

Mounted on the side walls 34 (Fig. 2) of the chute 8 is a shaft carrying the scraping device. The scraping devices, as shown in Fig. 2, comprise the arms 36 carrying the hubs 37 mounted on the shaft 35, the extremities of these arms 36 having riveted thereto the scoop-like plate 38, the lower edge 39 of which is adapted to contact with the paddles. These scraping devices are loosely mounted on the shaft 35 and as the paddles approach the scrapers the scrapers are lifted to bear against the paddles and contact with the paddles during their upward movement. As the paddles ascend, the scrapers ride over their faces and remove the "cush-cush" into chute 8. The sheet metal scraper 38 mounted on the arms 36 may be of such a length that their extremities hit the end walls 4 of the tank 1 and thus are maintained in proper position to contact with the extreme inner end of the paddles adjacent the drum as the paddles ascend. This insures thorough scraping of the paddles and positioning of the scraper arm to contact with the next ascending paddle immediately after the scraper has dropped off the extremity of a paddle, as will be understood.

In Figs. 5, 6 and 7, I have shown modified forms of scraping devices. In Figs. 1, 2 and 5, one scraper will suffice for scraping the paddle. In Figs. 6 and 7, a plurality of scrapers may be used. In Fig. 5, the tank 1 is provided with blocks 40 mounted beyond the ends of the drum and carrying the bearings 41 in which is mounted the shaft 42, such shaft carrying weighted arms 43, the weights 44 thereon being adjustable for proper balancing. These arms 43 carry at their lower extremity a bar to which are attached the depending scrapers 45 which contact with the paddles as they ascend and which ride over the extreme ends of the

paddles as these extreme ends arrive flush with the entrance of the chute 8. The downward movement of the arms 43 may be limited by the upper edge 46 of the tank.

In Fig. 6, I have shown a somewhat modified form of scraping arms. Shaft 47 may be suitably supported on brackets (not shown) and mounted on the shaft are a plurality of scraper arms 48 of such a weight as to swing freely on the shaft and to rest in normal position in such a way as to contact with the inner edge of the paddles and to ride over the surfaces of the paddles as they ascend. The paddle arms 48 are slightly offset, as at 49. The shaft 47 may carry two sets of these arms 48.

In Fig. 7 is shown another modification in which each set of paddles is provided with scraping arms 50 mounted similarly to the arms in Fig. 6.

In operating, the sugar juice from the mill is delivered, advantageously, as a constantly flowing stream, upon the top of the drum preferably as it rotates downwardly into the tank. The juice strains through the fine gauze or screen and past the coarser supporting gauze or screen while some flows into the tank 1. The drum may be revolved by means of a pulley or the like attached to the hollow trunnion at either or both ends. When a suction pump is used such pump is started in operation and it creates a suction of the liquid in the tank and thus draws it through the screen at the bottom to the central pipe 18 and thence out to the point of use. When the siphon principle is used the pipe 18 is, of course, extended downwardly past the receptacle or tank at a sufficient distance to create suction in the tank and draw the liquid up the pipe 20 through the screen. The drum in revolving carries the paddles 32 down in the tank near the bottom thereof and these paddles pick up the solid matters and carry them into proximity to the scrapers 38 (Figs. 1 and 2 or 45, 48 and 50 in Figs. 5, 6 and 7 respectively). The paddles being provided with the wire gauze 32 of course strain the juices and leave the liquid in the bottom of the tank to be drawn through the drum in the way described. The surface of the drum may be cleaned either continuously or from time to time by means of air or steam under pressure through the nozzles 28 and 30. When the air or steam is used continuously the nozzles 30 are best pointed in the direction shown in Fig. 2; but when they are used intermittently as the exigencies of operation demand they are best pointed in the direction shown in Fig. 5 so that adhering matter may easily drop back into the tank.

The scrapers shown in all the figures operate upon the same principle. In Figs. 1, 2 and 5 one scraper only is necessary, this scraper contacting with all the paddle arms throughout the length of the drum. In Fig. 5 the scraper is shown in dotted position after it has been raised to scrape the paddle arm and as it is in position to fall into contact with the next ascending paddle. In Figs. 6 and 7 there may be used as many scrapers as there are series of paddles along the length of the drum. The screening on the paddles may be coarser than that on the drum, and for this reason perforated sheet metal may be used in which event there would be less wear on the screen of the paddle than if wire gauze were used. When operating upon the siphon principle the liquid level in the tank must be as high as, or higher, than the top of the pipe 18 in order that the siphon shall not be "broken". In view of the fact that the wire screening will be used, it is possible to make the drum exceedingly light and at the same time of requisite strength through the use of the angle irons and hoops. The straps for attaching the screen and the paddles may be easily removed and new screens put in when necessary.

The liquor to be filtered or strained may be admitted by means of the nozzle A (Fig. 2) directly; or better from a trough A' (Fig. 1) extending across the top of the apparatus so adjusted that a steady stream is discharged across the surface of the drum at its highest point or as it descends into the receptacle, thus assisting in dislodging solid matter from the surface of the drum.

In Figs. 10 and 11 there is shown a somewhat modified form of apparatus in which a portion of the juice which passes through the periphery of the strainer is separately delivered from without the drum and in which the balance of the liquid or juice which has flown over the periphery of the drum into the bottom of the tank or through the drum into the bottom of the tank is delivered through separate means. Referring to these figures, the same reference numerals designate corresponding parts where applicable.

The central pipe 18^A is not provided with downward extensions as is the pipe 18 in the other views, but is provided with an upwardly projecting funnel-like portion 51, the mouth 52 of which extends substantially the entire length of the drum and about 90 degrees around the periphery of the top. The juice from the mill is delivered to the trough 53 from which it flows on top of the drum. All strained juices at this point are caught by the funneled mouth 51 and are delivered by gravity to the pipe 18^A and then out of the machine to the point of use. The juice which has flown from the side of the drum and carried down by it or which passes interiorly of the drum at points beyond the funneled mouth of the pipe 18^A, collects in the bottom of the tank and is re-

moved therefrom by a suction pump operating on line 54 extending through the trunnion 12. This line 54 is connected by pipe 55 to the longitudinal pipe 56 perforated along its bottom as at 57 and extending substantially across the entire length of the drum at a point very near the lower end. The paddles in this view operate the same as in the other views and any form of scraper mechanism for the paddles may be employed. The steam pipe or air pipe for cleaning the drum at intervals is designated by the reference numeral 58. It extends through the trunnion 12 and is provided with the pipe 25 to which may be connected the steam or air delivery pipe (27) and nozzles 28 and 30 as shown in Fig. 1.

What I claim is:

1. Filtering device comprising a receptacle, a foraminous cylinder arranged to revolve therein, means for exhausting liquid from the receptacle and through the cylinder, means for delivering material to be filtered to the receptacle, means extending from the face of the cylinder arranged to carry solids from a low point in said receptacle to a higher point spaced from the cylinder and means near said higher point for removing the solid material from the said carrying means without contacting the cylinder.

2. Filtering device comprising a receptacle, a foraminous cylinder arranged to revolve therein and spaced away from the bottom thereof, means for exhausting liquid from the receptacle and through the cylinder, means for delivering material to be filtered to the receptacle, means arranged to travel in the space between the bottom of the receptacle and the cylinder to carry solids from a low point in said receptacle to a higher point and means near said higher point arranged to ride over the surface of said carrying means as they carry the solids from the low point to a higher point and to thus scrape said carrying means.

3. Filtering device comprising a receptacle, a foraminous cylinder arranged to revolve therein and spaced away from the bottom thereof, means for exhausting liquid from the receptacle and through the cylinder, means for delivering material to be filtered to the receptacle, means arranged to travel in the space between the bottom of the receptacle and the cylinder to carry solids from a low point in said receptacle to a higher point, means near said higher point for eliminating solid material from said carrying means and means near said higher point for receiving said eliminated solid material.

4. Filtering device comprising a receptacle, a foraminous cylinder arranged to revolve therein, means for exhausting liquid from the receptacle and through the cylinder, means for delivering material to be filtered to the receptacle, paddles carried by said cylinder and extending toward the inner walls of the receptacle and arranged to carry solids from a low point in said receptacle to a higher point, and means arranged to contact with said paddles just before they reach said higher point and to ride over said paddles as they ascend to scrape the material therefrom.

5. Filtering device comprising a receptacle, a foraminous cylinder arranged to revolve therein, means for exhausting liquid from the receptacle and through the cylinder, means for delivering material to be filtered to the receptacle, screening means extending from the face of the cylinder and arranged to revolve therewith to carry solids from a low point in said receptacle to a higher point, and means near said higher point for eliminating said solid material from said screening means.

6. Filtering device comprising a tank having a stuffing box on each end, a hollow trunnion passing through each stuffing box, means for revolving a trunnion, a foraminous drum connected to the trunnions to revolve therewith and in said tank, a pipe in one of said trunnions, a connection leading from said pipe inside said drum and to a low point in said tank, means for creating suction in said pipe, and means on the drum arranged to travel between said drum and said tank to lift solid matter from a low point in said tank to a higher point outside said tank.

7. Filtering device comprising a tank having a stuffing box on each end, a hollow trunnion passing through each stuffing box, means for revolving a trunnion, a foraminous drum connected to the trunnions to revolve therewith and in said tank, a pipe in one of said trunnions, a connection leading from said pipe inside said drum and to a low point in said tank, means for creating suction in said pipe, means on the drums arranged to travel between said drum and said tank to lift solid matter from a low point in said tank to a higher point outside said tank, and means at said higher point for scraping solid material off said lifting means.

8. Filtering device comprising a tank having a stuffing box on each end, a hollow trunnion passing through each stuffing box, means for revolving a trunnion, a foraminous drum connected to the trunnions to revolve therewith and in said tank, a pipe in one of said trunnions, a plurality of connections leading from said pipe inside said drum to low points in said tank, means for creating suction in said pipe, means on said drums arranged to travel between said drum and said tank to lift solid matter from a low point in said tank to a higher point outside

said tank, and means at said higher point for scraping solid material off said lifting means.

9. In a filtering apparatus, a drum comprising a plurality of longitudinal members, end walls provided with hubs, hoops arranged at intervals around said longitudinal members, screening material arranged around said hoops and straps holding said screening material in place.

10. In a filtering apparatus, a drum comprising a plurality of longitudinal members, end walls provided with hubs, hoops arranged at intervals around said longitudinal members, screening material arranged around said hoops and straps holding said screening material in place, said straps carrying paddles.

11. In a filtering apparatus, a drum comprising a plurality of longitudinal members, end walls provided with hubs, hoops arranged at intervals around said longitudinal members, screening material arranged around said hoops, straps holding said screening material in place and a plurality of paddles attached to the outside of the screen in staggered relation.

12. In a filtering device, a revoluble foraminous drum and perforated paddles attached to the periphery of the drum extending outwardly and rearwardly therefrom to facilitate scraping thereof.

13. In a filtering device, a revoluble foraminous drum, perforated paddles attached to the periphery of the drum and extending outwardly therefrom, and means spaced from the drum for scraping solid materials from said paddles without contacting said drum.

14. The combination with a revoluble foraminous drum of a plurality of paddles projecting from the periphery thereof and arranged to travel therewith, and means mounted to wipe over the face of the paddles without contacting with the periphery of the drum.

15. The combination with a revoluble foraminous drum of a plurality of perforated paddles projecting from the periphery thereof and arranged to travel therewith, and means mounted to wipe over the face of the paddles without contacting with the periphery of the drum.

In testimony whereof, I have hereunto affixed my signature.

SAMUEL STODOLE PECK.