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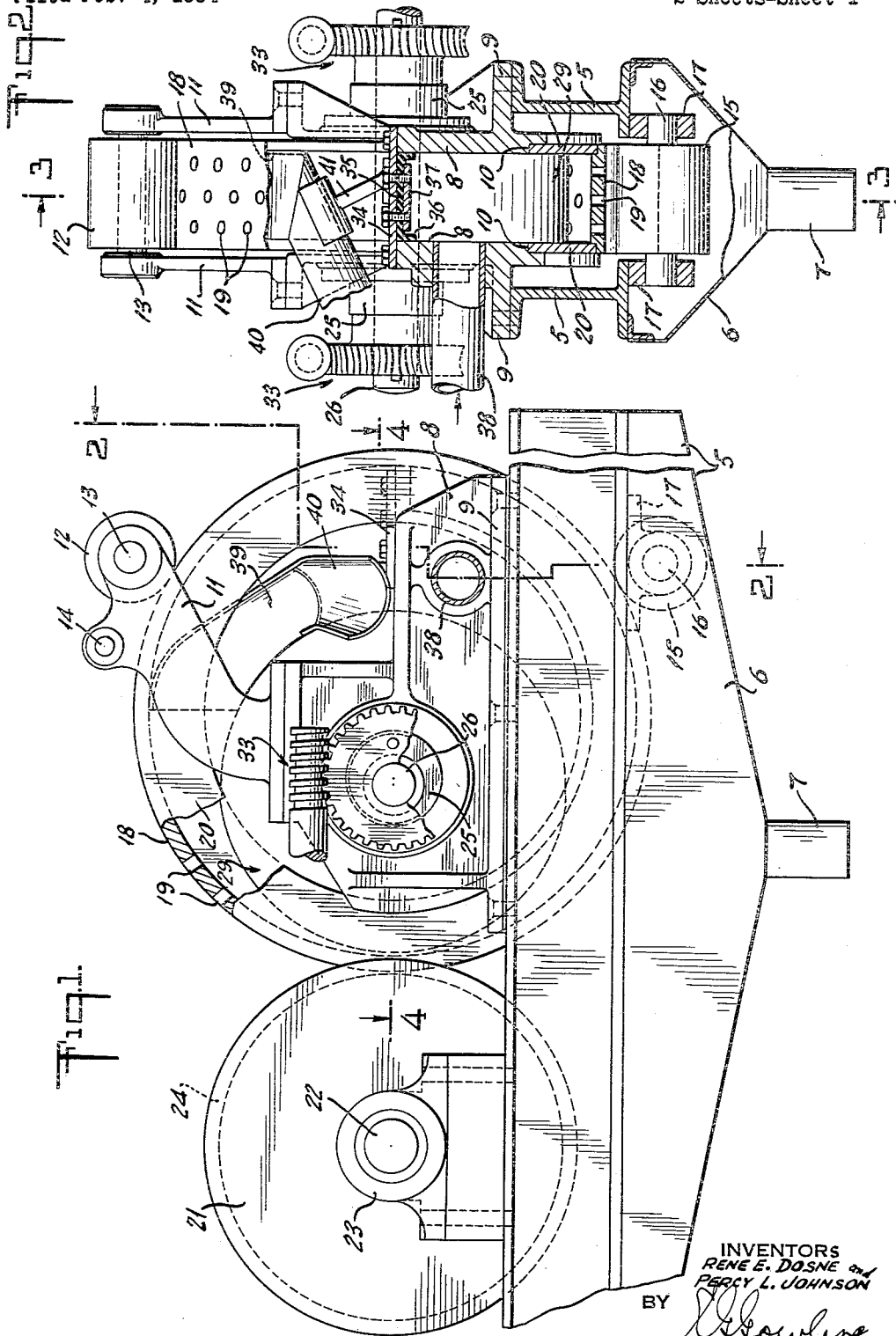
R. E. DOSNE ET AL

2,715,871

PULP PRESS

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2 Sheets-Sheet 1



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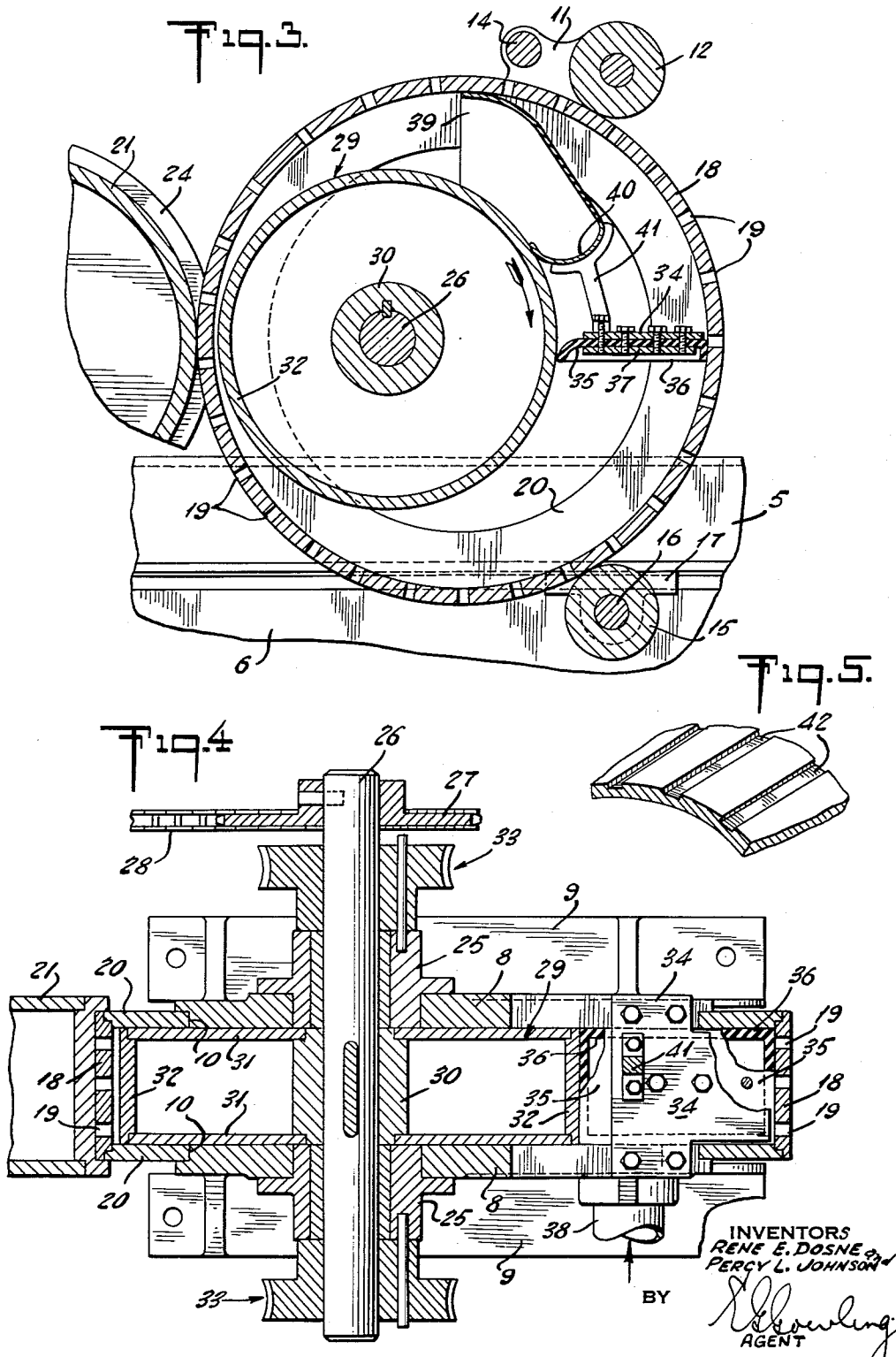
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PULP PRESS

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8 Claims. (Cl. 100—131)

This invention relates to new and useful improvements in presses generally and particularly seeks to provide a novel press for expelling liquid from a suspension of fibrous material.

Presses constructed in accordance with this invention are particularly useful for the dewatering of stock in wood pulp mills and for the removal of caustic soda solutions following caustic treatment in the bleach plant of a pulp mill or in the slurry process of manufacturing viscose rayon.

The removal of caustic soda solutions is particularly difficult due to the swollen, slippery nature of the caustic treated fibers, and improvement in presses usable for this purpose has long been desired.

Many efforts have heretofore been made to design presses which could be used for the above mentioned purposes such as providing two continuously rotating press rolls side by side or the well-known screw press or a press which gradually squeezes the liquid from a pulp suspension by pressing the suspension between two belts moving over rollers and mounted at a narrow angle with respect to each other.

The two-roll type of press has not been satisfactory because the wide angle leading to the zone of compression causes excessive pressures for the work involved. The screw press has proven unsatisfactory because the pressing of the stock is irregular. This is probably due to the fact that the pressing surfaces do not move in the same direction and at the same speed, conditions necessary for the smooth advancement of the stock into the compression zone. The roller supported, twin belt type of press is unsatisfactory because the pressing surfaces tend to sag between the supporting rollers causing the pressing action and the final relative dryness of the product to be correspondingly uneven. Furthermore, the construction of this latter type of press is rather complicated and subject to frequent breakdowns and frequent replacement of parts.

A press constructed in accordance with this invention overcomes the drawbacks and deficiencies which have been encountered with the above mentioned forms of presses by the provision of a simple machine employing two press rolls, one inside the other, providing a narrow curvilinear angle leading to the zone of compression between them which requires relatively low pressures to produce a uniformly pressed stock with the lowest possible moisture or liquid content.

An object of this invention, therefore, is to provide a press for the expelling of water or other liquid from a suspension of fibrous material which includes two press rolls, one of relatively large diameter and the other of relatively small diameter positioned within the large diameter roll and includes means for admitting a water or liquid suspension of stock and means for preventing the stock suspension from entering the discharge zone of the ultimately pressed material.

Another object of this invention is to provide a press

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of the character stated in which the outer press roll or ring is radially perforated to permit the free passage of expelled fluid therethrough.

A further object of this invention is to provide a press of the character stated in which scraper means are provided adjacent the outer surface of the inner press roll and the inner surface of the outer press roll for effecting a discharge of the pressed material from the press.

A further object of this invention is to provide a press of the character stated in which the outer press roll or ring is idle roll-supported at at least two points and resistance roll-supported at a point symmetrically opposed to the idle rolls.

Another object of this invention is to provide a press of the character stated in which the inner press roll is adjustably and fixedly positioned at any desired amount of clearance with respect to the outer press roll.

With these and other objects in view, the nature of which will be more apparent, the invention will be more fully understood by reference to the drawings, the accompanying detailed description and the appended claims.

In the drawings,

Fig. 1 is a side elevation partly in section of a pulp press constructed in accordance with this invention;

Fig. 2 is a transverse vertical section taken along line 2—2 of Fig. 1;

Fig. 3 is a detailed longitudinal section taken along line 3—3 of Fig. 2;

Fig. 4 is a horizontal section taken along line 4—4 of Fig. 1; and

Fig. 5 is a fragmentary detailed perspective illustrating an alternate form of surface which may be employed on the inner press roll.

Referring to the drawings in detail, the invention as illustrated is embodied in a pump or slurry press which includes a pair of spaced parallel flanged frame members 5, 5 carried by any suitable foundation means (not shown) and which dependably support a trough or tank 6 having a discharge pipe 7 for receiving and discharging the free liquid which has been expressed from the liquid suspension in the press. A pair of side plates 8, 8 having laterally extending mounting flanges 9 are rigidly affixed to the upper flanges of the frame members 5 and have their internal peripheral portions grooved as at 10 in order to rotatably receive and support a press ring as will be hereinafter more fully described. The side plates 8 are also each provided with an upwardly slanting arm 11 rigidly affixed thereto in spaced parallel relation.

An idler roller 12 is carried by a shaft 13 journaled between the arms 11. The outer ends of the arms 11 are braced against flexing by a transversely extending rod 14.

A similar idler roller 15 is carried by a shaft 16 journaled in brackets 17, 17 dependably secured to the lower flanges of the frame members 5.

A relatively large diameter press ring 18 provided with a plurality of radially extending apertures 19 and having rigidly fixed on each face an inwardly extending annulus 20 is rotatably engaged with the idler rollers 12 and 15. The inner edge portions of the annuli 20 are received within the grooves 10 of the side plates 8 for slidable rotation with respect thereto.

A resistance roll 21 is carried by a shaft 22 rotatably mounted in bearings 23, 23 affixed to the upper flanges of the frame members 5. The resistance roll 21 is provided with a peripheral groove 24 having a width equal to the face width of the press ring 18 which is received within the groove 24 in tangential contact with the face thereof. Thus the resistance roll 21 together with the idler rollers 12 and 15 and the side plates 8 provide multiple point rotative support for the press ring 18.

The side plates 8 carry a pair of eccentric bearings 25, 25 which rotatably support a shaft 26 adapted to be driven

from any suitable source of power (not shown) as, for instance, through a sprocket gear 27 and chain 28.

A press roll generally indicated at 29 comprises a hub 30 keyed to the shaft 26, face discs 31, 31 and a smooth face peripheral ring 32. The outer face to face dimension of the roll 29 is substantially equal to the distance between the inner faces of the side plates 8 and the distance between the inner faces of the annuli 20 of the press ring 18. The diameter of the press roll 29 is substantially longer than half of the diameter of the press ring 18 in order to provide a narrow curvilinear angle leading to the zone of compression between the outer surface of the press roll 29 and the inner surface of the press ring 18.

In normal operation for the pressing of water or other liquid from a pulp suspension there will be a small clearance at the nip between the press roll and press ring. The gap thus provided may be readily increased or decreased by rotating the eccentric bearings 25. This may be effected through the use of worm and gear connections generally indicated at 33 adjacent the front and rear end portions of the shaft 26.

It will be appreciated that by having the press roll 29 snugly but rotatably positioned between the side plates 8 and the annuli 20 of the press ring 18 a substantially liquid-tight chamber is formed below and slightly past the lower horn angle and zone of compression between the press ring and press roll.

Means must also be provided on the other side of the press roll 29 to prevent access of the liquid pulp suspension to the upper and discharge zone within the press. To this end a mounting plate 34 (see Figs. 1 and 2) is fastened across the side plates 8. A flexible seal or gasket 35 having depending lips 36 is secured beneath the mounting plate 34 by a clamp plate 37. As will be seen particularly in Figs. 2, 3 and 4 of the drawings, the gasket 35 is so proportioned that its longer edges contact the inner face portions of the side plates 8, and the inner faces of the annuli 20 can provide a tight liquid seal with respect thereto. Similarly, the end edges of the gasket 35 are maintained in contact with the outer face of the press roll 29 and the inner face of the press ring 18 to provide an effective liquid seal with respect thereto. The fact that the gasket 35 is preferably made from a flexible material such as an elastomer makes it possible for the press roll 29 to be adjustably positioned with respect to the press ring 18 through rotation of the eccentric bearings 25 without having to change the gasket each time an adjustment is made.

The fibrous or other material suspension from which the liquid is to be expressed is admitted to the chamber portion underlying the gasket 35 through an intake pipe 38 extending through one side plate 8 as indicated in Figs. 1, 2 and 4 of the drawings.

As soon as the fibrous suspension enters the chamber the liquid portions thereof will commence to drain through the apertures 19 of the press ring 18, and as the fibrous material moves towards contact between the press ring and the press roll it becomes progressively more densified as it approaches the nip position between the two, and frictional engagement between the fibrous material and the adjacent surfaces of the press ring and roll will cause the press ring to be rotated along with the press roll 29.

As the dewatered material is moved away from the nip position between the press ring and press roll it will adhere to the inner surface of the press ring and will be removed therefrom by a scraper element 39 (see Figs. 1, 2 and 3) provided with a discharge spout 40 supported by a bracket 41 extending upwardly from the mounting plate 34. The dewatered or deliquored material thus removed from the interior of the press will be discharged from the spout 40 onto any suitable type of conveyor (not shown).

It has been found that even though portions of the pulp being deliquored will be pressed into the apertures 19

they will readily be stripped therefrom by the scraper element 39 to thus clear the apertures 19 for the next rotation of the press ring.

When presses of this nature are used to deliquor certain materials it may be found desirable to roughen the face of the press roll 29 by providing the outer surface of its peripheral ring 32 with a plurality of grooves 42 (see Fig. 5) disposed parallel to the axis thereof.

It may be noted that through the use of a press constructed in accordance with this invention the density of the pressed material may be varied by changing the distance between the pressing faces of the ring 18 and roll 29, changing the speed of rotation, or both.

It is, of course, to be understood that various details of arrangements and proportions of parts may be modified within the scope of the appended claims.

We claim:

1. A pulp press including a perforate press ring provided at each edge with an imperforate annulus rigidly affixed thereto, means positioned exteriorly of said press ring for rotatably supporting the same about a fixed axis of rotation and including a resistance roll provided with a peripheral groove positioned in tangential contact with said press ring, a press roll having a diameter substantially smaller than that of said press ring and rotatably positioned off-center with said press ring to provide upper and lower horn angles between said press ring and press roll and having an axial length substantially equal to the interfacial distance between the annuli of said press ring, the axes of said press ring, resistance roll and press roll lying in a common plane, means for rotating said press roll, means for admitting a solids-containing liquid suspension to the lower horn angle between said press ring and said press roll, means for preventing admission of said liquid suspension to the upper horn angle between said press ring and said press roll, and means for removing and discharging the pressed solids from the inner surfaces of said press ring and its associated annuli.

2. A pulp press including a perforate press ring provided at each edge with an imperforate annulus rigidly affixed thereto, means positioned exteriorly of said press ring for rotatably supporting the same about a fixed axis of rotation and including a resistance roll provided with a peripheral groove positioned in tangential contact with said press ring, a press roll having a diameter substantially smaller than that of said press ring and rotatably positioned off-center within said press ring to provide upper and lower horn angles between said press ring and press roll and having an axial length substantially equal to the interfacial distance between the annuli of said press ring, the axes of said press ring, resistance roll and press roll lying in a common plane, means for rotating said press roll, means for admitting a solids-containing liquid suspension to the lower horn angle between said press ring and said press roll, means for preventing admission of said liquid suspension to the upper horn angle between said press ring and said press roll, means for removing and discharging the pressed solids from the inner surfaces of said press ring and its associated annuli, and means for varying the axial spacing of said press roll with respect to said press ring whereby to vary the tangential clearance therebetween.

3. A press of the character described including a pair of spaced parallel frame members, a pair of side plates supported by said frame members, means carried by said frame members and side plates for externally rotatably supporting a press ring and including a resistance roll and a pair of idler rollers, a perforate press ring rotatably engaged with said resistance roll and idler rollers and provided at each edge with an imperforate annulus rigidly affixed thereto, said resistance roll being provided with a peripheral groove in tangential contact with said press ring, a press roll having a diam-

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eter substantially smaller than that of said press ring and rotatably positioned off-center within said press ring to provide upper and lower horn angles between said press ring and press roll and journaled in said side plates, said press roll having an axial length substantially equal to the inter-facial distance between the annuli of said press ring, the axes of said press ring, resistance roll and press roll lying in a common plane, means for rotating said press roll, means for admitting a solids-containing liquid suspension to the space defined by the lower horn angle between said press ring and said press roll and said side plates, means for preventing admission of said liquid suspension to the space defined by the upper horn angle between said press ring and said press roll and the annuli of said press ring, and means supported by said side plates for removing and discharging the pressed solids from the inner surfaces of said press ring and its associated annuli.

4. A press of the character described including a pair of spaced parallel frame members, a pair of side plates supported by said frame members, means carried by said frame members and side plates for externally rotatably supporting a press ring and including a resistance roll and a pair of idler rollers, a perforate press ring rotatably engaged with said resistance roll and idler rollers and provided at each edge with an imperforate annulus rigidly affixed thereto, said resistance roll being provided with a peripheral groove in tangential contact with said press ring, a press roll having a diameter substantially smaller than that of said press ring and rotatably positioned off-center within said press ring to provide upper and lower horn angles between said press ring and press roll and journaled in said side plates, said press roll having an axial length substantially equal to the inter-facial distance between the annuli of said press ring, the axes of said press ring, resistance roll and press roll lying in a common plane, means for rotating said press roll, means for admitting a solids-containing liquid suspension to the space defined by the lower horn angle between said press ring and said press roll and said side plates, means for preventing admission of said liquid suspension to the space defined by the upper horn angle between said press ring and said press roll and the annuli of said press ring, means supported by said side plates for removing and discharging the pressed solids from the inner surfaces of said press ring and its associated annuli, and a trough positioned beneath said frame members for receiving the liquid expressed from said suspension through the perforations of said press ring.

5. A press of the character described including a pair of spaced parallel frame members, a pair of side plates supported by said frame members, means carried by said frame members and side plates for externally rotatably supporting a press ring and including a resistance roll and a pair of idler rollers, a perforate press ring rotatably engaged with said resistance roll and idler rollers and provided at each edge with an imperforate annulus rigidly affixed thereto, said resistance roll being provided with a peripheral groove in tangential contact with said press ring, a press roll having a diameter substantially smaller than that of said press ring and rotatably positioned off-center within said press ring to provide upper and lower horn angles between said press ring and press roll and journaled in said side plates, said press roll having an axial length substantially equal to the inter-facial distance between the annuli of said press ring, the axes of said press ring, resistance roll and press roll lying in a common plane, means for rotating said press roll, means for admitting a solids-containing liquid suspension to the space defined by the lower horn angle between said press ring and said press roll and said side plates, means for preventing admission of said liquid suspension to the space defined by the upper horn angle between said press ring

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and said press roll and the annuli of said press ring, means supported by said side plates for removing and discharging the pressed solids from the inner surfaces of said press ring and its associated annuli, a trough positioned beneath said frame members for receiving the liquid expressed from said suspension through the perforations of said press ring, and means for varying the axial spacing of said press roll with respect to said press ring whereby to vary the tangential clearance therebetween.

6. A press of the character described including a pair of spaced parallel frame members, a pair of side plates supported by said frame members, means carried by said frame members and side plates for externally rotatably supporting a press ring and including a resistance roll and a pair of idler rollers, a perforate press ring rotatably engaged with said resistance roll and idler rollers and provided at each edge with an imperforate annulus rigidly affixed thereto, said resistance roll being provided with a peripheral groove in tangential contact with said press ring, a press roll having a diameter substantially smaller than that of said press ring and rotatably positioned off-center within said press ring to provide upper and lower horn angles between said press ring and press roll and journaled in said side plates, said press roll having an axial length substantially equal to the inter-facial distance between the annuli of said press ring, the axes of said press ring, resistance roll and press roll lying in a common plane, means for rotating said press roll, means for admitting a solids-containing liquid suspension to the space defined by the lower horn angle between said press ring and said press roll and said side plates, a flexible seal supported by said side plates and positioned opposite the compression nip between said press ring and press roll whereby to prevent free passage of said liquid suspension to the space defined by the upper horn angle between said press ring and said press roll and the annuli of said press ring, and means supported by said side plates for removing and discharging the pressed solids from the inner surfaces of said press ring and its associated annuli.

7. A press of the character described including a pair of spaced parallel frame members, a pair of side plates supported by said frame members, means carried by said frame members and side plates for externally rotatably supporting a press ring and including a resistance roll and a pair of idler rollers, a perforate press ring rotatably engaged with said resistance roll and idler rollers and provided at each edge with an imperforate annulus rigidly affixed thereto, said resistance roll being provided with a peripheral groove in tangential contact with said press ring, a press roll having a diameter substantially smaller than that of said press ring and rotatably positioned off-center within said press ring to provide upper and lower horn angles between said press ring and press roll and journaled in said side plates, said press roll having an axial length substantially equal to the inter-facial distance between the annuli of said press ring, the axes of said press ring, resistance roll and press roll lying in a common plane, means for rotating said press roll, means for admitting a solids-containing liquid suspension to the space defined by the lower horn angle between said press ring and said press roll and said side plates, a flexible seal supported by said side plates and positioned opposite the compression nip between said press ring and press roll whereby to prevent free passage of said liquid suspension to the space defined by the upper horn angle between said press ring and said press roll and the annuli of said press ring, means supported by said side plates for removing and discharging the pressed solids from the inner surfaces of said press ring and its associated annuli, and a trough positioned beneath said frame members for receiving the liquid expressed from said suspension through the perforations of said press ring.

8. A press of the character described including a pair of spaced parallel frame members, a pair of side plates supported by said frame members, means carried by said frame members and side plates for externally rotatably supporting a press ring and including a resistance roll and a pair of idler rollers, a perforate press ring rotatably engaged with said resistance roll and idler rollers and provided at each edge with an imperforate annulus rigidly affixed thereto, said resistance roll being provided with a peripheral groove in tangential contact with said press ring, a press roll having a diameter substantially smaller than that of said press ring and rotatably positioned off-center within said press ring to provide upper and lower horn angles between said press ring and press roll and journaled in said side plates, said press roll having an axial length substantially equal to the inter-facial distance between the annuli of said press ring, the axes of said press ring, resistance roll and press roll lying in a common plane, means for rotating said press roll, means for admitting a solids-containing liquid suspension to the space defined by the lower horn angle between said press ring and said press roll and said side plates, a flexible seal

supported by said side plates and positioned opposite the compression nip between said press ring and press roll whereby to prevent free passage of said liquid suspension to the space defined by the upper horn angle between said press ring and said press roll and the annuli of said press ring, means supported by said side plates for removing and discharging the pressed solids from the inner surfaces of said press ring and its associated annuli, a trough positioned beneath said frame members for receiving the liquid expressed from said suspension through the perforations of said press ring, and means for varying the axial spacing of said press roll with respect to said press ring whereby to vary the tangential clearance therebetween.

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