Oct. 27, 1931. S. HILLER ET AL 1,828,968

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Filed June 23, 1926 3 Sheets-Sheet 1

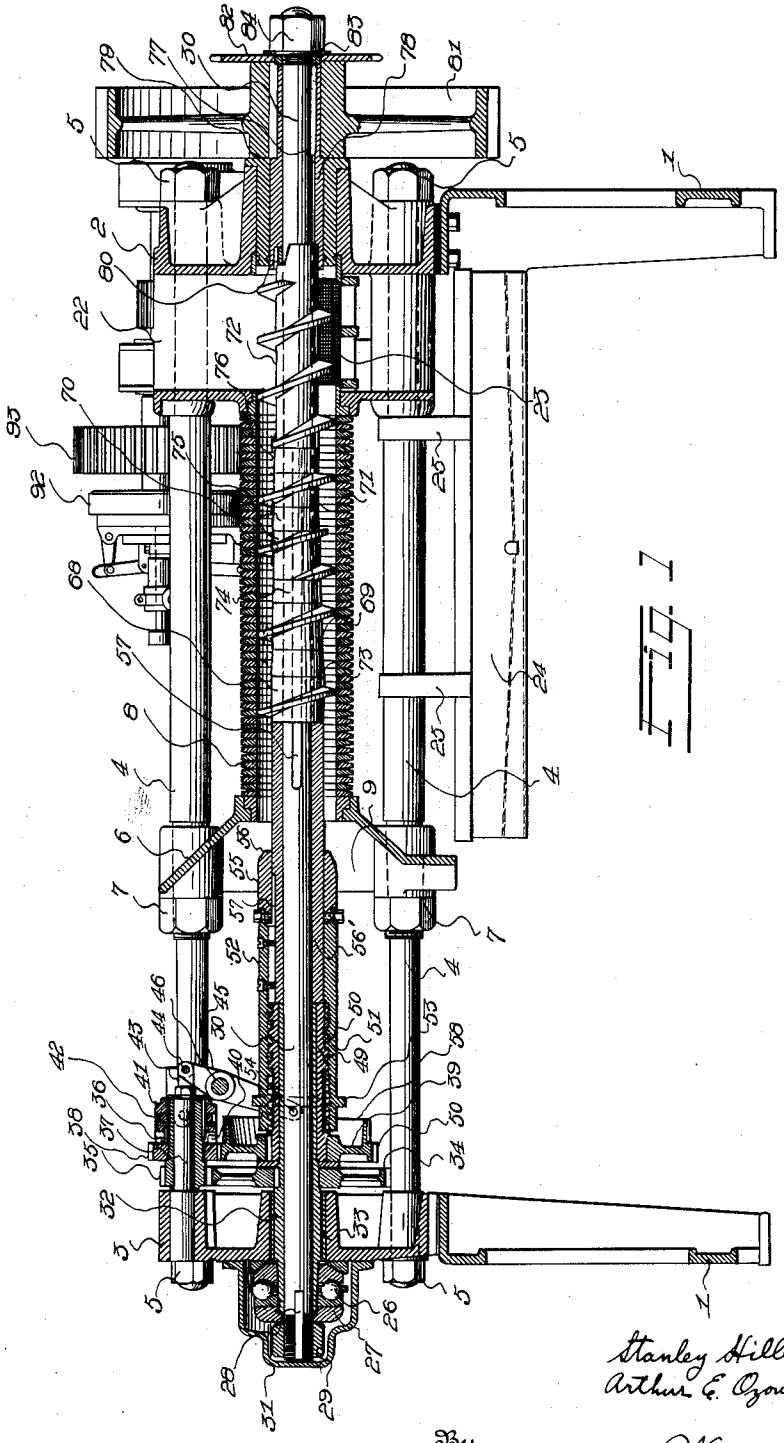


Fig. 1

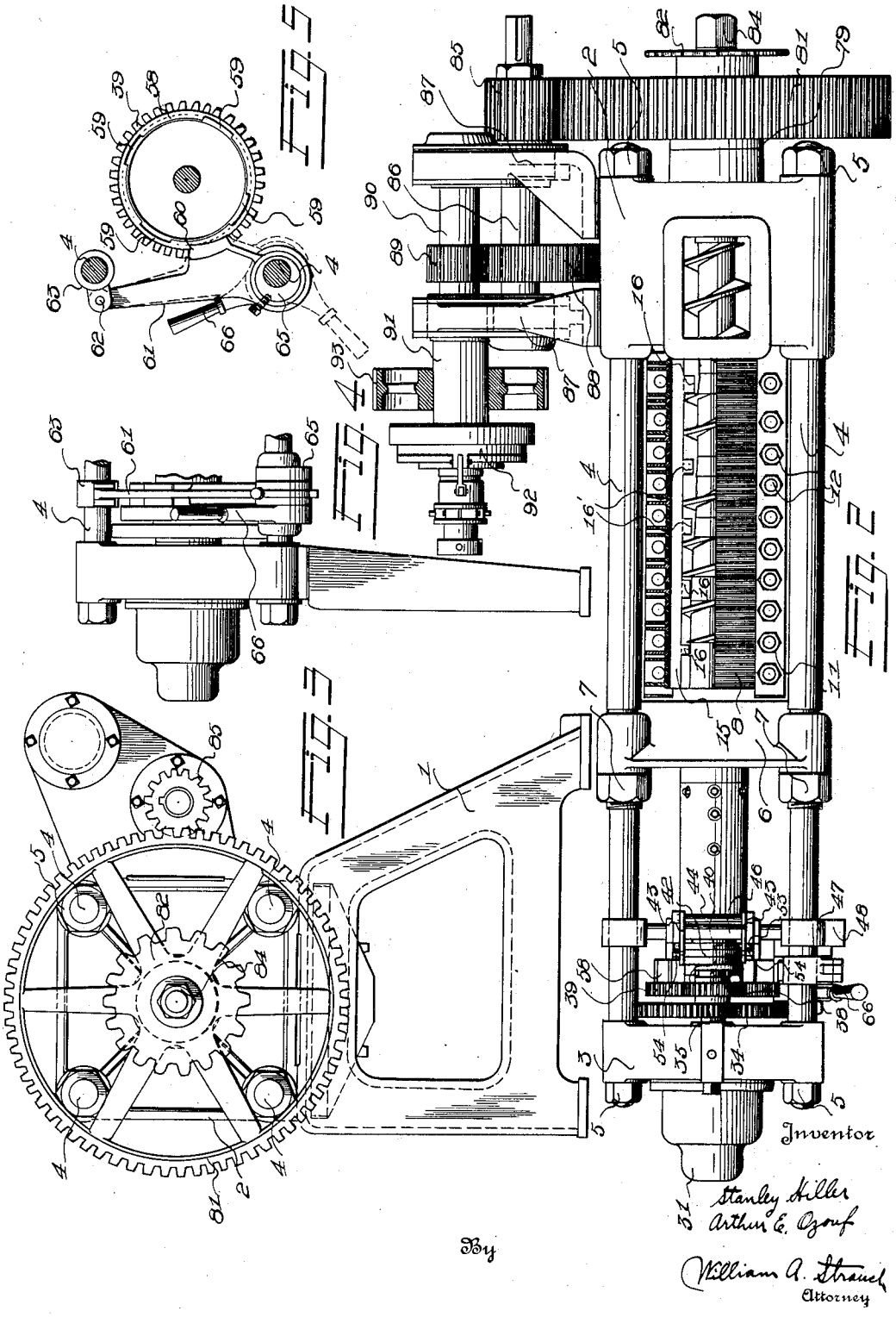
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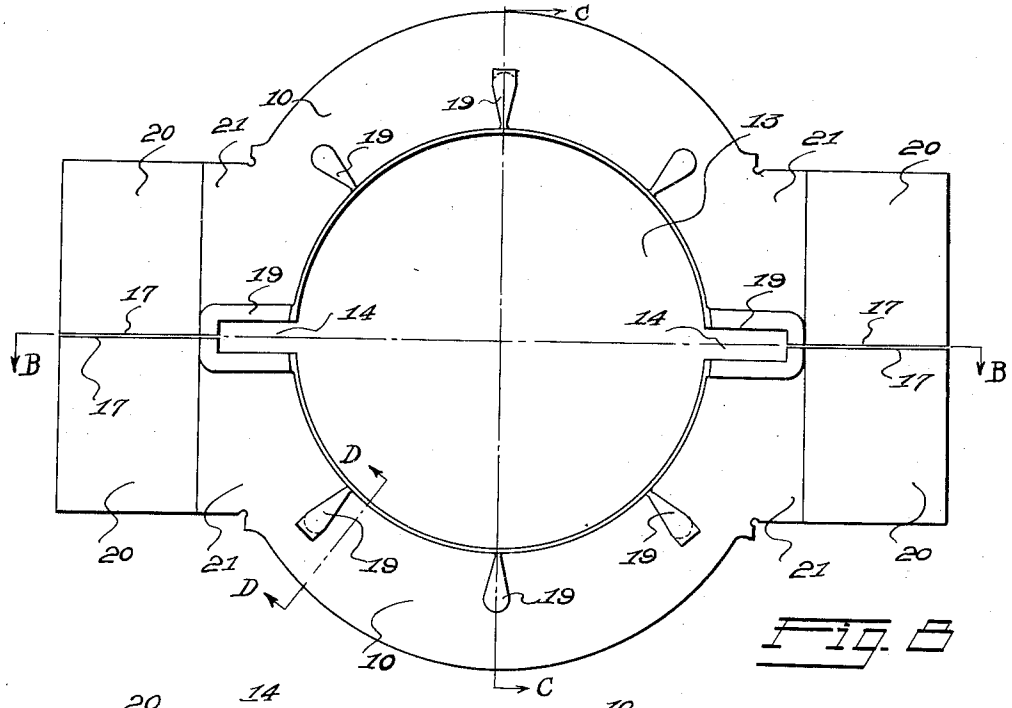


Fig. 8

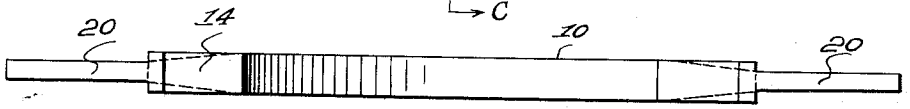


Fig. 9

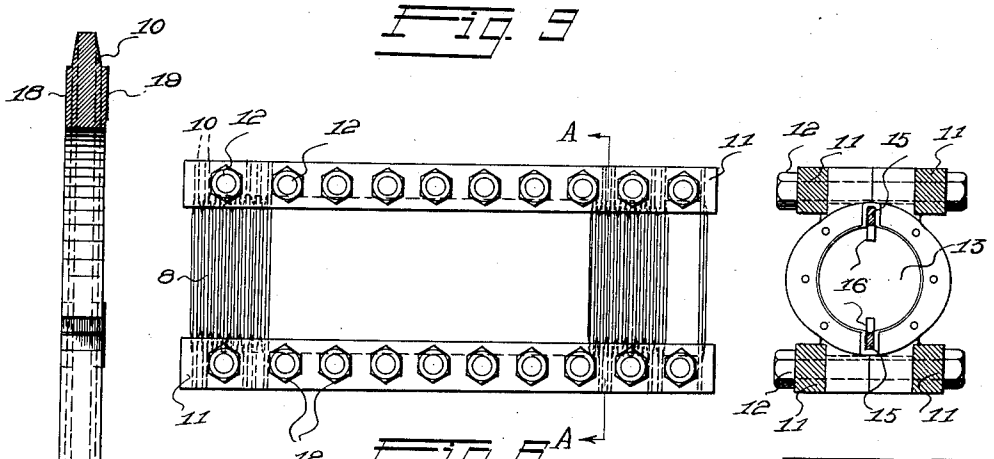


Fig. 6

Fig. 7

Fig. 11

Fig. 10

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UNITED STATES PATENT OFFICE

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SCREW PRESS

Application filed June 23, 1926. Serial No. 117,997.

The present invention relates to high pressure presses, and more particularly to continuous high pressure screw presses expressing fats and oils from materials such as fish, fish waste, packing house offal, garbage, cracklings from rendering processes, copra, cotton seed, and like oil bearing substances.

A primary object of the invention is to provide an efficient high pressure press of novel construction which may be manufactured at relatively low cost.

Another object of the invention is the provision of a novel press structure in which the parts are arranged for a rapid and convenient removal, and are easily accessible for cleaning purposes.

A further object of the invention is the provision of novel control mechanism for discharge cones of high pressure presses whereby rapid and easy adjustments of the discharge cone may be made to vary the thickness of the cake and the pressure developed on the materials.

Still a further object of the invention is the provision of a single feed and expressing screw in which the pitch of the flights is decreased and the hub diameter is increased from the feed to the discharge end in a manner to cause the application of pressure to the material in stages of increasing pressures as the material becomes reduced in volume or condensed in its advance from the feed to the discharge end of the press.

Further objects of the invention are the provision of novel driving arrangements and bearing structures, the provision of various improved combinations and sub-combinations of mechanisms, and the attainment of such other objects as will appear in the following detailed description of the preferred embodiments of the invention.

Referring to the drawings,

Figure 1 is a sectional side elevation, partially in section showing a preferred embodiment of the invention.

Figure 2 is a plan view partially in section, of the embodiment shown in Figure 1.

Figure 3 is a front end view of the embodiment shown in Figures 1 and 2.

Figure 4 is a fragmental side elevation of the rear end of the form of invention shown in Figures 1 and 2.

Figure 5 is a detailed sectional view of the cone control mechanism.

Figure 6 is a plan view showing the preferred press barrel construction.

Figure 7 is a sectional view taken along line A—A of Figure 6.

Figure 8 is a detailed end view showing the body plate construction.

Figure 9 is a view taken along line B—B of Figure 8.

Figure 10 is a sectional view taken along line C—C of Figure 8.

Figure 11 is a sectional view taken along line D—D of Figure 8.

As shown in Figures 1 to 3, castings 1 are provided, upon which the feed or hopper casting 2 and the end casting 3 are supported. Hopper casting 2 and end casting 3 are connected together and held in spaced relation by the rods 4 and the securing nuts 5. Supported on the rods 4 intermediate the castings 2 and 3 is a discharge end casting 6, which is held in position by means of the nuts 7 against the discharge end of the press body 8. Casting 6 supports the end of the press body 8, spaces and strengthens rods 4, and is provided with a discharge opening 9. The press body 8 is built up of a plurality of plates 10, (Figures 6 to 11) which are clamped between bars 11 by means of the bolts 12 to form a press body with a substantially cylindrical opening 13. Formed in the plates 10 are recesses 14 in which the knife bars 15 provided with the check projections 16 are clamped. As shown in Figure 2 projections 16 have their forward edges beveled at 16′ so that a sharp splitting edge is presented to the material by each projection as the material is forced forward under pressure through the press body. The inclination of the bevel on one knife bar is preferably downward as shown while the inclination of the bevel on the opposite knife bar is upward. The knife bars 15 are of sufficient width so that slight clearance will be maintained between the inner edges 17 of the plates 10 and the knife bars will be held tightly in position, strengthening of the body

construction against twisting, preventing movement of the plates 10 in the operation of the press. The plates 10 are provided with enlarged central sections, are finished flush on their sides 18, and on their opposite sides are provided with the raised finished surfaces, or spacing lugs 19, which space the plates and form the screen openings in the assembled press body for the egress of fluid. To provide a bearing and clamping surface for the bars 11, and spaces for the bolts 12, plates 10 between adjacent bolts 12 are provided with the long extensions 20, and between opposite bolts 12 are provided with the short extensions 21, as clearly shown in Figures 6 and 8. The screen openings may be made any width desired by varying the height of the spacing lugs or surfaces 19. If desired the central openings in plates 10 may be conical in shape and arranged so that the large diameters of the conical openings will be toward the feed end of the press so that a series of steps are formed in the body section in the manner disclosed in copending application S. N. 724,662, filed July 7th, 1924. The rear ends of the bars 11 of the body section 8 are supported in suitable recesses formed therefor in the casting 6 and the forward ends are supported in recesses formed in the hopper casting 2. By loosening the nuts on the bolts 12 when the body 8 is in position between the castings 2 and 6, and tightening the nuts 7, the plates 10 will be clamped tightly together, and the bolts 12 may then be tightened forming a rigid press body construction. When it is desired to clean the screen openings in the press, nuts 7 and the bolts 12 may be loosened, and the plates separated slightly, sufficient play being preferably allowed in the construction to permit effective cleaning in this manner. To thoroughly clean the press, the bars 11 and upper plates 10 may be removed, giving ready access to the screw and interior of the press.

Formed in the casting 2 is a feed or hopper opening 22 provided with a screen bottom 23 through which the liquids contained in the materials to be pressed may drain into a catch pan 24. Pan 24 is supported by means of extensions 25 from the lower rods 4 and is disposed beneath the press body 8 in a position to catch the liquid effluent from the screen openings of the press.

Supported on the end casting 3 is a ball or anti-friction bearing 26 against the outer race of which a collar 27 abuts. Collar 27 is secured by means of the key 28 and the nut 29 to the threaded end of a shaft 30. A protecting cap 31 for the bearing 26 is fastened removably to casting 3. Shaft 30 extends through a sleeve 32 on which collar 27 is threaded and which is driven by shaft 30 through key 28. Sleeve 32 is journaled for rotation in the bushing 33 of the end casting 3. Keyed to sleeve 32 is a spur gear 34 which drives a pinion 35 formed integrally on a sleeve 36 which is journaled for rotation on a spindle 37 supported from the end casting 3. Journaled on sleeve 36 is a pinion 38 which meshes with and drives a gear 39. Pinion 38 is provided with clutch teeth 40 adapted to engage a toothed clutch member 41 which is slidably keyed to the sleeve 36. Clutch member 41 is provided with an actuating collar 42 which is connected by means of the links 43 (Figures 1 and 2) and the removable pin 44 to the upper end of a pair of actuating arms 45. Arms 45 are secured to and movable with the shaft 46. Shaft 46 is journaled for rotation in bearing members 47, which are supported from the upper rod 4, and a handle 48 is provided on the end of shaft 46 by means of which the shaft 46 may be rocked to throw the clutch member 41 into and out of engagement with the clutch teeth 40 on pinion 38. A gear 39 is keyed to and drives sleeve 49 journaled for rotation on the sleeve 32 and provided with the external threaded or nut section 50 which threads into an internal thread 51, formed in a cone supporting sleeve 52. Sleeve 52 is provided with a collar 53 which in the extreme left position thereof in Figure 1, engages pins 54 secured in the lower extensions of arms 45 and rock shaft 46 to shift toothed clutch member 41 out of engagement with the clutch teeth 40 of the drive pinion 38.

Secured to the forward end of the cone sleeve 52 is the discharge cone 55, which is provided with the conical surface 56. Cone 55 is slidably supported on and keyed to a spacing sleeve 56′ which in turn is slidably supported on shaft 30 and connected thereto by means of the key 57. Formed integrally with the gear 39 is an extension 58 on the outer surface of which projections 59 are formed (Figures 4 and 5). Projections 59 are adapted to engage a stop shoulder 60 of stop member 61. Stop member 61 is pivotally connected at its upper end by means of a pin 62 to a supporting arm 63 which is journaled for rotation on one of the upper rods 4. The lower end of the stop member 61 is rotatably supported on an eccentric 65, which in turn is journaled on a lower rod 4. Secured to the eccentric 65 is the operating handle 66.

When it is desired to move cone 55 towards the discharge opening, shaft 30 is driven, clutch member 41 is disengaged from the teeth 40, and handle 66 is thrown to the dotted line position shown in Figure 5, and shoulder 60 will be thrown into the path of movement of projections 59, arresting rotation of gear 39 and sleeve 49. Sleeve 56 is driven by shaft 30 through the key 57 and in turn drives the discharge cone 55 and sleeve 52. With the sleeve 49 and the nut section 50 thereon held stationary and sleeve 52 ro-

tating, sleeve 52 will travel along the nut section 50 to the right in Figure 1 and will force the cone 55 toward the discharge opening of the press body, reducing the discharge opening. When the cone has been brought to the desired position with relation to the discharge opening, handle 66 is thrown to the full line position shown in Figure 5, stop shoulder 60 will be disengaged from the projection 59, and sleeve 49 together with gear 39 will be driven with shaft 30 and will drive the pinion 36 which will rotate on sleeve 36. Cone 55 will accordingly be held in fixed relation to the discharge opening. When it is desired to back the cone 55 away from discharge opening, handle 48 is actuated to throw the clutch member 41 into engagement with the clutch teeth 40 of the pinion 36. Shaft 30 through sleeve 32 drives gear 34 and pinion 35 which through sleeve 36 and clutch member 41 drives pinion 37. Pinion 37 meshes with and drives the gear 39 in the same direction as the rotation of shaft 30 but at a higher rate of speed. The difference of speed of rotation of the sleeve 52 which rotates with the shaft 30, and the sleeve 49 and nut member 50, causes the sleeve 52 together with the cone 55 to move to the left in Figure 1 on the nut 50, causing a movement of cone 55 away from discharge opening. When the adjustment of cone 55 to the left in Figure 1 has been made, lever 48 may be actuated to disengage the clutch member 41 from the teeth 40 and pinion 38 will no longer be driven by the pinion 35. Sleeve 49 and gear 39 will then rotate with the shaft 30 and the cone 55 will remain in fixed relation to the discharge opening. If clutch member 41 is not disengaged, when collar 53 of the sleeve 52 engages the pins 54, arms 45 will be rocked to disengage the clutch 41 arresting the travel of the sleeve 52 to the left before injury to the mechanism can occur. It is to be noted that a novel control for high pressure screw presses is provided which may be used independently of the particular combination herein set forth and is useful in various well known types of screw presses.

Slidably supported on shaft 30 are screw sections 68, 69, 70, 71 and 72, spaced apart by the conical spacing collars 73, 74, 75 and 76, respectively. The screw sections 68 to 72 and the collars 73 to 76 are slidably keyed to the shaft 30 by means of the key 57. In the preferred embodiments of the invention, each of the screw sections 68 to 72 comprise cylindrical hubs decreasing in diameter, each section being provided with a screw flight of constant pitch throughout its length, but the pitch of each screw section being different and decreasing from the feed to the discharge end of the press. Conical spacing collars 73 to 76 interposed between the screw sections provide inclined surfaces for between the different diameters of the cylindrical hubs of the screw sections. With this arrangement the material is fed most rapidly from the feed hopper into the press body by the screw section 72 which has the greatest lead or pitch of the screw sections. Knifebar check sections 16 (Figure 2) extend into the annular rings formed in the screw assembly by the interposition of the collars 73 to 76 preventing substantial rotation of the material with the screw, and compelling a forward movement of the materials over the plates. As the material fed inward by the screw section 72 reaches the conical sections due to the constriction in area caused by the increasing diameter of the collar 76, a pressure is built on the material in the first step or stage of the press at the end of the screw section 72. The materials passing collar 76 are compressed into a smaller volume and due to the increase in lead of the flight on the screw section 71, the material is moved forward at a slower rate and greater pressure over the conical collar 75 into the still more restricted space and higher pressure stage at screw section 70. The material from the third stage passes over the conical backing collar 74 to the fourth stage at screw section 69 where the forward movement is still slower and the pressures are higher and then over conical backing collar 73 to the fifth stage at screw section 68 where the highest pressures are developed. It will be seen that a single screw arrangement is provided in which the pressures are increased in steps or stages, as the material advances through the body section and becomes compressed and condensed. As many stages of pressing may be utilized as is desirable for the particular material to be expressed and at the same time, the pressures may be proportioned to give the most efficient expressing operation. As the screw sections are each made up with constant pitch throughout the length of each section, the individual flight sections may be conveniently machined and a built up variable pitch press which may be cheaply and accurately manufactured is provided. The provision of the conical collars between the screw sections to provide a backing for the material so that definite pressure stages with differing pressures are provided through the length of the press body increases the efficiency of operation to a substantial degree and is a valuable feature of the invention. This type of screw construction may obviously be applied to screw presses with different types of cages or bodies and the use of this arrangement in other screw presses is contemplated as within the scope of the invention.

The shaft 30 extends through the screw sections and is supported in and connected by means of a key 77 to a supporting and driving sleeve 78. Sleeve 78 is journaled for rotation in a bushing 79, which is supported in the end of the hopper casting 2, and is connected

to and drives the section 72 by means of a key 80. Keyed to and driving the sleeve 78 is a gear 81 to which a sprocket 82 is secured. The sprocket 82 may drive a chain (not shown) which drives a feeder and tempering device of any well known type for the press. Sleeve 78 abuts against a collar 83 which is held in position on the end of the shaft 30 by means of nut 84. It will be noted that the shaft 30 is driven by the gear 81 through the sleeve 78, and that the reaction of the screw sections due to the pressure developed on the material is transmitted through sleeve 78 and from sleeve 78 is transmitted through the collar 83 and nut 84 to shaft 30, placing shaft 30 under tension. The stress in shaft 30 is transmitted to nut 29, collar 27, and the anti-friction bearing 26. As shaft 30 is under tension buckling of the shaft due to the heavy pressures that are developed in operation of the press, such as tends to occur where the screw shaft is under compression, is avoided.

Gear 81 meshes with and is driven by a pinion 85 (Figure 2) which is secured to and driven by a shaft 86 journaled in bearing brackets 87 which are supported from the hopper casting 2. Shaft 86 is driven by a gear 88 which in turn is driven by a pinion 89 mounted on the shaft 90. Shaft 90 is supported in the bearing bracket 87 and is driven from sleeve 91 through a clutch 92 of any suitable type. Sleeve 91 is driven by a drive gear 93.

In operation of the press the clutch 91 is actuated to establish a driving connection between the gear 93 and the shaft 90 to drive the screw shaft 30 through gear 81 as above set forth. The material is fed into hopper 22 and the free liquid drains through the screen bottom 23 into the catch pan 24. The solid material in the hopper is fed forward rapidly by the screw section 72 into the press body and is then forced forward through the body by the screw sections, the check sections 16 of the knife bar preventing backing up of the material and substantial rotation thereof with the screw as the pressures on the materials increase in the various stages. The liquid pressed out of the material passes outward through the openings between the plates 10 into pan 24 while the solid residue is forced past cone surface 56 through the discharge opening 9 in the form of a cake. The operations of cleaning the press body, adjusting the cone for pressures, and the functioning of the details, mechanisms, as is carried out as above fully set forth.

Having described a preferred embodiment of our invention, what is desired to be secured by Letters Patent and claimed as new is:

1. In a high pressure press, a hopper casting; a discharge end casting; rods connected to said hopper casting and extending through said discharge end casting, a press body removably disposed between said castings; said press body comprising a pair of substantially semi-cylindrical sections; each of said sections comprising a plurality of plates provided with spacing projections; knife bar receiving recesses in the opposed plane faces of said sections; longitudinally extending and vertically disposed pairs of laterally spaced bars engaged with said plates of said sections; said bars having the opposite ends thereof engaged in recesses in said castings; means engaged with said rods for binding said plates and spacing projections thereof in contact; and means connecting the vertically disposed bars of said pairs of bars for drawing said sections into firm engagement with said knife bars.

2. The combination defined in claim 1 in which said plates are provided with lateral extensions for receiving said bars; some of said extensions being substantially shorter than the other extensions for providing space for said bar connecting means.

3. A unitary detachable press barrel for high pressure presses comprising a plurality of relatively thin plates; each of said plates provided with a semi-circular opening, a pair of recesses, and spacing projections adjacent said opening and said recesses; said recesses adapted to register to provide a pair of laterally disposed longitudinally extending knife bar receiving recesses; a knife bar disposed in each of said recesses; and means for clamping said plates into a cylindrical barrel formation with said knife bars firmly clamped in said recesses.

4. The combination defined in claim 3 in which said plates are provided with lateral extensions, and in which said last means comprises bars engaging said extensions; and bolts extending through said bars; some of said extensions being substantially shorter than the other extensions for the passage of said bolts between some of said other extensions.

5. A press comprising a body portion; a screw shaft extending through said body portion; an externally threaded sleeve journaled for rotation on said shaft and immovable longitudinally thereof; a discharge cone driven by said shaft and movable longitudinally thereof; an internally threaded cone supporting sleeve secured to said discharge cone and co-operating with said externally threaded sleeve; means for causing rotation of said externally threaded sleeve for moving said discharge cone away from the discharge end of said body portion; and means for preventing rotation of said externally threaded sleeve for moving said discharge cone toward the discharge end of said body portion.

6. A press comprising a body portion; a screw shaft extending through said body portion; a plurality of screw flight sections supported on said shaft; a sleeve surrounding and secured to said shaft adjacent one end

thereof; a spacing sleeve surrounding said shaft and disposed between said screw flight sections and said first sleeve; a sleeve journaled on said first sleeve; a discharge cone driven by said spacing sleeve and movable longitudinally thereof; operative connections between said journaled sleeve and said cone; and means for imparting rotation to said journalled sleeve and restraining same against rotation for moving said cone away and toward the discharge end of said body portion respectively.

In testimony whereof we affix our signatures.

STANLEY HILLER.
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