

Feb. 2, 1937.

F. L. IRELAND ET AL

2,069,448

ROTARY PRESS

Filed June 27, 1934

2 Sheets-Sheet 1

Fig. 1.

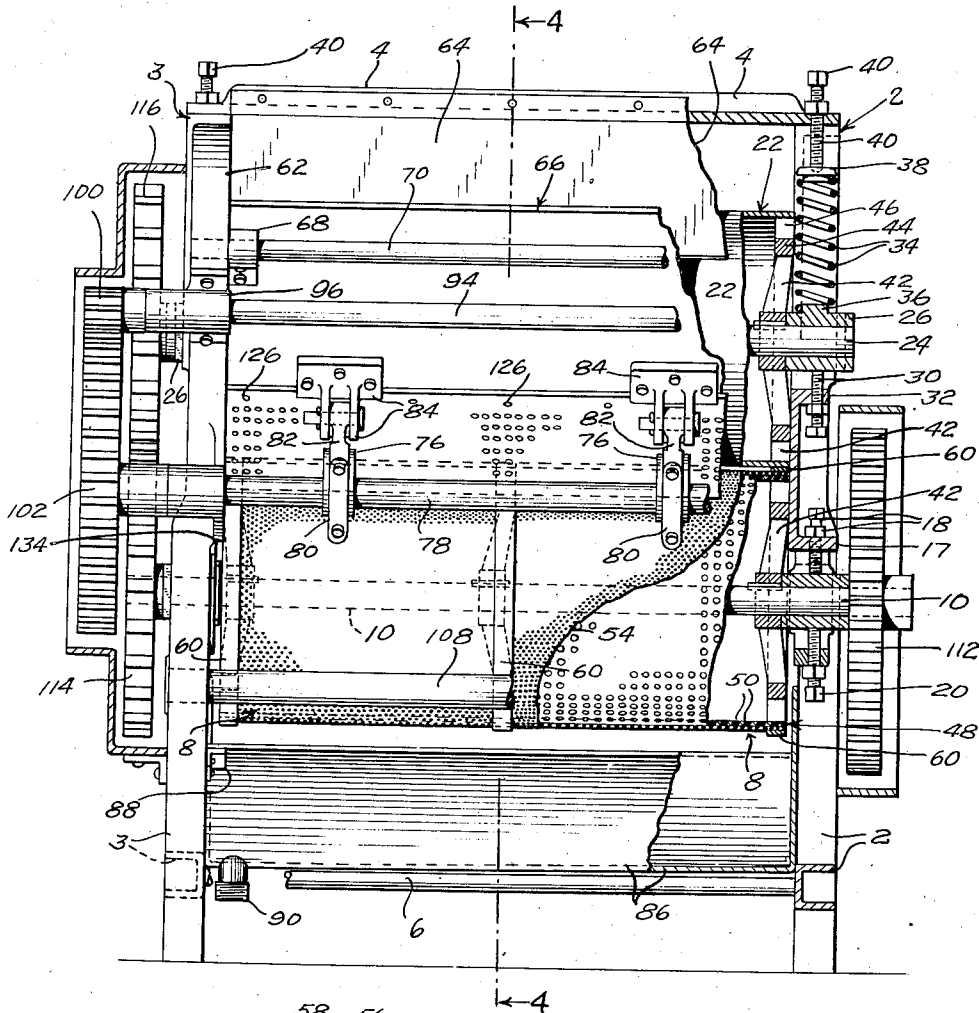
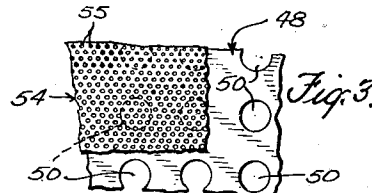
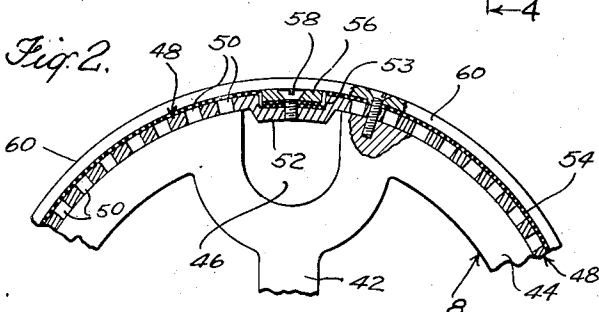


Fig. 2.



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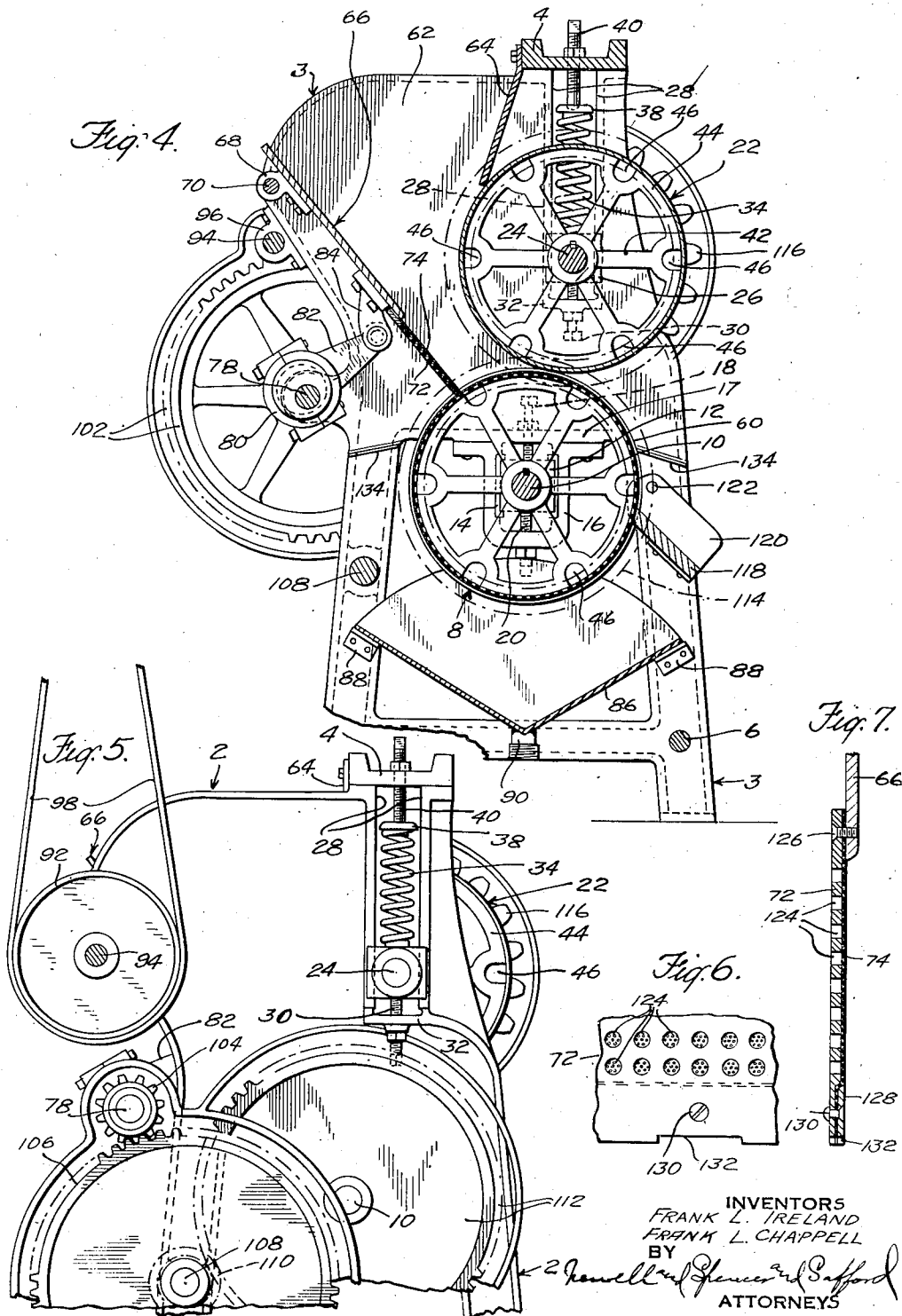
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**2,069,448**

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2 Sheets-Sheet 2



## UNITED STATES PATENT OFFICE

2,069,448

## ROTARY PRESS

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1 Claim. (Cl. 100—47)

This invention relates to rotary presses and particularly to rotary presses for expressing liquid from casein, or other materials having similar characteristics, in the course of the manufacture thereof.

In the manufacture of casein it is important, in order to give it the desired degree of whiteness, that it be dehydrated comparatively rapidly and without too much use of heat. To this end the casein, after it has been precipitated in the form of curds from the skimmed milk, is rapidly separated from the whey, preferably washed and then put through a press to express a large part of the water therefrom before it is shredded and placed upon trays for kiln drying.

A general object of the present invention is to provide improved means for expressing the moisture from the casein which will effect this operation so rapidly and efficiently as to help materially to reduce to a practicable minimum both the final drying step and the period between the production of the casein and its preparation for the final drying step.

Another object of the invention is to provide means for expressing the moisture from the casein and similar materials, which is so constructed that it will not be liable to injury in operation and can thus operate over long periods of time with a minimum of repair. The invention aims also to provide means for expressing the moisture from casein and similar materials, which is so constructed that it can readily be cleaned.

Other objects and important features of the invention will be apparent when the following description and claim are considered in connection with the accompanying drawings in which

Figure 1 is a front elevation, with parts broken away, of a casein press embodying the present invention;

Figure 2 is a detail section of a part of the lower perforated press roll;

Figure 3 is a fragmentary detail showing the perforations in the lower press roll and the perforations in the screen covering this roll;

Figure 4 is a section on the line 4—4 of Figure 1;

Figure 5 is a detail elevation, looking from the right in Figure 1, illustrating the driving connections;

Figure 6 is a fragmentary enlarged detail of the face side of the lower end of the movable hopper wall, and

Figure 7 is an enlarged section of the lower end of the movable hopper wall.

In the illustrative embodiment of the invention

the pressing mechanism, hereinafter to be described in greater detail, is carried in a frame comprising vertical end members 2 and 3 which carry the bearings for the various horizontal shafts hereinafter to be referred to, said end frame members being connected in part by a horizontal top frame member 4, fastened thereto in any suitable manner, and by cross rods 6 near their bottoms.

The lower press roll, generally indicated by the reference numeral 8, is carried by a shaft 10, which has its bearings in adjustable bearing blocks 12 sliding on vertical guides 14 in yokes 16 bolted to transverse flanges 17 on the end frame members 2 and 3. Vertical adjustment of the shaft 10, and with it the press roll 8, is effected by means of upper screws 18 threaded through the flanges 17, and lower screws 20 threaded through the lower parts of the yokes 16.

The upper press roll, generally indicated by the reference numeral 22, is carried on a shaft 24 having its bearings in bearing blocks 26 arranged to slide on vertical guides 28 formed in the frame members 2 and 3, the lower limit of movement of the bearing blocks 26 being determined by adjusting screws 30 threaded through flanges 32 constituting the bottoms of the slots in the frame members 2 and 3 in which the bearing blocks 26 slide.

The upper press roll is yieldingly maintained in its lowermost position of adjustment by means of springs 34 fitting over bosses 36 on the bearing blocks 26, at their lower ends, and, at their upper ends, fitting over similar bosses on caps 38. Adjusting screws 40, threaded through those parts of the cross frame member 4 which close the upper ends of the slots in the frame members 2 and 3 in which the bearing blocks 26 slide, engage the upper faces of the caps 38 and determine the amount of compression initially placed upon the springs 34.

These springs are preferably of substantial strength and preferably the pressure exerted by the upper press roll 22 on the lower press roll 8 is quite substantial; for example, in the neighborhood of 1500 pounds. It will be understood, however, that the illustrative pressure given is not controlling and that it may be much more or even less without departing from the invention, the particular pressure selected being that most suited to the expressing operation for which the press is being used.

The upper press roll 22 preferably presents a smooth uninterrupted outer surface and may conveniently be formed of sheet steel rolled into

cylindrical form and having its meeting edges welded together, the cylinder then being preferably chromium plated to make it substantially stainproof. This cylinder may be carried on and connected to spoked wheels 42 keyed to the shaft 24, there being preferably at least one intermediate wheel besides the two end wheels. These spoked wheels are preferably each cast in one piece and preferably have their peripheries 44 interrupted at the end of each of the spokes to provide drainage openings 46, each of the spokes, as shown, being forked at its end to straddle the openings 46 and form, with the rim sections 44, an integral unitary structure.

The lower press roll 8 has the same fundamental construction as the upper press roll 22, except that the sheet steel cylinder 48 of the lower press roll is provided with drainage perforations 50 through which the water or other liquid expressed during the pressing operation passes to the interior of the cylinder, this sheet steel cylinder also having at one point in its periphery a depressed portion 52 forming a channel 53 extending lengthwise of the cylinder for a purpose hereinafter to be described. The sheet steel cylinder 48 of the lower press roll 8, like that of the upper press roll 22, is preferably supported upon and connected to spoke wheels 42 of the same construction as the wheels of the upper press roll, there being preferably at least two end wheels 42 and an intermediate wheel.

To provide a proper supporting surface on the lower press roll 8 for the material to be pressed and at the same time to provide ample drainage for the water expressed during the pressing operation, the sheet steel cylinder 48 is preferably provided with comparatively large perforations 50 and is then itself covered with a screen 54 having much smaller and more numerous perforations 55. It has been found that satisfactory results are obtained in the dehydration of casein when the sheet steel screen is provided with  $\frac{1}{4}$  inch holes spaced  $\frac{1}{2}$  inch from center to center and when the covering screen is provided with perforations 55 of such small diameter that each square inch of the surface may carry, for example, 34 rows of 12 perforations per row, the perforations in adjacent rows being staggered with respect to each other so that two adjacent rows will present perforations spaced 24 different distances from the beginning of the inch measurement. The number per square inch just given and the arrangement are, of course, merely illustrative.

The covering screen 54 is preferably formed of brass or bronze and is preferably secured to the cylinder in the manner now to be described.

Referring to Figure 2 of the drawings, it will be seen that the screen 54 is so wrapped about the sheet steel cylinder 48 that its ends are received in the channel 53 formed by the depressed part 52 of the sheet steel cylinder 48, the screen 54 being preferably bent over the edges of this channel and then bent again so that its ends lie in the bottom of the channel. The screen 54 having been fitted smoothly to the cylinder 48 and its ends brought down into the channel 53 in the depressed part 52, a clamping strip 56, of such a thickness that its upper face will be flush with the cylindrical outer surface of the screen 54, is brought into clamping relation to the ends of the screen 54 and secured there by screws 58 threaded into the bottom of the channel 53.

In order further to secure the screen 54 on

the cylinder, peripheral bands 60 are provided, also preferably of brass. There are preferably three of these bands on the lower cylinder 8 of the machine illustrated, one at each end of the cylinder and one intermediate between the ends. In the illustrative embodiment of the invention in which the cylinders are of an outer diameter of 16 inches or more and of a length of about 30 inches, it has been found that three of the brass bands 60, one inch wide and one-eighth inch in thickness, furnish sufficient reinforcement for the brass screen 54.

It will be noted from an inspection of Figure 4 that the upper press roll 22 is offset somewhat toward the discharge side of the machine with respect to the lower press roll 8. This facilitates the novel construction and arrangement of the hopper and feeding mechanism now to be described.

The sides or ends of the hopper are formed by plane solid portions 62 of the frame members 2 and 3, the ends of the cylinders 22 and 8 running close to these plane portions 62 of the frame members 2 and 3. The rear or inner wall of the hopper is constituted by a portion of the cylindrical surface of the press roll 22 and by a wall member 64 extending down into substantial contact with the surface of the cylinder 22 and attached at its upper end to the cross frame member 4. The front or outer wall of the hopper is preferably movable and comprises an apron 66 carrying hinges 68 which swing on a cross rod 70 extending between the two frame members 2 and 3. At its lower end the apron 66 carries a perforated sheet of steel 72 (see Figs. 6 and 7) covered with a perforated screen 74 for a purpose hereinafter to be more fully set forth, this sheet and its covering extending approximately into contact with the lower cylinder 8 whereby the lower cylinder 8 constitutes the bottom of the hopper.

In order to effect a preliminary expressing of water from the mass of casein curds in the hopper just described, and at the same time to insure feeding of the casein between the pressing rolls 22 and 8, means is provided for oscillating the apron 66 and its attached plate 72 on the hinged rod 70. The illustrated means comprise two eccentrics 76 mounted on a driven shaft 78 carried in bearings in the end frame members 2 and 3. Eccentric collars 80 have hinge arms 82 pivotally connected to hinge brackets 84 attached to the apron 66 whereby turning of the eccentrics 76 oscillates the apron 66 toward and away from the press roll 22 and also toward and away from the "bite" between the press rolls 22 and 8.

It will be apparent that this movement of the apron 66 and its attached plate 72, when the hopper is filled with casein curds, will cause the mass adjacent the screen 74 to be squeezed between the screen covered plate 72 and the surface of the press roll 22, thus directly expressing some of the water, which will run out through the perforations in the screen 74 and in the plate 72, and at the same time this pressure will cause the casein to be fed into the bite between the two press rolls whereby the successive feeding operations will cause the casein to be squeezed between the rolls in a continuous comparatively thin layer. During the passage between the rolls more water or other liquid content of the casein will be forcibly expressed, the rolls breaking up the surfaces of the curds to some extent and thus facilitating the expressing of the water. The water thus expressed passes, for the most part, directly through the small perforations 55 of the

screen 54, then through the larger perforations 50 in the steel plate 48 into the interior of the press roll 8, where it gravitates to the bottom of the roll and passes out through the openings 46 in the rims 44 of the wheels 42 into the trough 86 supported below the lower roll 8 on brackets 88 on the end frame members 2 and 3, said trough being provided with an outlet nipple 90 which may be threaded to receive a hose coupling or a coupling for any other suitable conduit for conveying the expressed liquid away from the machine.

The shafts 10 and 24, which carry the press rolls 8 and 22, and the shaft 78, which carries the eccentric 76, are driven from driving connections now to be described: The driving pulley 92, connected to a shaft 94 extending across the front of the machine and having its bearings in brackets 96 attached to the end frame members 2 and 3, may be connected by belt 98 to any suitable source of power, such, for example, as an electric motor mounted on the press itself or a power driven shaft. At its end remote from the pulley 92, the shaft 94 carries a pinion 100 which drives a large gear 102 keyed to the shaft 78 which carries the eccentric 76. At its end remote from the gear 102 the shaft 78 carries a pinion 104 which drives the large gear 106 mounted to turn on a stationary shaft 108 carried by the machine frame. Attached to the gear 106 and rotating therewith is a pinion 110 which engages a large gear 112 connected to one end of the shaft 10 that carries the press roll 8. Connected to the end of the shaft 10 remote from that which carries the gear 112 is another gear 114 that meshes with a similar gear 116 on the shaft 24 that carries the upper press roll 22, the gears 114 and 116 having relatively long teeth to permit considerable movement of the shafts 12 and 24 toward and away from each other.

It will thus be seen that there is a considerable reduction in speed and multiplication of power in the driving connections between the driving pulley 92 and the gear 112 connected to the press roll 8. The gears 114 and 116 may be so related to each other as either to drive the press rolls at the same peripheral speed or to cause one to travel faster than the other, depending on whether or not it is desired to exert a dragging effect upon the material passing between the rolls. In some cases a difference in the peripheral speeds of the two press rolls, where they exert the pressing action, may be desirable to increase the surface disrupting effect of the pressing action upon the casein curds, in which event the gears 114 and 116 will be so designed that one of the press rolls 8 and 22 will be driven at a little faster speed than the other.

After the curds have been passed between the pressing rolls they tend to remain upon the surface of the lower perforated roll, both by reason of the construction of the roll and by reason of the action of gravity, and they are thus carried around with the roll until they meet a doctor or scraper 118, preferably formed of a strip of wood attached at its ends to hinge members 120 hinged at 122 to the end frame members 2 and 3. The bevelled edge of the scraper or doctor 118 which is adjacent to the screen 54 of the cylinder 8 and which serves to engage and remove from the screen the compressed and partly dehydrated mass of casein curds that have passed between the press rolls is provided necessarily with small recesses for the brass bands 60 which surround the press

roll in order that the scraper edge may engage the screen surface between the bands.

From an inspection of Figures 6 and 7 it will be noted that the perforated steel plate 72 which is carried by the apron 66 has in it perforations 124 similar to the perforations 50 in the sheet steel cylinder 48 and preferably of the same dimensions and spacing. Covering this plate 72 on the side adjacent to the curds is the perforated brass screen 74, preferably of the same construction as the screen 54 of the cylinder 8. It will be noted that the upper margin of the screen 74 is clamped between the upper margin of the plate 72 and the lower margin of the apron 66, the blade 72 being secured to the apron 66 by screws 126. At its lower margin the plate 72 is reduced in thickness to provide a rabbet into which the lower margin of the screen 74 is bent so that it may be clamped to the plate 72 by a brass clamping strip 128 attached to the plate 72 by brass rivets 130. Both the plate 72 and the clamping strip 128 are provided at their roll-engaging edges with recesses 132 to accommodate the brass bands 60 of the press roll 8.

From the foregoing description the operation of the device will readily be understood, the various steps in the operation having been incidentally referred to in the detailed description. The hopper of the machine may be fed continuously, if desired, by some continuous conveyor delivering casein curds or other material to be dehydrated in quantities within the capacity of the press to treat, or the hopper may be supplied with successive batches of the material to be treated.

The press being driven continuously from the driving pulley 92 and being supplied with material to be dehydrated, such, for example, as freshly made curds of casein separated from their whey and preferably washed substantially free of the acid used in their formation, the rotation of the eccentric carrier 78 will cause the oscillation of the apron 66 toward and away from the upper press roll 22 and over the lower press roll 8, this oscillation directly effecting some expression of water from the curds as the curds are compressed between the upper roll 22 and the screen-covered lower extension 72 of the apron 66. The movement of the screen toward the upper press roll will also cause that portion of the curds which is adjacent to the bite of the press rolls to be forced into the bite so that it is carried between the rolls and subjected to the pressure thereof, there being a normal space of about  $\frac{1}{8}$  inch between the effective pressing surfaces of the two rolls by reason of the separation of the smooth surface of the upper roll from the perforated surface of the lower roll by the brass bands 60.

By reason of the fact that the moisture expressing pressure upon the casein curds is a more or less localized pressure between two convex surfaces, there is not the tendency that is found in some forms of presses to press the casein into a cheese-like cake. Although the partly dehydrated casein adheres to the surface of the lower cylinder until it encounters the scraper or doctor 118, when it is scraped from the cylinder by the scraper or doctor 118 it comes off in comparatively small pieces which facilitates its subsequent treatment.

It will be noted that the scraper 118 extends over the entire length of the lower press roll 8.

and that the hinges 120 which support the scraper 118 overlap the ends of the roll 8. To permit this and at the same time have the ends of the roll 8 in substantial engagement with the plane solid portions 62 of the frame members 2 and 3, it will be noted that the lower or leg parts of the end frame members 2 and 3 are offset slightly at 134 from the upper solid parts 62.

10 By this invention there has been provided a simple durable, easily cleaned and effective press for quickly effecting a considerable dehydration of materials such as casein curds. In practical operation, the illustrated press, with press rolls 15 of the dimensions hereinabove given, that is, 16 inches in diameter and 30 inches long and operated at the normal speed for which the machine is designed will press, to a resultant moisture content of about 52%, from 1500 to 3000 20 pounds of casein curds per hour.

It will be understood, of course, that the embodiment of the invention herein described, although it has proved to be a very practicable and successful press for the uses intended and 25 has gone into extensive commercial use, may be

modified considerably without departing from the invention. For example, although the perforated screen 54 has some practical advantages the invention is not limited to the use of a punched screen.

What is claimed as new is:

A rotary press for dehydrating casein, or the like, comprising cooperating pressing rolls, the lower one of which is perforated to permit a discharge of the liquid therethrough, a hopper 10 for holding the mass of casein curds to be pressed and for guiding it into feeding relation to the rolls, said hopper having the outer wall thereof hinged to oscillate toward and from the bite 15 of the rolls in such a path with respect thereto that it both lifts the mass of curds away from the drainage openings of the lower roll on which it has been resting and squeezes it against the upper roll near the bite, said hopper wall being perforated adjacent to said lower roll to 20 permit discharge of the liquid thus expressed, and means for oscillating said hopper wall.

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