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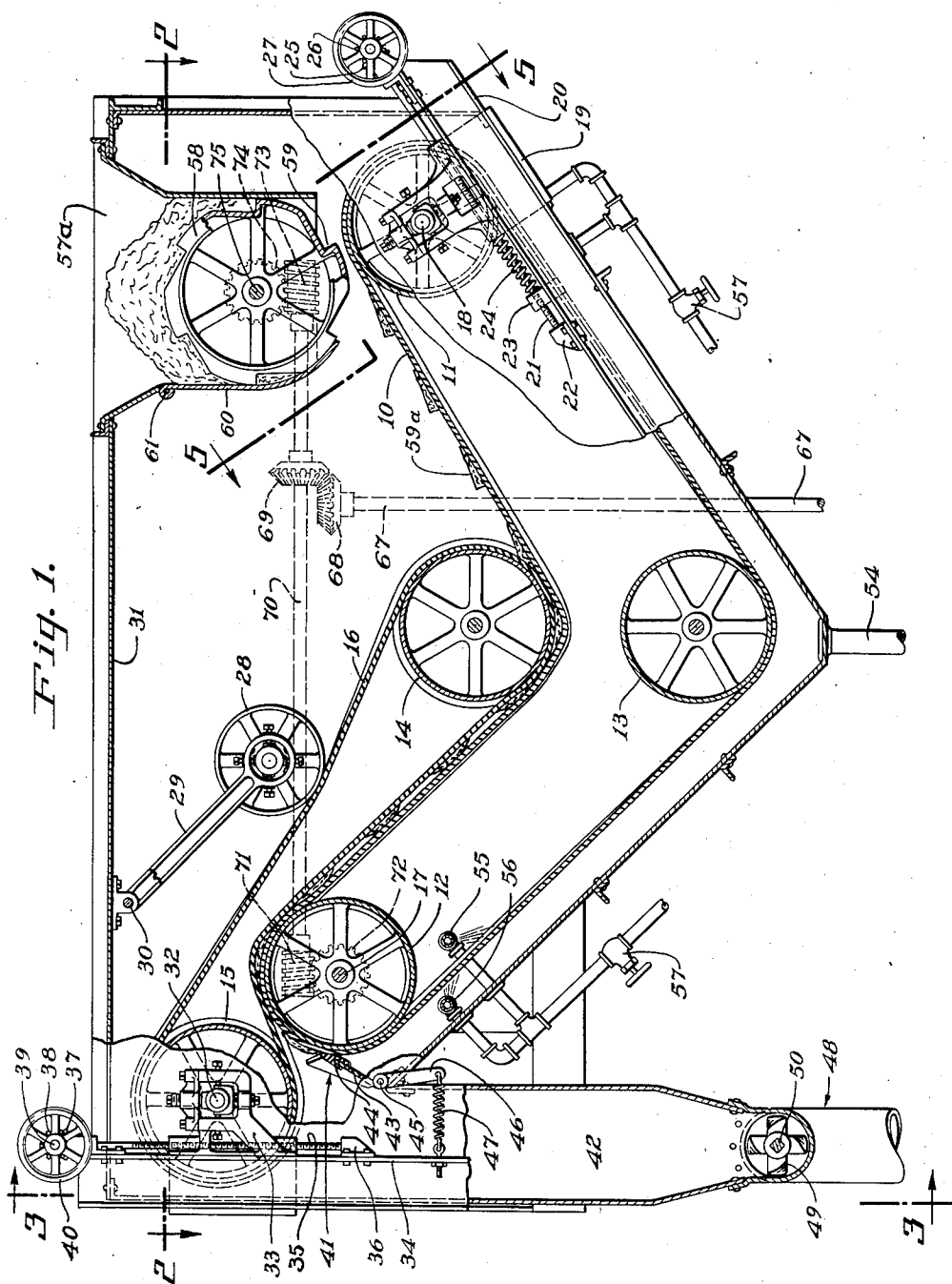
W. L. McEVER ET AL

1,991,760

PRESS

Filed March 14, 1933

3 Sheets-Sheet 1



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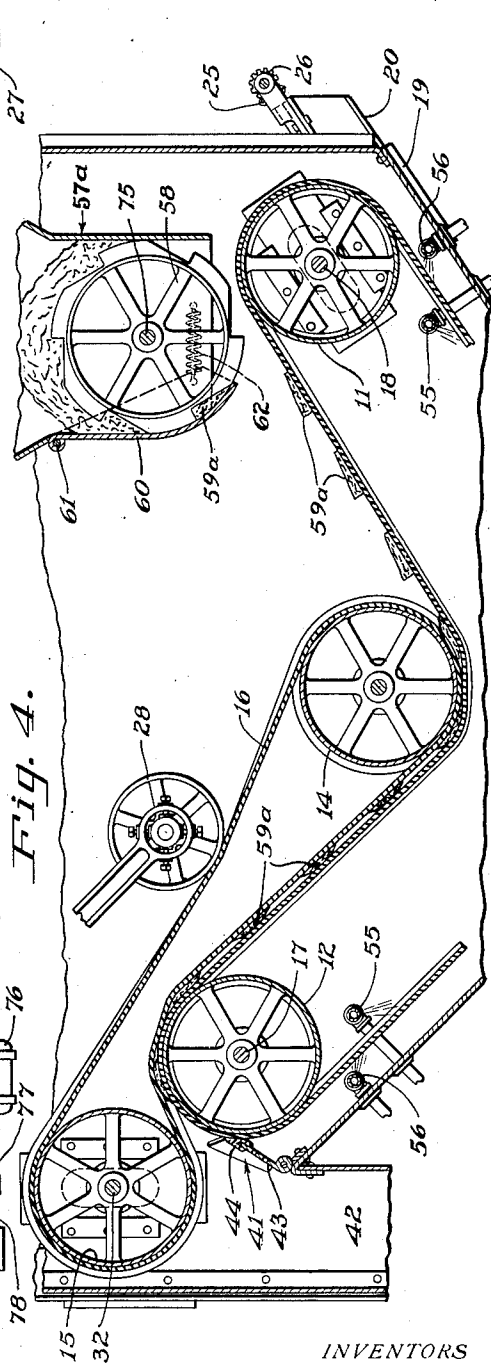
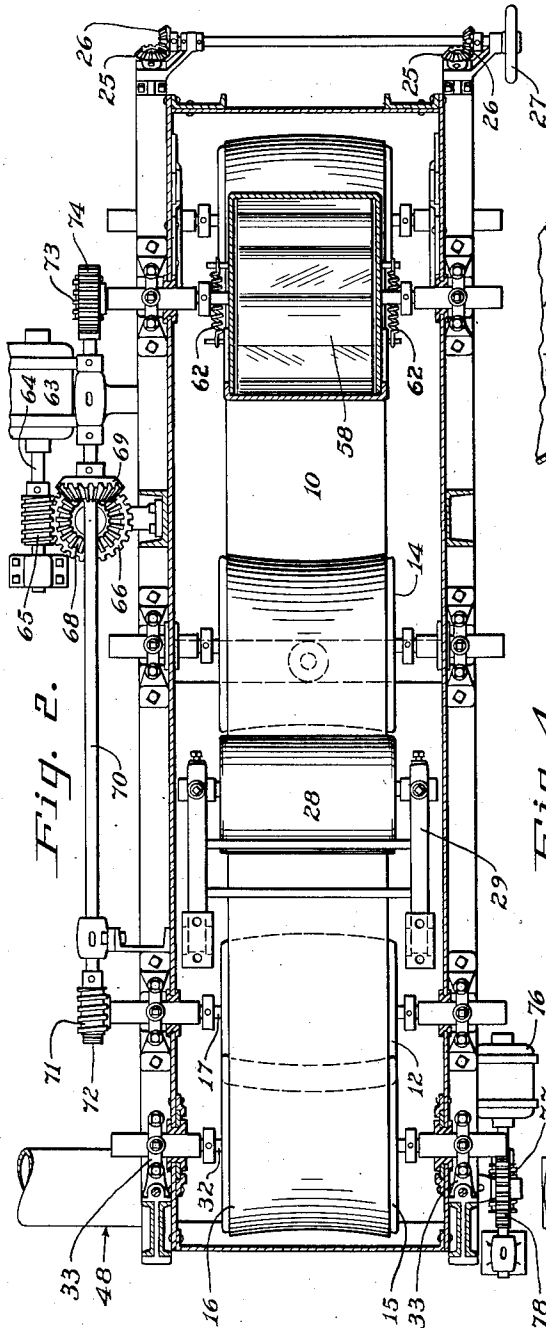
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Fig. 5.

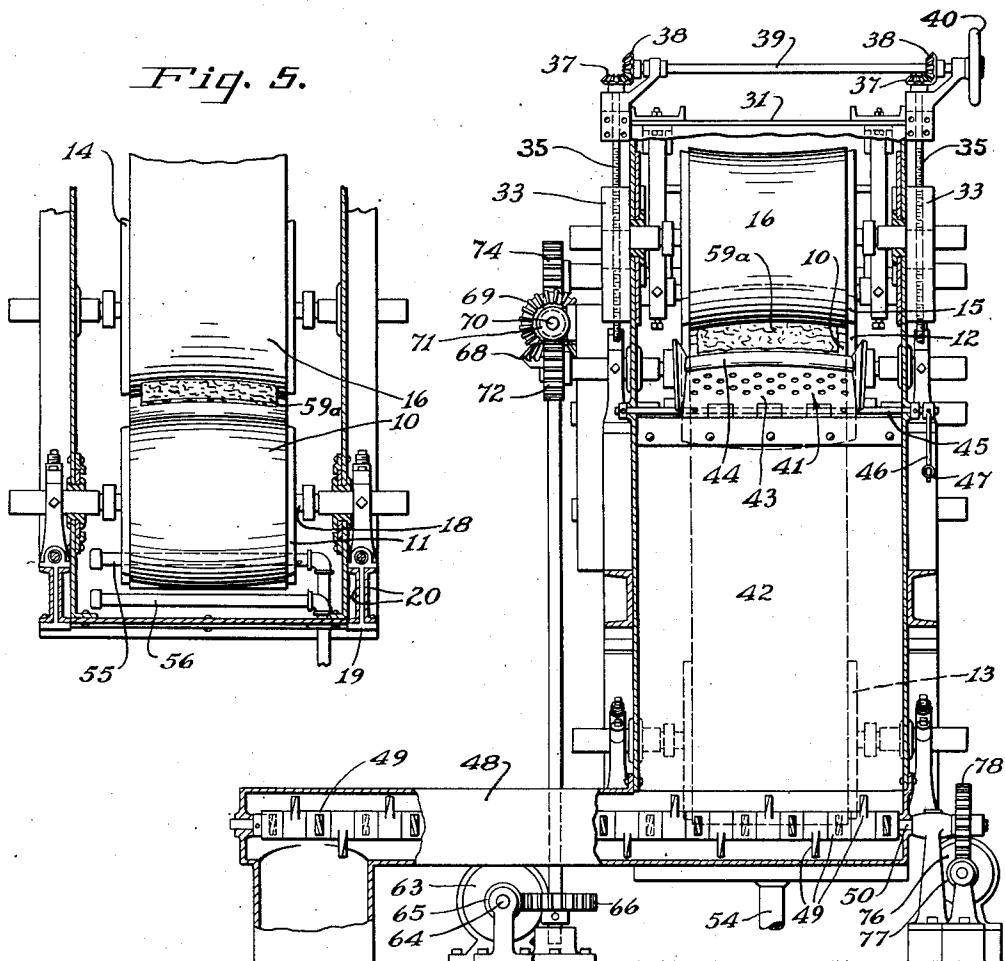
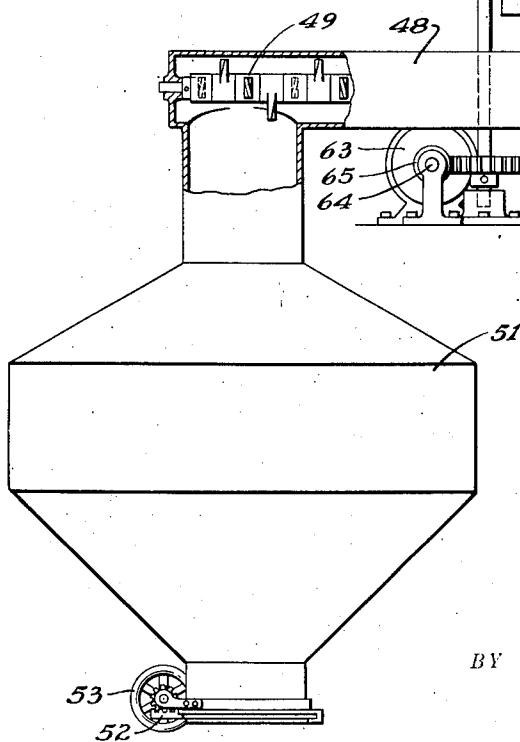


Fig. 3.



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UNITED STATES PATENT OFFICE

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PRESS

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Application March 14, 1933, Serial No. 660,638

4 Claims. (Cl. 100—37)

This invention relates to presses and more particularly to means for extracting a considerable percentage of water from wet material such as screenings and sludge from sewage.

5 In the treatment of sewage, it is a usual practice to remove the larger objects or coarse screenings by the use of relatively coarse screens, such as bar screens. Fine screenings may then be removed leaving finer material which may later, as by settling or filtering, be separated from the liquid of the sewage as sludge. The screenings are conveniently disposed of in incinerators and the sludge may be disposed of in the same way. This material contains a high percentage of liquid which must be substantially reduced in order to obtain fairly economical incineration, or to enable satisfactory disposal thereof in other ways. The apparatus of the present invention is more particularly adapted for dewatering fine screenings and sludge.

20 An important object of the present invention is to provide improved means for dewatering wet material such as sewage screenings and the like. An important feature of this invention relates to a novel use of belts in connection with pressing out liquid from the wet material and draining off the liquid. Another feature relates to preventing undue squeezing back of material when it enters between the travelling presser members. 30 Another feature relates to the deposition of the wet material in separate charges of special shape on a travelling belt, with suitable spaces between the charges to facilitate drainage. A further feature relates to the provision of a belt with a convex upper surface to facilitate the draining of liquid from wet material deposited thereon and later pressed thereagainst. Another feature relates to subjecting the slugs or charges to an action, in the nature of pumping, between two belts oscillated by the entrance of successive slugs.

Other features, objects, and advantages will appear upon consideration of the following description and of the drawings, in which

45 Fig. 1 is a side elevation, partly in section and partly broken away to show the underlying structure, of a preferred embodiment of the invention;

50 Fig. 2 is a section taken along the line 2—2 of Fig. 1;

Fig. 3 is a section taken along the line 3—3 of Fig. 1;

55 Fig. 4 is a fragmentary longitudinal, vertical section; and

Fig. 5 is a section taken along the line 5—5 of Fig. 1.

Referring to the preferred embodiment shown in the drawings, the press includes a lower continuous belt 10 travelling on rotating members 5 or pulleys 11 and 12 supporting the upper reach and a pulley 13 holding the lower reach of the belt down so as to permit downward bending of the upper reach without interference, and also to facilitate cleaning and drainage as will be brought out more clearly hereinafter. The upper reach of the belt 10 is bent downwardly by a pulley 14, around which and a pulley 15 beyond the pulley 12, travels a second continuous belt 16. Preferably the belts are made of heavy cotton fabric treated with suitable material, such as rubber, to render them waterproof.

The upper belt 16 is driven from the lower belt 10 and the belt 10 is driven by the pulley 12 which is mounted on a shaft 17 journaled in 20 the framework at opposite sides of the press. To take up all slack in the belt 10 and yieldingly tension the same, shaft 18 carrying pulley 11 passes through suitable slots in the housing and is adjustably journaled at opposite sides of the 25 press on slides or members 19 slidable along frame members 20.

To urge the slides in a direction to tension belt 10, provision is made at each side of the press of screw-threaded rods or members 21 held 30 against longitudinal movement by abutment blocks 22, preferably secured to the members 20, and threaded through nuts or nut members 23 slidable along frame members 20 and held against rotation with the rods or shafts 21. Yieldable 35 connections between the nuts 23 and slides 19 are provided by helical springs 24 on the rods 21 and interposed between the nuts or blocks 23 and the slides 19.

To actuate the threaded rods or screws 21 in unison they are provided at their outer ends with bevel gears 25 meshing with gears 26 on a transverse shaft 27 actuated by suitable means, such as a hand wheel 27. The tension of the upper belt 16 may be controlled in any suitable manner, 45 as by means of an idler pulley 28 carried by a frame 29 pivoted at 30 the lower side of the roof 31 of a housing, preferably of metal, enclosing the press. The extent of the wrapping of the lower reach of the belt 16 around the pulley 12 50 may be varied by raising or lowering the pulley 15. To this end shaft 32 carrying the pulley 15 passes through suitable slots in the casing and is adjustably journaled in members or slides 33 slidable on frame members 34 and these slides 55

are raised and lowered by screws 35 cooperating therewith.

Said screws 35 are held against longitudinal movement by blocks 36 secured to the frame members 34, and are turned by means including bevel gears 37 at the upper ends of the screws, bevel gears 38 on a transverse shaft 39 meshing with bevel gears 37, and a hand wheel 40 on said shaft 39.

To facilitate drainage of liquid from the belt 16, the upper reach of the belt may be maintained in convex form, that is with the middle thereof higher than the edges, preferably by having the pulleys 11 and 12 with convex surfaces and with the pulley 13 of proper shape to use with pulleys 11 and 12. With this form of pulleys 11 and 12, pulleys 14 and 15 are concave in form.

Wet material, such as screenings, deposited on the belt 10 is carried thereby beneath the pulley 14 and between the belts 10 and 16. After passing the pulley 12, the material is discharged from the belts over a scraper or stripper 41 and discharged into a hopper 42. Preferably the scraper includes a perforated plate 43 with a non-metallic nose 44, mounted on a shaft 45 journaled in the housing, and the scraper is held yieldingly against the belt 10 and pulley 12 by means of an arm 46 fixed on the shaft 45 outside of the housing and connected by means of a helical tension spring 47 with a fixed part, such as one of the frame members 34.

From the hopper 42, the dewatered material passes to a screw conveyor 48 including a screw 49 on a shaft 50. From the conveyor, the material drops into a closed receptacle or tank 51 having a bottom opening provided with a sliding gate 52 controlled by a hand wheel 53. From the tank, the dewatered material may be withdrawn as desired and disposed of, as by burning in an incinerator.

Water drains from material on the upper reach of the belt 10 while it is approaching the pulley 14, while it is pressed between the two belts 10 and 16, and while it is passing over the perforated plate 43 of the stripper; and all of this drainage passes into the lower part of the housing, which part is in the general form of a hopper directing the drainage to a drain 54.

To clean the belt 10 and the floor of the housing, spray pipes 55 may be provided at the upper side of the lower reach of the belt 10 and adjacent to the pulleys 11 and 12, and other spray pipes 56 may be provided at the lower side of such lower reach and, in general, adjacent to those at the upper side. Each set of spray pipes 55 and 56 may be controlled by a single valve 57.

The wet screenings or material to be dewatered may be deposited in any suitable manner on the belt 10. Preferably the feeding device includes a hopper 57a receiving material through a corresponding opening in the roof of the housing, and a metering and forming wheel 58 in the lower part of the hopper and provided with pockets 59 to receive and shape charges 59a of the wet material, such as screenings, and deposit them in spaced apart positions on said belt 10, thus leaving channels through which the water will drain off rapidly. At the discharge side of the wheel 58, the side 60 of the hopper is hinged at 61 and is urged against the wheel by means including spring 62, thereby acting as a wiping means and holding back all material not enclosed in the recesses.

As illustrated, the recesses 59 are relatively

deep at one edge and the depth decreases to nothing at the other edge. The wall at the deep edge of each recess is substantially radial and provides good supporting means for a charge when the latter is carried out of the hopper 57a. If the wheel were turned in the opposite direction, there would be no certainty that the material would stay in the pockets and be carried out of the hopper. The charges formed by the pockets are thicker at one edge and the thicker edges are made the leading edges when the charges are deposited on the belt 10.

An advantage of this form of charge is that when the thick leading edge of a charge enters the space between the presser belts 10 and 16 there is less resistance to the passage of water through the back part of the slug or charge. Another advantage is that the thick forward edge tends to force the belts farther apart and therefore prevent so much squeezing back and piling up of material as would occur if a flat layer of material were fed to the belts. As a matter of fact the charges are, as illustrated in Fig. 1, brought down to a substantially uniform thickness which, however, is sufficiently great to enable effective pressing action thereon. It will also be apparent that the water forced out of each slug as it enters the bight between the belts will be cleared out of the following channel due to the fact that the upper belt is forced down to the bottom of the channel (Fig. 1). The thick forward edges of the slugs or charges, in passing beneath the pulley 14, alternately force down and release the corresponding portion of the yieldingly tensioned belt 10, thus causing a flapping action of the portion between the pulleys 14 and 12 and a corresponding pumping action to draw water or liquid from the slugs due to the porous or capillary nature of the material.

Power for driving the principal parts of the apparatus may be provided by an electric motor 63 (Figs. 2 and 3) driving a shaft 64 and carrying a worm 65 by which motion is imparted to a worm gear 66 on a vertical shaft 67 provided, at a higher level with a bevel gear 68 meshing with a bevel gear 69 on a shaft 70 extending along the main housing and outside thereof. The shaft 70 is provided at one point with a worm 71 driving a worm gear 72 on the shaft 17 of the pulley 12 and thereby driving the belt 10 and consequently the belt 16, and at another point with a worm 73 meshing with a worm gear 74 on shaft 75 carrying the forming and metering wheel 58. The screw conveyor 49 may, however, be actuated independently, as for example by means of an electric motor 76, a worm 77 driven thereby, and a worm wheel 78 in mesh with the worm and mounted on the screw shaft 50 to turn the same.

In the operation of the apparatus, there is fed into the hopper 57a material comprising solids and liquids and from which a portion of the liquid is to be removed. Rotation of the metering and forming wheel 58 causes successive recesses or pockets 59 to be filled with corresponding charges or slugs of the wet material and deposited on belt 10 so as to provide between successive charges definite clear spaces adapted to serve as drainage channels or gutters. If the liquid content of the material be sufficiently high, some free liquid will drain away from the segment on to the belt 10 when deposited thereon. Each slug 59a is advanced by belt 10 into engagement with the belt 16 where the slug is put under pressure which acts to squeeze out a part of the liquid content and to flatten the slug as illus-

trated in Figs. 1 and 3. After passing the pulley 14 the slug is subjected to pressure between the belts 10 and 16 until it is discharged over pulley 12 and scraper 41 into hopper 42.

5 The first application of pressure occurs when a slug reaches the lowest point of its path of travel on the belt 10 and during this part of the travel the slug forms at its rear a gutter or drainage areas for collecting the liquid flowing from the following slug, and discharging it at the edges of the belt due to the convex upper surface of the belt. After passing from the bottom of pulley 14, each slug is moved upwardly, thereby aiding gravity drainage, and at the same time is subjected to pressure. The charges or slugs 59a in passing under pulley 14 cause an oscillating movement between the portions of belts 10 and 16 between the pulleys 14 and 12 thus producing a sort of pumping action on the material which is of a porous or capillary nature, this pumping action being more effective on belt 10 where the pumping action is aided by gravity.

Where belt 10 passes under pulley 14, there will always be direct contact between belts 10 and 16 after each slug 59a passes the effective point of contact. This prevents liquid, other than that pressed out after passing the contact point on pulley 14, from passing beyond such point of contact.

30 Protection against damage by the passage of larger particles is provided by springs 24 in the take up for belt 10, and by the idler 28 which serves as a take up for belt 16. The spring urged pivoted side of the feed device also protects against damage from this cause.

It should be understood that various changes can be made in the construction and arrangement of parts and in the manner of carrying out various features of the invention, and that certain features can be used without others, without departing from the true spirit and scope of the invention.

Having thus described our invention, we claim
1. In apparatus of the class described, pressing means, a travelling belt advancing wet material to the pressing means and having a portion on which the wet material drains before being subjected to the action of the pressing means, means for depositing on the belt successive charges of material at separated positions to provide transverse drainage channels, such depositing means including a hopper and a wheel at the bottom of the hopper having pockets to receive said charges, and driving means for the belt and wheel coordinating the relative speeds thereof to provide distinct drainage spaces between successive charges.

2. In apparatus of the class described, pressing means, a travelling belt advancing material to the pressing means and having a drainage portion with a convex upper surface inclined downwardly toward the pressing means, and means for depositing on the belt successive charges of material at separated positions there-

on to provide transverse drainage channels, such depositing means including a hopper and a wheel at the bottom of the hopper having pockets to receive said charges, and driving means for the belt and wheel coordinating the relative speeds thereof to provide distinct drainage spaces between successive charges.

3. In apparatus of the class described, an endless conveyor belt having an upper reach advancing the wet material; means including rotary convex belt-supporting members at opposite ends of said upper reach to provide a convex upper surface for said upper reach to assist drainage; pressing means including a concave rotary member depressing said upper reach of the conveyor belt to provide a portion downwardly inclined from the receiving end of the belt to the bottom of said concave member and a portion upwardly inclined toward the discharge end of the conveyor belt, an endless pressing belt passing around said concave rotary member above said conveyor belt and a second rotary concave member directing the lower reach of said pressing belt along the upper surface of said upwardly inclined portion of the conveyor belt; means for depositing successive charges of material on the conveyor belt at its receiving end; yieldable tensioning means for said conveyor belt to permit passage, between said conveyor belt and said presser belt, of the charges without complete flattening thereof; and driving means for said conveyor belt and depositing means coordinating the speeds thereof to provide for drainage channels between successive charges on their way to the pressing means and drainage passages between charges after flattening thereof in passing around the lower side of the first mentioned concave rotary member.

4. In apparatus of the class described, a conveyor belt having an upper reach for advancing wet material, means including rotary convex belt-supporting members at opposite ends of said upper reach to provide a convex upper surface to facilitate drainage, means cooperating with said upper reach of the belt to press liquid out of said wet material and including a concave rotary member engaging said upper reach and forming a bend therein with a straight draining portion inclined downwardly from the belt-supporting member at the receiving end of the upper reach, means for depositing successive charges of material on said draining portion, driving means for said conveyor belt and the depositing means coordinating the relative speeds thereof to provide distinct drainage channels between said charges, and yielding mountings for the belt-supporting member at the receiving end of the upper reach to enable said upper reach to be pressed downwardly as each charge begins its passage between the upper reach of the belt and said concave rotary member.

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