Sept. 29, 1936. L. A. MOLIN 2,055,697

OIL EXTRACTING MECHANISM

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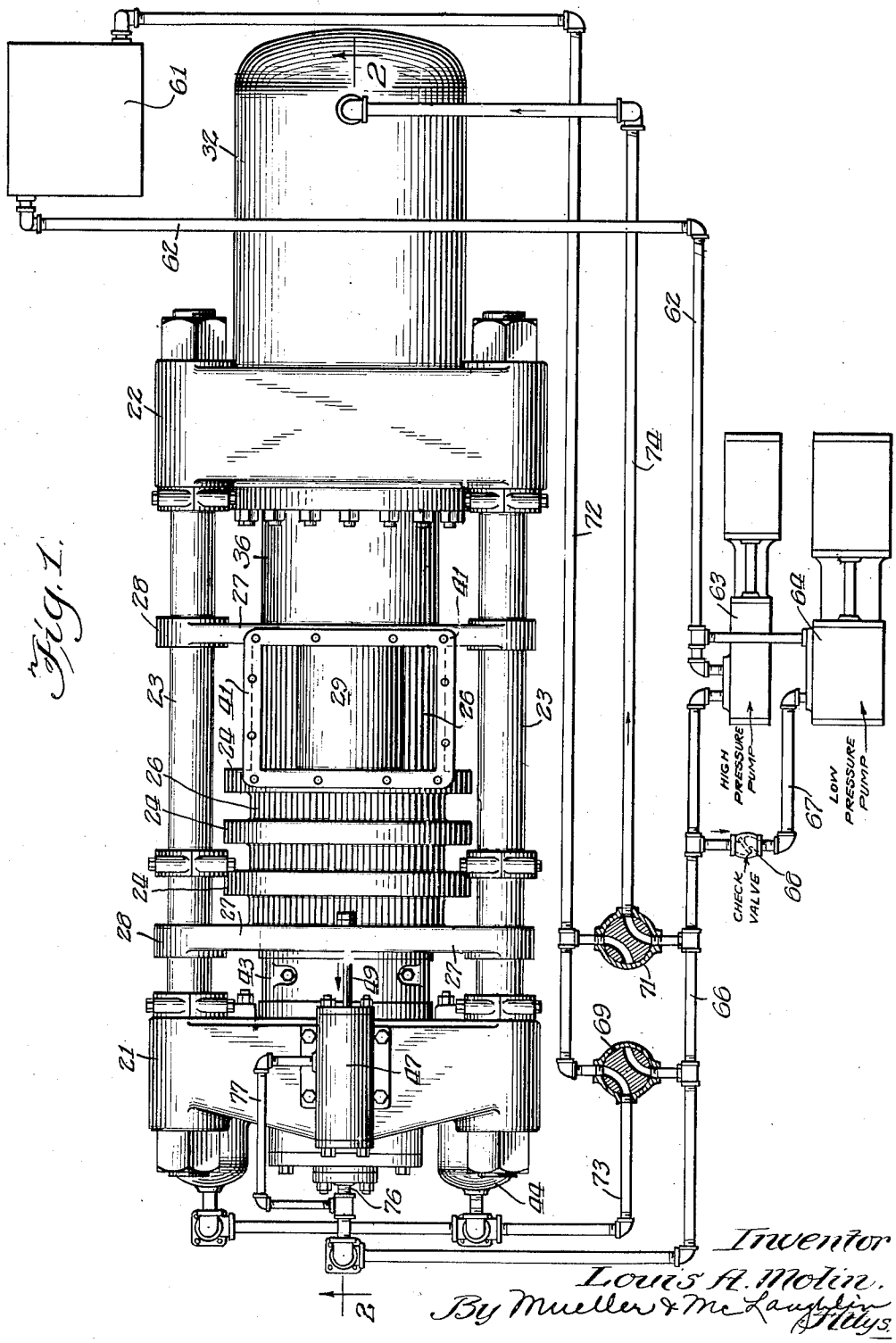


Fig. 1.

Inventor
Louis A. Molin.
By Mueller & McLaughlin
Attys.

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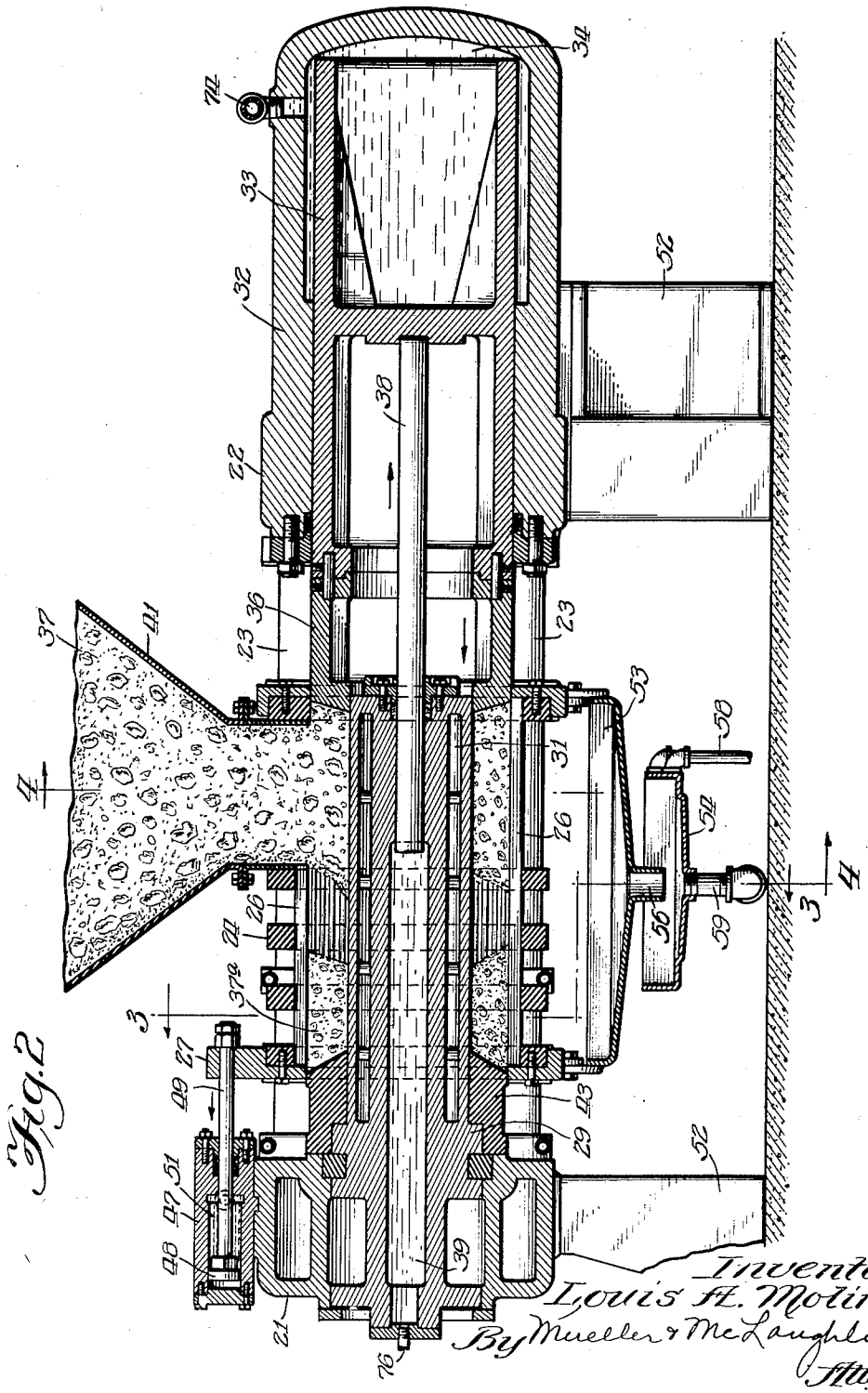


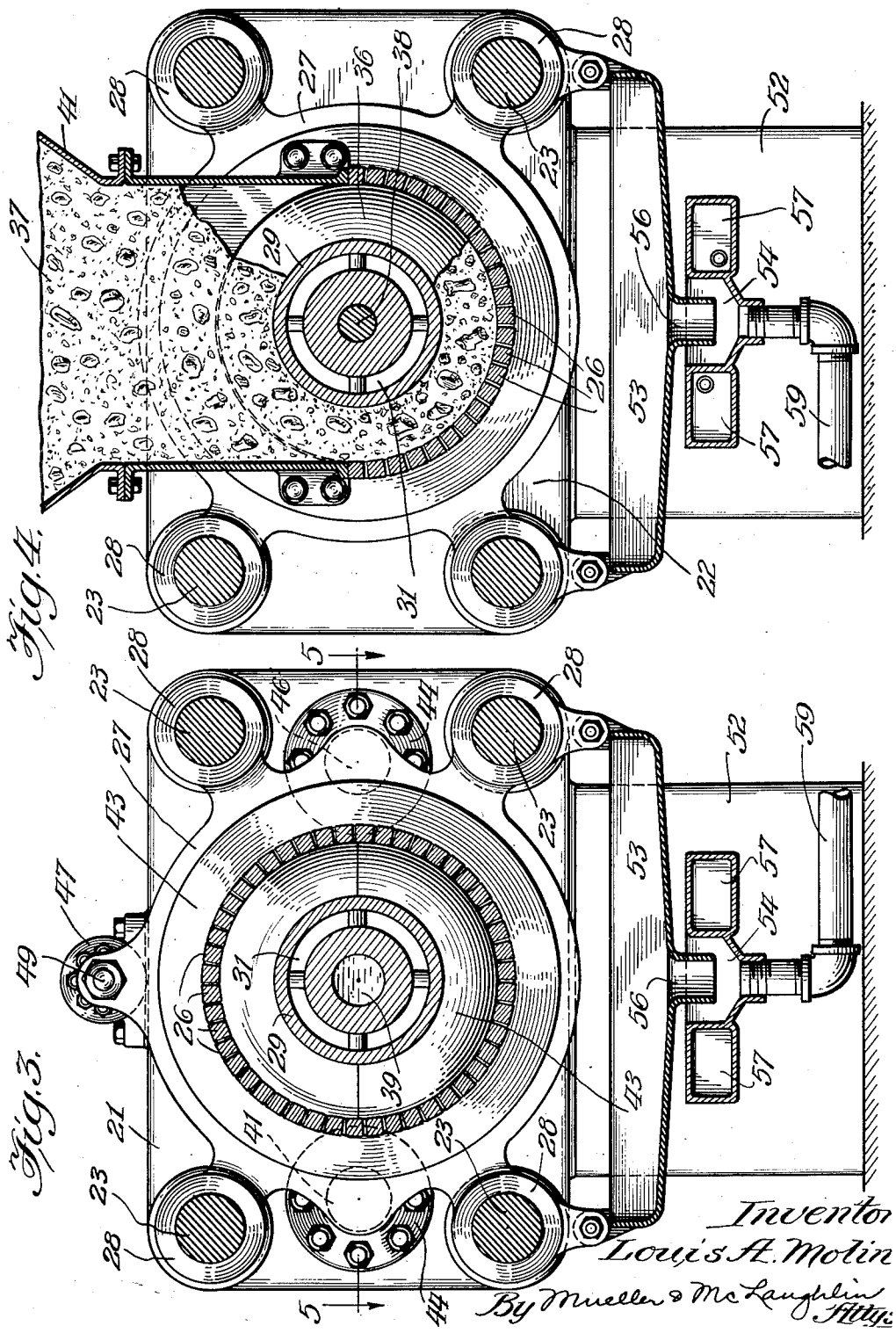
Fig. 2

Inventor
Louis A. Molin.
By Mueller & McLaughlin
Attys.

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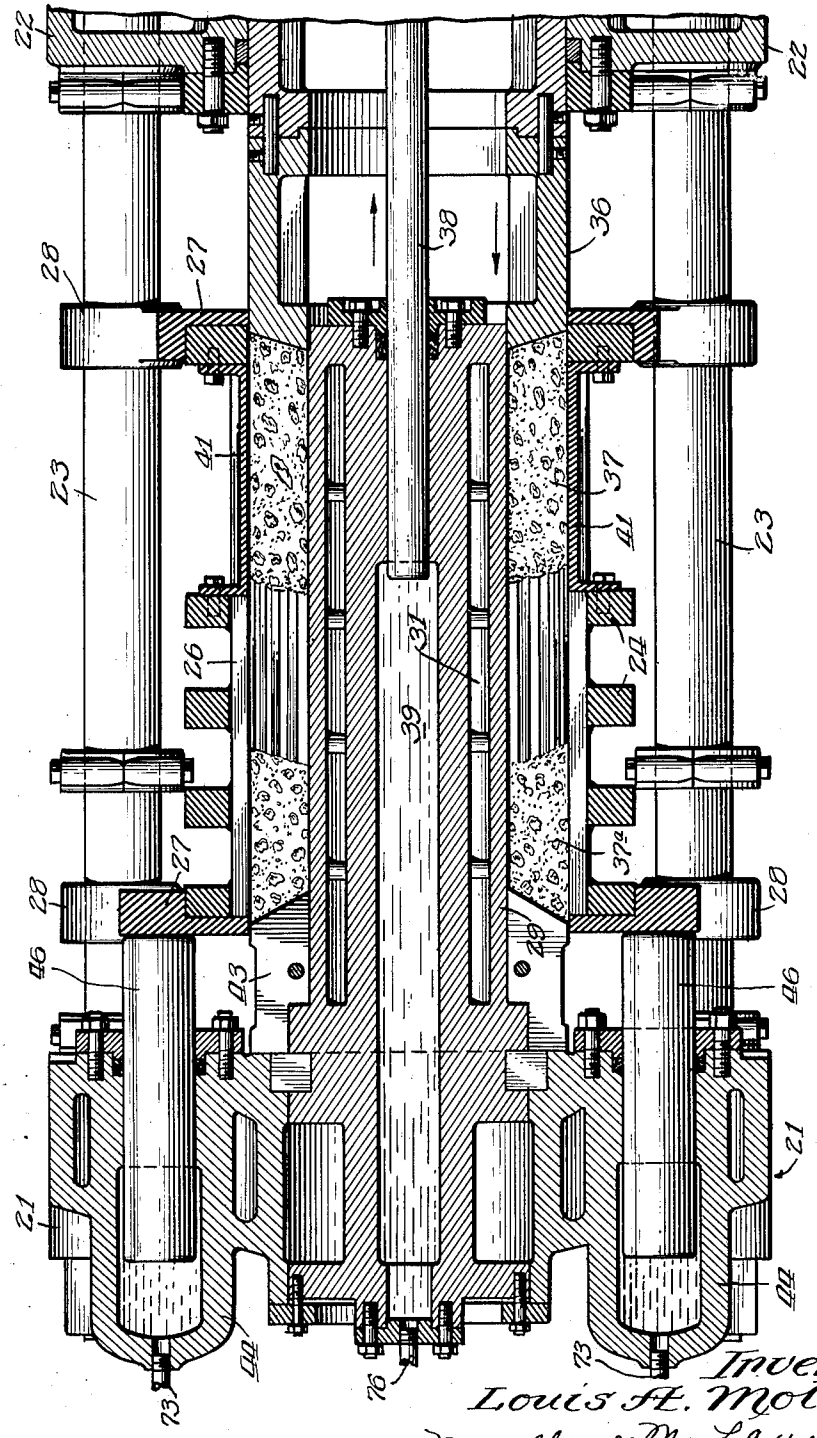


Fig. 5.

Inventor
Louis A. Molin.
By Mueller & McLaughlin
Attys.

Sept. 29, 1936. L. A. MOLIN 2,055,697

OIL EXTRACTING MECHANISM

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Fig. 6.

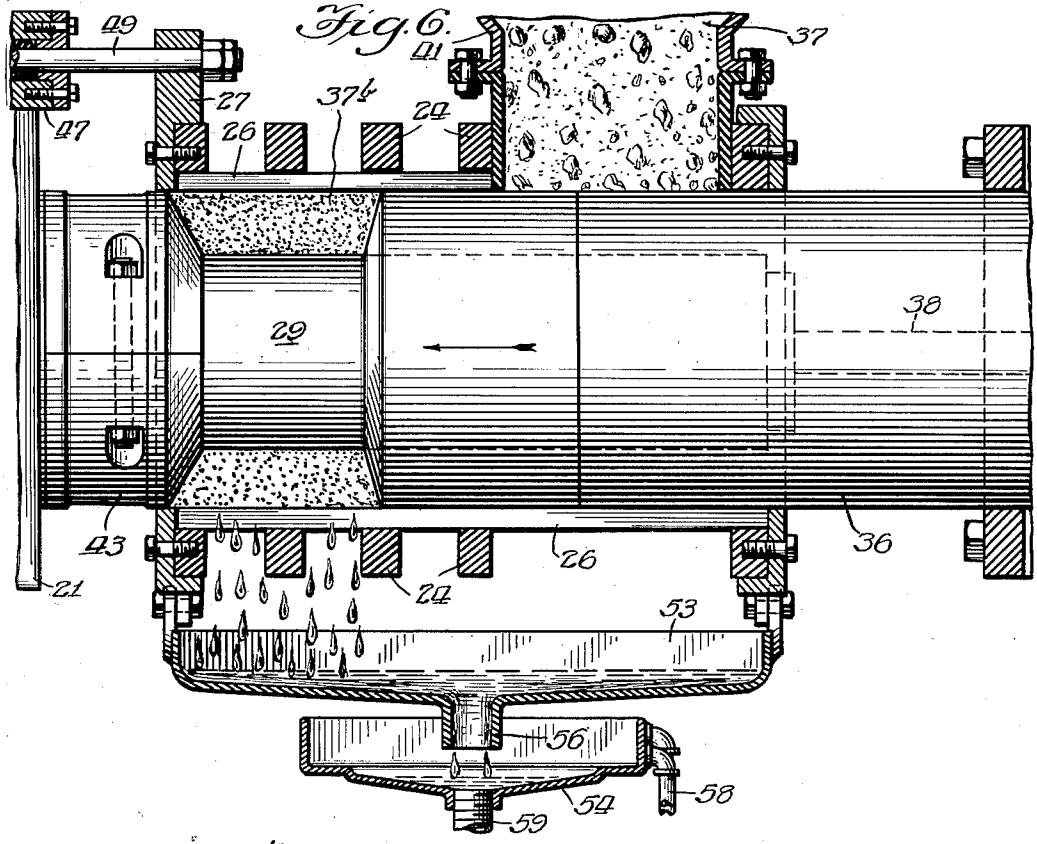
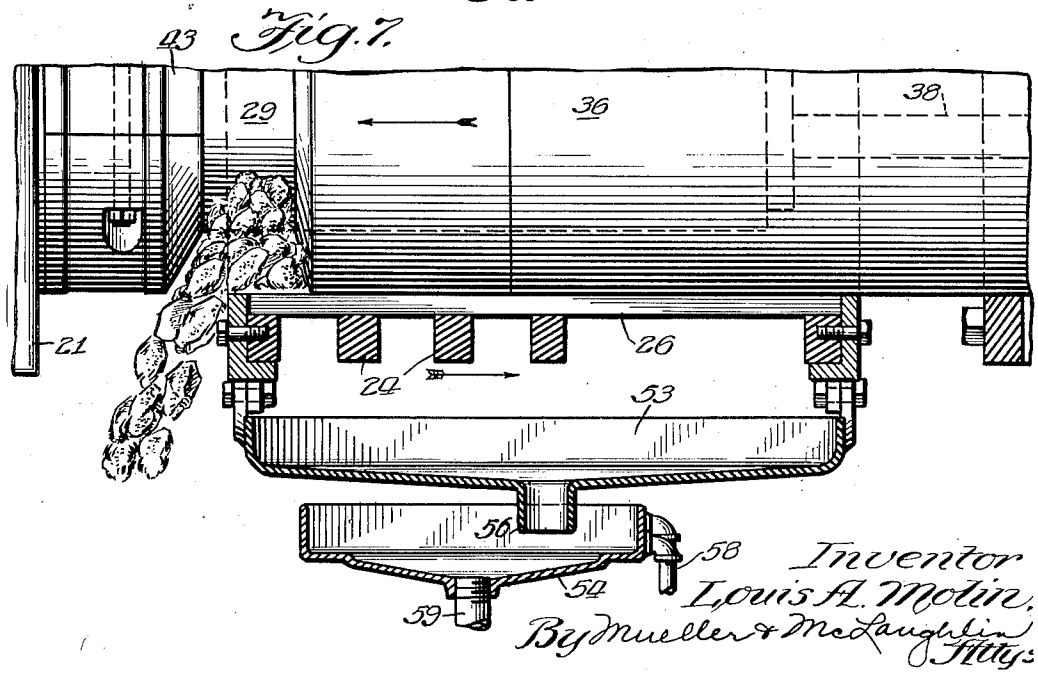


Fig. 7.



Inventor
Louis A. Molin,
By Mueller & McLaughlin
Attys.

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Fig. 8.

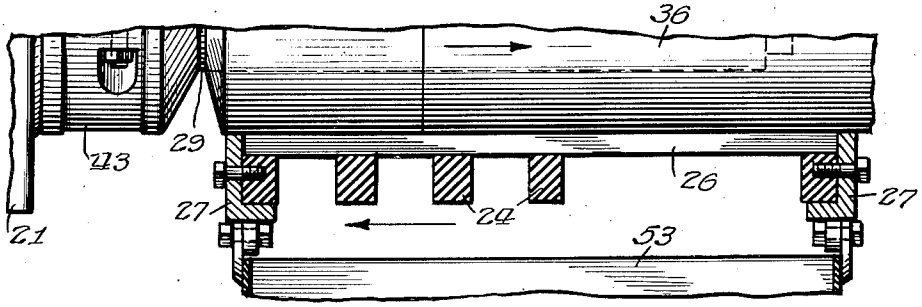


Fig. 9.

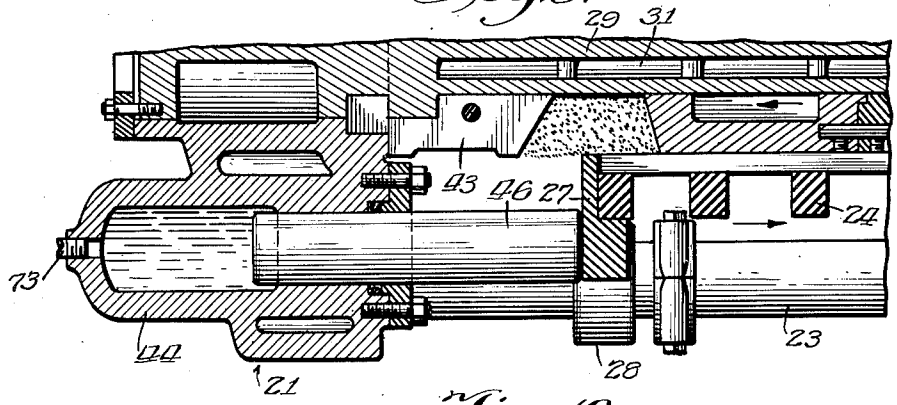
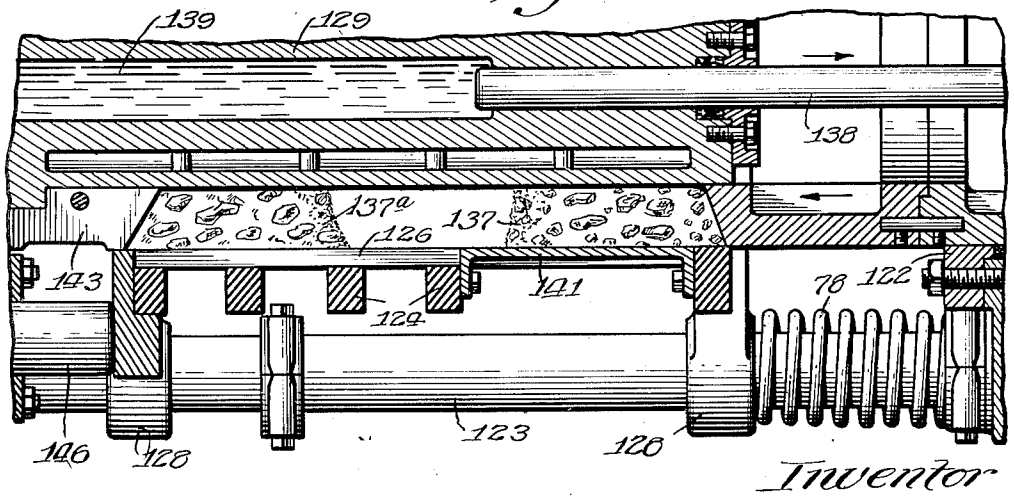


Fig. 10.



Inventor
Louis A. Molin.
By Mueller & McLaughlin
Attys.

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Fig. 11.

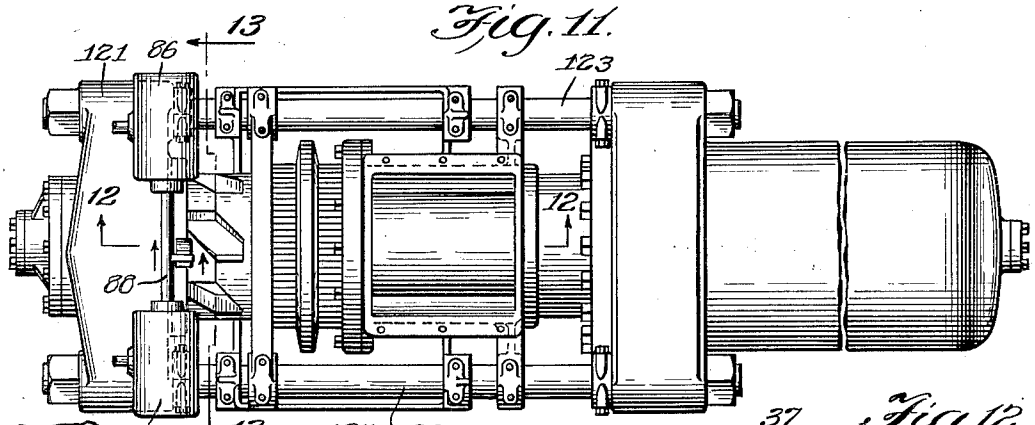


Fig. 12.

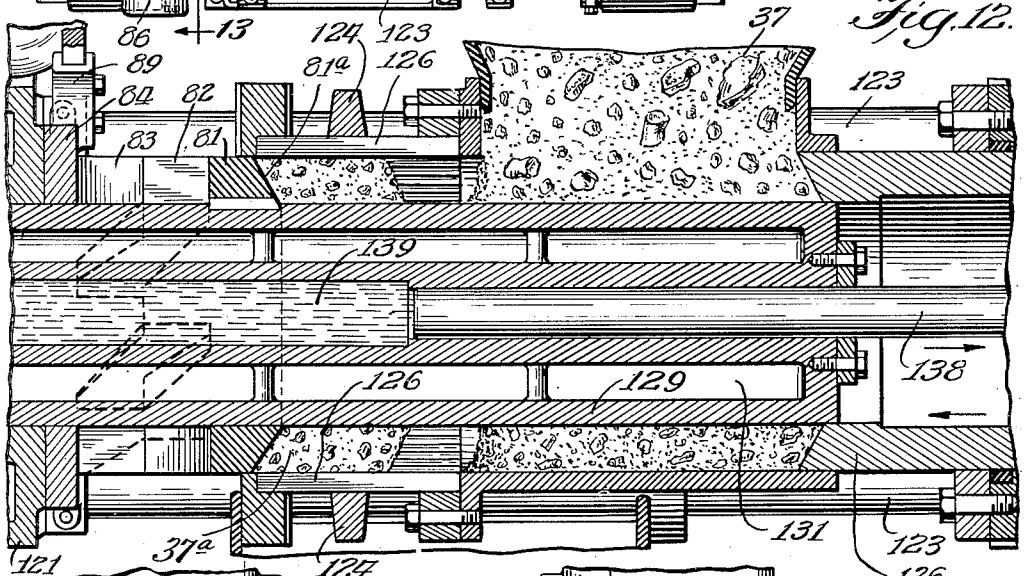
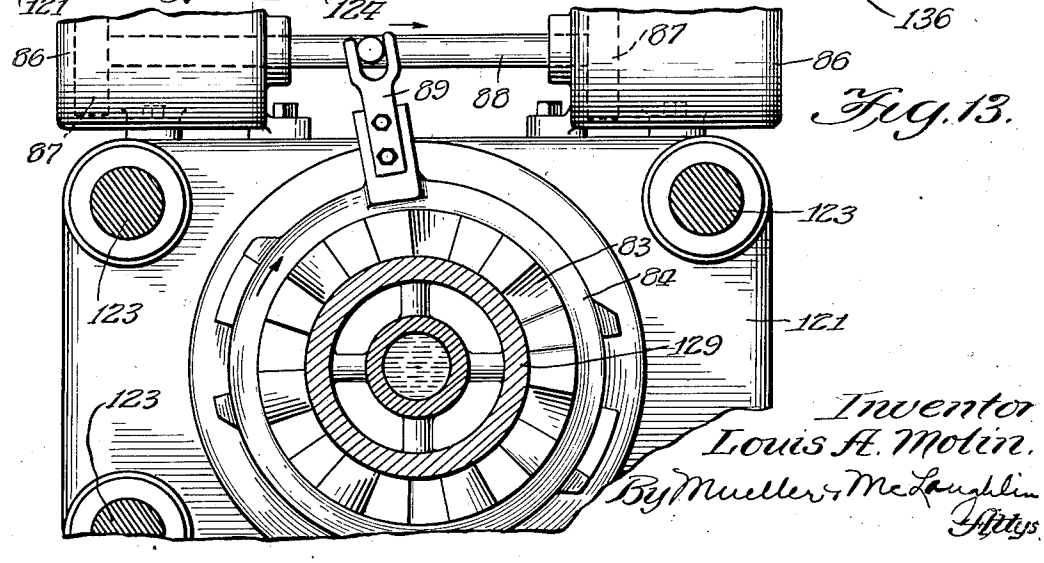


Fig. 13.



Inventor
Louis A. Molin.
By Mueller & McLaughlin
Attys.

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Fig. 14.

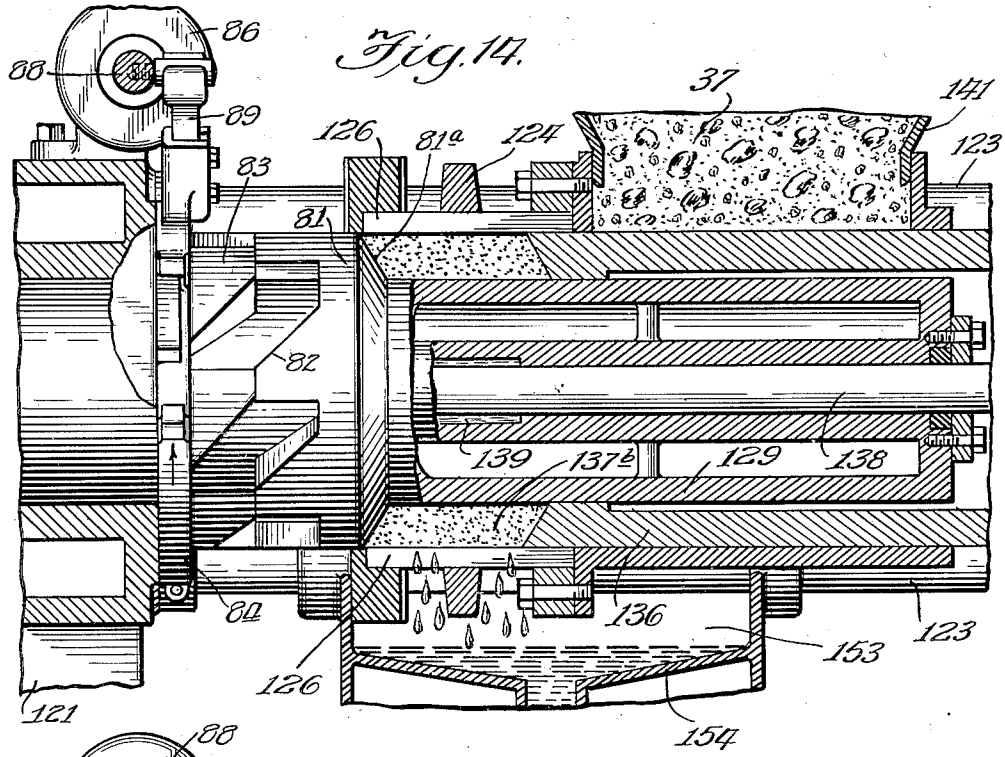
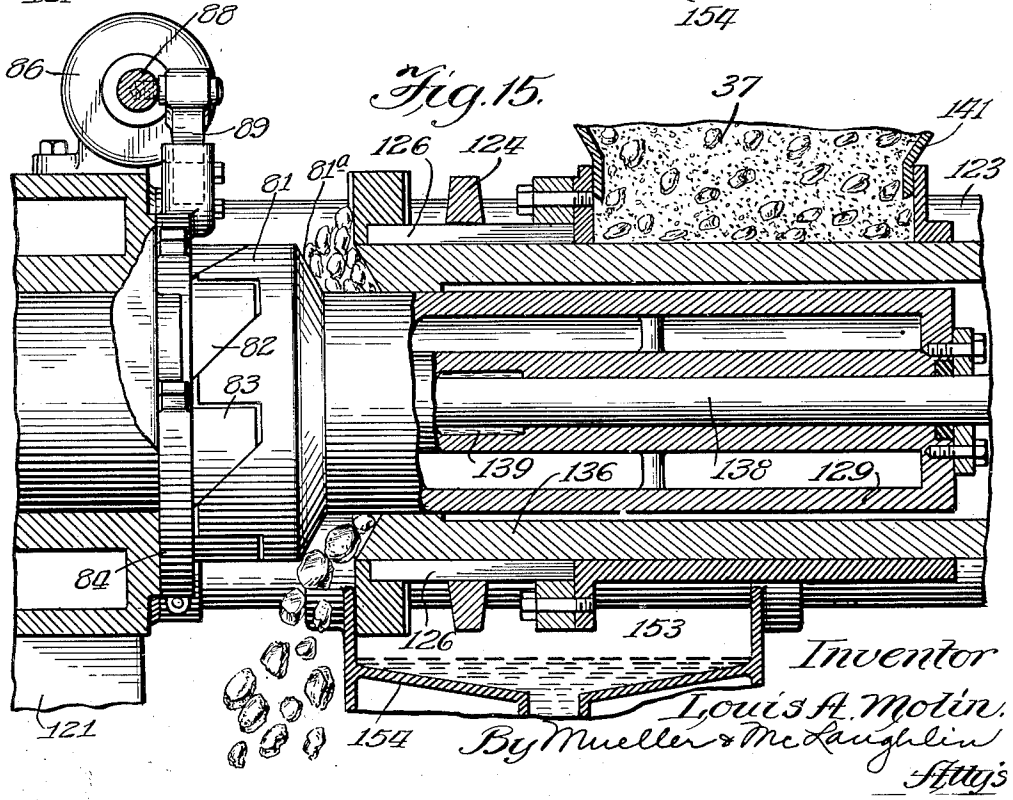


Fig. 15.



Inventor
Louis A. Molin.
By Mueller & McLaughlin
Attys

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OIL EXTRACTING MECHANISM

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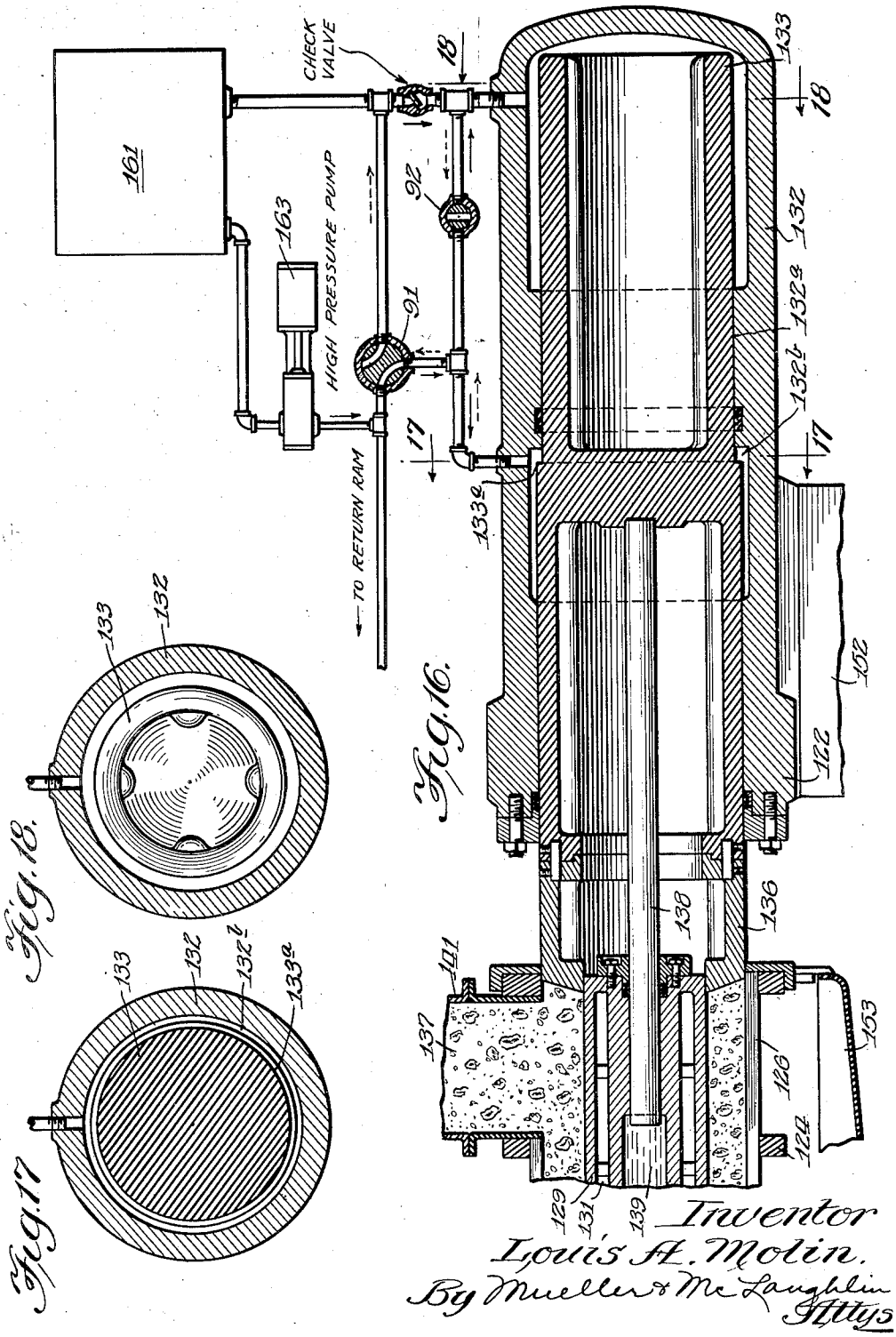


Fig. 16.

Fig. 18.

Fig. 17

Inventor
Louis A. Molin.
By Mueller & McLaughlin
Attys

Patented Sept. 29, 1936 2,055,697

UNITED STATES PATENT OFFICE

2,055,697

OIL EXTRACTING MECHANISM

Louis A. Molin, Chicago, Ill.

Application June 24, 1932, Serial No. 619,095

5 Claims. (Cl. 100—50)

My invention relates in general to the extraction of oil from oil bearing materials. It relates more in particular to improved method of and mechanism for extracting oils.

In the commercial extraction of oil from oil bearing materials such as oil bearing seeds, animal fats, and the like, it is customary to prepare the material by cooking in such a way as to leave the proper amount of moisture after which the material is pressed in a hydraulic press to remove all of the oils. Substantially all establishments using the hydraulic press system employ a curb anywhere from 18 to 24 inches in diameter, the material being loaded between dividing members, usually burlap, metal plates or some other form of separating device. This separation is to facilitate extraction of the oil to some extent but principally for the purpose of facilitating the removal of the residue. This form of pressing is objectionable principally from the time standpoint as it requires a great deal of time for the oil to pass from the inner portions of the material to the outside thereof. Moreover, when employing this method the curb must be loaded entirely by hand and the pressed cakes removed in the same way. Mechanism has been devised for the continuous extraction of the oil, but this mechanism has not been thoroughly satisfactory because inferior grade of oil is produced, a relatively large amount of oil is sometimes left in the residue, and the machines are apt to have a relatively short life.

In my prior co-pending application, Serial No. 589,382, filed January 28, 1932, and which matured into Patent No. 2,008,080 of July 16, 1935, I disclose a press mechanism having many other great advantages over the devices of the prior art. Under certain conditions, and treating certain types of materials, this form of press, while satisfactory, is capable of still further improvement.

The principal object of my present invention is to improve on the press mechanisms of the prior art as well as upon the press mechanism described in my co-pending application.

Another object is the provision of an improved oil extracting mechanism in which the curb can be loaded and the residue removed therefrom in a relatively short length of time.

Another object is the provision of an oil extruding mechanism of this character which is adapted for use with substantially any type of oil bearing material.

Another object is to improve the operation of the pressing ram to facilitate its use as a charging medium.

Another object is the inclusion of a mechanism as defined in any of the above objects in which the extrusion of oil is accelerated.

Other objects and features of the invention will be apparent from a consideration of the following detailed description taken with the accompanying drawings, wherein

Fig. 1 is a plan view showing one embodiment of the invention together with the hydraulic means for operating it;

Fig. 2 is a sectional view thereof taken on the line 2—2 of Fig. 1, the mechanism being shown partly loaded;

Figs. 3 and 4 are sectional views taken on the lines 3—3 and 4—4 respectively of Fig. 2;

Fig. 5 is a fragmentary enlarged plan section taken on the line 5—5 of Fig. 3;

Fig. 6 is a fragmentary vertical sectional view similar to Fig. 2 showing the parts in a different position;

Fig. 7 is a fragmentary section similar to Fig. 6 showing the position of the parts for expelling the residue material;

Fig. 8 is a fragmentary vertical sectional view of the parts in the position which they assume when all of the residue material has been removed.

Fig. 9 is a fragmentary plan sectional view showing the operation of the curb control piston;

Fig. 10 is a fragmentary plan section showing modified means for returning the curb;

Fig. 11 is a plan view partly broken away to conserve space and showing a modified residue expelling mechanism;

Fig. 12 is an enlarged fragmentary vertical sectional view taken on the line 12—12 of Fig. 11, showing the parts in loading position;

Fig. 13 is a cross section taken on the line 13—13 of Fig. 11;

Fig. 14 is a fragmentary vertical sectional view showing the position of the parts in the modified form in an oil extruding position;

Fig. 15 is a similar view showing the parts in position for expelling the residue material;

Fig. 16 is a fragmentary vertical sectional view showing a modified ram for accelerating the loading action; and

Figs. 17 and 18 are transverse sectional views taken on the lines 17—17 and 18—18, respectively, of Fig. 16.

In general, the oil extracting mechanism of my invention includes a curb formed with a

hopper for delivering material thereto, a ram for pressing the oil within the curb (the ram also functioning to charge the material into the curb delivered by the hopper), and means for providing an opening in the curb whereby by continued movement of the ram the residue material after the extraction of the oil may be forced out of said opening. In the preferred form of the invention, the curb is disposed longitudinally and a steam cylinder disposed within the curb but spaced therefrom provides an annular chamber for the oil bearing material. A ram annularly shaped to enter the space between the curb and cylinder also functions to deliver the material fed to the curb through a hopper to the portion of the curb removed from the hopper whereby two or more loading movements of the ram is sufficient to charge the entire curb space.

When pressure is applied to the material by means of the ram to extrude the oil therefrom, the hopper is closed by the side wall of the ram and the material is gradually compressed and in the form of a substantially solid cake. An annular opening is then provided either by moving the curb or moving a closure member against which the ram presses and continued movement of the ram will then function to break up the material and extrude or expel it through said annular space.

Referring now to Fig. 1, the embodiment there shown comprises a pair of frame members 21 and 22 in the nature of headers connected by tie rods 23—23. A curb is provided including a plurality of annular rings 24 and longitudinally disposed rectangular rods 26 spaced close enough together so as to allow the oil to pass between them but retain the residue material. A pair of end members 27—27 is provided secured to the curb and having ears 28—28 slidably supported on the tie rods 23. By this means, the curb is centered with respect to the machine as a whole, but is permitted to have sliding movement with respect thereto for a purpose and in a manner which will be described.

Within the curb I place a cylinder 29 provided with an open space 31 for admission of steam or other heating medium to hold the temperature of the oil bearing material at the most satisfactory temperature for pressing. A hydraulic cylinder 32 is formed integral with the header 22 and has disposed therein a hydraulic ram 33. This ram is suitably fitted in the hydraulic cylinder so that the hydraulic fluid such as water admitted to the space 34 will propel the ram in a left hand direction, looking at Fig. 2. This ram has an extension 36 and the main body of the ram with the extension is shaped so as to enter the space between the curb and cylinder 29 so that oil bearing material 37 may be moved along the space between the curb and cylinder and be pressed therein. The ram has secured thereto a piston rod 38 which extends into an open space 39 in the shoulder 29, into which space hydraulic fluid, steam, or other suitable material, may be admitted for returning the ram. A portion of the curb is cut away at the top thereof and a hopper 41 is secured over said cut-away place whereby the material 37 may be delivered to the inside of the curb. Materials so admitted will flow to the bottom around the sides and will fill the space at the top of the curb immediately below the hopper and to some extent also the space at the left of the hopper shown in Fig. 2.

By first advancing the ram a distance equal to part of this movement, however, material as indicated at 37*a* in Fig. 2 may be forced to the end of the curb space, the ram withdrawn, and a second charge applied which when the mechanism is diminished substantially as shown in the present embodiment will substantially fill the curb space.

When the ram is moved forwardly in the pressing operation, it covers the opening at the hopper, so as to avoid any possibility of any major portion of the material being forced out of this opening (Fig. 6). As the ram moves forwardly it continues to compress the material as the oil is removed until the major portion of the oil has been extracted, a solid cake of material substantially as shown in Fig. 6 at 37*b* will result. It should be borne in mind that this is merely illustrative, as in different materials a relative amount of residue differs. When the material has been compressed to a solid cake and substantially all of the oil removed, this substantially solid cake of residue material is removed to make ready for another charge.

For removing the residue material, I move the curb bodily in a right hand direction when looking at the drawings so as to provide an open space between a pressure ring 43 and the curb. A pair of cylinders 44 are formed integral with the head 21 or secured thereto as the engineering design might provide. Within the cylinders and reciprocable therein, I provide a pair of pistons 46, these pistons having their outer end engaging against the member 28. By admitting hydraulic fluid under pressure to the cylinders 44, the pistons 46 may be forced outwardly so as to move the entire curb assembly along the tie rods 23 and provide an open space immediately at the right of the pressure member 43. This pressure member is formed on a slant, as shown, and the ram has its end formed with an opposite slant to facilitate the breaking up of the residue material and the expelling and extrusion thereof. As will be made clear from the following description in which the modification of the invention is shown, it may be advisable under certain circumstances to leave the curb stationary and move the pressure member 43. Those skilled in the art will understand that mechanically this provision can be carried out by an ordinary skilled engineer.

When the residue material has been removed (Fig. 7), the entire curb assembly is returned to its original position. For this purpose, I provide a hydraulic cylinder 47 (Figs. 1 and 2) mounted on the header 21. A piston 48 disposed in the cylinder has secured thereto a piston rod 49 suitably attached to the adjacent member 28. By admitting hydraulic fluid under pressure to the space 51, the piston and rod may be forced in a left hand direction (Fig. 2) to return the entire curb assembly to its original position.

The frame proper is mounted upon suitable supports 52—52, leaving an open space between the two supports. An oil pan 53 is secured to the curb assembly for receiving the oil which passes between the curb members 26. This oil pan entirely moves with the curb assembly when it is moved and I provide a stationary receptacle into which oil from a spout 56 is adapted to flow independent of movement of the curb assembly. The receptacle 54 is provided with two open spaces 57 into which steam from pipes 58 is delivered for heating the receptacle 54 and maintaining the oil in a readily flowable condition. In some types of vegetable oils, this is unnecessary but can be used usually to great advantage

when animal fats are being extracted. The oil flows from the receptacle 54 through a pipe 59 to suitable storage tanks or to further equipment in which it may be given a subsequent treatment.

Suitable hydraulic means is employed for operating the various hydraulic pistons and rams heretofore described. In Fig. 1, I show a hydraulic system of a suitable type. This includes a source of water supply 61 which through a pipe 62 is adapted to deliver water to either a high pressure pump 63 or a low pressure pump 64. Water is delivered from the high pressure pump through a pipe 66 and a pipe 67 from the low pressure pump is adapted to deliver water into the pipe 66 through a check valve 68. Flow regulating valves 69 and 71 are provided having connection to the pipe 66 and each also having a connection to a pipe 72 which returns the water to the source 61. A pipe 73 having a connection to the control valve 69 delivers water to the curb operating cylinders 44, while a pipe 74 having a connection to the control valve 71 delivers water to the piston and main pressure ram.

The pipe 66 also is directly connected by a relatively short pipe 76 with the space 39 in cylinder 29, and also through a pipe 77 with the curb return cylinder 47.

When the valves are in the position shown, the ram 33 can be operated by operating through the high pressure pump 63 or the low pressure pump 64. When the curb is being loaded, I employ the low pressure chamber to move a relatively large body of water in a short length of time. I have not shown a valve in the pipe 76 to prevent flow of water into the cylinder 39 at this time. The control is somewhat simplified by leaving this valve out, as it merely has the effect of cutting down the size of the main hydraulic ram. It is understood, however, that any conventional valve may be employed in this connection. Similarly, the pipe 77 is open, thus holding the curb in closed position. This is satisfactory, although I may employ a valve in this pipe also to take some of the load off of the pistons 46 when the curb is being opened.

When the main ram is to be returned, the valve 71 is turned to allow water to flow through the pipe 74 through the valve and then through the pipe 72 back to the source 61. When dry material is to be expelled, the valve 69 is turned to allow water to flow from the pipe 66 through the pipe 73 to the cylinders 44. This valve is returned to the position shown in Fig. 1 when the curb is returned to its normal position. As to the two pumps, I may employ either of them. Preferably I use the low pressure chamber to initially press the material and substantially fill the cylinder 32 with water. Very little water is required then to build up and maintain pressure on the main ram and the high pressure pump delivering a relatively small amount of water is adequate for this purpose.

In the modification shown in Fig. 10, a plurality of relatively heavy springs 78 are disposed around the tie rods and between the member 128 and the header 122. Opening the curb by means of the pistons or plungers 146 has the effect of compressing the springs 78. When the hydraulic pressure is removed from the cylinders 44, however, the springs 78 are then effective to return the curb assembly together with the plungers.

The embodiment shown in Figs. 11 to 15, inclusive, is in its general makeup substantially the same as shown in the main form. This form, however, differs in the means for providing space at the end of the curb for expelling the residue material. The corresponding parts in the drawings are for convenience given the same numbers as employed in the main form, prefixed with the numeral "1". In this form however, the curb is stationary at all times, but I provide a pressure plate 81 having a slanting surface 81*a* against which the material is pressed. This pressure plate 81 has a plurality of toothlike cam members 82 co-operating with corresponding members 83 on a rotatable member 84, both the pressure plate 81 and the operating member 84 are journaled on the cylinder 129, the pressure plate being held against rotation by suitable keys. The operating member 84, however, is backed by the header 121 and in its turn backs the pressure plate 81 since the entire pressure of the ram 136 is against this pressure plate. Mounted above the header is a pair of cylinders 86 with pistons 87 connected by a rod 88. A connection 89 between the rod and member 84 permits this member 84 to be rotated partially by the action of hydraulic fluid in the cylinders. The pistons are preferably double acting, although if desired only a single piston may be made to operate in each direction. Suitable means as shown is provided for limiting the movement of the member 84.

As shown in Fig. 14, each of the sets of toothlike cam members 82 and 83 is provided with a slanting portion and a flat portion, the two flat portions abutting each other as shown in Fig. 14, to hold the pressure ring 81 in a position to close the curb. When the pistons are actuated, however, to partially rotate the member 84, it places the toothlike cam members 82 and 83 in the relative positions shown in Fig. 15 and the pressure of the material against the pressure ring moves the pressure ring over to cause an opening through which the material can be expelled. The pressure ring being held against turning when the curb is to be closed, the member 84 is merely moved in the opposite direction and the toothlike cam members performing their function return the pressure ring.

In the modification shown in Figs. 16 to 18, inclusive, I employ a ram construction which permits me to get the necessary quick movement of the ram to facilitate loading by means of a high pressure pump alone. The main cylinder 132 has an annular portion 132*a* engaging the ram 133 resulting in an offset 132*b*. The ram is formed with an annular shoulder 133*a* which forms in effect a separate relatively small area piston. The high pressure pump 163 withdraws hydraulic fluid from the storage tank 161 and delivers it to a two-way control valve 91. A single valve 92 is also provided so that water may be delivered from the high pressure pump either to the shoulder piston 133*a* or to the main ram. A suitable arrangement of check valves and pipes is, of course, provided for controlling the return of the water to the tank 161 when the ram is returned.

The operation of this ram appears clear from the description. During loading, the shoulder piston 133*a* only is employed whereby with a relatively small amount of water a rapid movement of the ram is obtained. The pressure is decreased due to the relatively smaller area, but I have determined that for loading purposes, the pressure obtained from the use of the shoulder piston is adequate. It will be understood that any of the usual means for avoiding the creation of a vacuum in the main ram piston can be employed. I may also employ any suitable means for causing a quick flow of water into the

main piston. Storage tanks in which a relatively large body of water is delivered by gravity are well known in the art and such may be employed in the present instance.

As to the remaining portions of Fig. 16, I employ the same reference characters as used in the main figures prefixed by the numeral "1". The remaining portions, therefore, may not be described in detail.

While I have described my invention fully including embodiments thereof to enable those skilled in the art to practice the same, I do not restrict myself to the various forms of the invention shown, but such invention is limited only by the scope of the appended claims.

What I claim as new and desire to protect by Letters Patent of the United States is:

1. In an hydraulic press for oil extrusion, a single curb, an immovable cylinder disposed within the curb and spaced therefrom to provide an annular storage space betwen the cylinder and curb, means for delivering oil bearing material to said space, a pressing ring immovable during the pressing operation carried at one end of the cylinder, a hollow ram closed at one end and open at the other to enter said annular space for pressing the material therein, hydraulic means for driving the ram from a normal position into said space, means operating within said cylinder and acting on said ram to return said ram to its normal position, and hydraulic means operating independently of said ram after completion of the pressing operation for dissociating said pressing ring and curb to provide for the expulsion of the residue material from the curb.

2. In an hydraulic press for oil extrusion, a front and a rear header, tie rods supported between the headers, a curb slidably supported on said tie rods for carrying oil bearing material therein, an immovable pressure ring on the front header closing the front end of the curb, an hydraulic cylinder secured to the rear header having an elongated central bore, a hollow ram reciprocable in said bore and closing the rear end of the curb, an elongated cylinder rigidly mounted on the front header extending into the curb the length of the curb but spaced away from the inner wall to permit forward insertion of said ram, a central hydraulic chamber in said elongated cylinder for receiving a corresponding forward extension on said ram to return said ram to inoperative position after the pressing operation, an annular heating chamber on said elongated cylinder surrounding the hydraulic chamber for carrying steam to heat the material in the curb, means for moving the curb on the tie rods away from the pressure ring to provide a material expelling opening, and means for returning the curb to closed position.

3. In an hydraulic press for oil extrusion, a front and a rear header, tie rods supported between the headers, a curb slidably supported on said tie rods for carrying oil bearing material therein, a pressure ring immovably carried on the front header to close the front end of the curb, an hydraulic cylinder secured to the rear header having an elongated central bore, a hollow ram reciprocable in said bore and closing the rear end of the curb, an elongated cylinder rigidly mounted on the front header extending through the pressure ring into the curb but spaced away from the inner wall thereof to permit reciprocable insertion of said ram to press the oil bearing material, a pair of supplementary hydraulic pistons operating in cylinders on said front header for moving the curb on the tie rods away from said pressure ring to provide a material expelling opening, and additional hydraulic means on said front header for returning the curb to engagement with the pressure ring after the expelling operation.

4. In an hydraulic press for oil extrusion, a front and a rear header, tie rods supported between the headers, a curb slidably supported on said tie rods for carrying oil bearing material therein, a pressure ring immovably carried on the front header to close the front end of the curb, an hydraulic cylinder secured to the rear header having an elongated central bore, a hollow ram reciprocable in said bore having a forward extension thereon, an elongated cylinder rigidly mounted on the front header extending through the pressure ring and into the curb but spaced away from the inner wall thereof to permit forward insertion of said ram to press the oil bearing material, a central chamber in said elongated cylinder to receive the ram extension and means for applying hydraulic pressure to said chamber to move said extension and ram rearwardly after the pressing action of the ram, a pair of supplementary hydraulic pistons operating in cylinders on said front header for moving the curb on the tie rods away from said pressure ring to provide a material expelling opening, and additional hydraulic means on said front header for returning the curb to engagement with the pressure ring after the expelling operation.

5. In an hydraulic press for oil extrusion, a front and a rear header, tie rods supported between the headers, a curb slidably supported on said tie rods, for carrying oil bearing material therein, a pressure ring immovably carried on the front header to close the front end of the curb, an hydraulic cylinder secured to the rear header having an elongated central bore, a hollow ram reciprocable in said bore and closing the rear end of the curb, an elongated cylinder rigidly mounted on the front header extending through the pressure ring into the curb but spaced away from the inner wall thereof to permit reciprocable insertion of said ram to press the oil bearing material, an annular heating chamber within the elongated cylinder adjacent the wall thereof to carry steam to heat the oil bearing material in the curb, a pair of supplementary hydraulic pistons operating in cylinders on said front header for moving the curb on the tie rods away from said pressure ring to provide a material expelling opening, and additional hydraulic means on said front header for returning the curb to engagement with the pressure ring after the expelling operation.

LOUIS A. MOLIN.