J. J. BERRIGAN.

EXTRACTION PROCESS AND APPARATUS THEREFOR.

APPLICATION FILED APR. 16, 1909.

994,631.

Patented June 6, 1911.

7 SHEETS—SHEET 1.

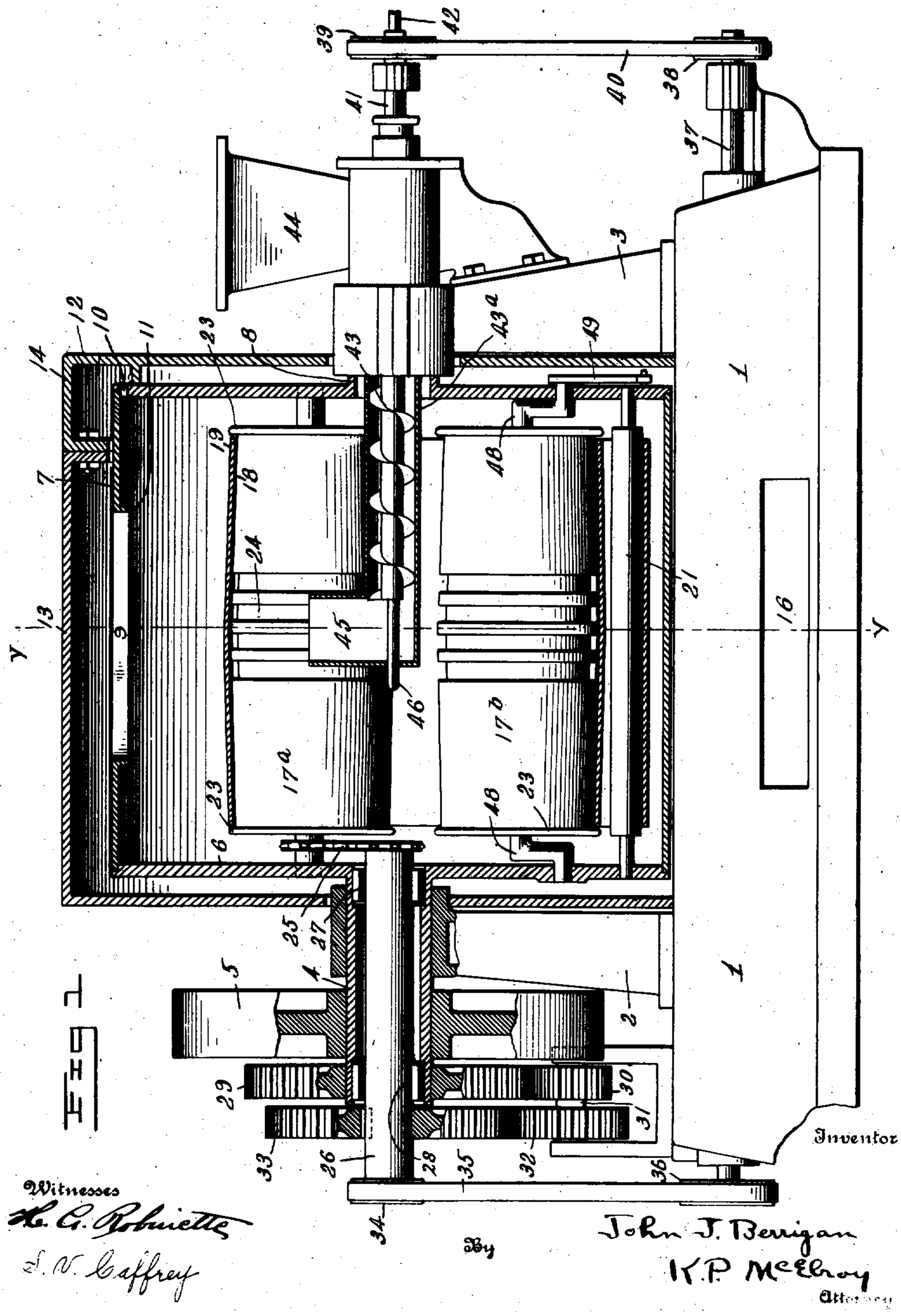


FIG 1.

Witnesses

H. G. Robinette

J. V. Caffrey

Inventor

John J. Berrigan

By K. P. McElroy

Attorney

J. J. BERRIGAN.

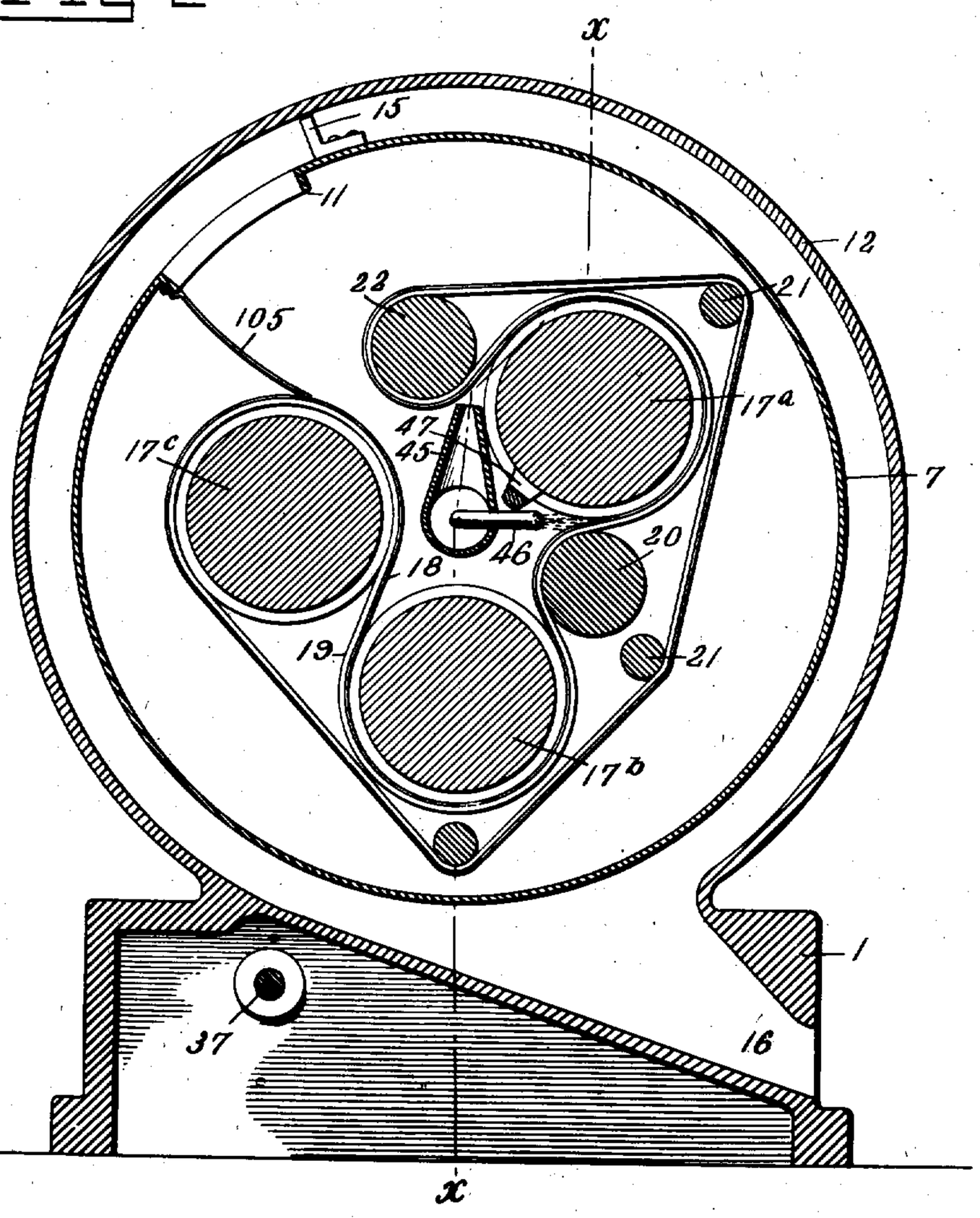
EXTRACTION PROCESS AND APPARATUS THEREFOR.

APPLICATION FILED APR. 16, 1909.

994,631. **Patented June 6, 1911.**

7 SHEETS—SHEET 2.

Fig 2



Witnesses

H. C. Bohnette

S. V. Caffrey

Inventor

John J. Berrigan

By K P McElroy.

Attorney

J. J. BERRIGAN.

EXTRACTION PROCESS AND APPARATUS THEREFOR.

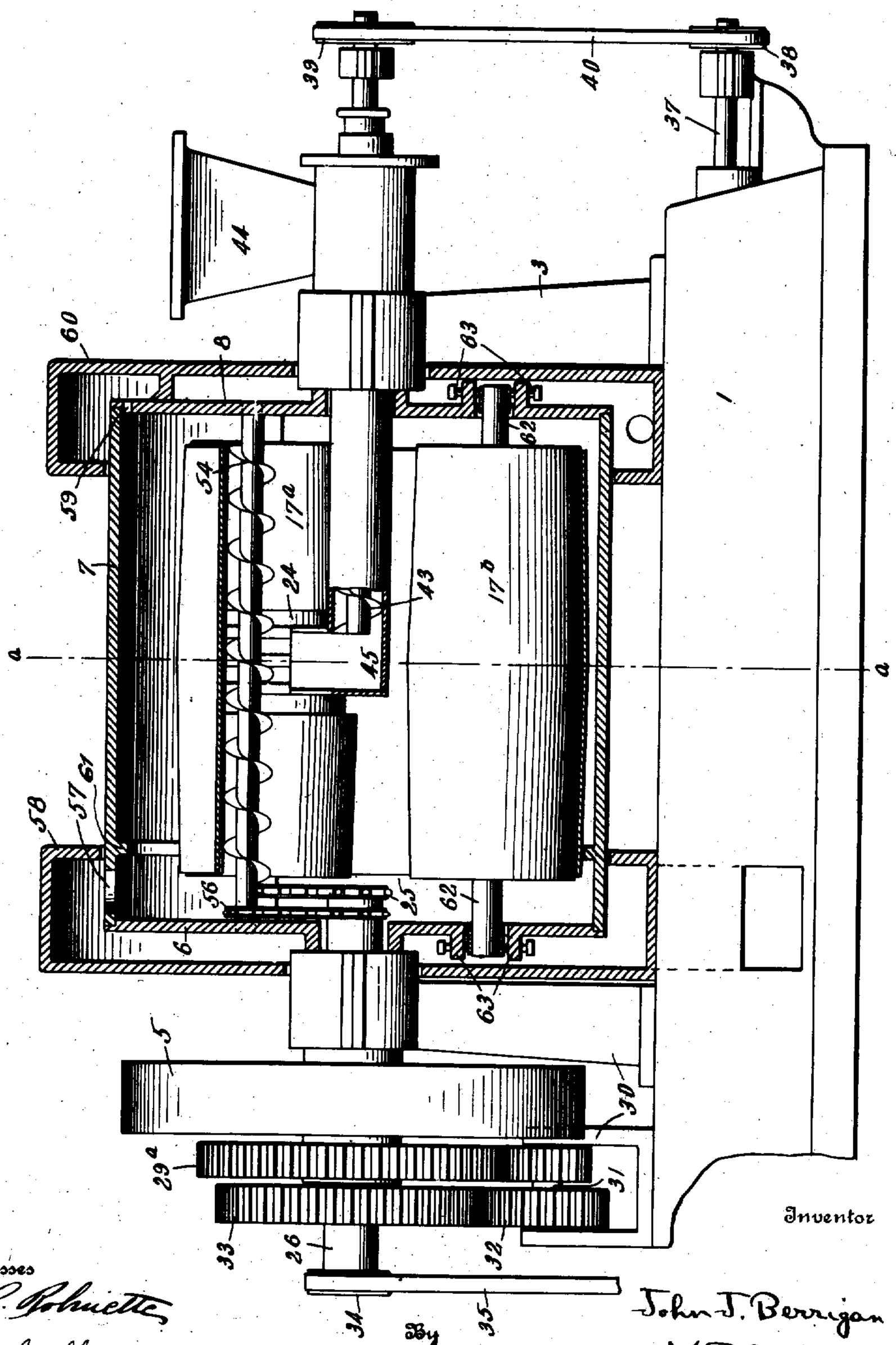
APPLICATION FILED APR. 16, 1909.

994,631.

Patented June 6, 1911.

7 SHEETS—SHEET 3.

Fig 3



Witnesses

H. C. Pohlette

S. V. Caffrey

Inventor

John J. Berrigan

K. P. McElroy.

Attorney

J. J. BERRIGAN.

EXTRACTION PROCESS AND APPARATUS THEREFOR.

APPLICATION FILED APR. 16, 1909.

994,631.

Patented June 6, 1911.

7 SHEETS—SHEET 4.

Fig 4

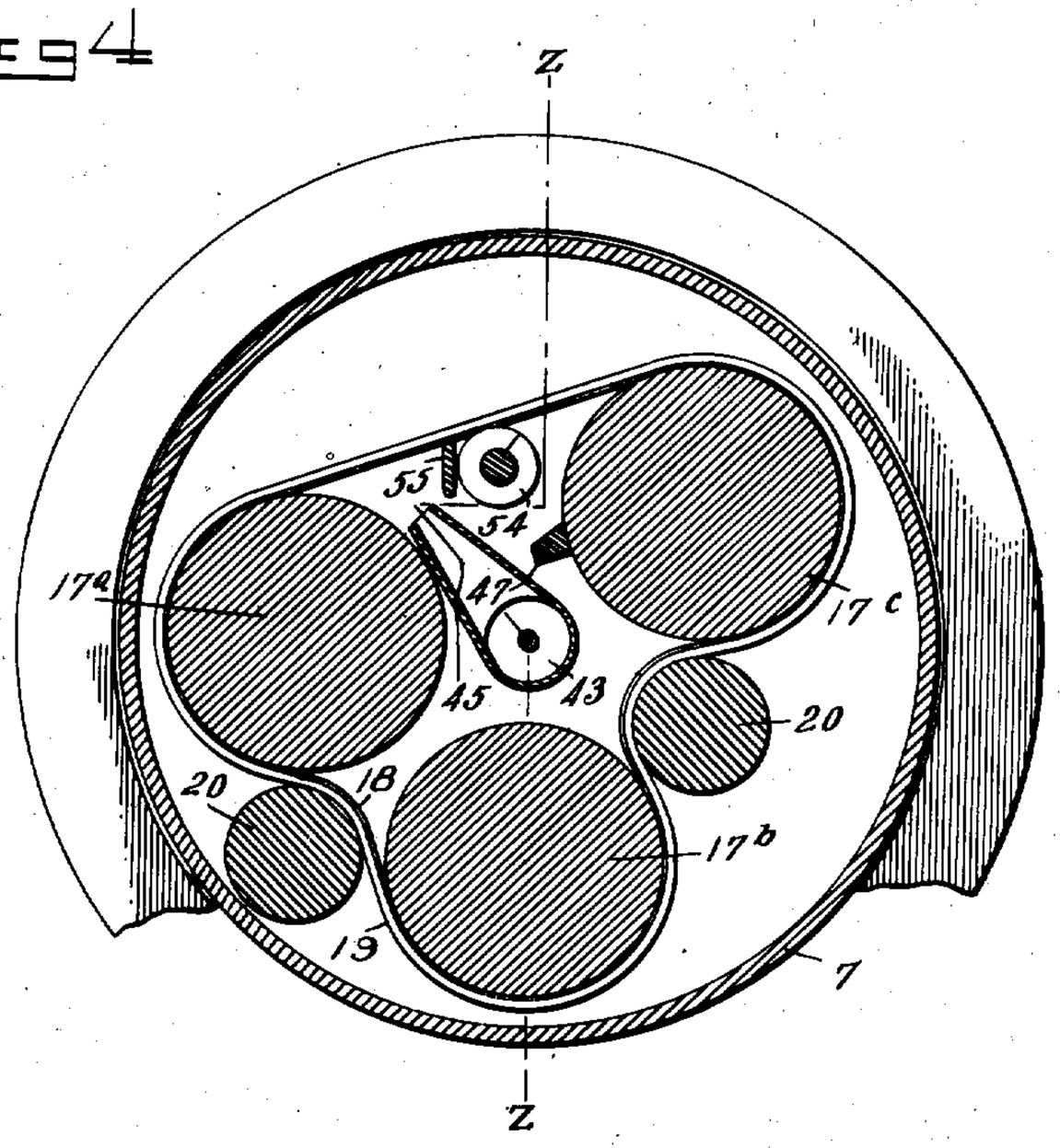
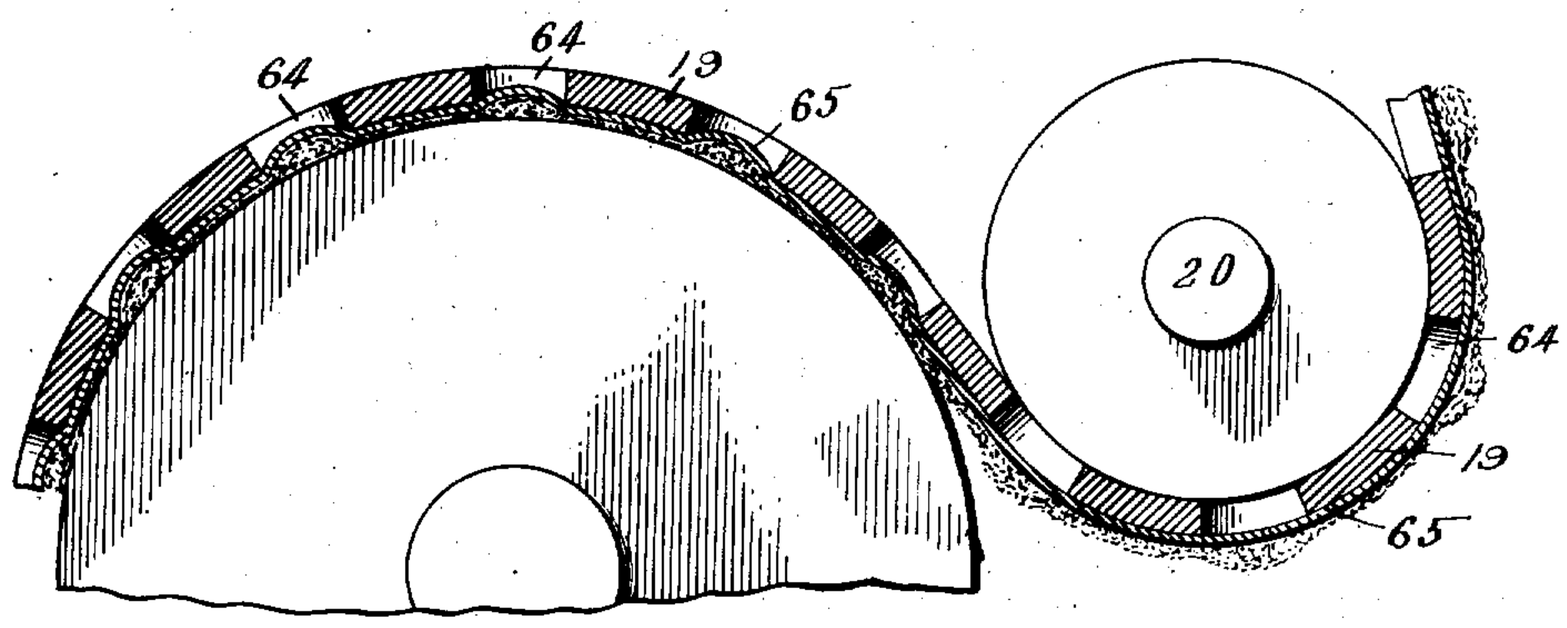


Fig 5



Witnesses

H. C. Bohnette

S. V. Caffrey

Inventor

John J. Berrigan,

By K. P. McElroy.

Attorney

J. J. BERRIGAN.

EXTRACTION PROCESS AND APPARATUS THEREFOR.

APPLICATION FILED APR. 16, 1909.

994,631.

Patented June 6, 1911.

7 SHEETS—SHEET 6.

Fig 6

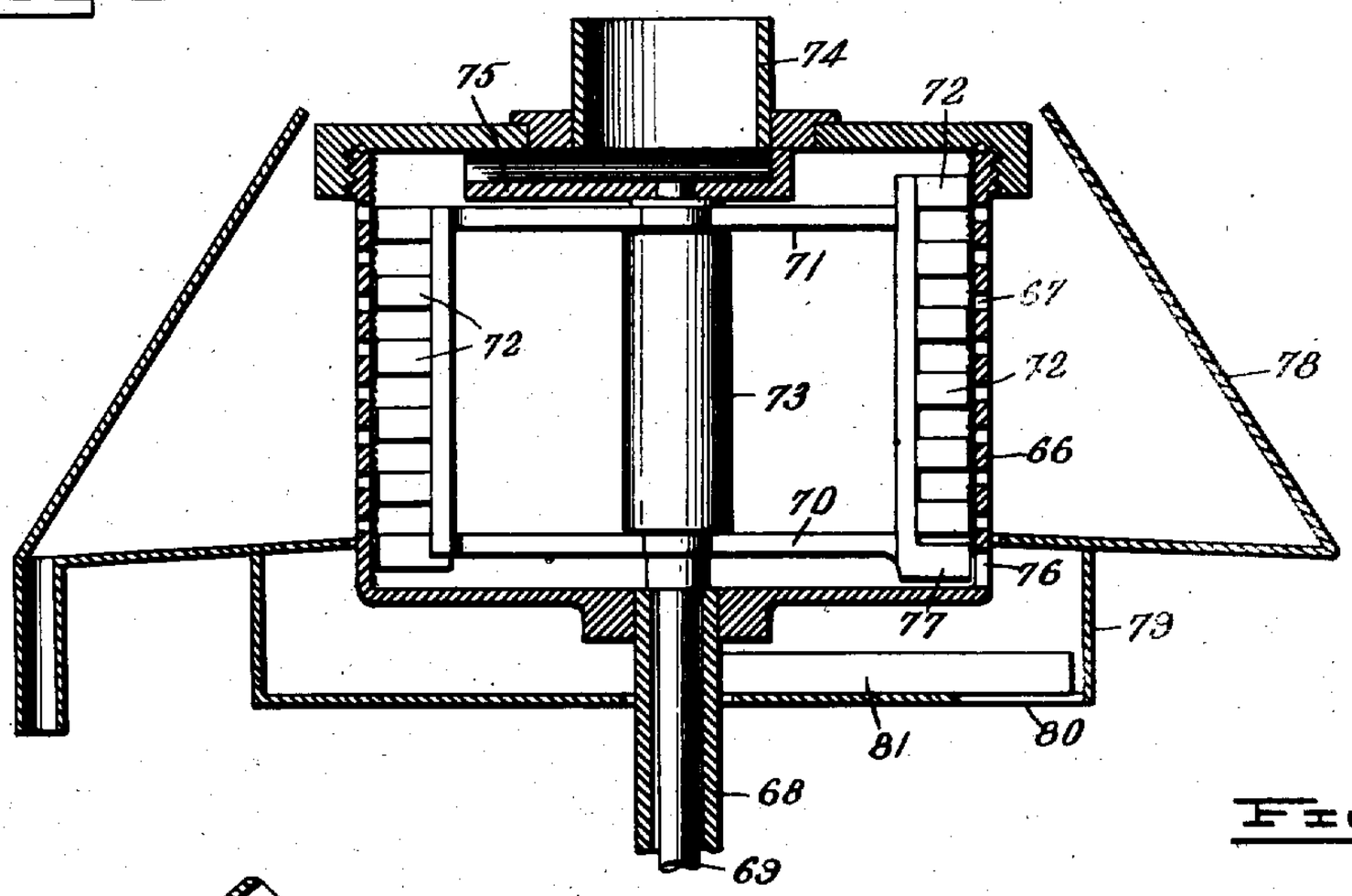


Fig 8

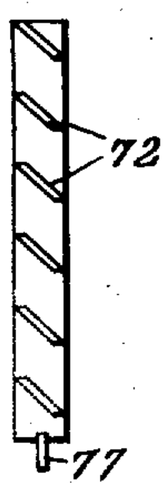


Fig 7

Witnesses

H. C. Policette

S. V. Caffrey

Inventor

John J. Berrigan

By K. P. McElroy.

Attorney

J. J. BERRIGAN.

EXTRACTION PROCESS AND APPARATUS THEREFOR.

APPLICATION FILED APR. 16, 1909.

Patented June 6, 1911.

994,631.

7 SHEETS—SHEET 6.

Fig 10

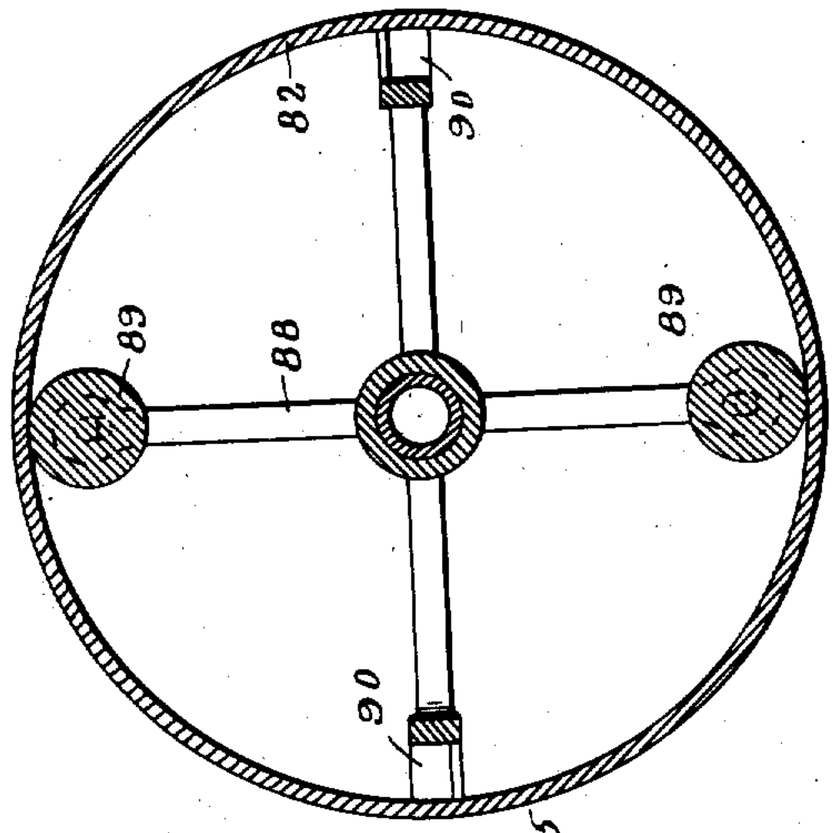
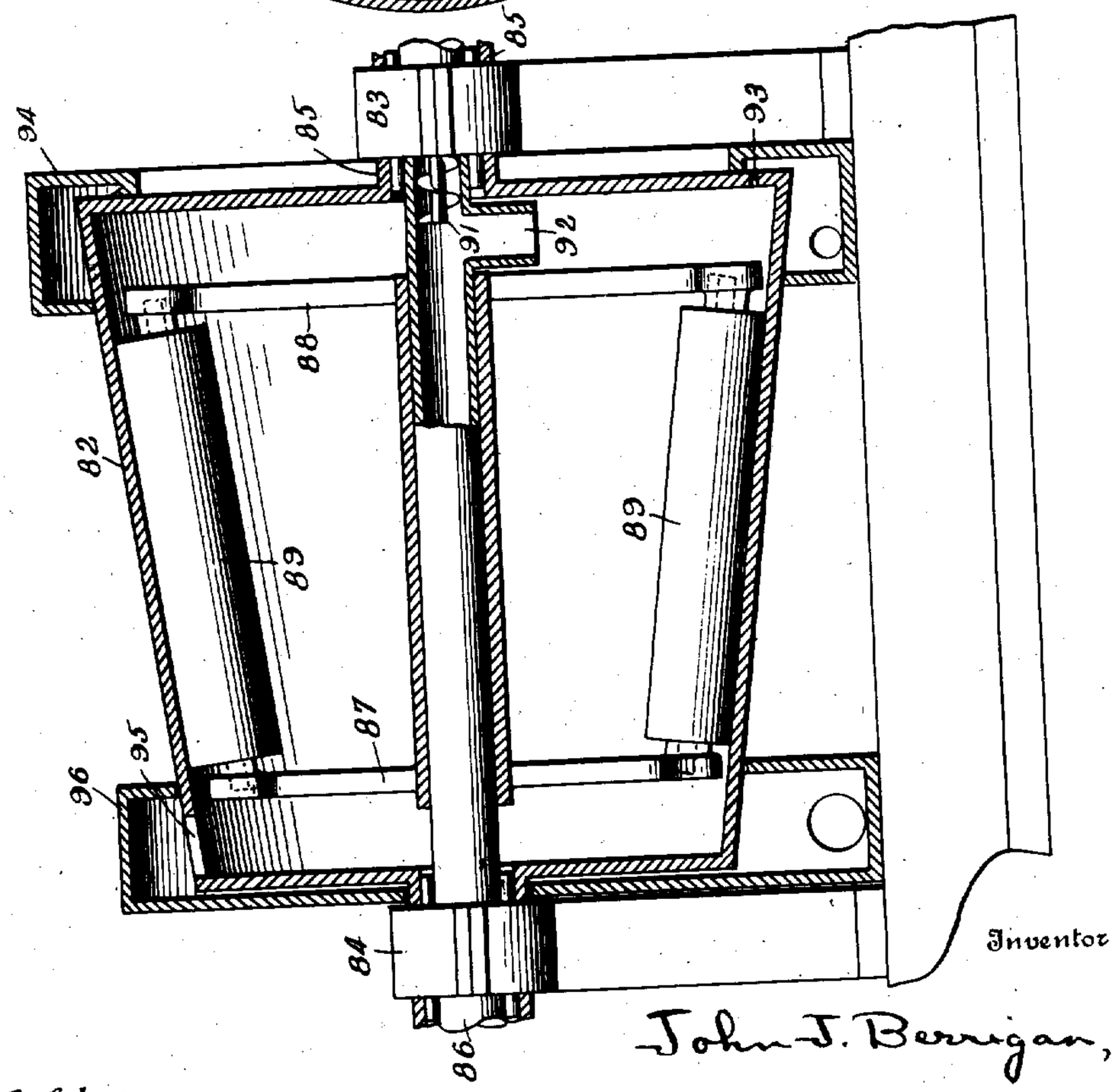


Fig 9



Witnesses

H. A. Schuette

L. V. Caffrey

Inventor

John J. Berrigan,

By K. P. McElroy.

Attorney

J. J. BERRIGAN.

EXTRACTION PROCESS AND APPARATUS THEREFOR.

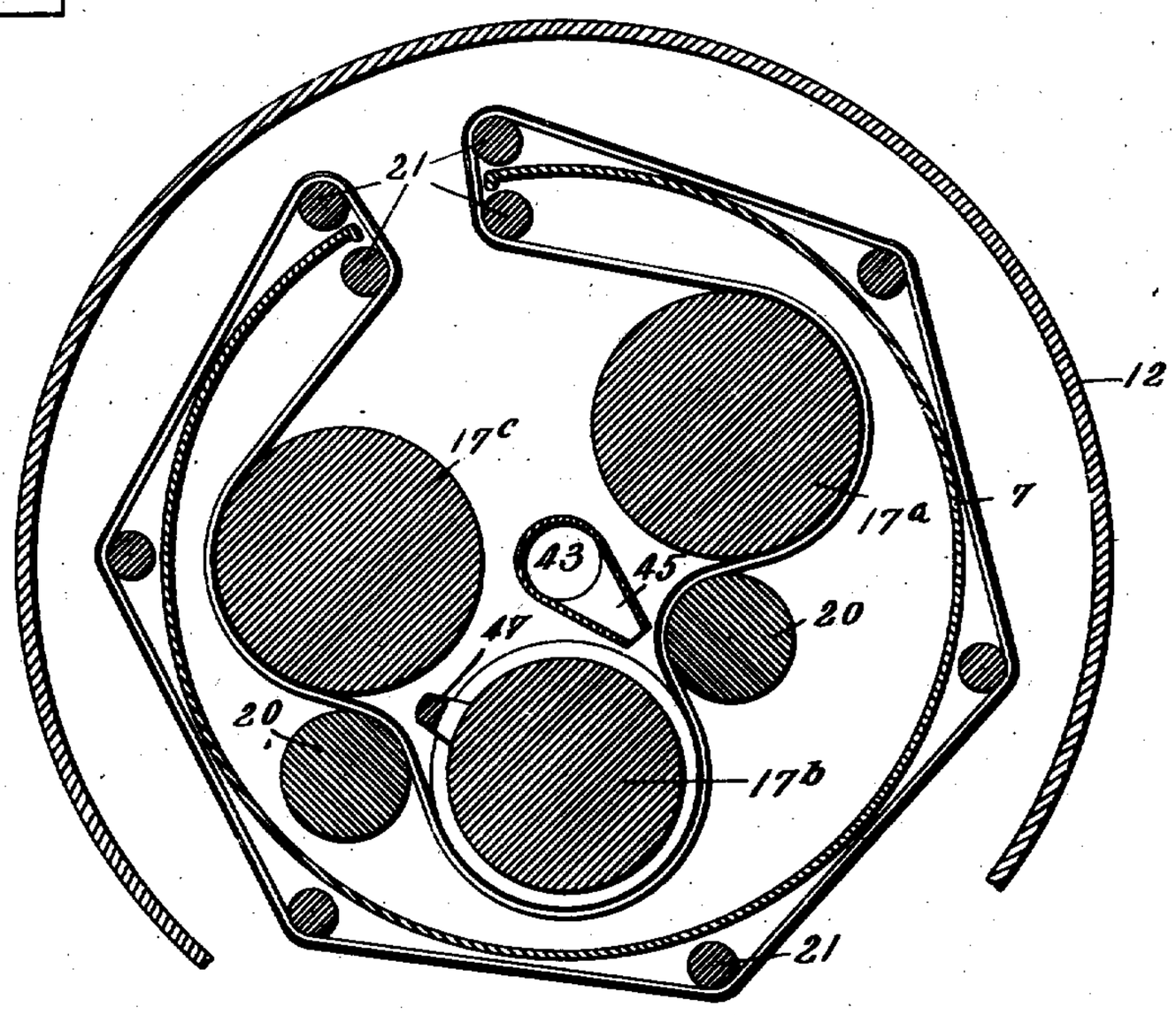
APPLICATION FILED APR. 16, 1909.

994,631.

Patented June 6, 1911.

7 SHEETS—SHEET 7.

Fig 11



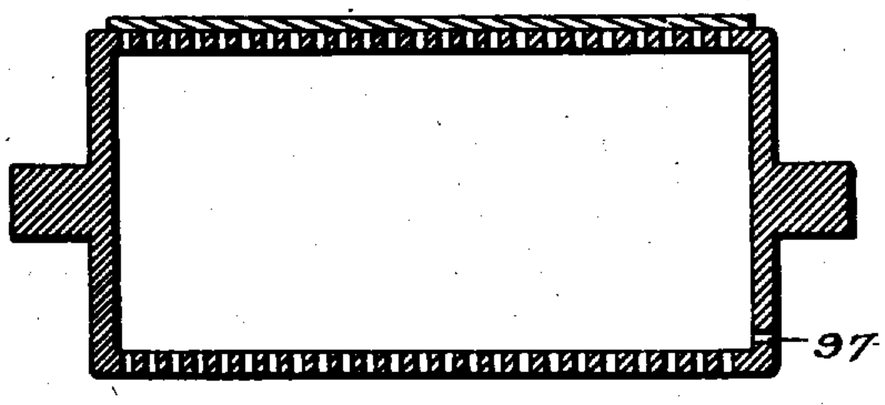


Fig 12

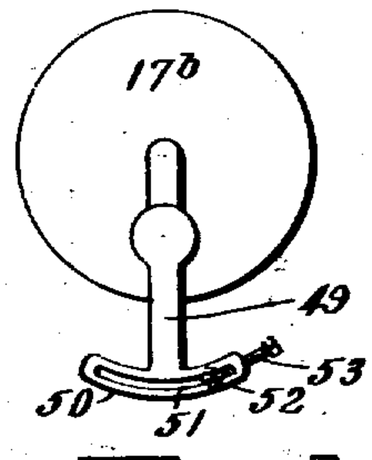


Fig 13

Witnesses
H. A. Polhuette
S. V. Caffrey

Inventor
John J. Berrigan.
By K. P. McElroy.
Attorney

UNITED STATES PATENT OFFICE.

JOHN J. BERRIGAN, OF ORANGE, NEW JERSEY.

EXTRACTION PROCESS AND APPARATUS THEREFOR.

994,631. Specification of Letters Patent. Patented June 6, 1911.

Application filed April 16, 1909. Serial No. 490,415.

To all whom it may concern:

Be it known that I, JOHN J. BERRIGAN, a citizen of the United States, residing at Orange, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Extraction Processes and Apparatus Therefor, of which the following is a specification.

This invention relates to extraction processes and apparatus therefor; and it comprises a process of extraction wherein a material to be pressed and freed of liquid is held and positioned centrifugally against an interior surface of a rotating member and while so positioned is subjected to a mechanical pressing action, such action if so desired being reinforced by centrifugal pressure, while subsequently, if so desired, the pressed material is removed from the presser member by, or with the aid of, centrifugal force; and it also comprises certain organizations of apparatus elements for extraction by pressing, such organizations comprising a rotatable or revoluble presser member having an interior presser face and adapted to maintain a centrifugally clinging layer of material thereon, means for rapidly rotating such member, means for supplying material to be pressed to the interior face of such member during its rotation and means for compressing such material against such face during such rotation; all as more fully hereinafter set forth and as claimed.

In the removal of oil from seeds, residual extractive liquors from extracted materials, mother liquor from crystals, water from slurry, moisture or liquid from magmas and in general in removing liquids from solids, it is frequently desirable to use a high degree of pressure, while it is also desirable to be able to perform the operation in a continuous manner, continuously supplying fresh material to be pressed and continuously removing pressed material. The ordinary hydraulic and screw presses, while capable of applying as much pressure as may be desired, operate in a discontinuous manner and cannot conveniently be made to operate otherwise. There are many types of continuous presses but these in practice are open to the objection that it is difficult to prevent caking and clogging on the pressing members, and to maintain the material in position.

In the present invention I have devised a new mode of operation wherein the material to be pressed is subjected to the action of pressing members while located and maintained in position as a layer of the desired thickness by the action of centrifugal force. For this purpose, the material may be brought by centrifugal force upon and positioned against an inner face of a hollow rotating outer presser member and while so positioned, compressed by the action of any suitable inward mechanism. This presser member may or may not be foraminous and may or may not be provided with a filtering surface of textile material. For many purposes the use of a foraminous presser member in this relation is desirable, and so also is the use of a textile material of the nature of the ordinary filter cloth. With a foraminous outer presser member, liquid separated from the material by the pressing action of an inner presser member is centrifugally thrown radially outward therethrough. If the rotating presser member against an inner face of which the material is positioned be not foraminous, it is usually desirable to form or construct it so as to give some other form of more or less positive removal of the separated liquid from the solid. The rotating presser member may for instance be an imperforate drum, preferably slightly coned. Material to be pressed may be fed to the inner face of the rotating drum, preferably at or near the larger end. Under the influence of the centrifugal force due to the rotation of the drum, such material will cling to and be positioned upon the inner face of the drum. While so positioned, it may be subjected to a compressive action by any suitable presser member. With the coned drum stated, the liquid will tend to flow to and over the edge of the larger end of the drum. The material may be forced toward the other end of the drum by any suitable mechanism being compressed during its progress by suitable compression means. Or the drum may be of a foraminous material such as wire fabric or cloth. In this event the separated liquid will pass outward radially through the orifices of the drum and the coning may be omitted. In another and advantageous embodiment of the present invention an endless belt may be looped around suitable rolls, traveling about them with a proper motion independent of that of the apparatus as a whole while the whole system of belt and rolls rotates or revolves on an included axis. Material fed against the inner face of the belt will cling thereto and be posi-

tioned thereagainst. The belt may be of foraminous or non-foraminous material. Using a belt filter cloth, which may be a textile or a wire fabric, this may be caused to travel under tension around an included series of compressing rollers having individual planetary rotations as well as an orbital revolution the whole assemblage of belt and rollers being given a rotation or revolution about a common axis. This latter rotation causes material fed to the interior surface of the traveling belt to cling thereon centrifugally while the compressing rollers compress it thereagainst. Since the surface of such an individually rotating roller after administering compression must move away from the belt toward the axis, there is little tendency for material to cling thereon, since such clinging would be against the centrifugal action due to the rotation of the apparatus as a whole, and if material which does cling be detached from the roller surface it at once flies back to the normal position upon the belt. In its progress around a plurality of compressing rollers, the belt may be given an inverse bend from time to time between the rollers by means of idler rollers bringing the belt temporarily a little nearer center, and these inverse bends tend to break up the solidity of the cake or layer clinging to the belt. The system of belt and rollers may or may not be included in a rotary casing. The casing is sometimes convenient in some embodiments of the invention but is not necessary to the operation as hereinbefore described. In a further development of the stated embodiment, the traveling belt may be given a further looping around the exterior of the assemblage in such a manner that the surface or face which was on the interior during its functioning as a presser member and whereon material tended to cling during compression, becomes an exterior surface from which clinging material readily detaches centrifugally. That is, an endless belt may be given an arcuate looping with the ends of the arc terminating somewhat short of a complete circle to afford an exit for pressed material, the two sides of the belt affording a pair of substantially concentric arcs. One such arcuate section of the belt passes around the interior of the system and over the rollers in the manner described, carrying the material to be extracted on its inner surface while the other arcuate section passes outwardly around the exterior of the assemblage and back to the interior again. With an endless belt so arranged and given a proper or traveling motion, it is obvious that any given point on the inner or presser face of the inner arc successively traverses the inner surface of the inner arc and the outer surface of the outer arc; that is, in this manner of operating what is the interior surface of the inner loop becomes the outer surface of the outer loop and material clinging positively to said inner surface in the inner position is positively detached when such inner surface becomes the outer surface. The outer arc or section may be held in a substantially circular position by idlers. While it is convenient to have the two turns or loops of the belt form arcs with ends somewhat apart to afford a ready passage for extracted material, the ends may be overlapped somewhat. The inner or compressing rolls or rollers may be given a positive pressure against the inner or presser face of the belt by any desired mechanical means, or, and very advantageously, may be given an adjustable pressure by centrifugal force, one or more of such rolls being mounted in such manner as to be free to move more or less radially, as by mounting it in radially slidable bearings, in a pivoted crank-like bearing or, and very simply, by merely mounting loosely. When so arranged, the greater the velocity of revolution or rotation of the whole system, the greater is the pressure between belt and rolls. But one roll need be so mounted, its outward pressure being sufficient to maintain the belt taut and thereby give equivalent pressure between it and the remaining rolls or idlers. With a radially movable roll weighing, say 10 to 150 pounds and with a velocity of rotation of the whole assemblage of, say, several hundred revolutions per minute enormous pressures between belt and rolls may be readily attained. The pressure will of course be dependent upon the velocity and may be readily regulated by regulating the speed of rotation. While the pressure may be adjusted and made independent of the speed by fixed mounting of the rolls in mechanically adjustable bearings, there is ordinarily no advantage in this and it is desirable to have at least part of the pressure centrifugally exerted.

With an arrangement of the type described, it is possible to use extremely high pressures in the extraction while at the same time the presser members do not clog or choke. With these very high pressures it is of course necessary to use belting of material having a very high tensile strength and it is usually desirable to have it of limited extensibility. In various embodiments of the described apparatus, any of the ordinary types of machine belting may be employed. With woven or knitted wire belting, expressed liquids find a ready exit outward centrifugally through the meshes but where close-woven canvas belting or rubber belting is employed it is usually desirable to employ special expedients for disposing of the liquid expressed. The roll forming the inner pressing member and coöperating with the belt may, for example, be made foraminous. Or, and very advantageously,

a double belt may be employed, one layer being of suitably textured relatively thin fabric, such as ordinary filter cloth—which need have no special mechanical strength—while another layer is of heavy belting material. The two layers may or may not be united, as by sewing, stitching, etc., but there is ordinarily no special advantage in so uniting them it being sufficient to superimpose the layers. Where the outer layer is not foraminous, as with rubber belting, or is very slightly porous, as with heavy canvas belting, it may be slotted, punched or slitted to give exit to the fluids draining through the filter cloth and to produce other advantageous results. With heavy machines, for example, an advantageous arrangement is a compound belt having an inner layer of fine filter cloth and an outer layer of heavy, strong plane surfaced canvas belting, say, ¾ inch in thickness, having a number of perforations punched in it. With the described arrangement of rolls and idlers, the latter giving a reverse bend to the belt, during the compression the filter cloth is given a shorter bend than the outer layer and bags upward into the punch holes more or less, the bag filling with the material under expression. In the reverse bend over the idlers, the filter cloth is stretched more than the reinforcing layers and the pocketed portions of material are dislodged. This is a very advantageous type of action for many purposes. With smaller and lighter machines, a simple belt of strong filter cloth or wire fabric may be sufficient. In operation, machines of this type of course cause considerable movement of air in their vicinity, and one of the advantages of the double-arc arrangement of the belt described is that the belting dries out during its progress through the outer arc.

The rolls may be heated, as by steam, where a hot expression is desired, or where the apparatus is to be used for making dry cooked food or feed, as, for example, in making dry flaked cereals, dry flaked malt, etc. In expressing oils from seeds, etc., this heating is often advantageous. Or steam jets or water sprays may be used in treating the material under expression. Where steam or water is used, it is advantageously applied to the material immediately after one or more of the compressing rolls since the material passing beyond the roll expands more or less and so is enabled to absorb the steam, water or other agent employed.

In the accompanying illustration, I have shown, more or less diagrammatically, certain organizations of apparatus elements embodying the described invention and capable of employment in the described process.

In this showing:—Figure 1 is a vertical longitudinal section, certain elements being shown in elevation, along line *x—x* of Fig. 2, showing one such embodiment; Fig. 2 is a vertical transverse section of the structure of Fig. 1 along line *y—y;* Fig. 3 is a vertical longitudinal section of a modification of the structure of Figs. 1 and 2, taken along line *z—z* of Fig. 4; Fig. 4 is a fragmentary vertical transverse section of the structure of Fig. 3, taken along line *a—a;* Fig. 5 is a view on an enlarged scale showing a perforated compound belt passing around a presser roll and given a reverse bend by an idler roll (see Fig. 2); Fig. 6 is a vertical section of another modification; Fig. 7 a horizontal section of the same; Fig. 8 is a detail view; Figs. 9 and 10 are respectively vertical longitudinal and transverse sections of another modification; Fig. 11 is a vertical transverse section of a modification of the structure of Figs. 1 and 2; Fig. 12 is a detail view of a presser roll; and Fig. 13 is a fragmentary detail of a roll mounting.

In the embodiment of this invention shown in different sections in Figs. 1 and 2, the base 1 is provided with standards 2 and 3 supporting the rotary parts. Journaled in the standard 2 is a short hollow shaft 4 carrying drive pulley 5 and rigid with head 6 of rotary casing or drum 7. At the other end, this drum is provided with head 8 and is journaled in standard 3. The drum is provided with an outlet 9 for solids and an outlet 10 for expressed liquid, the former being provided with a lip or dam 11 to prevent liquid gaining access thereto. Around and inclosing this rotary drum is a stationary housing 12 for collecting discharged matters, this housing having a section 13 inclosing the discharge outlet for solids and another section 14 receiving discharged liquid. The housing is spaced away somewhat from the drum and the drum is provided with a brush, fan or scraper 15 operating in the space thus formed and conveying discharged solids to an outlet 16 formed in the base. Within the drum are the compressing elements proper, these consisting of a plurality of presser rolls (three are shown—see Fig. 2), 17^a, 17^b, and 17^c, and a compound belt formed of an inner or presscloth layer 18 and an outer layer of heavy belting material 19. As shown, this belt is looped in what may be described as a double arc, the inner turn forming the presser face and passing first over a presser roll 17^a, thence over idler 20 which gives it an inverse bend, thence over another presser roll 17^b and thence out over another roll 17^c which though like the other rolls in structure in this embodiment has no pressing function. It is however useful not only as an idler roll but to balance the rotor, and to reverse the direction of travel of the belt. The reversed belt passes around the outside of the structure over idlers 21 and

back over idler 22 to the interior of the system. With this arrangement, it is obvious that what is the inner or presser face of the belt within the system becomes the outer face in the exterior arc. The presser rolls are given a slight central coning and may be provided with end flanges 23. One or more of them is also preferably circumferentially grooved, as at 24. It is desirable that at least the first presser roll functioning (in this showing 17ª) should be so grooved. The presser rolls are mounted in journals in the end walls of the revoluble drum and are given a rotary proper motion independent of that of the drum. In the embodiment shown, this motion is communicated by a sprocket and chain 25 to roll 17ª. The chain is driven from a short stub shaft 26 passing inward through the hollow shaft (4) and having roller bearings at 27 and 28. Mounted upon the hollow shaft is a gear wheel 29 driving pinion 30 upon shaft 31. Upon this latter shaft is another gear 32 which imparts motion to the stub shaft through 33. Upon the end of the shaft is a pulley 34, actuating belt 35 and pulley 36 which drives a shaft 37 extending through the base of the press, and serving to actuate the feeding means. At the other end of this shaft is a pulley 38 driving pulley 39 through belt 40. This latter pulley is mounted on a hollow shaft 41 containing pipe 42 for water or steam and carrying a screw conveyer 43, operating in conduit 43ª receiving material from hopper 44 and discharging it through 45 between the presser face of the belt and the first presser roll (17ª). Nozzle 46 is arranged to discharge water, steam or other fluid upon the expanding material behind this first presser roll. Scraper blades 47 may be set to clear the grooves (24). Scraper 105 serves to detach material clinging to the belt before the belt moves out of alinement with the discharge orifice in drum 7. In order to produce the desired amount of pressure between rolls and belt, one of the presser rolls may be so arranged as to be permitted a limited amount of radial movement, as by journaling it on a pair of crank arms 48, mounted in the end walls of the casing. One of these arms extends therethrough and is provided with a lever 49 having an arm 50, (see Fig. 13) provided with a curved guide slot 51 engaging a fixed pin 52 and limited in its movements by set-screw 53.

In Figs. 3 and 4 are shown views of another modification in which the belt is given a single in lieu of a double looping. Except where otherwise stated, the elements bearing the same reference numerals are the same as those in Figs. 1 and 2. With the presser belt arranged in a single turn in lieu of the double arc shown in the previous figures, special means must be used to remove the compressed material. In the embodiment here shown, these means consist of a screw conveyer 54 engaging the presser face of the belt at a point beyond the last presser roll 17ᶜ. Beyond this screw conveyer, scraper 55 also engages the face of the belt. The screw conveyer is actuated by sprocket and chain drive connections 56 deriving motion from the stub shaft (26). Material removed from the face of the belt by the screw conveyer is brought to the end of the apparatus beyond the line of the belt and presser roll and is thrown centrifugally through an orifice 57 in the rotary drum. Stationary housing 58 is arranged over this solid discharge outlet. Fluids accumulated on the inner wall of the drum are discharged through liquid outlet 59 into a stationary housing 60. Flange, rib or dam 61 prevents liquid on the interior of the rotary drum reaching the outlet for solids. The radially movable adjustment of roll 17ᵇ is also effected in a somewhat different manner from that of the preceding figure. The journal shafts 62 of this roll pass loosely through the end walls of the drum and are given a radial adjustment by set screws 63. In Fig. 5, is shown, on an enlarged scale, the effect of the reverse bend upon the described compound belt. As shown, the heavy belting material is perforated as at 64. In giving the compound belt curvature around presser roll 17ª, the filter cloth layer being on the shorter side is forced more or less into these perforations, forming bags or pockets 65 full of the material undergoing compression. In the reverse bend in the belt by idler 20 the filter cloth being on the outside is stretched somewhat over the convexed flat-surfaced belt obliterating these pockets or bags, and breaking up the press cake.

In Figs. 6 and 7 are shown different views of a modified form in which the belt is dispensed with. In this showing there is a rotary basket made of the usual perforated or slotted metal 66 and provided with liner 67 of a close woven metal or textile fabric. Preferably, this is a metal fabric. The basket is given rotary motion by a hollow shaft 68 through which passes another shaft 69. This latter shaft carries a pair of spiders 70 and 71. As shown, the spiders have 4 arms. Two of these arms carry scraper or plow blades 72 set at an angle (see Fig. 8) and adapted to move material from the top of the basket downwardly to the base. Intermediate these scrapers are a pair of rollers 73 loosely journaled in the spider arms and adapted to have a more or less radial movement. At the top, the basket is provided with a feed hopper 74 communicating with a feed duct 75 adapted to discharge material by centrifugal force against the top inner wall of the basket. At the base of the basket is an outlet 76 to which

material is fed by scraper 77. About the revolving basket is a liquid collecting housing 78 and a housing for collecting solids 79, this latter being provided with outlet 80 to which expressed material is conveyed by scraper 81.

In Figs. 9 and 10 are shown different views of still another modification under the present invention, in which foraminous members are dispensed with. In this showing, a coned imperforate drum 82 is revolubly mounted in standards 83 and 84 and given motion by driving means (not shown) actuating hollow shaft 85. Within this casing operates a shaft 86 carrying a pair of four-armed spiders 87 and 88. A pair of presser rolls 89 are loosely mounted in these spider arms to permit some radial movement. A series of scrapers 90, operating like the scrapers in Fig. 6, are carried by the other arms of the spider. Material to be expressed is fed into the apparatus from a hopper (not shown) by means of screw conveyer 91 and feed duct 92. Expressed liquid escapes through outlet 93 into stationary casing 94. Expressed solids are moved forward toward the smaller end of the cone by the scraper blades ultimately reaching and escaping through outlet 95 into stationary casing 96.

In Fig. 11 is shown a modification of the device employing a doubly-looped belt in which the outer turn of said belt passes around the exterior of the rotary drum. The reference numerals designating the several elements are the same as those in Figs. 1 and 2.

In Fig. 12 is shown a foraminous roll which may be employed as a presser roll in any of the modifications described, where it is not desirable or practicable to have the liquid escape outwardly through the belt, as where a non-foraminous belt is employed, or in such a device as that of Fig. 9. Liquid attaining the interior of this roll escapes through outlets 97 in the end faces of the roll.

Fig. 13 is a detail view showing the arrangement of the crank mounting of the presser rolls of Figs. 1 and 2.

The operation of these devices is obvious from the foregoing. The device of Fig. 1 having been given a rapid rotation by power from any suitable source, the material coming from hopper 44 is fed inward by means of conveyer 43 actuated by 39, until it reaches feed conduit 45 out of which it is thrown by centrifugal force upon the inwardly moving or press face of the double looped belt, clinging thereto positively with a force proportional to the rapidity of rotation of the apparatus as a whole. As the belt at the point where the discharge comes is also moving toward the "pinch" between belt and roller 17^a in a line which brings points upon it radially farther from the apparatus axis, centrifugal force positively assists the feed into and through the "pinch," which is also on a similar line, producing a sort of forced feed. Piling up on the belt or backward yielding or dislodgment of the layer by the crowding action of the roll is positively resisted by centrifugal action. The material fed clings to and is positioned against the presser face of the belt as a layer and this material is compressed by roll 17^a, the whole system of belts and rolls being given a high but adjustable degree of compressive engagement by the radial movement of adjustable roll 17^b. The grooving of the presser roll at 24 serves to retain the material at the desired point against lateral yielding. The layer of material passing around the roll 17^a on the belt does not tend to cling to and follow the roll beyond the point of engagement, since to do so would be in opposition to centrifugal force. Any material which may cling, however, when detached by scraper 47 engaging the groove, at once flies back to and is positioned upon the surface of the belt. The material passing outward beyond the point of engagement between roll and presser belt expands and becomes porous, and if desired or necessary water, steam, oil or other fluid may be discharged thereupon through nozzle 46. The use of steam or hot water at this point is often convenient in extracting oil from seeds. The cake of material upon the belt is given an inverse bend and broken up by roller 20. Where a compound belt is employed, having one layer of close-textured filter cloth and another layer of perforated belting material as is usually preferable in heavy machines, the operation diagrammatically shown in Fig. 5 materially aids in this breaking up of the cake. In the bend around 17^a the outer layer of the compound belt 19 is under more tension than the inner layer 18, and 18 therefore bags into the perforations more or less. In passing around roll 20, 18 becomes the outer layer and is placed under tension obliterating this pocketing. Using a foraminous belt in the structure of Figs. 1 and 2, liquid escapes outwardly through the belt and accumulates on the inner surface of the rotary drum as a very thin layer and escapes through 10 into housing 14. The rib 11 prevents this thin layer of liquid gaining access to outlet 9 for the solids. The solids clinging to the inner surface of the belt after passing idler 20, pass between the presser faces of the belt and roll 17^b and are given another pressing thereby. Passing beyond this roll the materials which still cling to the inner face 18, pass outward around 17^c to a point where the inner surface of the belt becomes an outer surface, and are thence thrown radially through

outlet 9 into the space between the drum and the casing 12, scraper 105 serving to prevent the material passing onward to a point out of alinement with the outlet. Scraper or fan 15 conveys them forward through this space to the solid discharge 16. In the structure of this figure, press roll 17c operates partly as an idler and to preserve the balance of the rotor and partly as a discharge means.

The structure of Figs. 3 and 4 operates as the structure just described, save in that the belt is not given an outward turn whereby expressed solids may be expelled radially. In this structure 17c also functions as a presser roll. Material passing between 17a and the presser face of the belt is given three compressions by 17a, 17b and 17c, and is finally removed from the presser face of the belt by the engaging screw conveyer 54 which delivers it at a point beyond the end of the belt and presser rolls whence it can be thrown out centrifugally through orifice 57 into casing 58.

The structure shown in Fig. 11 operates in the same maner as the structure of Figs. 1 and 2, save in that the belt is given the reverse turn around the outside of the rotating drum 7. The rotating drum being in rapid movement inside the stationary housing, a strong current of air is set up and the belt dries well during its passage around the circumference of such drum. In the structure of Fig. 6, the material is delivered against the inner face of the rotating casing by feed means 74 and 75 as a clinging layer. Material is worked downward in a spiral path over the inside of the drum by the scraper arms until it finally reaches the base, whence it is expelled centrifugally through orifice 76. In the course of its passage over the inner surface of the drum, it is subjected to repeated compression by rolls 73. The rolls and scrapers may be given a motion slightly faster or slightly slower than that of the drum, according to the angle at which the scraper blades are set. Liquid expressed by the pressure of rolls 73 escapes radially outward through the foraminous lining of the basket.

In the operation of the structure of Figs. 9 and 10, material to be expressed is fed inward by conveyer 91 and thrown centrifugally against the inner surface of the imperforate drum 82 at its widest point, forming a deposit which is moved forward in a spiral path over the inner surface of the drum toward and through the narrow end as a clinging layer, positioned by centrifugal force. During its progress it is exposed to repeated compressions by loosely mounted presser rolls 89. Expressed liquid tends to move backward by centrifugal action toward the wider end of the coned drum whence it escapes through 93 into collecting housing 94. The scrapers extend beyond the spider arms into the narrow and the wide end of the drum, in a manner similar to that shown in the structure of Fig. 6 where the drum is not coned, and work the material steadily forward toward such wide end. There the expressed solids escape centrifugally through orifice 95 into collecting housing 96.

The operation of the structure of Fig. 11 is the same as that of the structure of Figs. 1 and 2. But the presser belt being given its reverse arc around the outside of the rotary drum 7 is exposed to the drying action of the current of air always sweeping between the drum and the stationary housing while an increased cleansing of the belt surface is also secured.

The perforated presser rolls of Fig. 12 may be used in any of the foregoing embodiments of the present invention. In the type of press using a traveling presser belt, this belt may be non-foraminous or practically so, as in the case of a heavy canvas, leather or rubber belt and expressed liquid will escape inwardly into the interior of the presser roll, escaping thence through orifices 97. As liquid will only occur on the inner face of the hollow roll which happens to be radially outward, but one of these orifices will function at a time. The perforated presser roll may also be used in the structure of Figs. 9 and 10, or in the structure of Figs. 6 and 7. When used in the latter, the basket or drum need not be foraminous.

As the end walls of the rotary drum of the structure of Figs. 1, 2, 3, 4, 9, 10 and 11 serve mainly for mounting the journals of the presser rolls, they may be replaced by appropriate spider arms. Where a circulation of air in the interior of the rotor is desirable this may be advantageous.

The described process and apparatus may be advantageously employed in extracting oils from seeds, such as cotton seed, from fish, slaughterhouse scrap, etc., and from many other materials. Diffusion bagasse from sugar cane and the like may also be so handled. Diffusion bagasse from sugar cane occurs in short, waterlogged pieces which cannot be economically pressed free of contained water sufficiently to allow its employment as fuel, by the present methods.

Either the pin and crank mounting of the roll in Figs. 1 and 13 or the set screw mounting of Fig. 3 may be fixedly adjusted so as to give a predetermined pressure independent of rotation, but there is ordinarily no advantage in this. It is betters to use the adjustable pressure due to rotation in addition to, or to the exclusion of, such mechanical pressure. Spring mountings, special pressure means and the like are not ordinarily desirable.

What I claim is:—

1. The process of extraction which comprises forming and positioning a layer of material by centrifugal action and while so positioned, exposing said layer to compression by a presser member.

2. The process of extraction which comprises forming and positioning a layer of material upon a presser member by centrifugal action and while so positioned, exposing said layer to compression by another presser member, one of said members being foraminous.

3. The process of extraction which comprises forming and positioning a layer of material upon a foraminous presser member by centrifugal action and while so positioned, exposing said layer to compression by another presser member.

4. The process of extraction which comprises forming and positioning a layer of material by centrifugal action and while so positioned, exposing said layer to compression by a presser member, the pressure exerted by said presser member being aided by centrifugal action.

5. The process of extraction which comprises forming and positioning a layer of material upon a presser member by centirfugal action and while so positioned, exposing said layer to compression by another presser member, the pressure exerted by said presser member being aided by centrifugal action.

6. The process of extraction which comprises forming and positioning a layer of material upon a presser member by centrifugal action and while so positioned, exposing said layer to compression by another presser member, the pressure exerted by said presser member being aided by centrifugal action, one of said members being foraminous.

7. The process of extraction which comprises forming and positioning a layer of material upon a foraminous presser member by centrifugal action and while so positioned, exposing said layer to compression by another presser member, the pressure exerted by said presser member being aided by centrifugal action.

8. The process of extraction which comprises forming a centrifugally clinging layer of material upon an inner face of a presser member having a movement around an included axis, compressing said layer while so clinging and transferring the pressed material to an outer face of said presser member for centrifugal extrication.

9. The process of extraction which comprises forming a centrifugally clinging layer of material upon an inner face of a presser member having a movement around an included axis, compressing said layer while so clinging and removing the pressed material from said presser member by centrifugal force.

10. The process of extraction which comprises forming a centrifugally clinging layer of material upon an inner face of a presser member having a movement around an included axis, while so clinging compressing the material a plurality of times, the pressure being removed between compressions and removing the pressed material from the presser member after the final compression.

11. The process of extraction which comprises forming a centrifugally clinging layer of material upon an inner face of a presser member having a movement around an included axis, while so clinging compressing the material a plurality of times, the pressure being removed between compressions in such a manner as to break up the cake formed in compression and removing the pressed material from the presser member after the final compression.

12. The process of extraction which comprises forming a centrifugally clinging layer of material upon an inner face of a presser member having a movement around an included axis, while so clinging compressing the material a plurality of times, the pressure being removed between compressions in such a manner as to break up the cake formed in compression and centrifugally removing the pressed material from the presser member after the final compression.

13. In a press, means for forming a centrifugally clinging layer of material to be expressed, means for exerting mechanical pressure upon such layer while so held and means for separately removing expressed liquid and solids.

14. A pressing apparatus comprising a rotatable presser member having an interior face adapted for the centrifugal clinging of a layer of material thereto, means for feeding material thereto, means for rapidly rotating such presser member to produce such clinging layer and contained independent presser means for compressing said layer while clinging to said face and traveling therewith.

15. A press comprising a pair of orbitally movable, coacting pressing members, and means for feeding material to be pressed between them.

16. A rotary press comprising a system of presser rolls and a presser belt engaging said rolls, said system being mounted for orbital revolution about an included axis.

17. A press comprising a pressing member having an interior presser face adapted for reception of material to be pressed, means for rapidly rotating said member to produce centrifugal action therein, means for feeding fresh material to such face, means for removing expressed solid ma-

terial and means for removing expressed liquid therefrom and a presser member adapted to engage the centrifugally clinging layer on such face.

18. A press comprising a rotary member having an interior presser face, an orbitally movable interior presser member coacting with said presser face and means for feeding material therebetween.

19. A rotary press comprising a system of rolls mounted for orbital revolution about an included axis, a belt looped over the rolls and having an inner presser face, a portion of said belt prior to engagement with the first roll in series being nearer the axis than the place of engagement of said belt and roll, means for producing such orbital revolution, means for causing the belt to travel about said rolls and means for feeding material to be expressed upon the inner face of such portion of the belt.

20. A rotary press comprising a series of presser rolls, an engaging presser belt extending around said rolls and having a portion extending more or less outwardly as regards the center of the system to convergence with the first roll in series, means for rotating the system of belt and rolls about an included axis, means for producing a traveling motion of the belt and means for feeding material to be expressed upon the surface of the belt prior to such convergence.

21. In a pressing apparatus, the combination of means for centrifugally positioning a traveling layer of material to be expressed, and means for submitting such layer to pressure during its period of travel.

22. In a pressing apparatus, the combination of a presser member rotatable about an included axis, means for feeding material to be expressed to an interior face of said presser member and means for pressing the material upon such interior face, said pressing means being also rotatable about said axis.

23. A pressing apparatus, comprising a member having an interior face adapted to serve as a presser face, means for rotating said member about an included axis, means for feeding material against said face as a layer and means for compressing material clinging to said face, said compressing means being revoluble about the same axis.

24. A pressing apparatus, comprising a member having an interior face adapted to serve as a presser face, means for rotating said member about an included axis, means for feeding material against said face as a layer and one or more independently rotatable presser rolls revoluble about said axis and engaging the layer of material clinging to and positioned upon said face.

25. A pressing apparatus, comprising a member having an interior face adapted to serve as a presser face, means for rotating said member about an included axis, means for feeding material against said face as a layer and one or more independently rotatable presser rolls revoluble about said axis and engaging the layer of material clinging to and positioned upon said face, said rolls being radially movable.

26. A pressing apparatus, comprising a member having an interior face adapted to serve as a presser face, means for rotating said member about an included axis, means for feeding material against said face as a layer and one or more independently ro- presser elements being foraminous and said compressing means being revoluble about said axis.

27. A pressing apparatus, comprising a member having an interior face adapted to serve as a presser face, means for rotating said member about an included axis, means for feeding material against said face as a layer and one or more independently rotatable presser rolls revoluble about said axis and engaging the layer of material clinging to and positioned upon said face, one of the engaging presser elements being foraminous.

28. A pressing apparatus, comprising a member having an interior face adapted to serve as a presser face, means for rotating said member about an included axis, means for feeding material against said face as a layer and one or more independently rotatable presser rolls revoluble about said axis and engaging the layer of material clinging to and positioned upon said face, said rolls being radially movable, and one of the engaging presser elements being foraminous.

29. A pressing apparatus, comprising a system of engaging presser members rovoluble about a common axis, one of said members having an inner presser face and another presser member located axially inward from the first presser member and adapted to engage said presser face, and means for delivering material to be pressed on said presser face.

30. A pressing apparatus, comprising a system of engaging presser members revoluble about a common axis, one of said members having an inner presser face and another presser member being located axially inward from the first presser member and adapted to engage said presser face, means for causing a circumferential movement of one of the engaging presser members relative to the other and means for delivering material to be pressed on said presser face.

31. A pressing apparatus, comprising a system of engaging presser members revoluble about a common axis, one of said members having an inner presser face and another presser member located axially inward from the first presser member and adapted to engage said presser face, one of

said engaging presser members being foraminous, and means for delivering material to be pressed on said presser face.

32. A pressing apparatus, comprising a system of engaging presser members revoluble about a common axis, one of said members having an inner presser face and another presser member located axially inward from the first presser member and adapted to engage said presser face, one of said engaging presser members being foraminous, means for causing a circumferential movement of one of the engaging presser members relative to the other and means for delivering material to be pressed on said presser face.

33. A rotatable press comprising an endless belt having an inner face adapted to serve as a presser face, means for giving said belt an independent traveling motion, means for delivering material to be pressed upon said inner face, a presser member engaging the material upon said inner face, means for rotating the press as a whole and means for removing expressed material from the press.

34. A rotatable press comprising an endless belt having an inner face adapted to serve as a presser face, means for giving said belt an independent traveling motion, means for delivering said material to be pressed upon said inner face, one of said engaging presser members being foraminous, means for rotating the press as a whole and means for removing expressed material from the press.

35. A rotatable press comprising an endless belt having an inner face adapted to serve as a presser face, means for giving said belt an independent traveling motion, a series of presser rolls located to engage said inner face, means for feeding material to be pressed upon said inner face, means for rotating the press as a whole and means for removing expressed material from the press.

36. A rotatable press comprising an endless belt having an inner face adapted to serve as a presser face, means for giving said belt an independent traveling motion, a series of presser rolls located to engage said inner face, one or more of said rolls being circumferentially grooved, means for feeding material to be pressed upon said inner face and means for removing expressed material from the press.

37. A rotatable press comprising an endless belt having an inner face adapted to serve as a presser face, means for giving said belt an independent traveling motion, a series of presser rolls located to engage said inner face, one or more idler rolls located to engage the opposite face of said belt and give the same a reverse bend, means for feeding material to be pressed upon said inner face and means for removing expressed material from the press.

38. A rotatable press comprising an endless belt having an inner face adapted to serve as a presser face, means for giving said belt an independent traveling motion, a series of presser rolls located to engage said inner face, one or more of said rolls being circumferentially grooved, one or more idler rolls located to engage the opposite face of said belt and give the same a reverse bend, means for feeding material to be pressed upon said inner face and means for removing expressed material from the press.

39. A press comprising a plurality of compressing rolls and a traveling presser belt engaging the same, a plurality of idler rolls adapted to give said belt a reverse bend between said compressing rolls, means for feeding material to said belt and means for removing compressed material therefrom.

40. A press comprising a plurality of compressing rolls and a traveling presser belt engaging the same, said belt having an outermost layer of strong fabric material and an innermost layer of close-textured filter fabric next said rolls, a plurality of idler rolls adapted to give said belt a reverse bend between said compressing rolls, means for feeding material to said belt and means for removing compressed material therefrom.

41. In a belt press, a belt comprising an outermost layer of strong fabric material and an innermost layer of close-textured filter fabric, a plurality of compressing rolls engaging said innermost layer and adapted to curve the belt correspondingly and a plurality of idler rolls between said presser rolls and adapted to give said belt an inverse bend.

42. In a belt press, a belt comprising a perforated outermost layer of strong fabric material and an innermost layer of close-textured filter fabric, a plurality of compressing rolls engaging said innermost layer and adapted to curve the belt correspondingly and a plurality of idler rolls between said presser rolls and adapted to give said belt an inverse bend.

43. In a belt press, a belt comprising a perforated outermost layer of strong fabric material and an innermost layer of close-textured filter fabric, a plurality of circumferentially grooved compressing rolls engaging said innermost layer and adapted to curve the belt correspondingly and a plurality of idler rolls between said presser rolls and adapted to give said belt an inverse bend.

44. In a belt press, a belt comprising an outermost layer of strong fabric material

and an innermost layer of close-textured filter fabric, a plurality of circumferentially grooved compressing rolls engaging said innermost layer and adapted to curve the belt correspondingly and a plurality of idler rolls between said presser rolls and adapted to give said belt an inverse bend.

45. A press comprising an endless belt disposed in two concentric loops with the ends of said loops approximated, and a plurality of presser rolls, one loop of said belt passing over said rolls and engaging therewith on its inner face and the other loop encircling the first named loop, means for rotating the assemblage of loops and rolls about an included axis, means for giving the belt an independent traveling motion, and means for feeding material to be expressed to said inner face.

46. A press comprising an endless belt disposed in two concentric loops with the ends of said loops approximated, and a plurality of presser rolls, one loop of said belt passing over said rolls and engaging therewith on its inner face and the other loop encircling the first named loop, a plurality of idler rolls disposed between said presser rolls and adapted to give a reverse bend to the belt in said first named loop, means for rotating the assemblage of loops and rolls about an included axis, means for giving the belt an independent traveling motion, and means for feeding material to be expressed to said inner face.

47. A press comprising an endless belt disposed in two concentric loops with the ends of said loops approximated, said belt comprising an outermost layer of strong fabric material and an innermost layer of close-textured filter fabric, and a plurality of presser rolls, one loop of said belt passing over said rolls and engaging therewith on its inner face and the other loop encircling the first named loop, a plurality of idler rolls disposed between said presser rolls and adapted to give a reverse bend to the belt in said first named loop, means for rotating the assemblage of loops and rolls about an included axis, means for giving the belt an independent traveling motion, and means for feeding material to be expressed to said inner face.

48. In a belt press, a double belt having on one side a layer of flat-faced belting material of high tensile strength, said layer being perforated, and on the other a layer of filter fabric material.

49. In a press, an endless belt looped to form a double arc, means for revolving said double arc about an included axis, means for giving said belt an independent traveling motion and means for feeding material against the inner face of the inner arc.

50. In a press, an endless belt looped to form a double arc, means for revolving said double arc about an included axis, means for giving said belt an independent traveling motion, and a plurality of presser rolls engaging the inner face of the inner arc.

51. In a press, an endless belt looped to form a double arc, means for revolving said double arc about an included axis, means for giving said belt an independent traveling motion, and a plurality of presser rolls engaging the inner face of the inner arc, one or more of said rolls being mounted to permit radial movement.

52. In a press, an endless belt looped to form a double arc, means for revolving said double arc about an included axis, means for giving said belt an independent traveling motion, and a plurality of presser rolls engaging the inner face of the inner arc, one or more of said rolls being circumferentially grooved.

53. In a press, an endless belt looped to form a double arc, means for revolving said double arc about an included axis, means for giving said belt an independent traveling motion, a plurality of presser rolls engaging the inner side of the inner arc and one or more idler rolls engaging the outer side of the inner arc between said presser rolls.

54. In a press, an endless belt looped to form a double arc, means for revolving said double arc about an included axis, means for giving said belt an independent traveling motion, a plurality of presser rolls engaging the inner side of the inner arc, one or more of said rolls being circumferentially grooved and one or more being free to move radially, and one or more idler rolls engaging the outer side of the inner arc between said presser rolls.

55. In a press, a compound endless belt looped to form a double arc, said belt comprising a perforated layer of strong belting material and a layer of filter fabric, means for revolving said double arc about an included axis, means for giving said belt an independent traveling motion and means for feeding material against the inner face of the inner arc.

56. In a press, a compound endless belt looped to form a double arc, said belt comprising a perforated layer of strong belting for revolving said double arc about an included axis, means for giving said belt an independent traveling motion, and a plurality of presser rolls engaging the inner face of the inner arc.

57. In a press, a compound endless belt looped to form a double arc, said belt comprising a perforated layer of strong belting material and a layer of filter fabric, means for revolving said double arc about an included axis, means for giving said belt an independent traveling motion, and a plurality of presser rolls engaging the inner

face of the inner arc, one or more of said rolls being circumferentially grooved.

58. In a press, a compound endless belt looped to form a double arc, said belt comprising a perforated layer of strong belting material and a layer of filter fabric, means for revolving said double arc about an included axis, means for giving said belt an independent traveling motion, a plurality of presser rolls engaging the inner side of the inner arc and one or more idler rolls engaging the outer side of the inner arc between said presser rolls.

59. In a press, a compound endless belt looped to form a double arc, said belt comprising a perforated layer of strong belting material and a layer of filter fabric, means for revolving said double arc about an included axis, means for giving said belt an independent traveling motion, a plurality of presser rolls engaging the inner side of the inner arc, one or more of said rolls being circumferentially grooved and one or more being free to move radially, and one or more idler rolls engaging the outer side of the inner arc between said presser rolls.

60. In a rotary press, a rotor comprising a drum provided with peripheral means for the discharge of expressed solids and liquids, rotary pressing means mounted therein and means for giving independent rotary movement to said drum and said pressing means.

61. In a rotary press, a rotor comprising a drum provided with peripheral means for the discharge of expressed solids and liquids, a presser roll mounted therein, a presser belt engaging said roll, means for looping said belt around said roll and means for giving independent rotary motion to said drum and said roll.

62. In a rotary press, a rotor comprising a drum provided with peripheral means for the discharge of expressed solids and liquids, a plurality of presser rolls mounted therein, a presser belt engaging said rolls, means for looping said belt around said rolls and means for giving independent rotary motion to said drum and said rolls.

63. In a rotary press, a rotor comprising a drum provided with peripheral means for the discharge of expressed solids and liquids, a plurality of presser rolls mounted therein, a presser belt looped around and engaging said rolls, an idler roll engaging said belt between the presser rolls and adapted to give said belt a reverse bend and means for giving independent rotary motion to said drum and said rolls.

64. In a rotary press, a rotor comprising a drum having a peripheral opening for the discharge of expressed solids, a plurality of presser rolls mounted therein, a presser belt looped around the presser rolls to give a double arc, one end of said arcs being in cooperative position with regard to said peripheral means for the discharge of solids, idlers coöperating with said presser rolls to maintain the belt in arcuate form, and means for giving independent rotary motion to said drum and said rolls.

65. In a rotary press, a rotor comprising a drum having a peripheral opening for the discharge of expressed solids, a plurality of presser rolls mounted therein, a presser belt looped around the presser rolls to give a double arc, one end of said arcs being in cooperative position with regard to said peripheral means for the discharge of solids, idlers coöperating with said presser rolls to maintain the belt in arcuate form, one or more of said idlers being adapted to give the belt a reverse bend between said presser rolls, and means for giving independent rotary motion to said drum and said rolls.

66. In a rotary press, a rotor comprising a drum having a peripheral opening for the discharge of expressed solids, a plurality of presser rolls mounted therein, a presser belt comprising a perforated layer of heavy belting material and a layer of press-cloth material looped around the presser rolls to give a double arc, the second layer forming the inner face of the inner arc and engaging the face of the presser rolls and forming the outer face of the outer arc, one end of said arcs being in coöperative position with regard to said peripheral means for the discharge of solids, idlers coöperating with said presser rolls to maintain the belt in arcuate form, and means for giving independent rotary motion to said drum and said rolls.

67. In a rotary press, a rotor comprising a drum having a peripheral opening for the discharge of expressed solids, a plurality of presser rolls mounted therein, a presser belt comprising a perforated layer of heavy belting material and a layer of press-cloth material looped around the presser rolls to give a double arc, the second layer forming the inner face of the inner arc and engaging the face of the presser rolls and forming the outer face of the outer arc, one end of said arcs being in coöperative position with regard to said peripheral means for the discharge of solids, idlers coöperating with said presser rolls to maintain the belt in arcuate form, one or more of said idlers being adapted to give the belt a reverse bend between said presser rolls, and means for giving independent rotary motion to said drum and said rolls.

68. In a rotary press, a rotor comprising a rotary drum having peripheral openings for the discharge of expressed solids and liquids, contained rotary pressing means having a discharge point for solids in cooperative position with said peripheral discharge openings for solids, means for im-

parting independent rotation to the drum and the rotary pressing means and a stationary housing around the drum and spaced away therefrom to form a conduit for discharged solids.

69. In a rotary press, a rotor comprising a rotary drum having peripheral openings for the discharge of expressed solids and liquids, contained rotary pressing means having a discharge point for solids in cooperative position with said peripheral discharge openings for solids, means for imparting independent rotation to the drum and the rotary pressing means, a stationary housing around the drum and spaced away therefrom to form a conduit for discharged solids and means carried by the drum for sweeping said space.

70. In a rotary press, the combination of a rotary drum having peripheral discharge openings for solids and liquids, collecting casings surrounding said drum for receiving solids and liquids, a plurality of presser rolls revolubly mounted within said drum, a presser belt looped around said rolls and so located and arranged as to discharge expressed solids through said peripheral discharge openings for solids, means for rotating the drum and means driven thereby for imparting an independent rotation to the rolls.

71. In a rotary press, the combination of a rotary drum having peripheral discharge openings for solids and liquids, collecting casings surrounding said drum for receiving solids and liquids, a plurality of presser rolls revolubly mounted within said drum, a presser belt looped around said rolls and so located and arranged as to discharge expressed solids through said peripheral discharge openings for solids, a hollow driven shaft for rotating said drum, and a concentric solid shaft receiving power from the solid shaft and having a drive connection with one of said presser rolls.

72. In a rotary press, the combination of a rotary drum having peripheral discharge openings for solids and liquids, collecting casings surrounding said drum for receiving solids and liquids, a plurality of presser rolls mounted within said drum, a presser belt looped around said rolls and so located and arranged as to discharge expressed solids through said peripheral discharge openings for solids, a hollow driven shaft for rotating said drum, a solid shaft contained within the hollow shaft and having a drive connection with one of the presser rolls, and intermediate means transmitting power from the hollow to the solid shaft.

73. In a rotary press, a rotor comprising a drum, a plurality of presser rolls mounted therein, one of said rolls being mounted to permit a limited radial movement, a presser belt looped around and engaging said presser rolls and means for imparting differential rotation to said drum and said rolls.

74. In a rotary press, the combination of a rotary drum having peripheral discharge openings for solids and liquids, collecting casings surrounding said drum for receiving solids and liquids, a plurality of presser rolls mounted within said drum, a presser belt looped around said rolls and so located and arranged as to discharge expressed solids through said peripheral discharge openings for solids, a hollow driven shaft for rotating said drum, a solid shaft contained within the hollow shaft and having a drive connection with one of the presser rolls, intermediate means transmitting power from the hollow to the solid shaft, a screw feed supplying material to the interior face of the presser belt at a point near its engagement with a presser roll and intermediate power-transmitting connections between the solid shaft and the screw feed.

75. In a press, a plurality of presser rolls, a presser belt looped around and engaging said rolls, means for giving the assemblage a rotary motion about an included axis, means for feeding material to be expressed against the inner surface of said belt before its engagement with the first of said presser rolls, means for supplying a fluid to the expanding material upon the belt immediately behind said roll and means for removing expressed material from the belt behind the last of said presser rolls.

76. In a rotary press, a rotor, a plurality of presser rolls and a presser belt mounted therein, means for giving independent rotation to the rotor and the rolls, and a crank mounting for one of said rolls in said rotor, said crank mounting being adjustable to permit a limited radial movement of the roll so mounted.

77. In a rotary press, a rotor, a plurality of presser rolls and a presser belt mounted therein, means for giving independent rotation to the rotor and the rolls, and a crank mounting for one of said rolls in said rotor, said crank mounting comprising a lever arm carrying a slotted member, a fixed pin engaging the slot and a set screw for limiting the movement of the slotted member upon said pin.

78. The process of expression which comprises placing a layeriform body of material to be expressed in rapid orbital motion around an included axis and also giving said body an independent motion relative to its original position and subjecting such material to pressure and release of pressure in the course of said motions.

79. The process of expression which comprises placing a layeriform body of material to be expressed in rapid orbital revolution around an included axis and also giv-

ing said body an independent traveling motion, and during such traveling motion alternately compressing and decompressing said body a plurality of times.

80. The process of expression which comprises centrifugally depositing a layeriform body of material upon a carrier rapidly revolving about an included axis, and subjecting such material to a plurality of successive compressions while centrifugally positioned on said carrier.

81. The process of expression which comprises centrifugally depositing a layeriform body of material upon a carrier rapidly revolving about an included axis, giving such body a further independent traveling motion, and during such traveling motion alternately compressing and decompressing said body a plurality of times.

82. The process of expression which comprises centrifugally spreading a layer of material over a surface rapidly revolving about a central axis, and subjecting such layer to intermittent compression.

83. The process of expression which comprises continuously spreading a layer of material by centrifugal force over a surface rapidly revolving about a central axis, and subjecting such layer to intermittent compression.

84. In the art of expressing liquids from solids the process which comprises centrifugally distributing a layer of liquid-containing material over a surface having a rapid motion of rotation about an included axis, and an independent motion of translation, and intermittently compressing such layer upon the surface so moving.

85. In the art of expressing liquids from solids the process which comprises centrifugally distributing a layer of liquid-containing material over a surface having a rapid motion of rotation about an included axis, and an independent motion of translation, intermittently compressing such layer upon the surface so moving, and centrifugally removing from said surface the expressed solids and the liquid.

86. In the art of expressing liquids from solids the process which comprises centrifugally distributing a layer of liquid-containing material over a surface having a rapid motion of rotation about an included axis, and an independent motion of translation, and compressing such layer upon the surface so moving.

87. In the art of expressing liquids from solids the process which comprises centrifugally distributing a layer of liquid-containing material over a surface having a rapid motion of rotation about an included axis, and an independent motion of translation, compressing such layer upon the surface so moving, and centrifugally removing from said surface the expressed solids and liquids.

88. The process of expression which comprises continuously feeding a layer of material by centrifugal force against a surface having a rapid motion of rotation and a motion of translation, and compressing such layer upon the surface so moving.

89. The process of expression which comprises continuously feeding a layer of material by centrifugal force against a surface having a rapid motion of rotation and a motion of translation, compressing such layer upon the surface so moving.
trifugally removing the expressed material.

90. The process of expression which comprises supplying granular material to be expressed to form a constantly renewed and removed layeriform body in rapid orbital movement about an included axis and giving said body also an independent movement from the point of feed to the point of discharge, and during such movement mechanically compressing the body.

91. The process of expression which comprises continuously feeding granular material to be expressed against the inner periphery of a presser element in rapid orbital movement and continuously removing expressed material therefrom and subjecting said material to a temporary compression during the time it remains against said periphery.

92. A pressing apparatus comprising a flexible presser member, a second presser member adapted to contact therewith, both presser members being mounted in such a manner as to be revoluble about a common axis, means for revolving said presser members, means for imparting independent traveling motion to said flexible member, and means for feeding material upon said flexible member.

93. A pressing apparatus comprising a presser member mounted to revolve rapidly about an included axis, means for revolving said presser member, means for giving said presser member independent traveling motion, means for centrifugally distributing material upon said presser member, means for compressing said material thereon, and means for removing expressed material therefrom.

94. A pressing apparatus comprising a presser member mounted to revolve rapidly about an included axis, means for revolving said presser member, means for giving said presser member independent traveling motion, means for continuously distributing material upon said presser member, means for compressing said material thereon, and means for removing expressed material therefrom.

95. The process of expression which comprises centrifugally producing and maintaining a relatively thin clinging layer of granular material upon the inner periphery

of a presser member in orbital revolution, said layer being continuously replenished and removed and during the period of maintenance subjecting such layer to compression by another presser member.

96. The process of expression which comprises centrifugally producing and maintaining a relatively thin clinging layer of granular material upon the inner periphery of a presser member in orbital revolution, said layer being continuously replenished and removed and during the period of maintenance subjecting such layer a plurality of times to alternating compression and release of pressure.

In testimony whereof, I affix my signature in the presence of witnesses.

JOHN J. BERRIGAN.

Witnesses:
F. E. BENEDICT,
GEO. R. REMINGTON.

Corrections in Letters Patent No. 994,631.

It is hereby certified that in Letters Patent No. 994,631, granted June 6, 1911, upon the application of John J. Berrigan, of Orange, New Jersey, for an improvement in "Extraction Processes and Apparatus Therefor," errors appear in the printed specification requiring correction as follows: Page 8, line 79, the words and syllable "one or more independently ro-" should be stricken out and the words *means for compressing material clinging to said face, one of the engaging* inserted instead; same page, line 105, the word "rovoluble" should read *revoluble;* page 10, line 117, after the word "belting" the words *material and a layer of filter fabric, means* should be inserted; page 13, line 77, after the word "moving" the period should be stricken out and the word and syllable *and cen-* be inserted instead; and that the said Letters Patent should be read with these corrections therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 27th day of June, A. D., 1911.

[SEAL.]

C. C. BILLINGS,
Acting Commissioner of Patents.

of a presser member in orbital revolution, said layer being continuously replenished and removed and during the period of maintenance subjecting such layer to compression by another presser member.

96. The process of expression which comprises centrifugally producing and maintaining a relatively thin clinging layer of granular material upon the inner periphery of a presser member in orbital revolution, said layer being continuously replenished and removed and during the period of maintenance subjecting such layer a plurality of times to alternating compression and release of pressure.

In testimony whereof, I affix my signature in the presence of witnesses.

JOHN J. BERRIGAN.

Witnesses:
F. E. BENEDICT,
GEO. R. REMINGTON.

Corrections in Letters Patent No. 994,631.

It is hereby certified that in Letters Patent No. 994,631, granted June 6, 1911, upon the application of John J. Berrigan, of Orange, New Jersey, for an improvement in "Extraction Processes and Apparatus Therefor," errors appear in the printed specification requiring correction as follows: Page 8, line 79, the words and syllable "one or more independently ro-" should be stricken out and the words *means for compressing material clinging to said face, one of the engaging* inserted instead; same page, line 105, the word "rovoluble" should read *revoluble;* page 10, line 117, after the word "belting" the words *material and a layer of filter fabric, means* should be inserted; page 13, line 77, after the word "moving" the period should be stricken out and the word and syllable *and cen-* be inserted instead; and that the said Letters Patent should be read with these corrections therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 27th day of June, A. D., 1911.

[SEAL.]

C. C. BILLINGS,
Acting Commissioner of Patents.

Corrections in Letters Patent No. 994,631.

It is hereby certified that in Letters Patent No. 994,631, granted June 6, 1911, upon the application of John J. Berrigan, of Orange, New Jersey, for an improvement in "Extraction Processes and Apparatus Therefor," errors appear in the printed specification requiring correction as follows: Page 8, line 79, the words and syllable "one or more independently ro-" should be stricken out and the words *means for compressing material clinging to said face, one of the engaging* inserted instead; same page, line 105, the word "rovoluble" should read *revoluble;* page 10, line 117, after the word "belting" the words *material and a layer of filter fabric, means* should be inserted; page 13, line 77, after the word "moving" the period should be stricken out and the word and syllable *and cen-* be inserted instead; and that the said Letters Patent should be read with these corrections therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 27th day of June, A. D., 1911.

[SEAL.]

C. C. BILLINGS,

Acting Commissioner of Patents.