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J. J. DE LA ROZA, SR  
FLUID EXTRACTING PISTON PRESS

2,427,446

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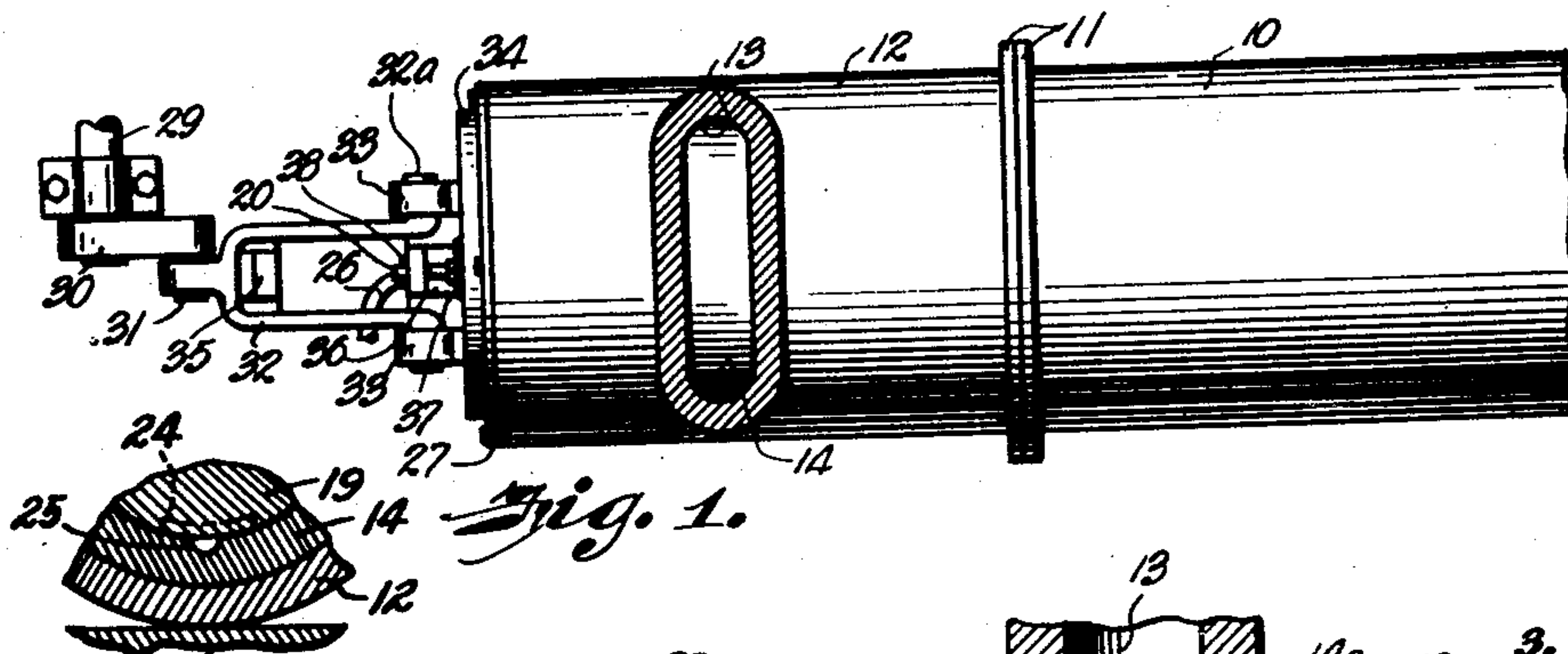


Fig. 1.

Fig. 5.

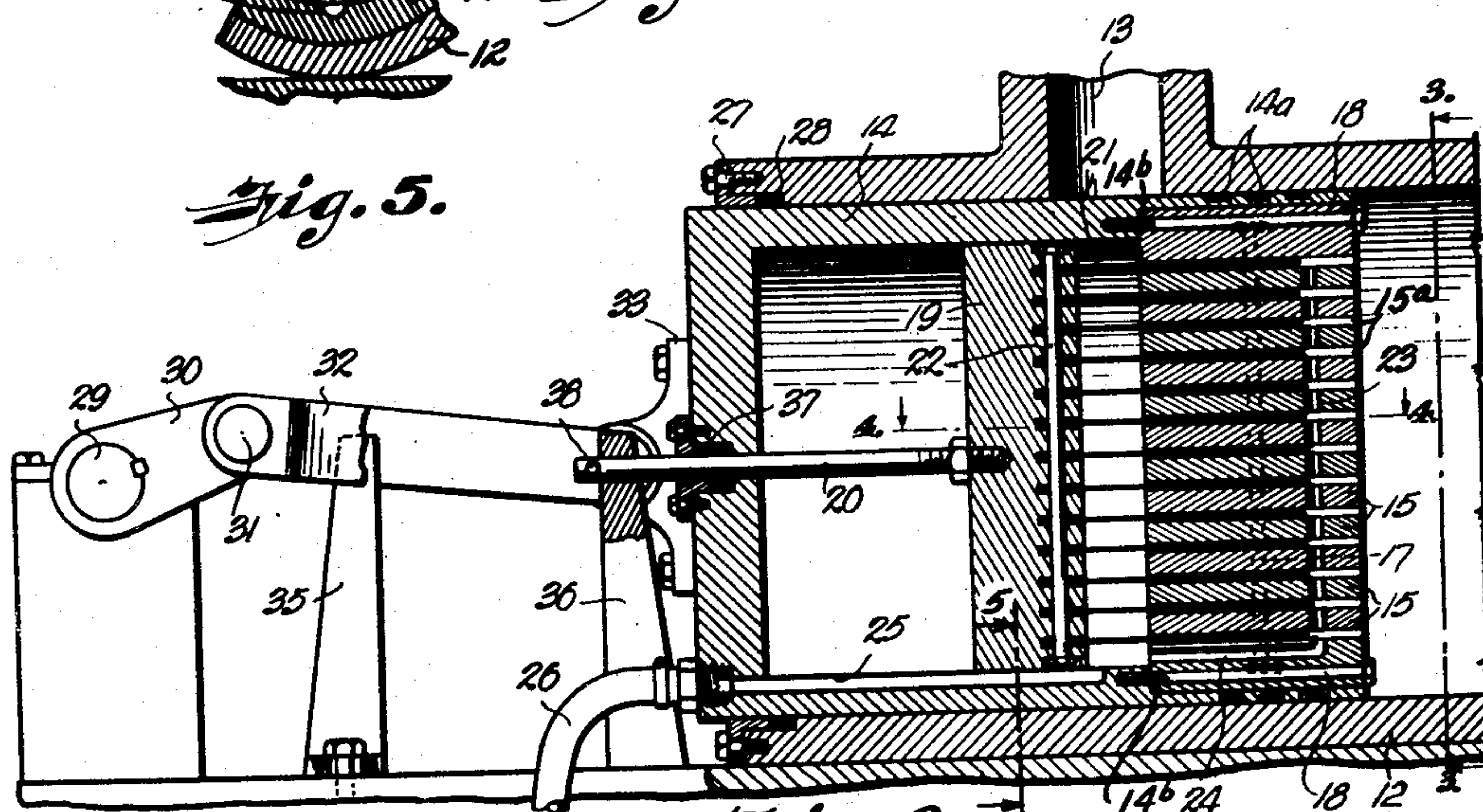


Fig. 2.

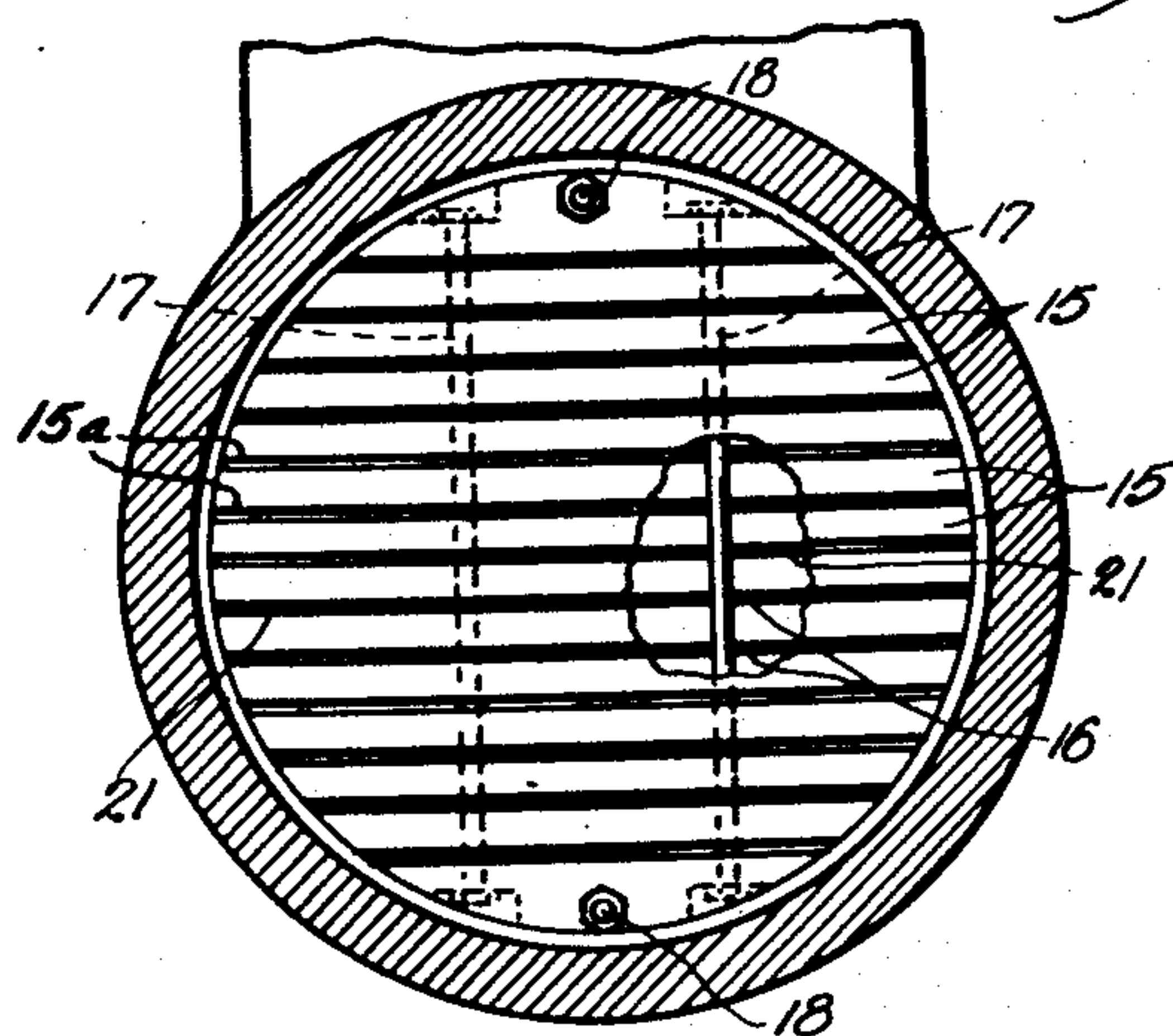


Fig. 3.

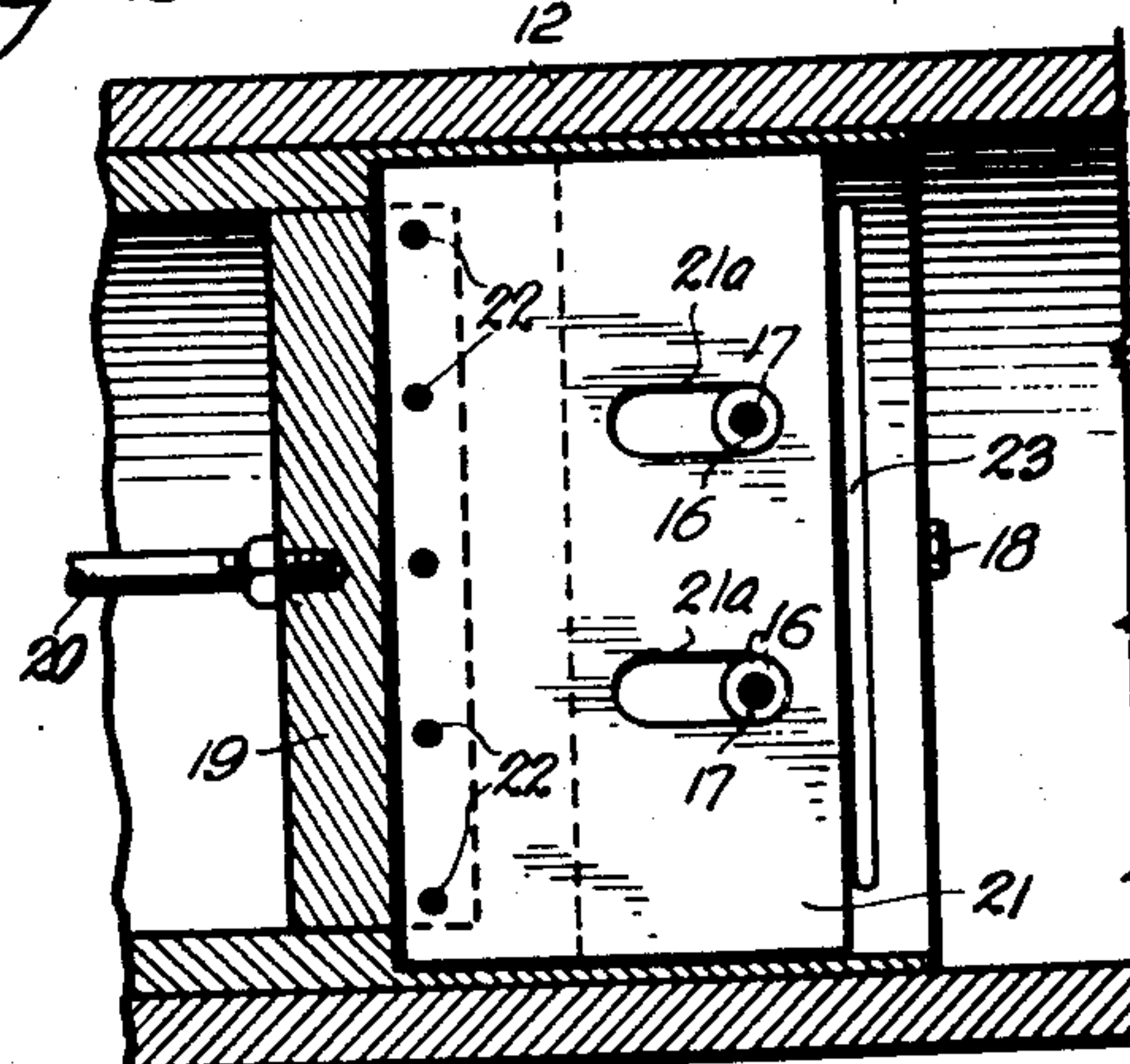


Fig. 4. Inventor, Joaquín de la Roza, Sr.

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# UNITED STATES PATENT OFFICE

2,427,446

## FLUID EXTRACTING PISTON PRESS

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4 Claims. (Cl. 100—50)

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This invention relates to improvements in a fluid extracting piston press and refers more particularly to a fluid extracting device through which mixtures of fluids and solids are passed to extract the fluid from the solid material. The press includes a pressure tube through which the fluid-solid mixture is advanced by a reciprocating piston. The pressure face of the piston is equipped with slotted apertures in which are advanced and retracted cleaning blades. The function of the slotted apertures is to serve as passageways for draining off the extracted fluid while the cleaning blades prevent solids from clogging or forming an obstruction to passage of fluid through the slots.

The concept has to do primarily with the apparatus or the construction of the device and is therefore not limited to any particular use. In other words, the fluid extracting piston press may be utilized in extracting fluids from fluid-solid mixtures of any kind, whether the solids be of vegetable, animal or mineral matter combined with liquids of any kind such as water, hydrocarbons, or chemical solutions. In describing the invention the disclosure is limited to the extraction of water or liquor used in treatment or digestion of vegetable fibers such as wood chips, bagasse, straw, bamboo or other sources of cellulosic material.

In the separation of liquids from liquid-solid cellulosic mixtures difficulties are encountered due to the separation and entrainment of gums, resinous and thickening substances which are carried off with the liquids and tend to obstruct the drains and passageways or ducts for removing the separated liquids. Different types of cleaning apparatus have been devised to maintain the drain apertures and ducts clear and open with varying degrees of success. Where high pressures are necessary to satisfactorily extract the liquids from the mixtures the problem of keeping discharge openings for the liquid free of obstructions becomes a major concern in the operation of the press or extracting device. In a copending application, Serial No. 514,817, now Patent 2,398,135, issued April 9, 1946, there is disclosed a press in which apertures in the piston face or pressure plate constitute ducts which are circular in cross section and which are cleaned by advancing and retarding cylindrical filter pins. The construction here suggested is to substitute for that structure parallel slotted openings or apertures in the face of the piston in which are reciprocated cleaning blades.

One of the objects of the invention therefore

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is to provide an improved type of fluid extracting piston press in which high pressures are imposed upon the fluid-solid mixture to extract the fluid from the solids.

Another object is to provide a simple rugged type of construction which will withstand heavy pressures without clogging.

A further object is to provide a construction for effectively separating fluids from a fluid-solid mixture where there is a tendency for resinous and gummy materials to be drained off with the fluid.

Other and further objects of the invention will appear from the following description.

In the accompanying drawings which form a part of the instant specification and are to be read in conjunction therewith, and in which like reference numerals are used to indicate like parts in the various views,

Fig. 1 is a plan view of a piston press embodying the invention,

Fig. 2 is an enlarged sectional elevation of the device shown in Fig. 1,

Fig. 3 is a view taken along the line 3—3 in Fig. 2 in the direction of the arrows,

Fig. 4 is a view taken along the line 4—4 in Fig. 2 in the direction of the arrows.

Fig. 5 is a fragmentary cross sectional view taken along the line 5—5 of Fig. 2 in the direction of the arrows.

Referring to the drawings, at 10 is shown a tubular passageway which may be of any desired shape in cross section. This tube has an outlet on its right-hand end, and is either tapered or has positioned therein a restriction in the form of a valve or other congesting device to limit the size of the passageway. By compacting, congesting and increasing the density of the mixture pressure is imposed upon the congested mass and liquid extracted from the solids. Joined to the tube 10 at flanges 11 is a cylinder 12 which has a top inlet port 13. Any suitable type of conveyor or transporting duct such as a hopper or pipe is connected to the inlet port 13 and serves to supply the mixture to be separated into the cylinder.

Within the cylinder is fitted a reciprocating piston consisting of a hollow housing 14 equipped with piston rings 14a to prevent leakage and assure a pressure-tight fit between the cylinder and the piston. The forward end of the piston housing is open and has a shoulder 14b formed therein. A plurality of bars 15 form the pressure face of the piston. These bars are spaced apart by separators 16 shown in cross section in Fig. 3



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and are assembled together by bolts 17 and fit into the open end of the piston upon the shoulder mentioned above. The bar assembly is held in place on the shoulder by bolts 18 screwed into threaded apertures drilled axially of the piston walls.

Behind the bar assembly and within the piston housing is a circular plate 19 the outer diameter of which is slightly smaller than the bore of the housing whereby it is free to slide axially of the housing. On one side of this plate is a threaded aperture into which is screwed stop rod 20. The opposite side of the plate is slotted to receive a plurality of cleaning blades 21. These cleaning blades are held in position in the face of the plate by bolts 22. The free ends of the blades extend into and reciprocate, as will be hereinafter explained, in the slots 15a between bars 15. Spacers 16 which surround bolts 17 and are located between the bars 15 to form the slotted openings move within the elongated apertures 21a formed in each of the blades as shown in Fig. 4. Extending through all but the upper bar 15 and adjacent the forward face of the piston are elongated ducts 23 which form a continuous passageway for draining extracted fluid to the horizontal pipe 24 in the lowest bar. Fluid extracted with congestion or compacting of the fluid-solid mixture passes through the horizontal slots in the piston face between bars 15 into the vertical duct 23. From duct 23 it passes through the lower horizontal duct 24 from which it is discharged into the space between the bar assembly and plate 19. A groove 25 extending longitudinally along the bottom of the inner wall of the piston permits the fluid to drain from this space and discharges it into the flexible pipe 26 by means of which it is discharged from the press. To assure a pressure-tight fit between the piston and cylinder adjacent the driven end of the piston a flanged ring 27 is bolted to the cylinder and holds in place a sealing ring or gasket 28 in the form of a packed gland between the inner face of the cylinder and outer periphery of the piston housing.

The piston is reciprocated by rotation of shaft 29 which receives its energy from any suitable source of power not shown. On the end of the shaft is a crank 30 whose crank pin 31 bears in the end of yoke 32. Arms 32a of the yoke bear in crosshead 33 bolted to the end of the piston. The arms of the yoke straddle stops 35 and 36.

As previously suggested, there is screwed into one side of plate 19 a stop rod 20 whose function is to limit with the aid of stops 35 and 36 the travel of cleaning blades 21 and plate 19. A gland 37 and stuffing box in the end of the piston surrounding the rod prevents leakage.

In operation the fluid-solid mixture from which the fluid is to be extracted is introduced to the press through inlet 13. With the reciprocation of the piston the material is pressed forwardly (i. e., to the right) through tube 10 toward the outlet and due either to the shape of the tube or a restriction placed in the tube in the form of a valve the material is congested and compacted to a high density in the tube. With reciprocation of the piston fluid is separated from the solids draining through the slots in the face of the piston into vertical duct 23.

Cleaning of the slots between bars 15 is accomplished by reciprocation or sliding movement of the cleaning blades 21 in the slots. This is made possible by the relative differences in lengths of travel of the stroke of the piston and carrier

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plate 19 upon which the cleaning blades are mounted. As the piston is advanced during its pressure stroke bolts 17 slide spacer members 16 forward in slots 21a of the blades and move the blades forwardly to an advanced position, as shown in Fig. 2. The end of stop rod 20 extends through the rear piston wall and a hole in stop 36. At its end between stops 35 and 36 is a cross pin 38. Abutment of this cross pin on stop 36 limits the forward movement of plate 19 and blades 21. Rearward movement of the plate and blades is arrested by abutment of the rod and cross pin on stop 35. In operation when the piston is retracted by action of the crank pin 30 from its advanced position shown in Fig. 2 cleaning blades 21 remain stationary in the piston and travel with it during the initial stages of the return stroke. When stop rod 20 moving with the piston abuts stop 35 further retraction of the blade carrier plate 19 is halted and as the piston continues its rearward stroke the blades are advanced in the slots until their forward edges are flush with the face of the piston or extend slightly therebeyond. When the blades and carrier plate stop, continued rearward reciprocation of the piston moves bolts 17 and spacers 16 through slots 21a until they arrive at their rearward ends. Thus, reciprocation of the piston from an advanced position by crank 31 in a stroke whose length is determined by the throw of the crank causes the blades to travel with the piston until stopped by abutment of rod 20 with stop 35. Then the movement of the cleaning blades within the slots is arrested and as the piston continues to move rearwardly the blades are advanced in their slots toward the face of the piston as described. Slots 21a through which bolts 17 pass permit continued rearward movement of the piston after the blades have been stopped.

When the direction of the piston is reversed on its forward or pressure stroke, the cleaning blades in their advanced position in the piston travel with the piston until stopped by abutment of cross pin 38 with stop 36. The piston continues to advance but as the travel of the blades is arrested they are again retracted in the slots of the piston to a position shown in Figs. 2 and 4. Thus, movement of the cleaning blades through the slots in the face of the piston is synchronized with the piston's stroke to retract the blades from the piston face during the forward pressure stroke and advance the blades during the rearward stroke. Advancement of the cleaning blades through the slots removes any solid material pressed into the slots during the pressure stroke or carried into the slots with the fluid. When pressures are employed of 1000 pounds or upward during fluid extraction of the mass and when the material being extracted contains resinous and gummy materials the importance of an efficient cleaning mechanism is appreciated.

In the extraction of fluids from vegetable fibrous materials containing incrustants including waxes, resins, sugars and other substances readily separable from the fibers and drained with the fluids, it becomes of the utmost importance to keep the drains and channels through which the extracted fluids are removed open and free from accumulation of solids.

While the invention has been described in connection with its use in the production of pulp from vegetable fiber, it may as well be used in the extraction of fluids from any substances where it is desired to remove liquids from solids. From the foregoing it will be seen that the in-



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vention is well adapted to attain all of the ends and objects set forth, together with other advantages which are obvious and which are inherent to the structure.

As many possible embodiments may be made of the invention it is understood that all matter herein set forth or shown in the drawings is to be interpreted as illustrative and not in a limiting sense.

Having thus described my invention, I claim:

1. A fluid extracting piston press for separating fluids from fluid-solid mixtures comprising a pressure tube, a piston reciprocating therein and means for reciprocating the piston, inlet and outlet ports in the tube for introducing material to be extracted and for discharging extracted materials, slotted apertures in the face of the piston, a drain connected to said apertures, and cleaning blades slidable in the slotted apertures adapted to clean the slots of the piston with each reciprocation thereof and permit free passage of the extracted fluid through the slots and drain.

2. A piston press as in claim 1 having a reciprocating blade assembly on which the cleaning blades are mounted, said blade assembly synchronized with the reciprocation of the piston to retract the cleaning blades from the face of the piston at the forward or pressure end and advance the blades at the rearward stroke of the piston.

3. A piston press as in claim 1 having a reciprocating blade assembly on which the cleaning blades are mounted, said blade assembly recip-

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rocated in an opposed direction to the direction of the piston strokes and means for governing the length of the strokes of the blade assembly.

4. A piston press for separating fluids from fluid-solid mixtures comprising a pressure tube having inlet and outlet ports, a piston reciprocable therein and means for reciprocating the piston, a plurality of spaced apart elements in the face of the piston, a drain connecting the slots between said elements, a blade assembly including a plate positioned rearwardly of said elements and cleaning blades mounted on the plate so they extend forwardly therefrom into said slots, and means driven from the piston reciprocating means for advancing and retracting the blade assembly in opposed directions to the travel of the piston.

JOAQUIN J. DE LA ROZA, SR.

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