

Feb. 9, 1926.

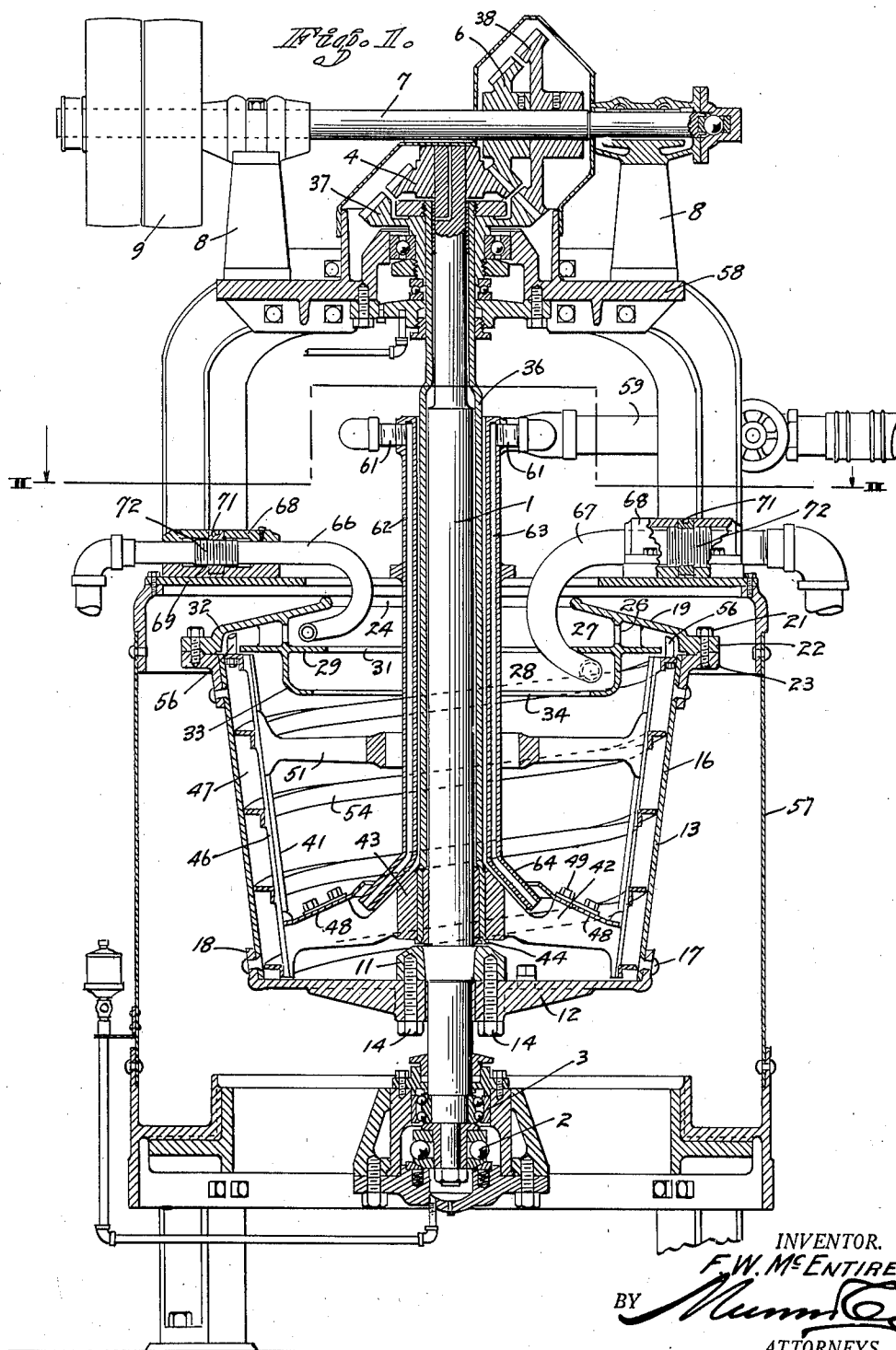
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F. W. McENTIRE

CENTRIFUGAL SEPARATOR

Filed June 18, 1923

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Feb. 9 , 1926.

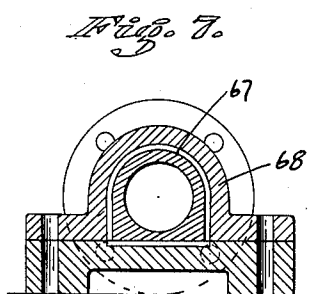
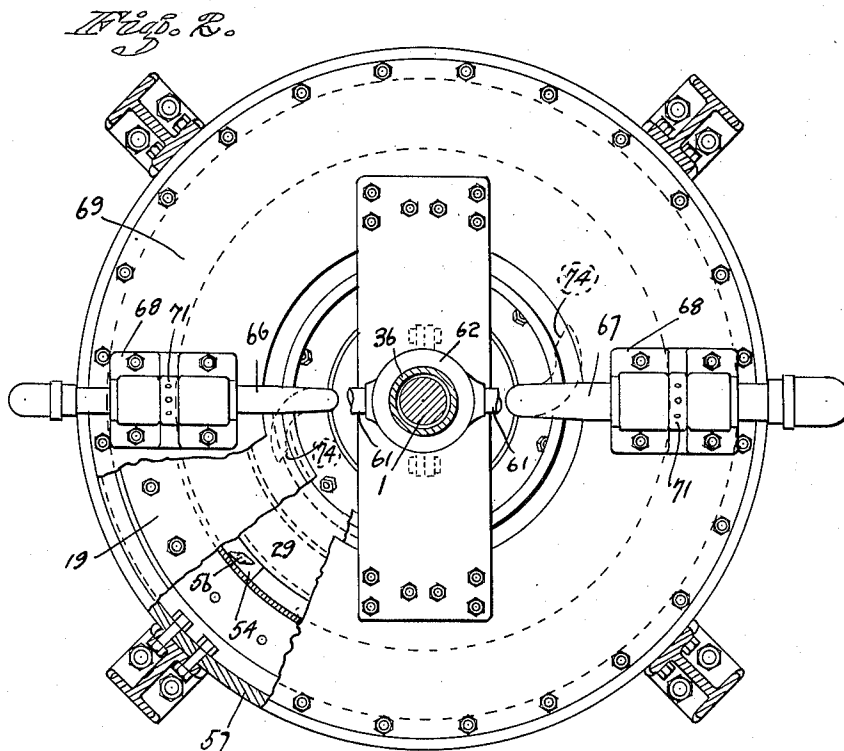
1,572,299

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Fig. 9.

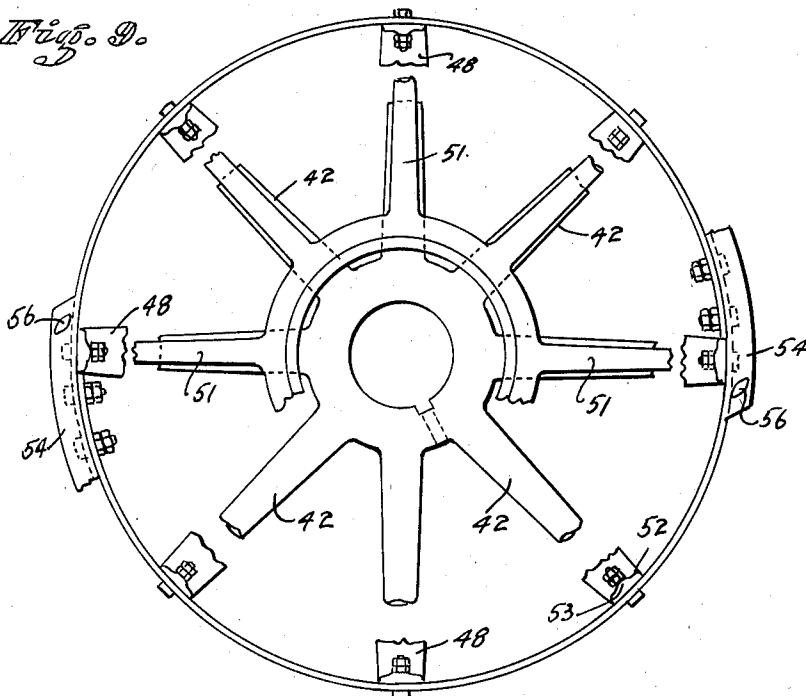


Fig. 10.

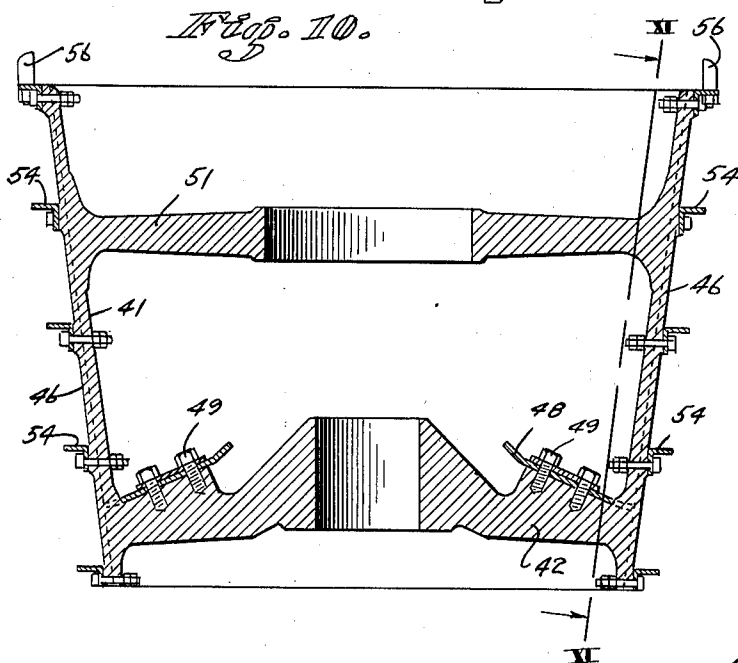
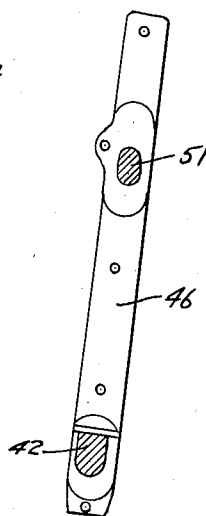


Fig. 11.



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1,572,299

UNITED STATES PATENT OFFICE.

FRED W. McENTIRE, OF SALT LAKE CITY, UTAH.

CENTRIFUGAL SEPARATOR.

Application filed June 18, 1923. Serial No. 646,170.

To all whom it may concern:

Be it known that I, FRED W. McENTIRE, a citizen of the United States, and a resident of Salt Lake City, county of Salt Lake, and State of Utah, have invented a new and useful Centrifugal Separator, of which the following is a specification.

The present invention relates to improvements in centrifugal separators and its particular object is to provide a separator that may be used successfully for the separation of solid matter suspended in a liquid in cases where the difference in specific gravity between the elements to be separated is comparatively small. The device described and illustrated in the present application is an improvement on the centrifugal separator described in my Patent #1,481,426, dated January 22, 1924. It is principally intended to be used in the sugar industry for the separation of solids from the carbonated juice of sugar beets. This separation, due to the flighty nature of the solids and the small difference in specific gravity offers particular difficulty which can be overcome only by taking advantage of every point presenting itself furthering an easy operation of the machine and a handling of the solids in such a careful manner that they remain clear of the liquid while being advanced to their respective receiving vessels.

The preferred form of the present invention is illustrated in the accompanying drawings in which Figure 1 shows a vertical section through the separator, Figure 2 a horizontal section taken along line II—II of Figure 1, Figure 3 a detail view in plan of a collecting element, Figure 4 a side view of the same, partly shown in section, Figure 5 a plan view of a second collecting element, Figure 6 a vertical section through the same, Figures 7 and 8 vertical sections taken along lines VII—VII and VIII—VIII of Figure 6, Figure 9 a plan view of a basket frame, Figure 10 a vertical section through the same and Figure 11 a detail view of a single frame element as viewed from line XI—XI of Figure 10. While I have shown only the preferred form of the invention it should be understood that various changes or modifications may be made within the scope of the claims hereto attached without departing from the spirit of the invention.

Referring to the drawings in detail, a vertical shaft (1) is supported on a ball thrust

bearing (2) against endwise motion and held by a second bearing (3) against lateral motion. At the upper end of the shaft is provided a bevel gear (4) meshing with a bevel gear (6) on the horizontal shaft (7) supported in standards (8) and adapted to be rotated by means of any suitable power engaging the pulley (9). A collar (11) on the vertical shaft (1) has the bottom (12) of a basket (13) secured thereto by means of screws (14). The basket comprised besides the bottom plate (12) a conical wall (16) secured to the bottom plate by means of pivots (17) passing through a flange (18) of the bottom plate and a top (19) secured by means of screws (21) passing through corresponding flanges (22) and (23) of the wall and the top. The top plate which is also conical in form has a large central opening (24) and has a structure (26) depending therefrom defining an upper chamber (27) and a lower chamber (28). The plate (29) forming the bottom of the upper chamber and the top of the lower chamber has a large center opening (31) and is of slightly less diameter than the top of the basket so as to leave an annular space (32) through which the upper chamber communicates with that portion of the basket adjoining the wall. The member (33) forming the side and the bottom of the lower chamber has a large central perforation (34) through which it communicates with the interior of the basket, no other communication being provided.

Around the shaft (1) is placed a sleeve (36) resting on the collar (11) and terminating at its upper end in a bevel gear (37) meshing with a second bevel gear (38) on the horizontal shaft (7) previously mentioned. It should be mentioned that the gear ratio between the bevel gears (37) and (38) differs slightly from that between the bevel gears (4) and (6) so that the sleeve (36) rotates at a speed differing slightly from that of the shaft (1). A basket frame (41) is secured to the sleeve in the following manner: A plurality of arms (42) extend radially from the hub (43) resting on a flange (44) of the sleeve (36) and engage with their outer ends a plurality of uprights (46) arranged symmetrically so as to run parallel to the wall of the outer basket but disposed at a distance from the same so as to leave an annular space (47) between the outer basket and the frame.

Spreading plates (48) are bolted to the arms as shown at (49). A second set of radial arms (51) engaging the upper portion of the basket frame serves to reinforce the same.

5 The uprights are rounded as shown at (52) and projected toward the center as at (53) to present stream line faces preventing any solids to lodge on the inside. Externally the basket frame has secured thereon a plu-
10 rality of windings of a spiral guideway (54) comprising preferably an angle iron one flange of which is secured to the uprights of the frame while the other flange forms a gradually and slowly ascending path for
15 the solid material confined between the basket and the basket frame. The winding as shown in the drawings represents a double thread with the two ends of the two threads terminating at the level of the top of
20 the basket frame on opposite sides of the shaft. It will be noted that the guideways lead directly to the open annular passage (32) through which the solids may enter the upper chamber (27). This entry neces-
25 sitates a change in the direction of motion since the material traveling upwardly in spiral winding up to that time has now to be turned to adopt an inward course and to facilitate this turning movement and to
30 allow the same to be carried out without agitating the material more than is absolutely necessary I provide plows (56) at the end of each guideway which are set in such a manner as to divert the material in
35 radial direction.

A cylindrical housing (57) surrounds the rotating basket and is supported by being secured to a plurality of cylindrically arranged I beams which extend above the
40 housing and carry the plate (58) on which the standards (8) previously mentioned are mounted.

The material to be separated is fed from the source of supply through the pipe (59) and two smaller pipes (61) and then into
45 a hollow sleeve (62) providing a passage (63) and guiding the material through a flaring lower portion (64) into the bottom part of the basket.

50 To collect the separated material I provide stationary collecting pipes (66) and (67) in the upper and lower chambers. The same are curved to present their open mouths to the revolving material so that the latter
55 is forced into the pipes. Each pipe is supported in a box (68) resting on a plate (69) covering the cylindrical housing and holding against endwise motion nuts (71) adapted to be rotated by means of any suitable wrench. The nuts engage threaded
60 portions (72) of the pipes so that the latter may be advanced or moved backwardly by rotating the nuts (71). The pipes (66) and (67) with their peculiar curvatures are
65 shown in detail in Figures 3 to 6 and it

should be noted particularly that the curved portion of each pipe is provided with rubber or other suitable nonabrasive lining (73) which protects the metal pipe from the abrasive action of the material to be
70 handled. Each pipe terminates in a rubber nipple (74) preferably reinforced by wire netting (76).

The operation of the device may be described as follows: Material to be separated
75 is fed into the bottom portion of the basket from the pipe (59). The basket and the basket frame are rotated at slightly different speeds whereby the material is forced out-
80 wardly by centrifugal action. The solids being slightly heavier than the liquid are thrown farthest and engage the wall of the basket. They are then gently carried up-
85 ward by the spiral guideways until they reach the level of the upper chamber when the plows (56) will gradually and gently change their spiral direction into radial di-
90 rection so that it fills the upper chamber and is fed into the pipe (66). In the meantime the liquid remains in the central portion of the basket and is carried upward through the opening (34) into the lower
95 chamber from where it is discharged into the pipe (67).

While my machine may be used where the difference in specific gravity of the ma-
100 terials to be separated is comparatively small it will render effective service where the difference is more pronounced.

I claim:

1. In a separator of the character de-
105 scribed, a basket, a basket frame rotatably mounted therein, means for rotating the basket and the basket frame at slightly different speeds and means for feeding material to be separated into the basket whereby the
110 heavier particles are forced into the space between the basket and the basket frame, the latter frame consisting of a plurality of upright members presenting streamlined inner faces so as to present a minimum re-
115 sistance to the flow of the material.

2. In a separator of the character de-
120 scribed, a basket, means for rotating the same, means for feeding material to be separated into the basket whereby the heavier particles are thrown in contact with the wall of the basket, a spiral guideway for guiding the said particles upwardly, a plurality of upright members supporting the guideway presenting streamlined inner
125 faces for reducing the resistance offered to the flow of material to a minimum and radial arms holding the upright members in place.

3. In a separator of the character de-
130 scribed, a basket, means for rotating the same, means for feeding material to be separated into the basket whereby the heavier particles are thrown in contact with

the wall of the basket, a spiral guideway for guiding the said particles upwardly, a plurality of upright members supporting the guideway presenting streamlined inner faces for reducing the resistance offered to the flow of material to a minimum and two sets of radial arms mounted one above the other for holding the upright members in place.

10 4. In a separator of the character described, a basket, means for feeding material to be separated to the bottom thereof, means for rotating the basket causing the heavier particles of the material to be flung

15 into the proximity of the basket wall while confining the lighter material to the inner portion of the basket a differentially rotated spiral path adjacent the basket wall proportioned to engage with the heavier particles only to carry the same upward and to

20 produce a shearing action relative to the unguided lighter materials, and a plow sub-

stantially coextensive with the width of the path traversing the upper end thereof for agitating the heavier material and forcing 25 the same inwardly.

5. In a separator of the character described, a central shaft having a basket fixed thereto, a sleeve on the shaft having a basket frame fixed thereto disposed on the inside of 30 the basket, means for revolving the shaft and the sleeve at different speeds and a second sleeve surrounding the first sleeve and formed with a hollow wall adapted to discharge material to be separated into the 35 bottom of the basket in the form of a thin sheet, the second sleeve flaring outwardly at the bottom so as to deflect the material from the center of the basket, and the basket frame having spreader plates fixed thereto 40 in overlying relation to the discharged material.

FRED W. McENTIRE.