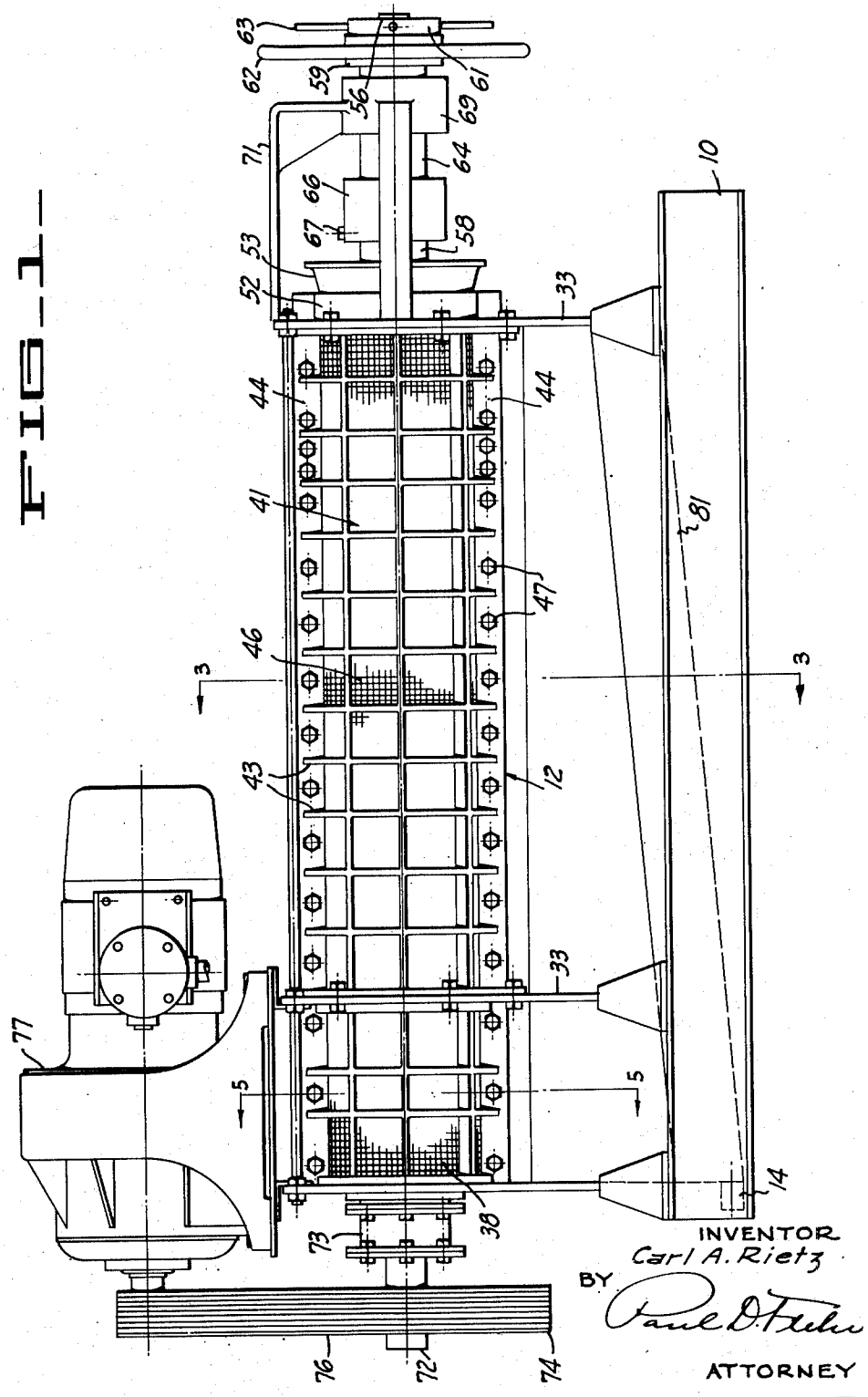
Sept. 9, 1952 C. A. RIETZ 2,609,744

PRESS CONSTRUCTION

Filed Sept. 30, 1946 3 Sheets-Sheet 1

FIG. 1




INVENTOR
Carl A. Rietz
BY
Paul D. Fuller
ATTORNEY

Sept. 9, 1952 C. A. RIETZ 2,609,744

PRESS CONSTRUCTION

Filed Sept. 30, 1946 3 Sheets-Sheet 2

FIG. 2

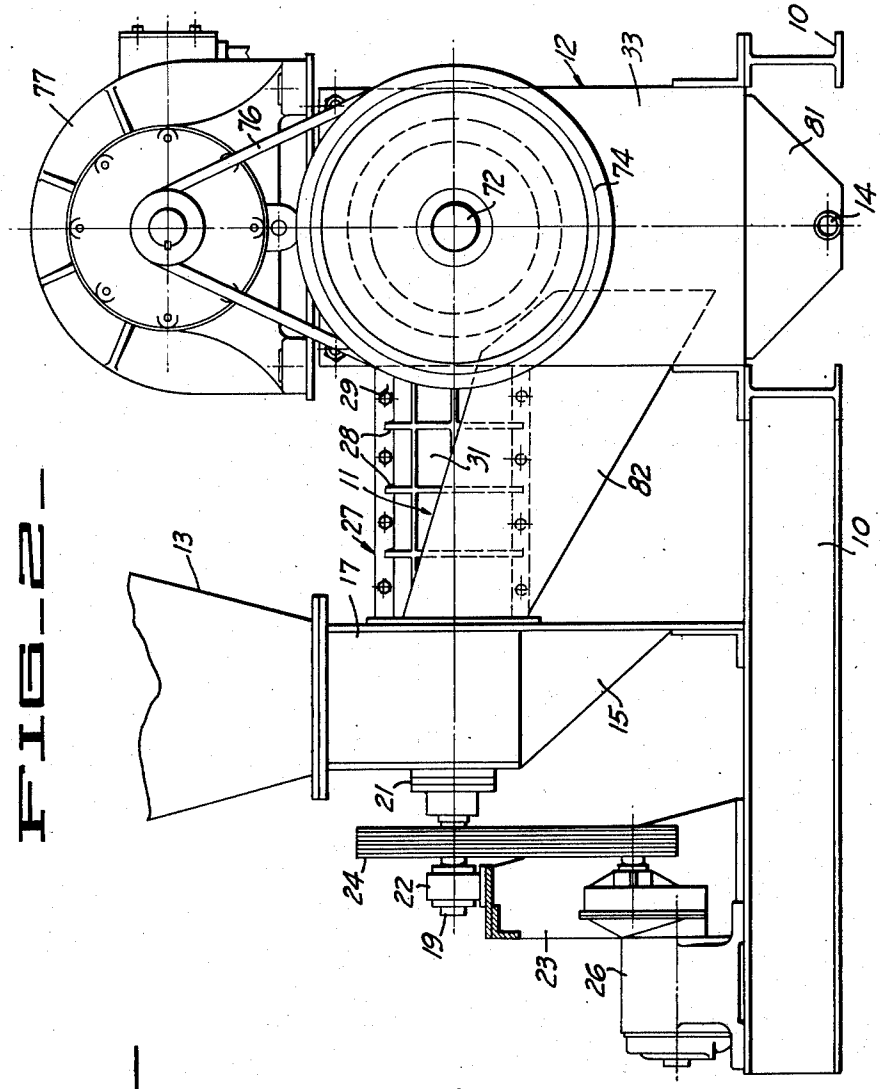
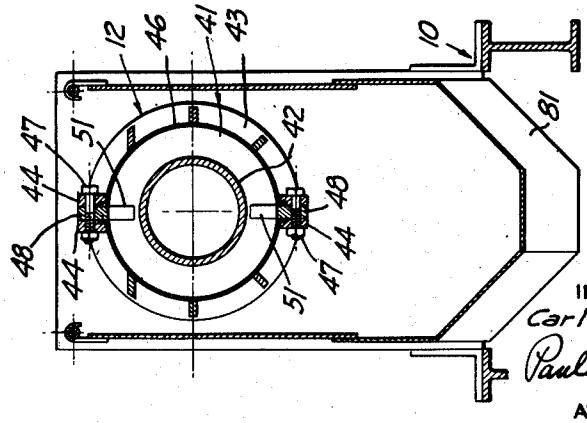



FIG. 3




INVENTOR
Carl A. Rietz
Paul D. Fehlner
ATTORNEY

Sept. 9, 1952 C. A. RIETZ 2,609,744

PRESS CONSTRUCTION

Filed Sept. 30, 1946 3 Sheets-Sheet 3

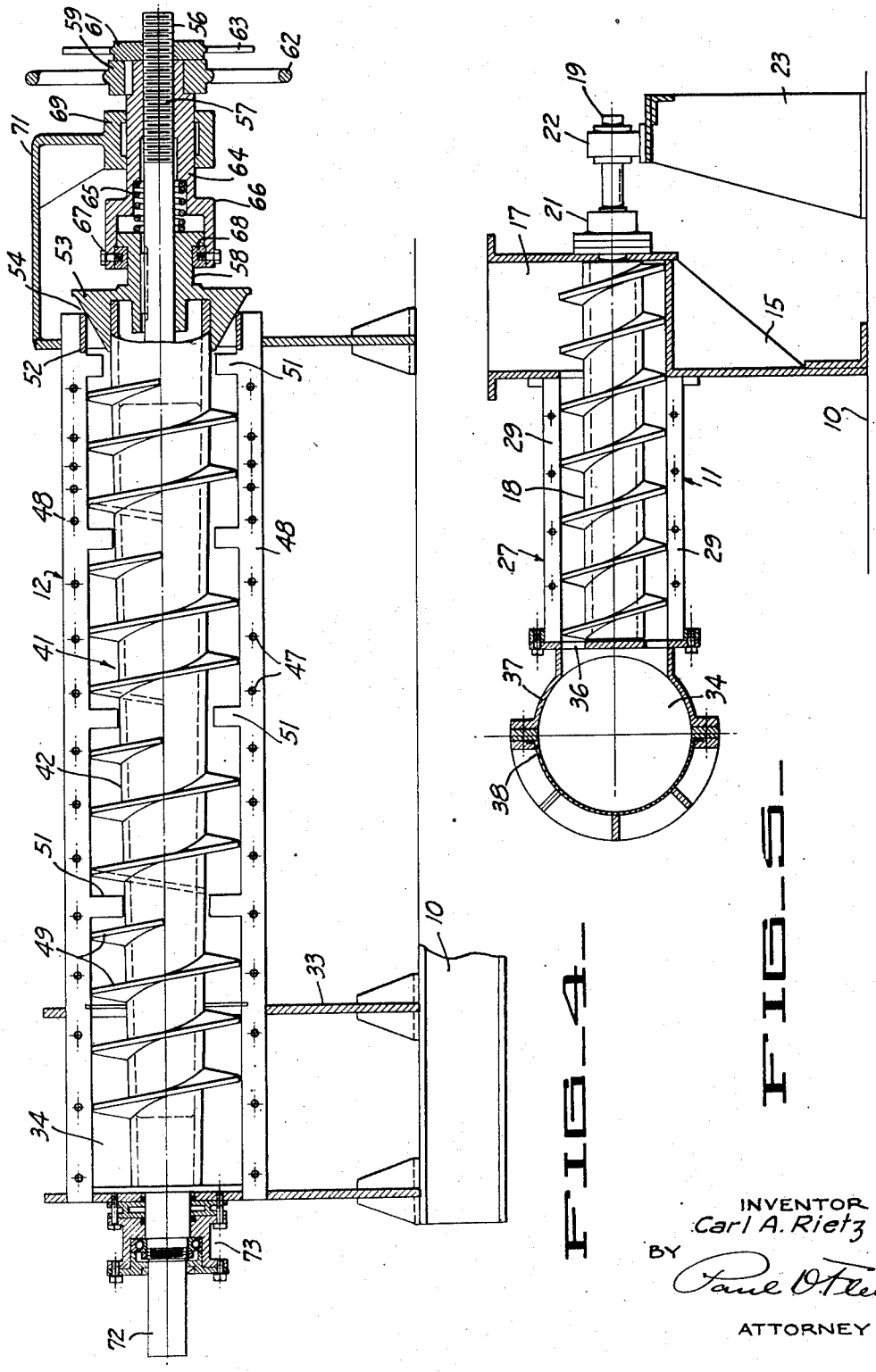



FIG-4-

FIG-5-

INVENTOR
Carl A. Rietz
BY
Paul O. Fleck
ATTORNEY

Patented Sept. 9, 1952 2,609,744

# UNITED STATES PATENT OFFICE

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## PRESS CONSTRUCTION

Carl A. Rietz, San Francisco, Calif., assignor to Rietz Manufacturing Co., San Francisco, Calif., a corporation of California

Application September 30, 1946, Serial No. 700,228

2 Claims. (Cl. 100—148)

1

This invention relates generally to press constructions of the screw type adapted to express water or other liquid from a feed material.

Conventional presses of the screw type make use of a cylindrical screen surrounding a suitable screw and having its one end arranged to receive feed material. At the discharge end of the screw there is a cone or like convex form of end plate whereby the press cake is discharged through an annular orifice surrounding the cone. Generally the pitch of the screw diminishes toward the discharge end in order to enable application of sufficient pressure to express the desired amount of water. Many difficulties are encountered in the operation of such conventional screw presses. In many instances it is difficult to provide for optimum feeding of material to one end of the screw, with the result that the screw is not operated at optimum capacity or with even loading. Due to inability to maintain the feed under optimum conditions there is a frequent tendency for the material under treatment to rotate about the axis of the screw, which likewise results in decreased efficiency and capacity, and requires the use of an excessive number of lock or plow bars.

Aside from the difficulties mentioned above conventional screw presses are not applicable to the handling of materials of slurry or mush like consistency. Such materials cannot be properly advanced under pressure by a conventional screw operating at the speeds customarily used for such equipment. As a result it is customary in the treatment of such slurries to first resort to supplemental dewatering methods, such as settlement or centrifugation, in order to provide a material dewatered to such an extent that it can be supplied to the conventional screw press equipment.

It is an object of the present invention to provide a screw press which overcomes the difficulties outlined above. A particular feature of my construction is that it can be supplied directly with feed material of slurry consistency.

A further object of the invention is to provide apparatus of the above character which operates at optimum capacity and efficiency, particularly with respect to application of pressure and progression of the material undergoing treatment.

Another object of the invention is to provide an improved screw press having novel means for the mounting and adjustment of the end plate cone.

Another object of the invention is to provide improved feed means for screw press equipment in which centrifugal force is utilized to aid in the

2

elimination of liquor, whereby material of proper consistency is supplied to the feed end of a secondary screw press.

An additional object of the invention is to provide a primary screw press in conjunction with a secondary screw press, and which primary press is of novel construction adapted to receive feed material of slurry consistency, and to supply properly dewatered feed to the secondary press.

Additional objects of the invention will appear from the following description in which the preferred embodiment of the invention has been set forth in detail in conjunction with the accompanying drawing.

Referring to the drawing:

Figure 1 is a side elevational view, partly in section, illustrating screw press equipment incorporating the present invention.

Figure 2 is an end view of the equipment illustrated in Figure 1.

Figure 3 is a cross sectional view taken along the line 3—3 of Figure 1.

Figure 4 is a side elevational detail in section showing the secondary screw and its associated parts but with the screen basket removed.

Figure 5 is a cross sectional view taken along the line 5—5 of Figure 1.

The screw press equipment illustrated in the drawing consists generally of a suitable supporting frame 10 upon which are mounted the primary and secondary press units 11 and 12. Feed material being supplied to the apparatus is introduced into the feed hopper 13, and dewatered press cake is discharged from one end of the secondary unit 12 (the right hand end as viewed in Figure 1). The expressed liquid is collected by launders or pans underlying the units 11 and 12, as will be presently described, and is finally withdrawn through the pipe 14.

The primary unit 11 consists of a frame 15 which is mounted upon the base 10, and which forms a feed hopper 17 adapted to receive material from the lower end of hopper 13. A feed screw 18 is carried by the frame 15, and is provided with a stub shaft 19 extending from its one end. The shaft is carried by bearing 21 mounted on the frame 15, and by a second bearing 22 carried by the standard 23. Suitable drive means is applied to shaft 19, such as the V belt pulleys 24, driven by V belts from the electric motor 26.

That part of the screw 18 which extends beyond the frame 15 is surrounded by the two part screen basket 27. As is conventional practice each part of the basket consists of the arcuate ribs 28 which are attached at their ends to the

longitudinally extending bars 29. The ribs serve to support a suitable screen assembly 31 which is cylindrical in form and which surrounds the feed screw, in close apposition to the exterior end faces of the screw threads or flights.

The frame of the secondary unit, which has been designated generally at 33, includes a chamber 34 having an opening 36 communicating with the discharge end of basket 27. Chamber 34 is cylindrical as illustrated in Figure 5, and it is formed in two parts 37 and 38. Part 37 is of solid plate while part 38 is made perforated or as a screen. Part 38 comprises substantially one-half of the walls of chamber 34, and particularly that half which is diametrically opposite from the opening 36.

The secondary screw press 12 consists of the screen basket 41 which surrounds the horizontally extending feed screw 42. As is customary practice basket 41 is formed of two halves clamped together, with each half consisting of the arcuate ribs 43, with their ends connected by the longitudinally extending bars 44. Ribs 43 serve to support a suitable screen assembly 46, whereby a substantially cylindrical screen is disposed about the screw. In assembling this basket, bars 44 are clamped by bolts 47 upon opposite sides of the longitudinally extending bars 48, which form a part of the general frame. It will be noted that the flights 49 on the screw have the same pitch throughout the length of the screw, and it is desirable that they be interrupted at regular intervals, in order to accommodate the stationary lock bars 51. These bars tend to prevent the general rotation of the material being acted upon whereby the material is properly advanced as the screw rotates. One end portion of the screw 42, which forms the feed portion of the same, extends into the chamber 34. The other or discharge end of the screw extends in proximity to a ring 52 which is carried by the frame, and which forms a circular opening in alignment with the screw and serving to accommodate the discharging press cake.

Adjustably disposed within the opening formed by ring 52 there is a cone 53, whereby the discharging material must pass through the annular orifices 54. A shaft 56 extends from the screw and is provided with a threaded portion 57. Cone 53 is carried by a hub 58 which is splined to the shaft 56, whereby the cone rotates with the screw, but may be adjusted in a longitudinal direction. A pair of nuts 59 and 61 are threaded upon the shaft 56 and are provided respectively with a suitable handwheel 62 and handles 63, to enable them to be locked or disengaged with respect to each other. A tube 64 has its one end attached to nut 59 and its other end provided with the collar 66. A counter bore in this collar servies to accommodate a portion of the hub 58, and these parts are attached together for relative rotation as by means of screws 67 which are carried by the collar 66, and which have their inner ends extending into an annular ring 68 on the hub 58. A spring 65 abuts against the outer face of hub 58 and is seated in an annular groove formed in the tube 64. Tube 64 is carried by a bearing 69 which in turn is carried by the yoke 71. It will be evident that with the arrangement just described one may loosen the nuts 59 and 61 with respect to each other, after which one may turn the handwheel 62 to adjust the cone 53 in a longitudinal direction with respect to the screw. When the cone has been located in a desired adjusted position the two nuts 59 and 61 are locked by jamming them together. As previously mentioned the cone 53 rotates with the screw, as is also the case with nuts 59 and 61. However while the parts are in rotation it is possible for an operator to loosen and change the setting of the nuts.

The other end of the screw 42 is provided with a projecting shaft 72, which is accommodated within a suitable packing gland and bearing 73. As suitable drive means for the screw 42, shaft 72 is shown carrying the V pulleys 74, which are engaged by V belts 76 leading from V pulleys carried by the electric motor 77.

Extending beneath the screw 42 there is a suitable pan or launder 81 which is tilted for drainage of liquid to the pipe 14. A similar drain pan 82 extends beneath the screw 18, and discharges into the pan 81.

Operation of the apparatus described above, in the carrying out of the present method can be described as follows: In a typical instance a feed material is being treated containing from say 25 to 40% solids. This material may for example be wine pomace such as is produced in the wine industry. Instead of driving the screw 18 at a rate of the order of from 10 to 15 R. P. M., which would be common in the operation of ordinary screw presses, it is driven at a relatively high rate of speed, as for example of the order of from 90 to 400 R. P. M., where the screw has an outside diameter of the order of 6 inches, and a pitch of the order of from 3 to 6 inches. This provides a peripheral speed of the order of from 140 to 650 feet per minute. The secondary screw 42 however is driven at a relatively low speed. Thus assuming that the secondary screw has a diameter of the order of 15 inches, with a pitch of 6 inches, it can be driven at speeds such as from 11 to 20 R. P. M. While the particular speeds employed for driving the two screws will vary in practice depending upon the material being handled, the diameters of the screws, the pitch of the flights, and like factors, in general it is desirable that the primary screw 18 be driven at a speed many times the speed of rotation of the secondary screw.

The feed slurry is supplied to the hopper 13 at a sufficient rate to maintain this hopper partly filled. This causes complete flooding of the chamber 17 at all times, whereby the screw 18 is at all times completely submerged in the material being treated. As the slurry is advanced along the screen 31 by the screw 18, a considerable amount of the water passes through the screen and is collected by the drain pan 82. By the time the material has progressed to the discharge end of the screw 18 its liquid content has been reduced to the point where it is of proper consistency for further treatment in the secondary unit 12. Thus assuming that the material contains from 25 to 40 percent solids at the time it is supplied to the hopper 13, upon reaching the discharge end of the screw 18 it may in a typical instance contain from 40 to 50 percent solids.

While being acted upon by the screw 18 water is expressed not only because of the pressure being applied to the material, but in addition because of the pressure being applied due to the effect of centrifugal force. Centrifugal force is applied in a direction tending to urge water outwardly through the screen 31 because the material being acted upon by the rapidly rotating screw rotates about the axis of the screw, although at a rotational velocity somewhat less

than the rate of rotation of the screw itself. Considerable static pressure is applied to the pulp being discharged through opening 36, and this pressure serves to insure complete filling of the chamber 34, thereby preventing the formation of voids in the operation of the secondary unit 12. Both the pressure and the movement of the material through opening 36 carries it completely around the adjacent end of the feed screw, and at this point some additional water is expressed from the material through the screen 38. Secondary screw 42 causes progression of the material from chamber 34 through the screen 46, with a gradual application of increasing pressure and with a further removal of water. By the time the solids have reached the discharge end of the unit 12 the material may contain, (taking wine pomace as an example) from 45 to 55 percent solids. Such a material in the form of press cake is discharged through the annular orifice about the cone 53.

As is known to those skilled in construction and operation of conventional screw presses, the setting of the cone 53 can be adjusted for the purpose of adjusting the pressure applied to the material being treated, thereby securing a press cake of the desired moisture content. The fact that the cone 53 is mounted to rotate together with the secondary screw minimizes the power requirements. In addition it is possible to effect adjustment of the cone as previously described.

In general my equipment and method is applicable to treatment of a variety of feed materials in the form of slurries or which are of mush-like consistency. Such materials cannot be supplied to an ordinary screw press because they tend to rotate with the screw or in other words they will not "hold," in the parlance of those skilled in the art. Treatment in my equipment serves to remove liquid from such feed materials by treatment with the primary screw, whereby when the material is delivered to the secondary screw, it is of such consistency that it will "hold."

Although in the foregoing description particular reference has been made to wine pomace, which consists of solids together with water, in many instances the liquor content may consist of an oil with or without water. For example in the treatment of copra the feed material may consist of the ground copra fiber together with copra oil and water. Both oil and water are partially removed by treatment with the primary screw, and additional oil and water are removed by treatment with the secondary screw. An example of another type of feed material is an industrial pulp such as is found in solvent extraction processes, where a fibrous material is mixed with liquid solvents such as petroleum, ether, alcohol, or carbontetrachloride.

It will be evident that the liquor content of the feed material supplied to the equipment will vary in different instances and further more that the consistency of the feed material will vary not only in accordance with the percentage of solids present, but also with the character of the liquor and the properties of the solids present. Such factors must be considered in operating my equipment, particularly with respect to removing a sufficient amount of liquor by the primary screw whereby the material when delivered to the secondary screw will "hold" in the manner desired.

The elimination of an inner bearing for the primary feed screw 18 is a desirable feature of the machine. If it were attempted to utilize an internal bearing at the discharge end of this screw the bearing would interfere with proper movement of the material, and would tend to cause blocking. In effect this feature of the machine provides a floating primary press screw which is free to rotate without any restriction other than the back pressure applied to it as the result of its action upon the material being treated. The provision of the screen 38 is a desirable feature in that when handling feed materials containing a relatively high percentage of water or other liquids, a substantial amount of liquid is removed through the screen 38, thereby considerably increasing the effectiveness and capacity of the secondary screw.

It will be evident that my equipment can be modified in many respects within the spirit of the present invention. For example a double set of threads can be used on the screws in place of single threads or flights as illustrated.

I claim:

1. In a press construction for the handling of a feed of slurry consistency, a feed screw adapted to be rotated, a cylindrical shaped screen surrounding the screw and providing a cylindrical space for accommodating the screw, means for supplying slurry-like feed material to one end of the screw whereby such material is advanced along the screw with a part of its liquid content passing through the screen, a second screw disposed at right angles to the first screw and having its one end positioned to receive material from the discharge end of the first screw, a screen surrounding the second screw, means at the discharge end of the second screw for enabling the discharge of press cake, the last named screen at the feed end of the second screw being in substantially unobstructed communication with the discharge end of the first screen, and means for driving both the first and second screws, the rate of drive of the first screw being of the order of 90 R. P. M. or more for a screw 6 inches in diameter and having a pitch of from 3 to 6 inches, and the rate of drive for the second screw being relatively slow compared to the first screw, whereby centrifugal force aids delivery of liquid through the screen surrounding the first screw while the second screw removes liquid by compression.

2. In a press construction for the handling of a feed of slurry consistency, a feed screw adapted to be rapidly rotated, a substantially cylindrical shaped screen surrounding the screw, a basket serving to support said screen, said screen and basket forming a substantially cylindrical space for accommodating the screw, means for supplying feed material to one end of the screw whereby such material is advanced along the screw with a part of its liquid content passing through the screen due to the combined pressing action of the screw and centrifugal force resulting from rotation, a second screw disposed at right angles to the first screw, one end of the second screw being disposed to receive material from the discharge end of the first screw, a substantially cylindrical shaped screen surrounding the second screw, a second basket serving to mount the second screen, said second basket and screw having substantially unobstructed communication with the discharge end of the first basket and screen, means at the discharge end of the second screw for enabling the discharge of press cake, and means for driving

said screws, the rate of drive of the first screw being of the order of 90 R. P. M. or more for a screw having a diameter of 6 inches and a pitch of from 3 to 6 inches, and the rate of drive of the second screw being of the order of 20 R. P. M. or less for a screw having a diameter of 15 inches and a pitch of 6 inches.

CARL A. RIETZ.

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