Oct. 27, 1942. R. T. ANDERSON 2,299,784

LIQUID EXPRESSING SYSTEM

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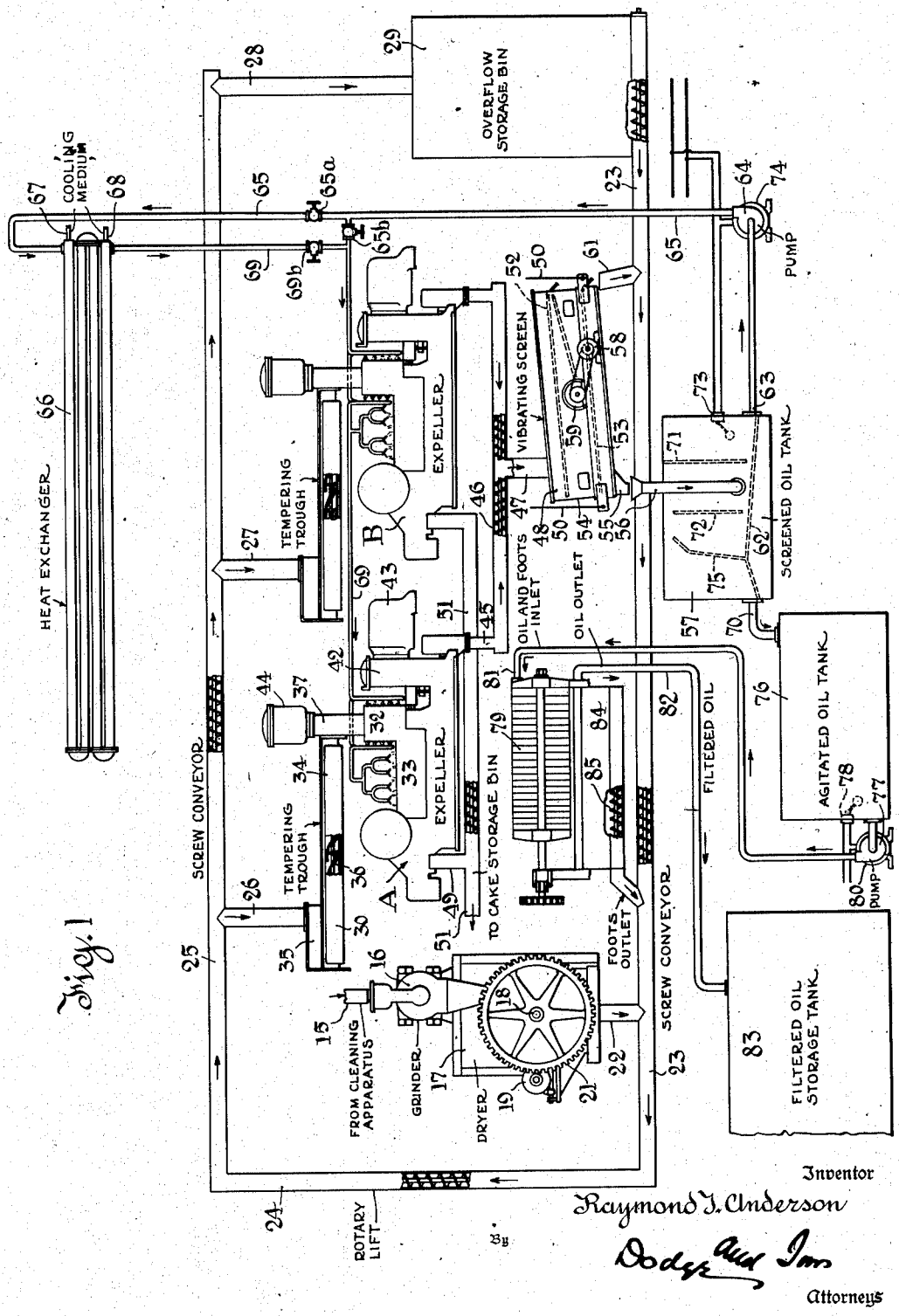


Fig. 1

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LIQUID EXPRESSING SYSTEM

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Fig. 3

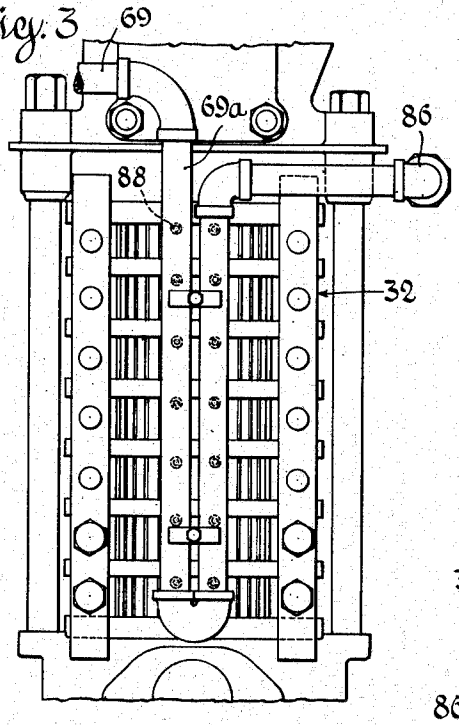


Fig. 4

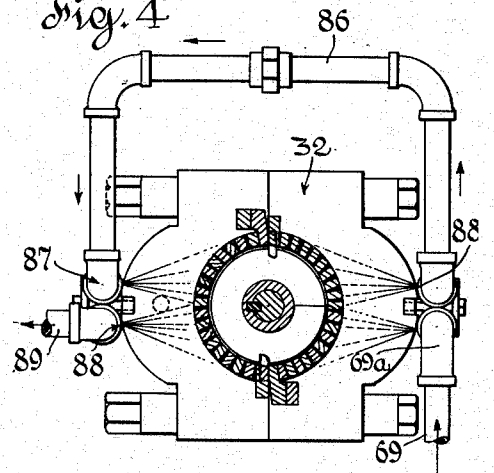
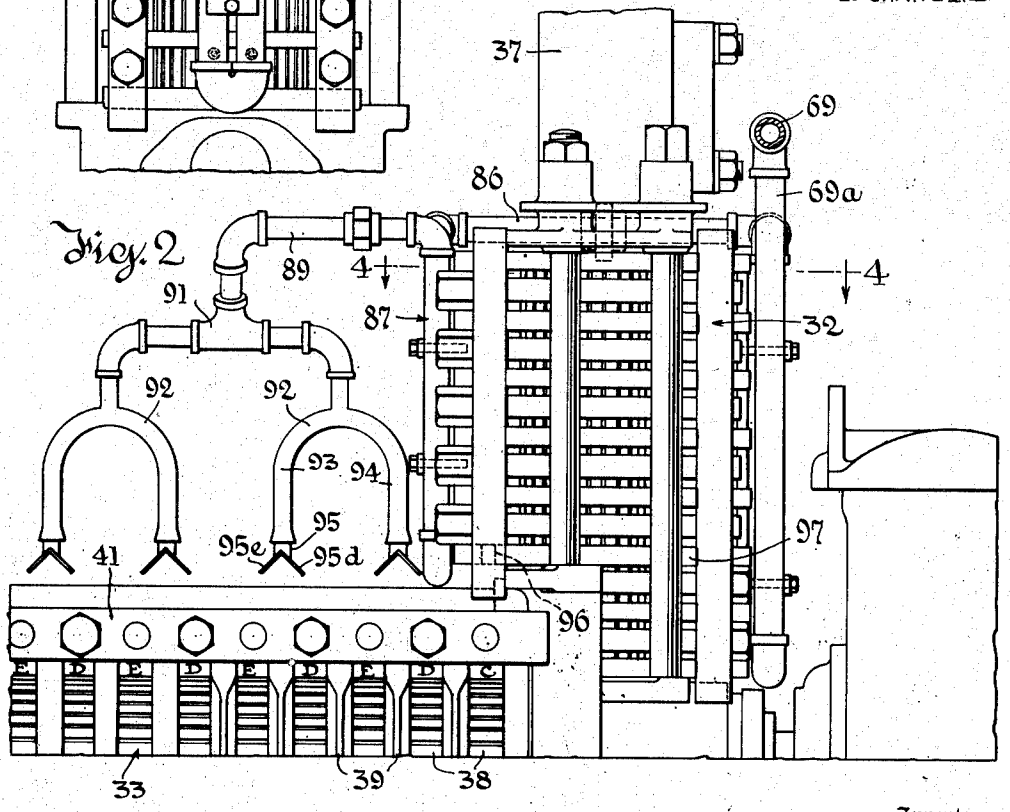


Fig. 2



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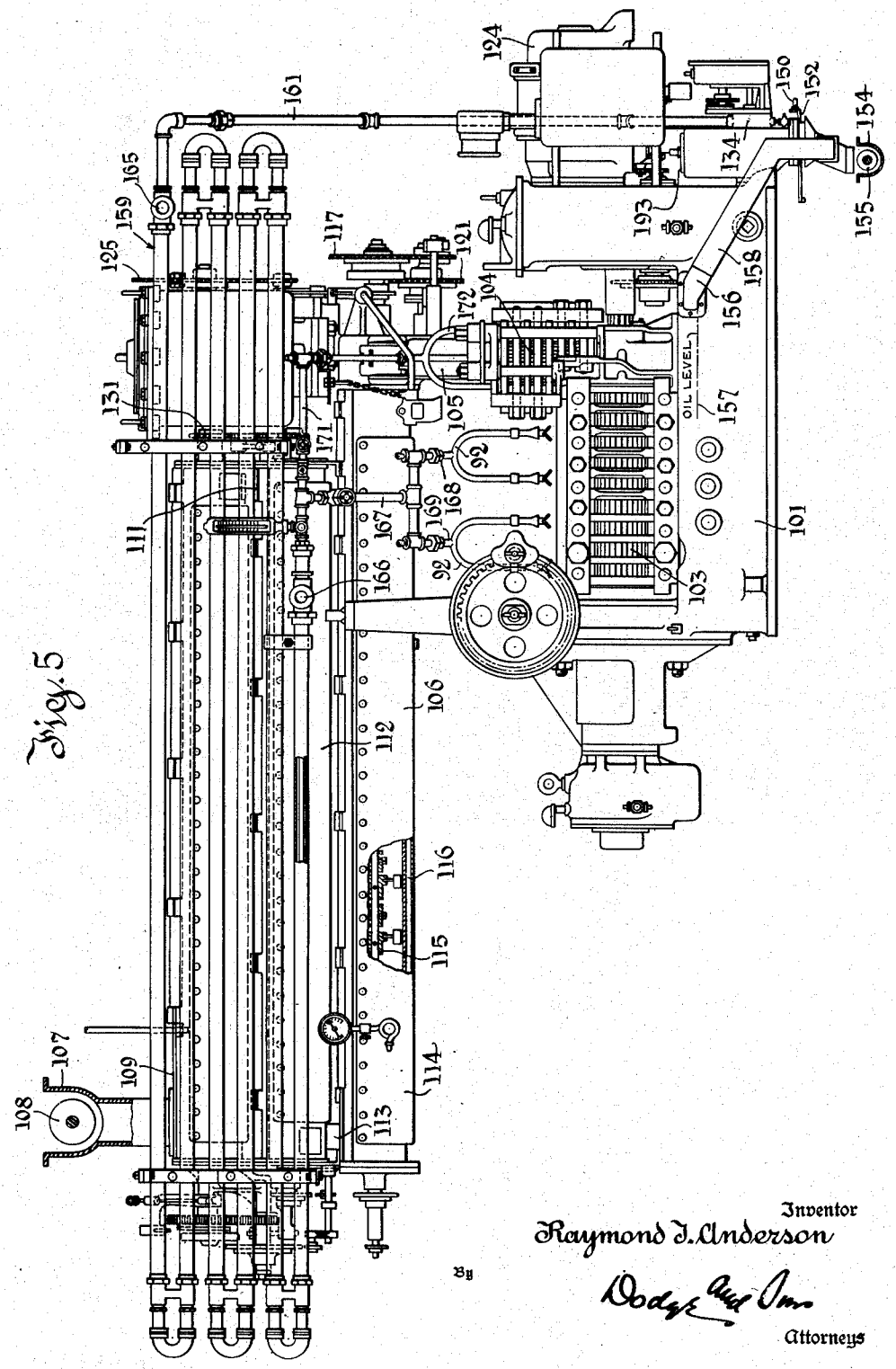


Fig. 5

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Fig. 6

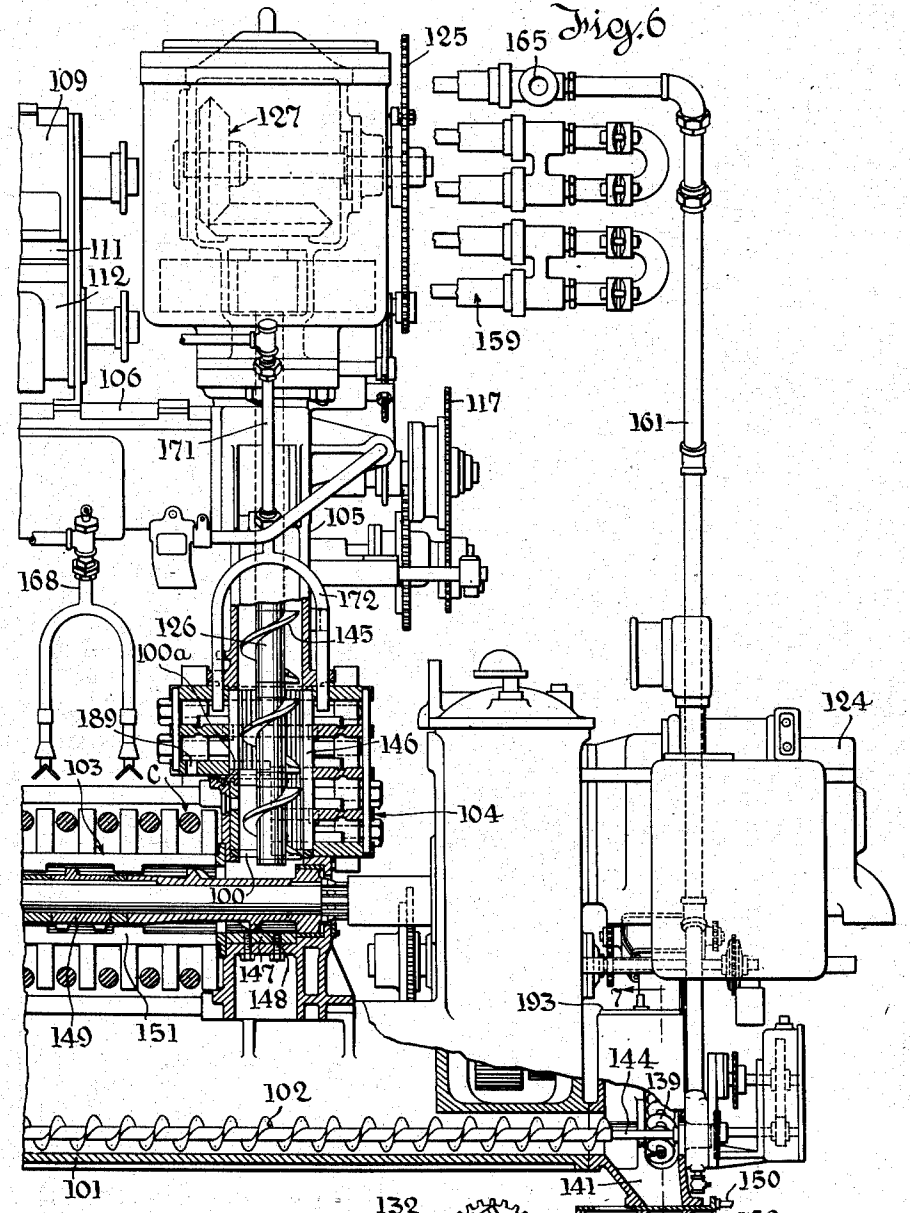
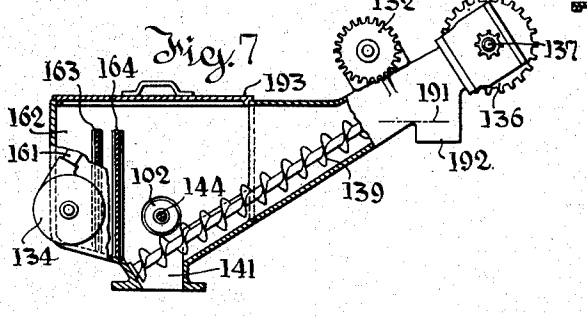


Fig. 7



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LIQUID EXPRESSING SYSTEM

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Fig. 9

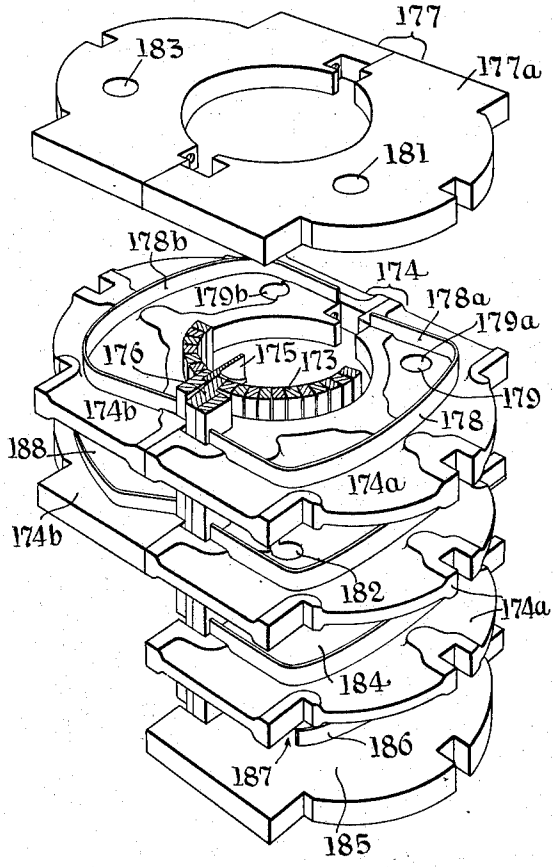
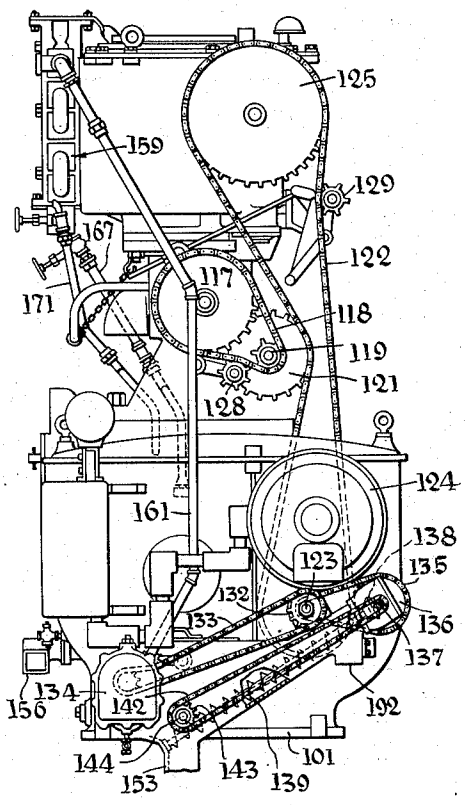


Fig. 8



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Patented Oct. 27, 1942 2,299,784

UNITED STATES PATENT OFFICE

2,299,784

LIQUID EXPRESSING SYSTEM

Raymond T. Anderson, Berea, Ohio, assignor to The V. D. Anderson Company, Cleveland, Ohio, a corporation of Ohio

Application July 7, 1939, Serial No. 283,286

11 Claims. (Cl. 100—48)

This invention relates to liquid expressing systems and particularly to systems employing presses of the type wherein heavy pressure is employed to expell liquid from materials containing the same. More especially, it relates to the expressing of oil from oleaginous materials.

The invention is particularly concerned with a system of and apparatus for operating presses of the type mentioned above so as to prevent excessive temperature rises within the press, thus avoiding discoloration of the oil or other liquid and possible burning of solid expressed material on the operating parts of the press. Although the invention may be applied to various types of press, and such application is contemplated, it is illustrated in connection with and will probably find its greatest application in presses of the expeller type disclosed in the various patents granted to The V. D. Anderson Company, and reference is made to the following for a general understanding of their structure and operation: Patent No. 829,314 dated Aug. 21, 1906; Patent No. 1,722,882 dated July 30, 1929; Patent No. 1,773,771 dated Aug. 26, 1930; and Patent No. 1,971,632 dated Aug. 28, 1934.

One of the objects of the invention is to provide means for cooling the press by causing flow of a cooling medium thereover, and more particularly liquid or oil which preferably has been expressed by the press to be cooled. This cooling process may be applied not only to a horizontal press barrel, but to a vertical press barrel as well, where the press includes it, either by the utilization of gravity flow or by a forcible spraying of the same. The cooling medium may be applied to either of the barrels alone, or to both of them, depending upon circumstances, but it is preferred that it be applied to both.

Another important object of the invention is the provision of a unitary system by means of which oil from a central collecting point, chamber or exchanger may be applied to a plurality of presses simultaneously, and without duplication of parts, as would be necessary if an individual cooling system were employed in connection with each press.

The main object of the invention is, therefore, to provide a continuous system of oil or liquid expressing whereby with a continuous feed of material to the inlet, there is a constant discharge of oil from the outlet of the system, as well as a discharge of cake from the various expellers employed. An important and useful aspect of this system is the provision of an overflow or storage bin in which excess material may accumulate whenever the supply of material to the inlets of the various expellers exceeds their combined capacity. In this way, the expellers may be made to operate at full capacity without interruption, and whenever the supply of material to the inlet is for any reason interrupted temporarily, the accumulation in the storage bin will ensure a continuous supply of material to the inlets.

Another important object of the invention is the provision of a central oil supply system embodying refinements over that disclosed in my copending application, Serial No. 93,907, Patent No. 2,216,658, dated October 1, 1940, whereby an entire bank of expellers may be supplied with cooling oil from a central point, thus avoiding the expense and difficulty of duplicating oil circulating systems, and ensuring uniform operation of all the expellers in the bank.

Numerous other objects and advantages of the invention will be apparent from the following description when read in connection with the accompanying drawings, in which:

Figure 1 is a diagrammatic view of a complete oil cooling system embodying the present invention, with parts of the conveyers in the system shown in section;

Fig. 2 is an enlarged view of a portion of one of the expeller presses shown in Fig. 1, illustrating the application of pressure oil cooling to both the horizontal and vertical barrels of the press;

Fig. 3 is a rear elevation of the vertical barrel of the press shown in Fig. 2, illustrating the arrangement of the oil supply pipes to provide for forcible spraying of the oil onto a vertical press section;

Fig. 4 is a section substantially on the line 4—4 of Fig. 2;

Fig. 5 is a view in elevation of a single oil cooled press embodying the present invention as it is applied to an oil cooling system in which the vertical press section is cooled by cascade flow, parts being broken away to show the interior construction;

Fig. 6 is an enlarged view of a portion of Fig. 5, with portions of the press shown in section to illustrate the path of travel of the cooling oil;

Fig. 7 is a detail view, partially in section, substantially on the line 7—7 of Fig. 6;

Fig. 8 is a side elevation of the drive end of the press as it is shown in Fig. 5, with the driving chains in position; and

Fig. 9 is an exploded view showing the details

of the vertical barrel of Fig. 6, as it is arranged for cascade flow.

While systems embodying the present invention may take various forms and arrangements, for purposes of illustration, one complete system has been shown in Fig. 1, the parts being indicated more or less diagrammatically in order to simplify the explanation.

Although the apparatus as indicated above may be applied to the treatment of various oleaginous materials containing oil or other liquid to be expressed, for purposes of the present description it will be assumed that the presses or expellers are applied to the expressing of oil from oil bearing materials, such as cottonseed or the like. Accordingly, reference character 15 designates a suitable source of supply of cleaned seeds or meats feeding into the hopper of a grinding mechanism for conditioning the meats for further treatment prior to the expressing of the oil. The grinder is designated generally by reference character 16, and while it may take various forms, it will in general consist of parts arranged to reduce the size of the meats to be treated. This reduction facilitates conditioning of the meats for treatment in the expellers for producing a maximum yield of oil of maximum quality, and an expressed cake of low oil content.

The discharge of the grinder may lead into a suitable drier or conditioning apparatus 17 having a rotating element 18 driven from motor 19 through gearing 21. In this drier the ground meats are reduced in moisture content to a desired amount and are then discharged at 22 into a screw conveyer 23. Leading from a rotary lift 24 is a second screw conveyer 25 having a plurality of discharge pipes 26 and 27 for distributing the material to be expressed to the expellers.

Although but two of the expellers, designated A and B, are shown, it will be obvious that the system is adaptable to any number, applying the principles herein disclosed. The screw conveyer 25 terminates in a discharge pipe 28 leading to an overflow storage bin 29 of a capacity sufficient to accommodate a reserve supply of dried ground meats, and to ensure the uniform operation of the expellers even if the supply of material to be expressed be interrupted for a short period, as when replenishing the source of supply of material to be treated, or to perform minor adjustments requiring the stopping of one of the expellers.

The bottom of the storage bin 29 constitutes one terminal of the screw conveyer 23, completing a closed cycle of flow made up of the screw conveyer 23, rotary lift 24, screw conveyer 25, discharge pipe 28 and storage bin 29. Briefly, when the supply of material from the drier 17 is just sufficient to equal the capacity of the two expellers, all of the material will be discharged through the pipes 26 and 27 and nothing will be returned to the storage bin through pipe 28. On the other hand, when the supply of material from the drier exceeds the capacity of the expellers, or if for any reason the operation of one of the expellers should be interrupted, then material will be discharged into the storage bin and will accumulate there to stabilize the flow of material and to ensure uniform continuous operation of the system.

The expellers shown are of identical construction, consequently a brief description of one of them will be sufficient. In this description, reference may be had to Figs. 2, 3 and 4, showing the details.

The first expeller, A, for example, comprises a vertical barrel 32, a horizontal barrel 33 and a tempering or conditioning trough 34. Dried ground meats introduced through the pipe 26 pass through the hopper 35 and are discharged into the tempering or conditioning trough 34. This trough preferably contains a heating jacket 30 and an agitating conveyer 36 designed to agitate the material by back and forth movement and to cause it to pass slowly from the hopper 35 to the discharge end where it enters the vertical barrel feeding means at 37. The conveyer may, for example, be of the type disclosed in Anderson Patent No. 805,112, dated November 21, 1905.

Expellers of this general type are well known and the details thereof are fully set forth in the Anderson patents above mentioned. For the purposes of the present description, it may be stated that the horizontal barrel 33 is made up of a series of spaced barrel bars 38 held in position by barrel rings 39 and clamping bars 41. Within the horizontal barrel 33 are the usual separated worm flights (see Fig. 6) driven in any suitable manner, as by gearing in box 42 and motor 43. The vertical barrel 32 is similarly constructed and contains separated worms driven by a suitable means in casing 44. As material is fed from the tempering trough, it enters the vertical barrel 32 where its liquid content is partially removed, and it then enters the horizontal barrel to be subjected to further compression. The expressed oil or other liquid, together with the foots, flows outwardly through discharge 45 to a conveyer 46 leading to a discharge pipe 47 associated with a vibrating screen arrangement 48, later to be described. The cake expelled at the discharge end of the expeller is discharged through pipe 49 to conveyer 51 which carries it to a suitable cake storage bin (not shown).

The vibrating screen 48 as shown comprises two vertically aligned spaced sections 52 and 53 in a closed casing 54. The casing is suspended by pendulous members 50, so as to permit limited back and forth movement during the operation of the vibrating means. The casing has an oil discharge at 55 leading to an inlet pipe 56 of a screened oil tank 57. A motor 58 mounted on the base of the screen 48 drives suitable vibrating mechanism 59 to vibrate the screens 52 and 53, causing a gradual travel of the foots on the screens to the foots delivery pipe 61, while the oil after passing the screen sections 52 and 53 in succession is discharged at 55 and delivered to the tank 57. The foots discharged into pipe 61 are delivered to the conveyer 23 where they are fed forward in the cycle and commingle with the dried ground meats discharged into this same conveyer from pipe 22, whence they are fed to the inlets of the various expellers. Inasmuch as the oil discharge lines 45 from both expellers lead to the conveyer 46, all of the oil with the foots contained in it passes through the vibrating screen where the coarser foots are screened out and the oil containing the very fine foots is delivered to the screened oil tank.

The screened oil tank 57 has an inclined floor 62 leading to a cooling oil discharge line 63, whence it is fed by suitable means such as centrifugal pump 64 and pipe 65 to a heat exchanger 66. The cooling medium is supplied to and discharged from the exchanger 66 by pipes 67 and 68, while

the cooled oil is delivered through pipe 69 to the expellers A and B, under a pressure head determined by the location of the exchanger 66. The tank 57 contains baffles 71 and 72 to cause air escape from the oil in the tank so that the pump acts on air free oil. The inclination of the floor 62 prevents settling out of the fine foots remaining in the oil and ensures, as far as possible, delivery of oil of more or less uniform concentration to the pipe 63. A float switch 73 controlling the driving motor 74 for pump 64 serves to prevent the pump from running on no load and ensures an adequate depth of liquid in the tank before the pump starts. An upstanding baffle 75 in the tank ensures a substantial depth of product oil before overflow into the discharge to tank 76 is possible. The floor of the product oil space to the left of baffle 75 is inclined for the same purpose as that previously described in connection with bottom 62. The baffle 75 tends to prevent passage of any substantial amount of foots into the agitated oil tank 76, thus reducing the load on the filter press to which the oil tank discharges under the control of circulating pump 77. As shown, the tank 76 is fed by gravity while the motor 80 which drives pump 77 is provided with a suitable head under the control of a float switch 78. The oil tank 76 contains the product oil which remains only to be filtered before delivery of the final pure product to a storage point. This filtering may be accomplished, as illustrated in the drawings, by a filter press 79 having an oil inlet 81 from pump 77 and a filtered oil outlet 82 leading to a storage tank 83. The foots and other solid material are discharged from the bottom of the filter press into a trough 84 having a feed screw 85 for conveying the solid material into the screw conveyer 23, where it joins the foots discharged from the presses A and B and the entering material to be expressed.

Under some conditions the temperature of the cooling liquid may be such as to render use of the exchanger at times unnecessary. It may also be necessary at times to isolate the exchanger from the system in order to effect repairs. A by-pass line controlled by valve 65*b* may be opened while valves 65*a* and 69*b* are closed in order to effect this isolation and deliver the oil from pump 64 directly to the line 69. With the exchanger cut out, cooling of the liquid may result from the normal travel of the liquid through the apparatus.

The above description indicates the general operation of the system shown in Fig. 1, with the exception of the cooling action which is an important feature of this invention, and will now be described.

The cooled oil from discharge pipe 69 is delivered to the expellers as shown in Figs. 2, 3, and 4, under a pressure head sufficient to cause forcible ejection of the oil against and spraying over the press barrels with consequent cooling of the barrels and removal of the foots therefrom. This action maintains the temperature of the barrels within a range which prevents discoloration of the oil, and avoids hardening of the foots on the press barrel or burning of the same, either of which would introduce impurities in the discharged material.

Referring now to Figs. 2, 3 and 4, the cool oil discharge pipe 69 leads to the right hand end of the vertical barrel 32 and supplies a pipe 69*a* having a plurality of spaced discharge or spray openings 88 therein and in line with the sections of the barrel 32 where the barrel bars are exposed between the barrel rings. As many of the openings 88 are provided as there are barrel sections to be cooled and the openings give the sprayed liquid a substantial diverging spread, the arrangement being well shown in Fig. 3. The pipe 69*a* is U-shaped and has oil spray openings in both legs thereof and its outflow end leads through pipe 86 to a similar U-arrangement 87 on the left hand side of the vertical barrel and containing spray openings 88 arranged similarly to those already described. The discharge end of U-section 87 leads through pipe 89 to a T 91 having at either end a depending U-shaped fitting 92. Each of the fittings 92 has two depending legs 93 and 94 terminating in discharge openings located adjacent the barrel bars of the press and provided with spouts 95 having opposed baffles 95*d* and 75*e* so arranged that two diverging streams of oil flow from each of the baffles onto two adjacent sections of the barrel bars. As shown in Fig. 2, the exposed barrel bar sections D and E are each bathed with cooling oil from the streams coming from the deflecting baffles 95*d* and 95*e*, respectively. The remaining sections to the left are bathed by liquid from the spray pipe associated with them, thus completing the delivery to the horizontal barrel of the press, with the exception of section C which is mounted underneath a portion of the clamping means for the vertical barrel 32. This barrel bar section C is supplied with oil sprayed over the vertical barrel and discharging through an opening 96 provided in the barrel ring 97 adjacent the bottom of the vertical barrel.

It will be understood upon reference to Fig. 1 that the oil flows over the horizontal and vertical barrels to the chamber in the expeller base where it mingles with the foots and oil discharged from the expellers and is delivered through pipes 45 to the vibrating screen for screening and circulation along with the newly expressed oil.

The arrangement shown in Figs. 2, 3 and 4 has the outstanding advantage that a complete bathing of the vertical barrel is ensured by oil under sufficient pressure to cause its distribution over the whole barrel section with enough force to ensure removal of the foots before they dry and harden on the barrel. At the same time, the oil delivered to the horizontal barrel is evenly distributed over all of the sections, and by adjustment of the deflectors 95 such delivery may be assured at all times with the consequent uniform cooling of the barrel bars and complete removal of foots accumulated thereon. In the arrangement shown by way of example the oil and foots from all of the presses are collected in and distributed from a single chamber or tank.

The use of a system embodying forcible spraying of cooling oil onto the vertical barrel of the press offers the advantages which have been set forth. It requires, however, screening of the oil for the removal of at least the coarser foots, otherwise the discharge nozzles may clog and prevent or interfere with adequate circulation.

Where a system is too small to justify the expense of operating a vibrating screen, or where other factors make it undesirable to use such apparatus, cascade flow without spraying may be relied upon for distributing the cooling oil over the vertical barrel. A cascade flow system is illustrated in Figs. 5 to 9, particularly as applied to a single expeller, but obviously other arrangements, within the scope of the claims, are contemplated.

In the arrangement shown in Fig. 5, a single expeller having horizontal and vertical barrels

and the usual conditioning and tempering apparatus is cooled by a system in which cooled oil from a heat exchanger pours over the horizontal barrel as in Fig. 2, but is delivered to the top of the vertical barrel wherein it cascades over the various sections of the barrel until it reaches the oil discharge trough at the bottom of the machine.

In the description of the embodiment shown in Fig. 5, reference may also be had to Figs. 6, 7 and 8 showing details of the arrangement and the circuits through which the entering material, the oil and the foots travel.

An expeller of the Anderson type is shown in Fig. 5 and comprises horizontal and vertical barrels and driving mechanism conforming substantially to the description already given in connection with Figs. 2 and 3. In this embodiment, however, the clamping rings associated with the vertical barrel are designed to permit cascading flow of cooling oil from the top to the bottom of the barrel. Other diversities of structure are indicated by way of example to show that the invention is not limited in any way to any one particular arrangement of the press.

The press comprises a base 101 adapted to receive and discharge expressed oil and foots which are conveyed by a screw conveyer 102 (see Fig. 6). Mounted above the base 101 in the usual manner is the horizontal barrel 103 connected to a vertical barrel 104. A packing ring 100 interposed at the base of the vertical barrel where it joins the horizontal barrel seals the connection and prevents extrusion of material between the two. An arcuate plate 100a performs a similar function at the point where the barrel rings of the vertical barrel overlap the horizontal barrel. This plate takes the place of the barrel bar ends on the opposite side of the barrel. The feed hopper 105 leading to the vertical barrel is adapted to be supplied with material from a tempering or conditioning apparatus 106 made up, as here shown, of three sections. A feed hopper 107 is adapted to receive material fed by means such as an endless screw 108, and to supply it to the inlet of top tempering apparatus section 109 through which it is conveyed and discharged at 111 to the right hand end of the middle section 112. Material from section 112 after traversing that section, enters the bottom section 114 through pipe 113. The material is fed from left to right in the section 114 by agitating and conveying mechanism 115 which delivers it to the feed chute 105 which, in turn, discharges it into the top of the vertical barrel 104.

As is well understood, the sections 109, 112 and 114 may be provided with heating jackets such as 116 in order to condition the material to the proper temperature and moisture content for most efficient expressing of the material. The heating jackets may be supplied with steam from any suitable source, while the conveying apparatus associated with each section of the tempering device is driven through a sprocket 117, receiving its drive through chain 118 and pinion 119 (see Fig. 8). Pinion 119 is carried on a stub shaft which also carries a sprocket 121 meshing with main drive chain 122 actuated from the shaft 123 directly driven from motor 124. The sprocket chain 122 and sprocket 125 drives the shaft 126 of the vertical hopper feeder through suitable bevel gearing 127 (see Fig. 6). Associated with the sprocket chains 118 and 122 are suitable slack adjusters 128 and 129, respectively.

As above stated, the main shaft of the bottom section 114 of the tempering apparatus receives its drive through sprocket 117. The shaft carrying the conveying mechanism 115 communicates its drive at the end of the tempering apparatus adjacent the inlet 107 to the middle section of the tempering apparatus. Again, at the right hand end of the middle section, a chain and sprocket connection 131 communicates the drive to the shaft of the agitator in the top section 109 of the tempering apparatus.

As above stated, the main drive shaft 123 receives its drive from motor 124. A sprocket 132 together with a sprocket chain 133 drives suitable oil conveying means such as a centrifugal pump 134 over a circuit which will be traced hereinafter. The shaft 123 also drives a sprocket chain 135 which through a sprocket 136 drives a stub shaft 137. This stub shaft carries in addition to the sprocket 136 an intermediate beveled pinion meshing with a bevel gear 138 attached to one end of the shaft of screw conveyer 139 for elevating the foots from a chamber 141 to which they are discharged by the endless screw conveyer 102. The stub shaft 137 also carries a small pinion driving a sprocket chain 142 which communicates its movement through a pinion 143 to the shaft 144 of the endless screw conveyer 102.

Material to be expressed is fed to the inlet feed hopper 107 and after passing through the tempering apparatus where it is thoroughly conditioned as to moisture content and given a uniform temperature throughout, it discharges into the feed chute 105, where it is conveyed downwardly and the screw flights 145 in cooperation with the barrel bars 146 and the associated knife bars express a portion of the oily or liquid material, discharging it through the bottom of the feed chute at 147 into the chamber in the base of the press. As indicated, the bottom of feed chute 147 is made up of spaced bars forming a perforate structure through which a portion of the liquid expressed in the vertical barrel of the feed press escapes to the chamber in the base. The details of the arrangement are illustrated in the patents to Anderson 1,780,218, dated November 4, 1930, and 1,780,961, dated November 11, 1930. The solid material is picked up by the feed screw 148 and conveyed from right to left, where it is acted upon by the endless screw flights 149 in cooperation with the knife bars 151 in the usual manner, to provide further expressing of the oil or other liquid from the solid material. Here, again, the expressed oil and foots are discharged into the base of the machine. The material, after the expressing of the oil therefrom, is discharged at the outlet end of the press in the form of cake, in the usual manner.

The expressed foots and oil are caused to flow by the endless screw conveyer 102 to the chamber 141. Associated with this chamber is a slide valve 152 having an operating lever 150 by means of which the bottom of the chamber can be closed off when oil cooling is to be carried out. When this slide valve is open, the foots and oil discharge through the pipe 153 to a trough 154 containing an endless screw conveyer 155. Liquid escaping around the slide valve 152 flows into the diverging hopper portion 160 of pipe 153 and is directed into the trough 154. The screw conveyer may deliver the foots and oil to any suitable location for further treatment.

The endless screw conveyer 102 is disposed in the bottom of the chamber where the foots tend to collect by gravitation. The oil chamber also contains an oil discharge connection 156 con-

nected slightly above the normal level of oil in the chamber, this level being designated 157 in Fig. 5. A pipe 158 connects the discharge 156 to the trough 154 where the overflowing oil and foam is delivered, by-passing the slide valve 152 and regardless of the operation or lack of operation of the oil cooling system.

The operation just described is the normal operation of the expeller before the application of oil cooling thereto. When oil cooling is employed, additional apparatus is required. That apparatus and its mode of operation will now be set forth, with particular reference to the structures illustrated in Figs. 6, 7 and 9.

Mounted above the main press of Fig. 5 is a heat exchanger 159 adapted to receive oil from a pipe 161 communicating with an oil collecting space 162 in the chamber 141 (see Fig. 7). This chamber contains two spaced baffles 163 and 164 adapted to facilitate settling of the foots from the oil by permitting the oil to flow over the baffles 163 and 164 and to collect in the chamber 162 in amounts sufficient to at all times ensure priming of the circulating pump 134. This oil is delivered through pipe 161 to the heat exchanger which is cooled by a suitable cooling liquid supplied through inlet connection 165 and discharge connection 166. After passing in heat exchange relation with the cooling liquid or water, the cooled oil is discharged at the bottom of the exchanger through a pipe 167 having two branches 168 and 169 connected to U-fittings 92 similar to the fittings 92 already described in connection with Fig. 2, and having the same function, namely, of directing cooling oil over the barrel bar sections in a volume and at a temperature sufficient to maintain the press temperature below that which would char the foots or discolor the oil. This cooling oil is, of course, discharged into the chamber in the base of the machine along with the oil which is expressed. The bottom of the exchanger also contains another discharge pipe 171 leading to a U-fitting 172 adapted to supply cooling oil for the vertical section of the press. The details of this arrangement will be best understood by reference to Fig. 9, in which the vertical barrel bar assembly is indicated with the top section removed. This assembly comprises the usual barrel bars 173 held in assembled relation by barrel rings 174 each in two sections interposed at two spaced points diametrically opposed to one another. In the assembly, knife bars 175 are held in place by wedging means 176. The barrel rings, with the exception of the top ring 177 which is special, carry oil confining rims 178 cooperating with openings 179 within the confines thereof. These rims cause oil accumulation to a depth and over an area to ensure contact with the exposed barrel bar section for the depth of the chamber. For example, the barrel bar sections 174*a* of Fig. 9, when placed in superposed relation, form a cascading flow path for cooling oil which enters opening 181 in barrel bar section 177*a* and flows across the chamber within rim 178*a*, bathing the barrel section and discharging through opening 179*a* into the chamber formed in the barrel bar ring next below. It then flows through opening 182 to the space 184 below and across through another opening, which discharges it into the chamber formed on barrel ring section 185. The rim 186 of this section is interrupted at 187 and affords an oil discharge path by which the oil overflows and returns to the space in the expeller base.

The flow from the other branch of fitting 172 along the left hand side of the barrel is through opening 183, across the chamber defined by rim 178*b*, through the opening 179*b* to the chamber 188 next below. It then flows through the opening 189 (see Fig. 6) associated with chamber 188 and drenches the horizontal barrel bar section C which is next to and partially under the projecting portions of the vertical barrel bar assembly. Consequently, this oil also is returned to the chamber in the base of the expeller. In this way cooling oil flows continuously in contact with the exposed arcuate portions of the vertical barrel.

Having described the path of oil circulation it will now be pointed out how the arrangement shown in Fig. 7 may be applied to a system of the type shown in Fig. 1 with the utilization of oil cooling means. The base of the machine contains the screw conveyer 102 for conveying foots and oil to chamber 141. Chamber 141 contains the screw conveyer 139 to elevate the foots collected in the chamber. The discharge level for the conveyer 139 designated 191 is slightly above the top of the baffles 163 and 164 so as to make it impossible for oil to escape from chamber 141 except by way of the pump 134. Consequently, when the slide valve 152 is closed, as shown in Fig. 6, oil will be circulated by pump 134 over the paths already explained. Oil discharged through pipe 158 into trough 154 will be carried by conveyer 155 to a filter press or a storage tank for storage or further treatment. Oil overflowing the baffles 163 and 164 will be delivered by pump 134 to the exchanger and after circulating over the horizontal and vertical barrels of the press will return to the oil chamber in the expeller bottom, as previously described. Foots accumulating in the chamber 141 by the separating action of baffles 163 and 164 will be elevated by screw conveyer 139 and discharged at 192. The chamber 141 is preferably closed by a cover plate 193 through which access may be had to the chamber for the cleaning of the baffles 163 and 164 or other repair, cleaning or adjustment purposes.

It is to be understood that the invention in its various aspects as set forth above lends itself to numerous applications which will be apparent from the description. Practice of the invention results in the production of a high quality of oil of excellent color and purity and of a cake which is of superior quality and of low oil content. Discoloration of the oil due to excessive temperature rise is absolutely precluded, while the accumulation of charred foots on the barrel bars of the press becomes non-existent.

The permissible optimum temperatures in the press will vary with the material under treatment. For example, in pressing cottonseed, the temperature should never exceed 230° F. and should preferably be about 220° F. With copra the temperature range may be from 180° to 250° F., but preferably in the neighborhood of 210°. Soy beans should be expressed at a temperature of the order of 270° F. With corn germs, nuts and other fibrous materials which generate heat and tend to explode at the discharge of the expeller barrel, the temperatures will vary with the particular material. In the pressing of materials of animal origin, such as fat, cracklings, and the like, the temperature range is determined by the point at which the expressed liquid begins to discolor and may be determined by experiment. The figures given will suffice for the description.

The term "straining" employed herein is used in its broad generic sense.

It is to be understood that where reference is

made to fluid or liquid cooling medium it does not preclude the presence in that medium of some solid matter. For example, in expressing oil from copra with a press of the interrupted screw type the expressed oil always contains some solids or foots which are removed by filtering or screening, or both, before the oil is suitable for oil cooling purposes. Where oil containing foots is employed as a press cooling medium, the presence of foots does not hinder or affect the cooling action so long as the delivery ducts are of ample capacity to permit free flow of the medium.

The system may be employed in any relation, whatever the type of expeller or press employed, and the presses may vary in number, limited only by the location in which the assembly is placed. By the provision of the storage bin illustrated in Fig. 1, the flexibility of the system is increased enormously and idleness of the expellers due to a temporary failure in supply of material is avoided. By this arrangement, it becomes possible to stop one expeller temporarily for adjustment or repairs without shutting down the entire system. It is to be understood, furthermore, that while particular types of machines have been illustrated, any equivalent means may be employed without departing from the spirit and scope of the invention as defined in the accompanying claims.

What is claimed is:

1. In a liquid expressing system a main press including a barrel having liquid expressing means therein; a feeding press including a barrel discharging into said main press barrel and also having liquid expressing means therein; means for supplying cooling liquid expressed by said presses to the barrel of the main press to cool the same; and means for forcibly spraying the cooling liquid onto the barrel of the feeding press.

2. In a liquid expressing system a press unit comprising a main press having a barrel with liquid expressing means therein and a feeding press including a vertical barrel discharging into said main press barrel, said vertical barrel also having liquid expressing means therein; means for supplying cooling liquid expressed by said main and feeding presses to the main press barrel; means for supplying cooling liquid to the top of the feeding press barrel; and means for directing flow of cooling liquid in a tortuous downward path including in succession downward, lateral and downward steps in which the cooling liquid is brought in contact with a substantial portion of the vertical barrel.

3. In a liquid expressing system a main press including a barrel having liquid expressing means therein; a feeding press including a barrel having liquid expressing means therein, said feeding press barrel being arranged to discharge material under treatment into the main barrel; means for flowing at least a portion of the liquid expressed by said expressing means over said main and feeding press barrels to cool the same; and heat exchanging means for cooling said expressed liquid before it is delivered to the flowing means.

4. In a liquid expressing system a plurality of press units each comprising a main press of the interrupted screw type having a perforate barrel with liquid expressing means therein and a feeding press of the interrupted screw type including a perforate barrel having liquid expressing means therein, said feeding press barrel being arranged to discharge material under treatment into the main press barrel; a single collecting chamber for expressed liquid from all of said presses; means for cooling a portion of the liquid collected in said chamber; means for circulating the cooled liquid and passing it in heat exchanging relation to said main and feeding press barrels to cool the same; and means for returning the cooling liquid to said chamber after it has absorbed heat from said barrels.

5. In a liquid expressing system a plurality of presses of the expeller type and each having a horizontal main press barrel and a vertical feeding press barrel for expressing liquid from material containing the same; a common means for feeding all of said presses with material to be treated; a common means for collecting the liquid expressed by all of said presses; means for circulating liquid from said collecting means and showering it over the main press barrels of all of said presses; and means for forcibly spraying a portion at least of said liquid against the vertical feeding press barrels of said presses.

6. In combination with a press of the interrupted screw type adapted to express oil from materials fed thereto; means comprising a press of the interrupted screw type for feeding such material to the intake end of the press under pressure; and means for forcibly spraying cooling medium over substantially the entire exterior surface of said feeding means.

7. In combination with a press adapted to express oil from materials fed thereto; means for feeding such material to the intake end of the press under pressure; means for cooling the oil expressed by said press and flowing a portion of said oil over the press; and means for forcing a portion of the cooled oil under pressure against the exterior of the feeding means.

8. In combination with a press having a perforate barrel adapted to express oil from material fed thereto; means disposed substantially at right angles to said press for feeding the material to the intake end of the press under pressure; means for spraying cooled oil against substantially the entire exterior surface of said feeding means; and means for spraying cooled oil upon the exterior surface of the press barrel.

9. In combination with a press of the interrupted screw type adapted to express oil from materials fed thereto; feeding means including a perforate barrel containing interrupted screw means for forcing the material to be treated into the intake end of the press under pressure; means for cooling at least a portion of the expressed oil; and means for forcibly spraying such cooled oil under pressure against the exterior of the press and against the exterior surface of the barrel of the feeding means.

10. In a liquid expressing system a press unit comprising a main press having a barrel with liquid expressing means therein and a feeding press including a vertical barrel discharging into said main press barrel, said vertical barrel also having liquid expressing means therein; means for supplying cooling liquid expressed by said main and feeding presses to the main press barrel; means for supplying a portion of said cooling liquid to the top of the feeding press barrel; and means for directing flow of said cooling liquid in a tortuous downward path made up of downward, lateral and downward steps in succession, and only in said lateral paths contacting the barrel whereby the cooling liquid is brought in contact with a substantial portion of the vertical barrel.

11. In an expressing system, a main press of

the interrupted screw type including a perforate barrel having expressing means therein, and a vertical feeding press of the interrupted screw type also having a perforate barrel with expressing means therein, and discharging into the main press; and a common means for bathing the barrels of both said main and feeding presses with cooling medium expressed by said main and feeding presses to reduce the temperature of the presses, the bathing means for the vertical barrel including baffle means for directing the flow in succession through axial, lateral and axial paths along the vertical barrel.

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