

Jan. 29, 1929.

1,700,407

S. HILLER

HIGH PRESSURE PRESS

Filed July 7, 1924

4 Sheets-Sheet 1

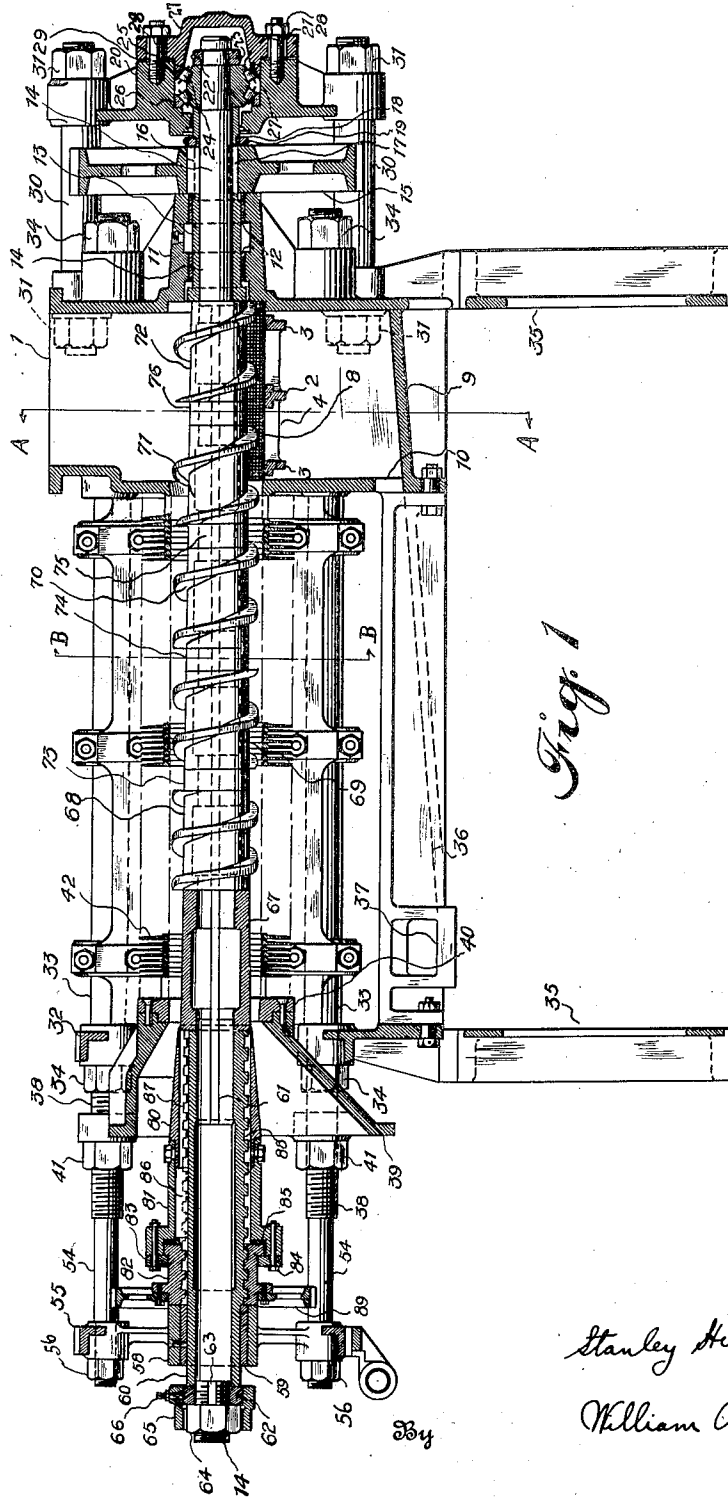


Fig. 1

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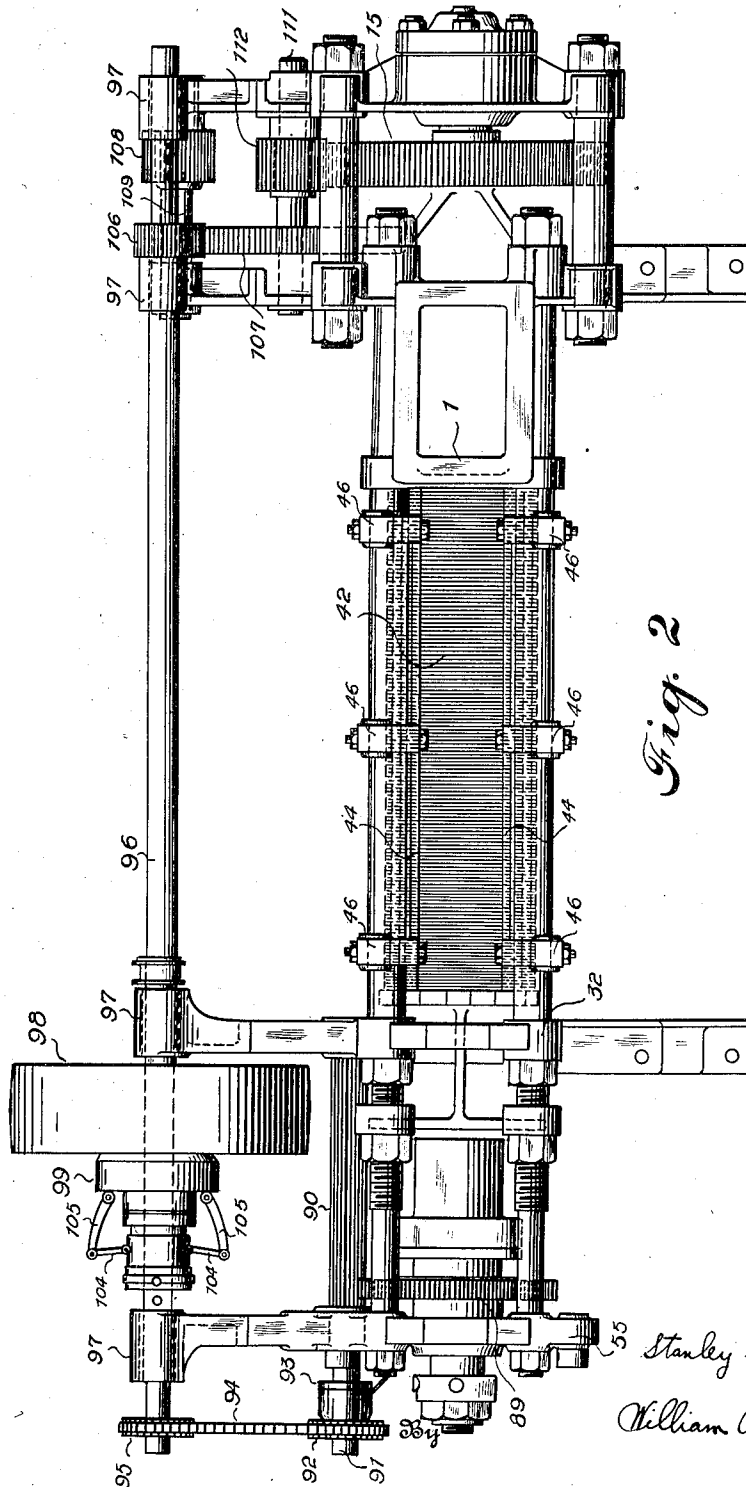
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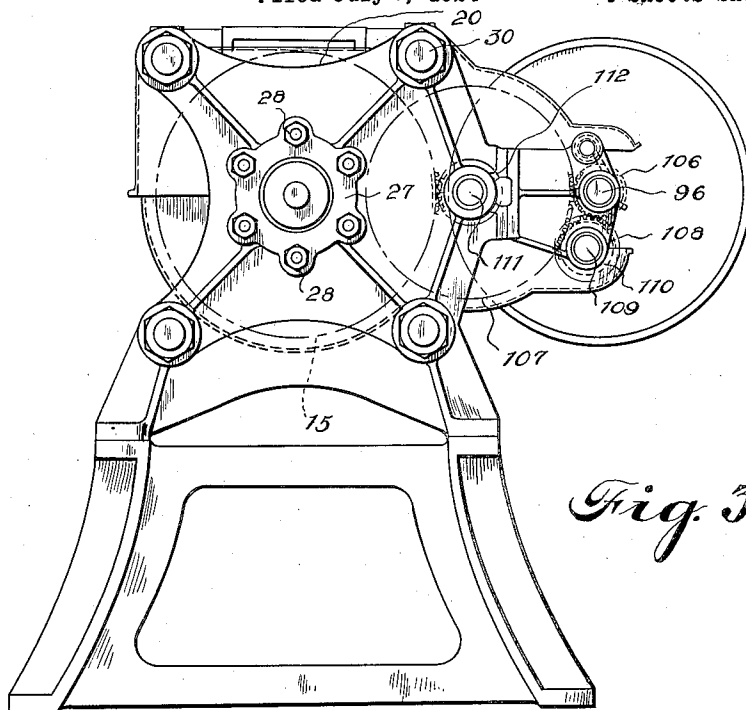


Fig. 3

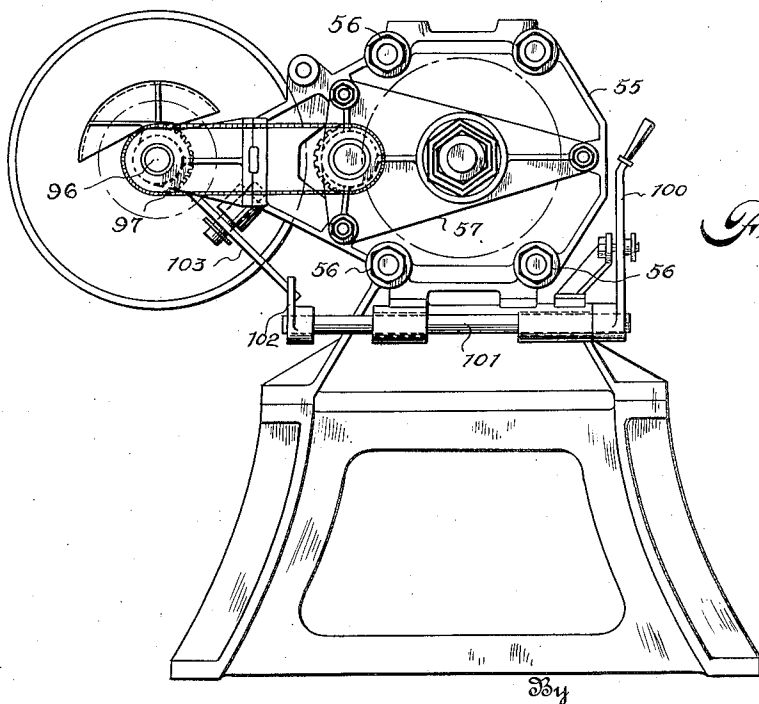


Fig. 4

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4 Sheets-Sheet 4

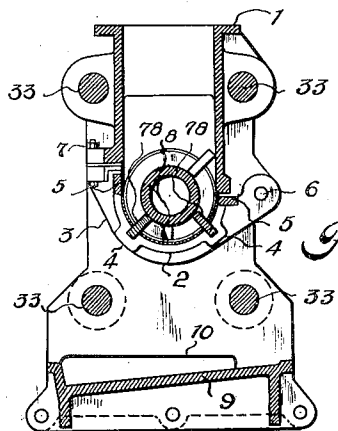


Fig. 5

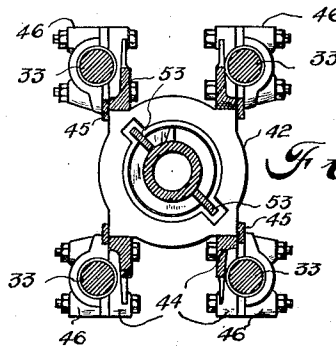


Fig. 6

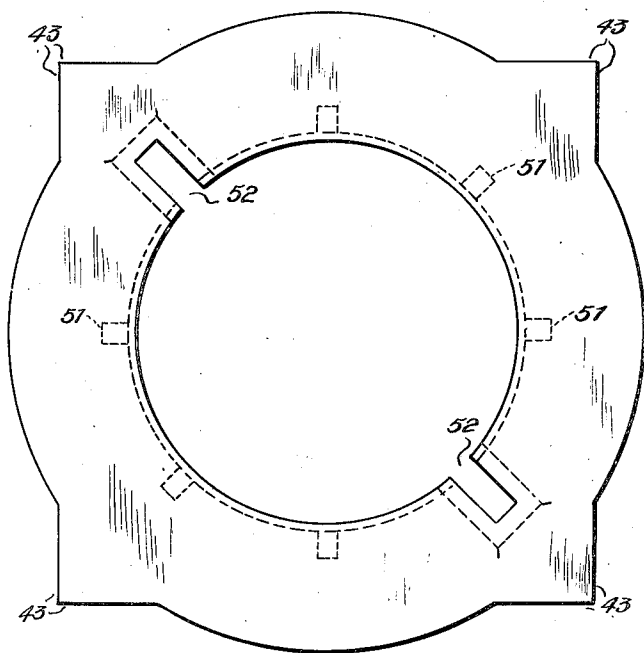


Fig. 7

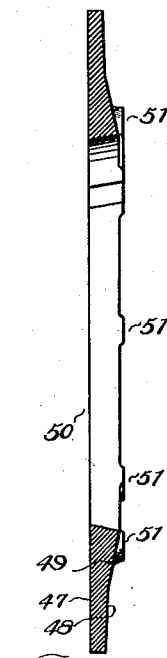


Fig. 8

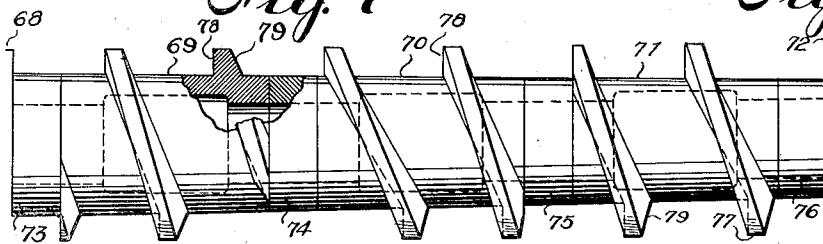


Fig. 9

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UNITED STATES PATENT OFFICE.

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HIGH-PRESSURE PRESS.

Application filed July 7, 1924. Serial No. 724,662.

The present invention relates to high pressure presses or expressing devices.

More particularly the invention relates to continuous presses adapted to exert relatively high pressures on materials such as fish, fish waste, packing house offal, garbage, oil bearing seeds, copra, or any other oil bearing materials, for the purpose of expressing or extracting the oils or other fluid substances contained therein.

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

Another object of the invention is the provision of a novel press structure in which the parts are arranged for rapid and convenient removal of the material therein, and in which the parts are easily accessible for cleaning when operation is stopped for a substantial period.

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

Still another object of the invention is the provision of a novel discharge cone for the regulation of the pressures built up in the press, which also is effective to exert a material pressing effect upon the materials as they pass out of the press.

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

Fig. 1 is a side view partially in section.

Fig. 2 is a plan view.

Fig. 3 is an end elevation looking at the feed end of the press.

Fig. 4 is an end elevation looking at the discharge end.

Fig. 5 is a sectional view taken along line A—A of Fig. 1.

Fig. 6 is a sectional view taken along line B—B of Fig. 1.

Fig. 7 is a front view showing the body plate construction.

Fig. 8 is a detail end view of the plates.

Fig. 9 is a detail view showing the screw flight construction.

Referring to the drawings, the improved press preferably comprises a feed hopper 1 with a bottom frame work consisting of a central member 2 and end pieces 3 joined by cross pieces 4 and 5 (Figs. 1 and 5). This bottom frame work is pivotally secured to hopper 1 by pins 6 passing through end pieces 3 and is normally clamped in position by means of suitable bolts or studs 7. A drainage screen 8 nests in the bottom frame work and as the material passes into the hopper it falls on screen 8 and the free fluids pass downward through the screen while the solid materials are carried into the press body as will more fully hereinafter appear. The fluids passing downward through the screen are caught in a pan, the bottom 9 of which is pitched so that the fluid will drain forward through an opening 10 toward the feed end of the press. The rear wall of the feed hopper has a bearing extension 11 formed integrally therewith lined with bushings 12 of suitable material. Slidably journaled in bushings 12 is a driving and thrust sleeve 13 in which screw shaft 14 is journaled. A drive gear 15 is secured by means of a key 16 to sleeve 13, and sleeve 13 is in turn keyed to shaft 14 by means of key 17. A split collar 18 held together by a spring 19 and fitting in a recess on sleeve 13 holds gear 15 releasably in position. The outer end of sleeve 13 extends into a thrust bearing supporting head 20 and abuts against the end of a hardened steel roller bearing ring 21 carried on shaft 14. Ring 21 in turn abuts against a split retaining ring 22 held in position in a recessed portion of shaft 14 by spring 23. Ring 21 is supported upon thrust rollers 24 which in turn are supported on hardened rings 25 and 26. Rings 25 and 26 are supported in head 20. The parts of the thrust bearing are held in position by cap 27 which is clamped to the head 20 by means of studs 28. Adjustment of the bearing parts is effected by varying the thickness of shims 29 interposed between head 20 and cap 27. Head 20 is secured to hopper casting 1 by

suitably shouldered spacing and securing rods 30, the ends of which are threaded to receive securing nuts 31.

A discharge end supporting frame 32 is 5 connected to and spaced from hopper 1 by means of shouldered screw threaded rods 33 and nuts 34. Hopper 1 and frame 32 are suitably supported from pedestals 35, and are further joined together by and supporting 10 a catch pan 36. Pan 36 communicates with opening 10 in the feed hopper casting 1, and is provided with a suitable connection 37 for the withdrawal of the expressed fluids. Adjustably supported from exten- 15 sions 38 or rods 33 is a discharge hopper casting 39 to which a clamping plate 40 is secured. Casting 39 and plate 40 are adjustable by means of nuts 41 on extensions 38, which serve to force the clamping plate 40 20 endwise against a series of body plates 42. Plates 42 are provided with supporting surfaces 43 (Fig. 7) which rest against supporting and guide members 44 and 45 (Fig. 6). Members 44 and 45 are suitably 25 supported by clamping members 46 which are bolted to rods 33. Each plate 42 comprises a flat surface 47 on one side, and the other side thereof, gradually thickens from the outer edge inward towards the center 30 along surface 48, then the taper increases along a surface 49 to the large diameter of a central truncated conical opening 50. A plurality of spacing and supporting lugs 51 are provided on each plate so that when 35 clamped together a series of radially extending screen openings will be provided between plates 42 which increase in area from the center of the built up body outward. A pair of diametrically opposite slots 40 is cut into each plate 42 for the reception of knife bars 53 (Fig. 6).

Plates 42 are placed in juxtaposition supported between guides 44 and 45, with the 45 lugs 51 thereof abutting surfaces 47 of the adjacent plates, and with the central truncated conical openings for most purposes having the small diameters towards the front or discharge end of the press and the large diameter towards the feed end. Where it is 50 desired to use the press as a pulper for olives and the like materials in the formation of emulsions for the extraction of oils, the plates are reversed and the small area is positioned towards the feed end. The plates 55 are pressed together by tightening nuts 41 to force discharge hopper 39 and plate 40 to the right in Fig. 1. The area of the screen openings between plates 42 may be varied to accommodate the variations in the volume 60 of fluid expressed at different points along the body of the press by simply enlarging or decreasing the thickness, or width, or both, of lugs 51. The taper of conical openings

65 tiveness of the expressing action, and to reduce the quantity of solid material forced out through the openings to a minimum as the pressures in the material are increased in the advance from the feed to the discharge 70 end of the press. It will be seen that the advantages of varying taper in the steps, and variation in the size of the screen openings may be readily attained with the construction. Furthermore, when it is desired 75 to clean the openings between the plates, nuts 41 may be loosened so that the plates may be separated. The plates 42 are self-sustaining and the pressures developed in operating the press simply set up internal 80 stresses therein. Accordingly, the supporting of the plates is a relatively simple and inexpensive matter. If desired the openings 50 may be made cylindrical and the interior of the body will then become a built up cylinder with spaced screen openings. It is also 85 apparent that by gradually decreasing the size of openings 50, a tapered body of decreasing diameter may be provided, and the decrease in diameter may be proportioned to the decreasing volumes and increasing pres- 90 sures of the materials. The openings 50 may be shaped to give a smooth or stepped conical interior surface.

Formed integrally with extensions 38 of rods 33 are shouldered extensions 54 upon 95 which an end plate 55 is secured by means of nuts 56. Secured to plate 55 by means of suitable bolts or studs is a cross piece 57 (Fig. 4) carrying a bearing 58 in which is secured a bushing 59. Rotatably and slid- 100 ably mounted in bushing 59 is a sleeve 60 which in turn is slidably keyed to screw shaft 14 by means of a key 61. At its outer end sleeve 60 abuts against a collar 62 secured to shaft 14 by means of a key 63. 105 Collar 62 is held in position by means of a nut 64 which in turn is prevented from loosening in operation by means of a locking collar 65 which is detachably secured to collar 62 by means of a set screw 66. At its 110 other end, sleeve 60 abuts against a discharge collar 67 which is slidably keyed to shaft 14 by key 61. Mounted upon shaft 14 between discharge collar 67 and sleeve 13, and slidably keyed thereto by means of key 61 115 are screw sections 68, 69, 70, 71 and 72, spaced apart by spacing collars 73, 74, 75 and 76. It will be seen that by tightening or removing nut 64 all of the parts mounted on shaft 14 between collars 22 and 62 may be clamped 120 together to take up end play, or may be removed from the shaft. For purposes of cleaning or replacement of parts, all of the parts carried by shaft 14 between nut 64 and sleeve 13 may be removed and replaced 125 without disturbing the roller thrust bearing, the built up body or the remaining parts. This accessibility is a decided operating ad-

vantage. All end thrust due to the operation of the built up screw for expressing the material is transmitted through sleeve 13 to the roller thrust bearing, and end thrust due to reversing the rotation of the screw for cleaning purposes, as will more fully hereinafter appear, are transmitted through collar 67, sleeve 60, collar 62, nut 64, shaft 14 and collar 22 to the roller thrust bearing.

The operating end thrusts are all carried by a single roller thrust bearing designed especially for this purpose, and all end play and lost motion is readily compensated or taken up. Lost motion and wear in the thrust bearing may be taken up by adjusting the thickness of shims 29 so that bearing cap 27 will properly position ring 25 when the cap is tightened.

The sections 68 to 76 of the screw, when assembled, form a single screw with a single flight 77, interrupted at the sections where collars 73 to 76 are inserted. Into the interruptions formed by collars 73, 74 and 75, and from the end of screw section 68 to the plate 40, projections of knife bars 53 are extended (Fig. 6). The collar 76 is in the feed hopper and a pair of projections 78, supported from the bottom frame of the feed hopper extend into this interruption. The knife bar projections prevent the material from being carried around with the screw and also with the discharge cone, as will more fully hereinafter appear, compel forward movement of the material. This results in effective feeding of the material from the hopper into the press body and eliminates a substantial part of the rotary movement of the material which would tend to force solid material out through the screen openings.

The pitch of the flight 77 may be gradually decreased from the feed end to the discharge hopper. For convenience in machining operations, the pitch may be uniform along the sections 68 to 72, but differs and is decreased on each section from the feed to the discharge end, so that the advantages of a decreasing screw pitch may be attained in an easily manufactured construction. In other words section 72 may be provided with a long uniform pitch flight, section 71 may be provided with a shorter uniform pitch flight and so on to section 68 which will be provided with the shortest uniform pitch flight. Under the hopper there is substantially no pressing effect and this portion of the screw acts simply to feed the material forward. The density of the solids is least at this point. As the material advances through the press it is progressively compressed and condensed in volume, and increasing pressures are required to effectively remove the fluids. The pitch of the flight is therefore progressively decreased so that the pressure exerted by the screw progres-

sively increases and the speed of advance of the material is correspondingly decreased to produce the increase of pressure necessary for effective expressing and to compensate for the decrease in volume.

In order to reduce the decrement or diminution of pitch of the flight rendered necessary for the maintenance of proper pressures by the increase in density of the material and decrease in volume, the hub diameter of the screw is preferably progressively increased from the feed to the discharge end. In operation, due to the decreasing pitch and increasing hub diameter of the screw, the pressures exerted on the material are increased from the feed to the discharge end in a manner to give a maximum efficiency of extraction.

It will also be understood that the pitch of the screw flight may be made uniform throughout the entire length thereof for use in presses where such a screw may be desired, as where it may be desired to use a conical shaped body interior to compensate for the increasing density and decreasing volumes. Any suitable combination of varying screw flight pitches, hub diameters, and body diameters may be used to effect the increase in pressures to give efficient expressing.

The interruptions in the screw in the body of the press assist the building up of pressures in a well known manner. For reasons that will more fully hereinafter appear, the advancing face 78 of the screw flight 77 extends substantially perpendicular from the screw hub as shown in Fig. 9, while the other face 79 thereof extends at an obtuse angle from the hub sections.

The material is forced from the discharge end of the screw over discharge collar 67, and is then forced over discharge cone 80 and finally passes out through the discharge hopper 39. Cone 80 is slidably mounted upon collar 67 and sleeve 60 and is secured to and movable with a cone-head 81. Cone-head 81 is secured to and movable longitudinally with a locking gear nut 82 by means of a securing ring 83 and bolts 84. A bronze bearing washer 85 is interposed between the cone-head 81 and the nut 82. Cone-head 81 is driven from sleeve 60 by means of a key 86 secured to 81 and which is adapted to slide in a keyway 87 of sleeve 60. Locking gear nut 82 is threaded internally to fit a square or Acme thread 88 cut into the exterior of sleeve 60. The direction of thread 88 is such that as the screw is rotated to press the material, if nut 82 is held from rotating, it will move with cone 80 toward the discharge hopper. Secured to nut 82 is a drive gear 89, meshing with an elongated pinion 90, which in turn is journaled in plates 32 and 57. The shaft of pinion 90 extends through end plate 57 and ends in an extension 91 shaped

to receive a handle or wrench by means of which pinion 90 may be manually held to stop rotation of gear 89 and nut 82, causing the relative position of nut 82 and cone 80 inward with respect to the discharge opening of the press, in this manner varying the area of the discharge opening, and governing the pressures that may be built up in the press body. In the normal operation of the press, nut 82 and gear 89 rotate with sleeve 60, and pinion 90 rotates freely in its journals. To cause nut 82 and cone-head 81 to move away from the discharge opening, pinion 90 is adapted to be driven by a sprocket 92 (Figs. 2 and 4) through any suitable type of clutch 93, in a manner to drive gear 89 and nut 82 in the same direction as sleeve 60, but at a faster rate. During the engagement of clutch 93, nut 82 and cone 80 will accordingly move outward, but as soon as the clutch is disengaged, the parts will rotate in the new relative position on sleeve 60. A control mechanism for clutch 93 is provided which may be actuated manually to cause a driving engagement between sprocket 92 and pinion 90; and a suitable automatic disengaging mechanism is provided for this clutch which is actuated by the locking gear 89 or related parts when the safe outward limit of travel of the locking gear nut and related parts is reached so that no injury to the parts will occur. Sprocket 92 is driven by a chain 94 from a sprocket 95 on a main drive shaft 96. Shaft 96 is supported in journals 97 from the side of the press and is driven by a pulley 98 through a suitable clutch 99. Clutch 99 is controlled manually through handle 100, spindle 101, and links 102, 103, 104 and 105. When the clutch is disengaged pulley 98 runs idle on shaft 96 which remains at rest, and when engaged, shaft 96 is driven.

Driven by shaft 96 at the feed end by a sliding key arrangement is a pinion 106 which may be held in a position to mesh directly with a gear 107 or may be shifted to mesh with an intermediate gear 108. A set screw or any convenient latching device may be utilized to hold pinion 106 in operating position. Gear 108 drives a shaft 109 which in turn drives pinion 110 meshing with gear 107 (Figs. 2 and 3). Gear 107 drives a shaft 111, upon which is mounted a pinion 112 which meshes with and drives gear 15. With pinion 106 in the position shown in Fig. 2, the screw is driven in a manner to express the materials when pinion 106 is shifted to mesh with gear 108, the direction of the screw is reversed in a manner to back the material out of the press.

In order to produce a pressing effect on the material as it passes over cone 80, the cone may be flattened along diametrically opposite outer surfaces so that it will be more or less oval in cross-section. The material is forced into the enlarged areas produced by

this flattening and as the cone rotates, the material will be further effectively pressed by the rotation of the oval shape. The flattened parts of the cone may be varied at different parts along the surface thereof. To prevent rotation of the material with the cone, knife bars 53 may have long projections suitably shaped and extending into the press body in a manner to permit free rotation of the cone in operation, and at the same time to check rotation of the material.

In operation, the material is dropped into the feed hopper and falls on screen 8 where the free oils or other fluids will drain off and the solid materials will be caught by the screw and forced forward. Projections 78 extending into the interruption formed by collar 76 will limit rotation of the material with the screw and compel forward movement thereof into the press body. In the press body the material is compelled to assume forward movement by the knife bar projections in the interrupted section and the material is subjected to average increasing pressures as it advances due to the increase in hub diameter and decrease in flight pitch. When the stepped surfaces are utilized momentary pressures are alternately increased and decreased due to the series of truncated conical openings through which the material is forced from the large to the small areas thereof, with the result that immediately over each set of openings an expansion of the material is permitted and the pressures are lowered. The effect of this action is to increase the efficiency of extraction, to reduce the quantity of solid material or gurry passing out through the openings, and to reduce tendency to clog the openings. From the end of the screw the material is forced out over the cone 80, is further pressed by the rotation thereof when an oval shape is used, and finally passes through the discharge hopper. The expressed fluids pass out through the openings between the plate, are collected in catch pan 36, and drained off for further treatment if necessary.

When the operation of the press is to be stopped for a substantial period or for cleaning, pinion 106 is shifted into engagement with gear 108 and the drive of the screw is reversed. Bolts 7 are loosened and the feed hopper bottom frame is permitted to drop around pins 6 as a pivot. When the press is now operated, the material will back out of the press and drop to pan 9 of the feed hopper. Owing to the special angle of the rear flight face 79, the increase of pitch and decrease of hub diameter of the screw towards the feed end, or the increasing area of the body when a conical interior is used, the material will have ample clearance and will back out easily without any substantial pressing effect.

The openings may then readily be cleaned by loosening nuts 41 and backing the hopper frame 39 away from the plates.

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

1. A press comprising a body section, a screw in said body section, means for driving said screw to force material from the feed to the discharge end of said body, and means for reversing the rotation of said screw to force material from the discharge end of said body to the feed end thereof.

2. A press comprising a body portion; a screw shaft extending through said body portion, a threaded sleeve mounted on and driven by said shaft; a traveling nut mounted on said threaded sleeve and moved away from the discharge end of said body by the expressing rotation of said screw; a discharge cone movable axially along said said shaft with said nut, and rotated with said shaft; and means for rotating said nut in the same direction as the rotation of said shaft and said cone to change the relative position of said cone with respect to the discharge end of said body portion.

3. The combination as set forth in claim 2 together with manual means for adjusting the operating position of said cone with respect to the discharge end of said body portion.

4. A press screw structure comprising a shaft; a plurality of sleeves of differing diameters mounted on said shaft; a spacing collar interposed between adjacent sleeve sections; and a helical screw flight formed on each of said sleeve sections.

5. A press screw comprising a shaft; a plurality of sleeve sections keyed to said shaft; spacing members interposed between adjacent sleeve sections; and a helical screw flight of different pitch formed on each sleeve section.

6. The combination as set forth in claim 5 in which said sleeve sections are of different diameters.

7. A press comprising a body portion; a feed hopper connected to said body portion; and a removable bottom for said feed hopper comprising a pivotally mounted framework and a drainage screen, to permit material in the body of said press to be backed out through the feed end thereof for cleaning purposes.

8. A screw press comprising a feed hopper and end supporting structure; a discharge end supporting structure; a plurality of members extending between said feed hopper structure and supporting structure securing them together; a discharge member adjustably mounted on said members; a plurality of plates having aligned central openings clamped between said discharge member and

said feed hopper structure to form a body section; a pressure screw extending through said body section with spaced interruptions formed therein; a locking bar for said plates provided with projections extending into said interruptions in said screw; means for driving said pressure screw; and an adjustable discharge cone structure extending into said discharge member.

9. A rotary screw press comprising a press body built up of a plurality of substantially parallel transversely extending plates each having a central opening and being slotted to receive an aligning bar; a shaft extending through said openings; a plurality of screw sections separated by spacing collars interposed therebetween supported on said shaft; and projections formed on said bar extending between said screw sections adjacent said collars to compel materials to travel in a forward direction over said plates.

10. In a high pressure screw press, a body built up from a plurality of parallel transverse plates provided with longitudinal screw receiving opening extending therethrough, and a bar extending through said body adjacent said opening arranged to resist relative rotational movement of said plates with respect to each other in operation during pressing operations.

11. A high pressure screw press body comprising a plurality of parallel plates clamped together in a body structure having a screw receiving opening extending therethrough and a locking bar extending through said body adjacent said opening arranged to resist relative rotational movement of said plates during pressing operations.

12. The combination as set forth in claim 11 in which said bar is provided with a plurality of spaced projections extending into said opening.

13. A high pressure screw press provided with a body built up of a plurality of transversely extending plate sections, a screw receiving opening extending longitudinally therethrough; a pressure screw provided with a screw flight having a plurality of spaced interruptions and extending through said body; and a knife bar extending longitudinally through said press body adjacent said opening resisting relative turning movements of said plates in operation of the press, and provided with projections extending into said flight interruptions.

14. The combination as set forth in claim 13 with an additional knife bar extending through said body adjacent said opening disposed opposite said first mentioned knife bar.

15. In combination, a press body built up of a plurality of comparatively thin plates with thickened central portions; each plate being provided with a central opening adapted to receive a press screw, and a plu-

5 rality of comparatively small and relatively widely spaced projections engaging an adjacent plate, whereby thin and relatively long openings of increasing width are formed between the plates permitting high pressures to be developed in the body without causing substantial portions of the solids to pass out through the openings; slotted sections formed in said plates through said thickened portions thereof; and an aligning 10 and strengthening bar extending through said slotted sections.

In testimony whereof, I affix my signature.
STANLEY HILLER.