No. 786,902. PATENTED APR. 11, 1905.

J. W. HYATT.

JUICE EXTRACTING MACHINE.

APPLICATION FILED JULY 17, 1903. RENEWED SEPT. 10, 1904.

4 SHEETS—SHEET 1

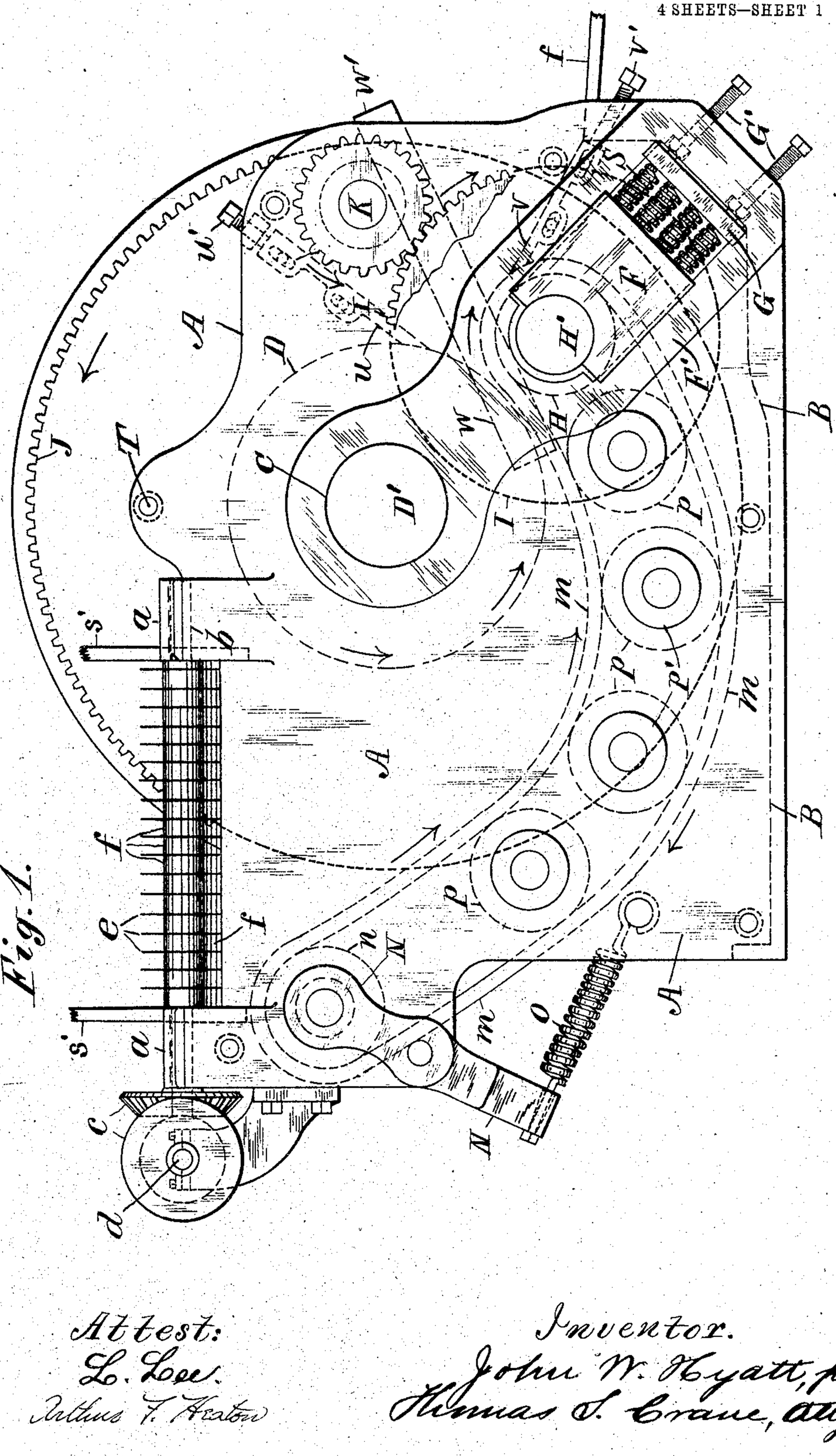

Fig. 1.

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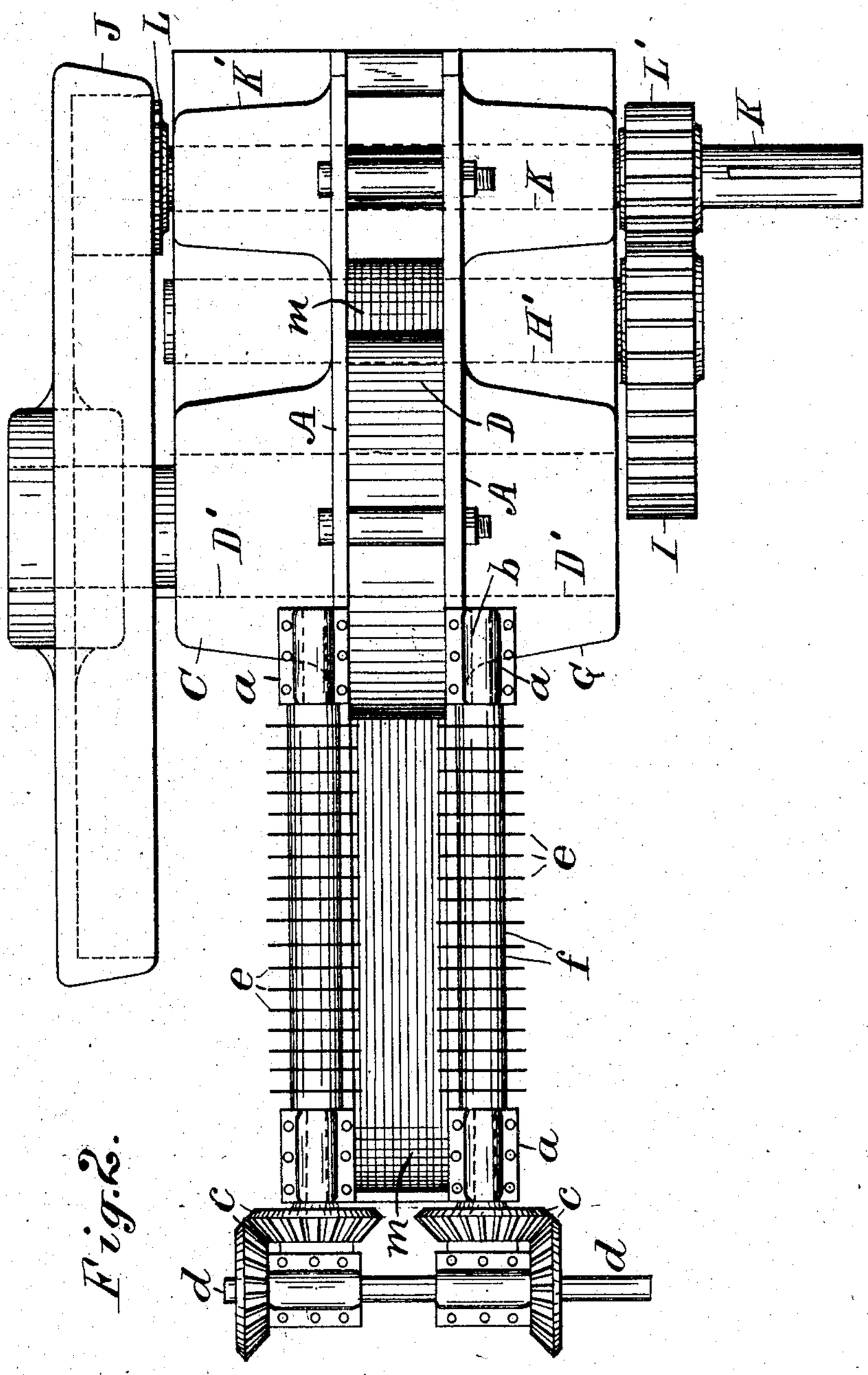

Fig. 2.

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4 SHEETS—SHEET 3.

Fig. 4.

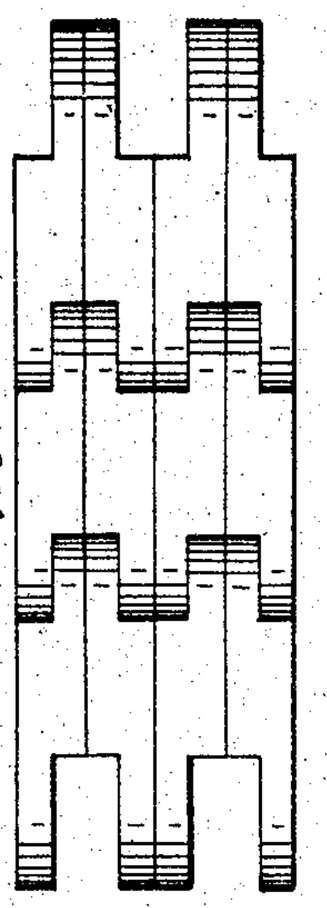

Fig. 5.

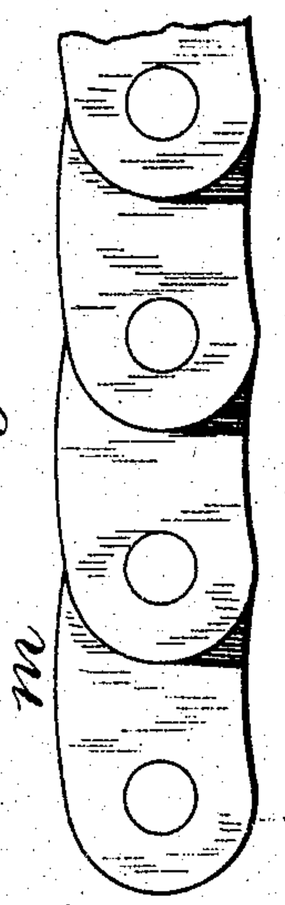

Fig. 3.

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4 SHEETS—SHEET 4.

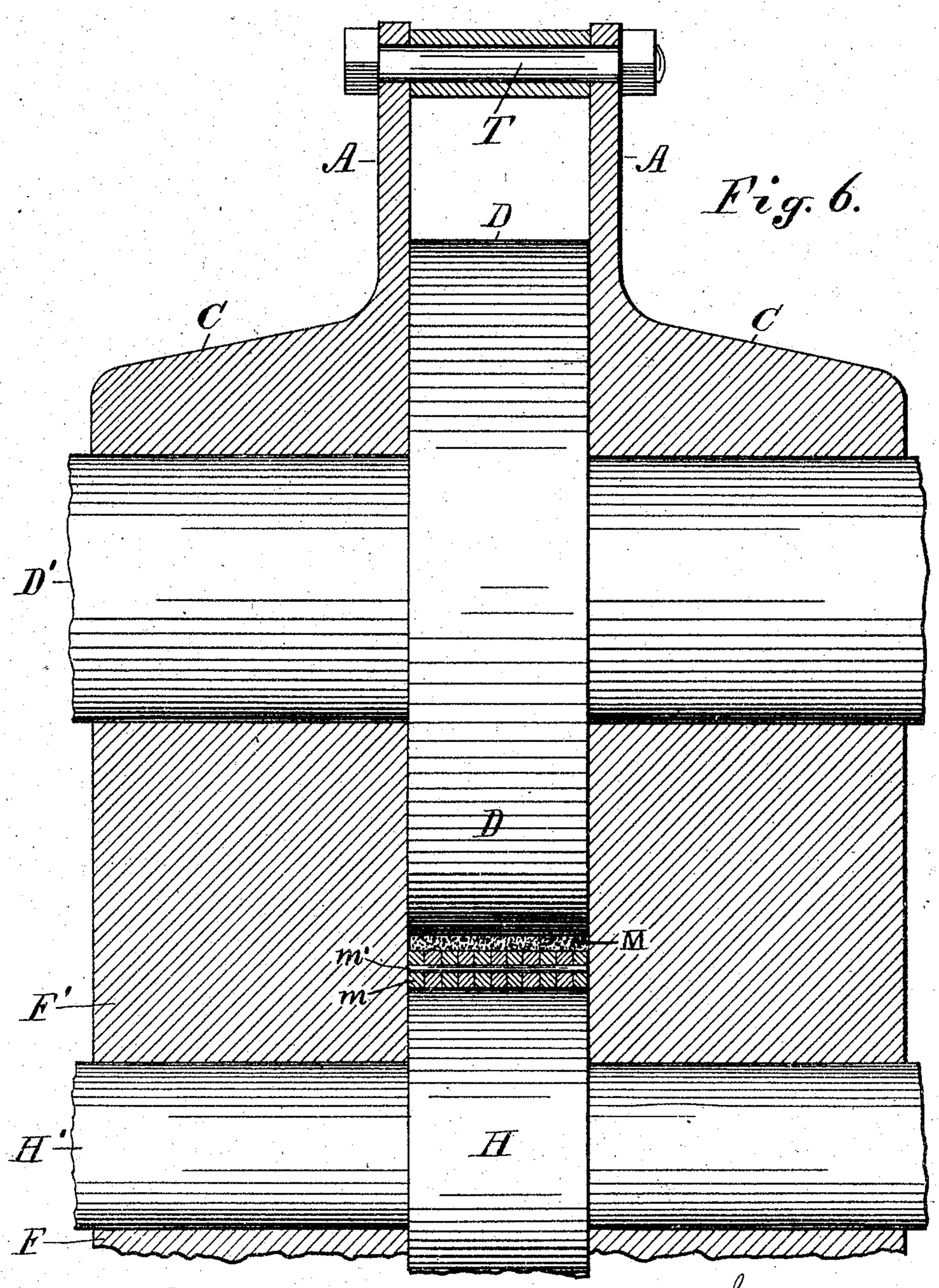

Fig. 6.

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No. 786,902. Patented April 11, 1905.

UNITED STATES PATENT OFFICE.

JOHN W. HYATT, OF NEWARK, NEW JERSEY.

JUICE-EXTRACTING MACHINE.

SPECIFICATION forming part of Letters Patent No. 786,902, dated April 11, 1905.

Application filed July 17, 1903. Renewed September 10, 1904. Serial No. 224,025.

To all whom it may concern:

Be it known that I, JOHN W. HYATT, a citizen of the United States, residing at 141 Commerce street, Newark, county of Essex, State of New Jersey, have invented certain new and useful Improvements in Juice-Extracting Machines, fully described and represented in the following specification and the accompanying drawings, forming a part of the same.

The present invention comprises an improved apparatus for compressing fibrous vegetable material, like sugar-cane, against a permeable chain belt, through which the juice of the material may be discharged before the fiber is relieved from pressure, and the fiber thus prevented from reabsorbing the juice.

In the present invention the chain belt is supported upon horizontal pulleys or drums to form a bed for the material, and the pressing-roll is journaled above one end of such chain, within which a drum may be pressed elastically toward the roll to produce the required pressure between the roll and chain. The chain belt is disposed in a curve concave to the periphery of the roll and extended laterally and downwardly to the junction of the roll and chain, so as to form a downwardly-converging channel in which the material may be gradually contracted as it approaches the pressing-point. The roll and the chain belt are fitted between cheeks which form the sides of a receptacle or channel to confine the material, and such cheeks may also serve to support the bearings for the roll and chain-belt pulleys. The receptacle or channel between the cheeks is preferably supplied with the material by means of shaft S, extended along the edges of the cheeks, a chute conducting the material to such shafts, and feed-wheels upon the shafts to discharge the material from the chute into the channel. The drum in one end of the chain belt is made adjustable toward the roll and is preferably supported upon springs to produce an elastic pressure of the desired degree upon the material, and the opposite end of the chain belt is carried over a return-pulley which is mounted movably in a bearing actuated by springs to produce the required tension in the chain. Idler-pulleys are inserted between the sides of the chain belt at different points to form a support for the bed which carries the material to the roll.

The pressing-roll and the drum are connected by gearing so proportioned as to drive the chain belt and periphery of the roll at the same surface speed. The chain belt is made of links connected with interspaces adapted to permit the escape of the juice which is expressed from the material, and as the chain belt is permeable at all joints any juice which is discharged from the material before it receives the greatest pressure escapes downwardly through the chain belt and is wholly removed from the influence of the compressed fiber when the latter is discharged. The compressed fiber is thus prevented from reabsorbing any of the juice and is discharged in a drier condition than when pressed between ordinary solid rolls. This result is attained by forming the chain belt with numerous links between its two edges, the links being jointed together in series or rows and the several series or rows connected together laterally by rivet-bars, extending through the entire width of the chain. This construction furnishes numerous interstices between the joints of the links in the rows and between the rows themselves for the discharge of the liquid downwardly. Only a single chain belt is used, as I have found that the application of a pressing-roll to the upper side of such a chain belt prevents the liquid most effectively from any reabsorption when the material is discharged from pressure, as the solid pressing-roll prevents any of the expressed liquid from escaping upwardly, and the ample provision for the escape of the liquid downwardly enables the same to flow away from the material before it is freed from pressure. This operation is wholly different from that of two chain belts pressed upon the upper and lower sides of the material, as the liquid which escapes into the interstices of the upper chain belt rests upon the compressed material and flows out from the interstices of the upper chain belt upon such material when the pressure is relieved, and is thus reabsorbed by the same.

One form of the invention is shown in the annexed drawings, in which—

Figure 1 is a side elevation of the appara-

tus. Fig. 2 is a plan of the same. Fig. 3 is a view at the left end of the same. Fig. 4 is a portion of the chain shown in plan, and Fig. 5 an edge view of the same portion. Fig. 6 is a transverse section through the center of tie-bolt T, roll D, and drum H in Fig. 1.

A designates the cheeks, which are shown united at the bottom to a bed B, which forms a trough to receive the juice.

C designates bearings upon the cheeks to receive the spindle D′ of the pressing-roll D. Beneath one of the quadrants of the pressing-roll a spring-bearing F is mounted adjustably in housings F′ upon the cheeks, the springs S being adjusted by a plate G and screws G′. A drum H has shaft H′ fitted to the bearings F and extended beyond the same to receive a gear-wheel I. The spindle D′ is projected beyond one of its bearings to receive an internal gear J, and a shaft K is journaled in bearings K′ upon the cheeks in such position that a driving-pinion L′ meshes with the wheel I, and a similar pinion L meshes with the internal gear J. The shaft K is rotated by connection to a suitable motor.

The cheeks A are extended beyond the ends of the pressing-roll to form a hopper for receiving the material and to support the bearings which sustain the pressure, as well as the feeding apparatus which forces the material from a chute into the channel between the cheeks. The cheeks also extend past the junction of the drum and pressing-roll, so as to fully embrace the edges of the chain belt wherever the material rests upon it.

One end or loop of the endless chain belt *m* is fitted around the drum H, and the chain belt is first extended downwardly in a curve therefrom, so as to be tangential to the periphery of the roll D. The chain belt then extends upwardly in a continuation of the same curve to a return-pulley *n*, which is carried by a fork-lever N, provided with springs O to produce the required tension upon the chain. The idler-pulleys *p* are inserted between the chain belt at suitable intervals between the drum and the return-pulley *n*, and their shafts are carried by bearings *p′* upon the cheeks. Each of the cheeks is shown with two bearings *a*, carrying feed-shafts *b*, which are connected at one end by gear-wheels *c*, and a cross-shaft *d*, which would be driven by suitable connection to the driving-motor.

Fig. 3 shows a chute *s*, extended vertically, so that the sugar-cane or other material fed therein would gravitate toward the shafts. The shafts are furnished with star feed-wheels *e*, adapted to draw the material from the chute and force it positively into the channel between the cheeks above the bed. The material thus forced upon the moving chain belt is drawn gradually into the curved tapering space between the chain belt and pressing-roll, and is thus subjected to an increasing pressure, which gradually discharges the juice therefrom. When between the drum and pressing-roll, as shown in Fig. 6, the material M is compressed to the greatest extent, which may be regulated by the tension of the springs S, and is then discharged to the waste-board *f*. The drum may be adjusted without openings and remain in a fixed position. The disposition of the drum beneath one of the quadrants of the pressing-roll produces a downward curve of the chain beneath the pressing-roll, which greatly facilitates the flow of the juice away from the point of greatest pressure, and as the channel between the pressing-roll and chain converges gradually a great portion of the juice is discharged through the chain belt before the material receives its greatest pressure.

One form of permeable chain belt is shown in Figs. 5 and 6, the chain belt having parallel rows of links, which are formed with half-lap at the ends, so that when jointed together each row is of uniform thickness. The links would be jointed by rivets extended across the entire width of the chain belt; but the particular construction of the chain belt is not claimed herein, as it is made the subject of a separate application. The links are so constructed that interspaces or narrow passages exist between the same for the discharge of the fluid, which flows downward upon its escape from such passages to the trough B, from which it is conveyed in any desired manner. A large amount of space is provided for the discharge of the fluid by making the links in numerous rows, so that interspaces are formed not only between the joints or hinges of the several links, but between the walls of the rows themselves. Such interspaces are shown in Fig. 4; but only the longitudinal interspaces between the several rows are indicated in Figs. 2 and 3, as the scale of the drawings is too small to show the joints between the links in the rows. A belt formed of transverse slats, supported only at the ends, would obviously be broken and crushed by the great pressure exerted under the pressing-roll, and a chain belt or chain having single links extended the whole width of the belt would not afford the numerous interspaces for the discharge of liquid. Perforations formed in such broad links would not be an equivalent for such interspaces, as they are more liable to be clogged by the fiber than interspaces between jointed links, which move upon one another at the joints where they turn around the supporting-drum. It is well-known that in a cane-crushing mill several pairs of rolls are required to efficiently extract the juice, because the juice cannot escape freely from the fiber where it passes into the rolls.

With solid rolls the juice, owing to the acute angle between the rolls, must be forced back through several inches of the compressed

fiber before it can escape, and a portion of the juice is unavoidably retained in the fiber when it passes through the rolls.

My construction affords a great facility for the escape of the juice, as clearly shown in Fig. 6, where the numerous links *m* of the chain (connected by a through-rivet *m'*) are shown resting upon the drum H and supporting the material M under the pressure of the roll D.

The liquid expressed from the material cannot flow upwardly on account of the solid roll D, and is therefore all forced downwardly into the chain belt, which consists of numerous series or rows of links connected together laterally.

In my construction the interspaces between the links of the chain belt permit the juice to escape before and at the point of greatest pressure, and the fiber is thus freed from the juice more perfectly. In an ordinary roller-mill nine rolls are required to extract the juice, and their diameter is for various reasons usually limited to thirty-four inches.

In the present invention I employ only a single pressing-roll D, and no disadvantage results from making such roll six feet or more in diameter, provided the drum which supports the chain belt is made proportionately small to avoid too acute an angle between the two. The aggregate of the diameters of my roll and drum may, however, be made considerably greater than that of the pair of rolls in the roller-mill.

In my construction the pressing-roll is made of much shorter length relative to its diameter than the rolls of a cane-mill; but owing to the gradually-converging channel formed by the large roll and the curved chain belt I am enabled to pass beneath the roll a layer of cane five times as thick as in an ordinary cane-mill and am also enabled to draw in the material while carrying five times the pressure per unit of area that is possible in the cane-mill. I have employed in practice a pressure of one hundred and fifty tons per lineal foot upon the material where it passes under the pressing-roll. The machine is thus able to operate upon a great quantity of the cane in a short space of time and to discharge the bagasse with a much smaller percentage of moisture than the ordinary roller cane-mill.

Although the bearing for the chain-belt drum is shown supported upon springs, it is not essential that the bearing should be thus sustained, as it may be adjusted rigidly at the proper point if the material is fed uniformly to the chain. The bearing F may therefore be made adjustable and secured or supported rigidly during the operation of the machine, if desired. Certain details of construction are desirable to promote the operation of the machine. For instance, scrapers or strippers *u v* are shown applied, respectively, to the roll D and to the chain belt *m* beyond the point of greatest pressure to clean the bagasse from the pressing-surfaces. These strippers are mounted adjustably and provided, respectively, with adjusting-screw *u'* and *v'*.

The material when subjected to the greatest pressure is crowded against the cheeks at the junction of the roll D, and the chain belt and the material are liable to wear the cheeks at such point. To compensate for such wear or to furnish a means of renewing the surface of the cheeks when worn, a longitudinal recess *w* is shown in Fig. 1 formed upon the side of the nearer cheek at the said junction, and a removable facing-strip *w'* is fitted to such recess flush with the inner side of the cheek.

The facing-strips may be made of harder material than the cheeks and renewed at any time and any injurious wear prevented at the junction of the roll and the drum.

The feed-wheels *e* are secured rigidly to the feed-shafts *b*, and to clear or strip the material from the points of the feed-wheels strippers *f* (shown in Figs. 1 and 3) are fitted loosely upon the feed-shaft intermediate to the feed-wheels and furnished each with a prong or ear which rests upon the top of the contiguous cheek, so that the strippers are held from rotating with the shaft.

The inner sides of the strippers and of the ears form a sloping surface directed downwardly into the channel between the cheeks, and the material which clings to the points of the feed-wheels is thus stripped automatically therefrom and discharged into the channel as desired. These various attachments are claimed herein, as they facilitate the practical working of the machine; but they may be varied without departing from the essential features of the invention.

Having thus set forth the nature of the invention, what is claimed herein is—

1. A juice-extracting machine having a large pressing-roll, a belt-carrying drum opposed directly to the same, and a single permeable chain belt carried over the drum tangentially to the periphery of the pressing-roll and forming a moving bed for the material, the belt consisting of numerous series or rows of links all connected together laterally to move in unison and each link resting upon the drum to sustain the pressure, and the spaces between the joints of the links in the rows and between the rows themselves permitting the escape of the liquid expressed from the material.

2. A juice-extracting machine having a large pressing-roll, cheeks extended from the opposite ends of the same and provided with the roll-spindle bearings, a belt-carrying drum opposed directly to the pressing-roll with the cheeks extending over the junction of the roll and drum, and a single endless permeable chain belt impelled between the cheeks to

form a moving bed for the material, the belt consisting of numerous series or rows of links all connected together laterally to move in unison, and each resting upon the drum and concaved to fit the same, to sustain the pressure, and the spaces between the joints of the links in the rows and between the rows themselves, permitting the escape of the expressed liquid downwardly, while the pressing-roll which expresses the liquid prevents any escape of the liquid upwardly.

3. A juice-extracting machine having a large pressing-roll, cheeks extended from the opposite ends of the same and provided with the roll-spindle bearings, a belt-carrying drum opposed directly to the pressing-roll with the cheeks extending over the junction of the roll and drum, an endless permeable chain belt impelled between the cheeks to form a moving bed for the material, the belt consisting of numerous series or rows of links all connected laterally to move in unison, and each resting upon the drum and concaved to fit the same, to sustain the pressure, a longitudinal recess *w* in each cheek at the junction of the roll and drum, and a renewable facing-strip *w'* fitted to such recess to receive the pressure and wear of the moving material.

4. A juice-extracting machine having a pressing-roll with diameter materially greater than its length, a drum materially smaller than the pressing-roll beneath the same, a single permeable chain belt carried by the drum and consisting of numerous series or rows of links all connected together laterally to move in unison, and each resting upon the drum to sustain the pressure, and the spaces between the joints of the links in the rows and between the rows themselves, permitting the escape of the liquid downwardly, while the pressing-roll which expresses the liquid prevents any escape of the liquid upwardly.

5. A juice-extracting machine having a large pressing-roll, cheeks extended from the opposite ends of the same, a belt-carrying drum opposed directly to the pressing-roll, an endless permeable chain belt impelled between the cheeks to form a moving bed for the material, the belt consisting of numerous series or rows of links all connected together laterally to move in unison, with interspaces between the various links for the escape of liquid, and the stripper *v* applied to the chain belt beyond the junction of the roll and drum to clean the material from the surface of the belt, such surface being made concentric with the drum to facilitate the operation of the stripper.

6. A juice-extracting machine having a large pressing-roll, cheeks extended from the opposite ends of the roll to confine the material, a single permeable chain belt impelled between the cheeks, a drum within the chain belt at its junction with the roll, and means for pressing the drum and chain belt elastically and adjustably toward the roll, the chain belt consisting of numerous series or rows of links all connected laterally to move in unison with each link resting upon the drum to sustain the pressure, and the spaces between the joints of the links in the rows and between the rows themselves, permitting the escape of the expressed liquid downwardly, while the pressing-roll which expresses the liquid prevents any escape of the liquid upwardly.

7. A juice-extracting machine having a large pressing-roll, cheeks extended from the opposite ends of the roll to form a hopper and chain belt guide, a single permeable chain belt propelled between the cheeks, a drum within the chain-belt at its junction with the roll, means for pressing the drum and chain belt toward the roll, a chute for delivering the material at the top of the cheeks, and a feeding device for grasping the material and operating to draw it from the chute and force it downwardly between the cheeks upon the chain belt, whereby the space between the cheeks is filled positively with the material, which is thus forced to travel with the chain belt to the pressing-roll.

8. A juice-extracting machine having a large pressing-roll, cheeks extended from the opposite ends of the same, an endless permeable chain belt propelled between the cheeks tangentially to the roll to form a bed and converging channel for the material, bearings upon the cheeks with shafts extended parallel to the cheeks, a chute leading the material to the cheeks and feed-wheels upon the shafts to force the material into the channel upon the chain belt.

9. A juice-extracting machine having a large pressing-roll, cheeks extended from the opposite ends of the roll to confine the material and form a hopper, a single permeable chain belt propelled between the cheeks, the belt consisting of numerous series or rows of links all connected together laterally to move in unison, and each resting upon the drum and concaved to fit the same, to sustain the pressure, and the spaces between the joints of the links in the rows, and between the rows themselves, permitting the escape of the expressed liquid downwardly, while the pressing-roll prevents any escape of the liquid upwardly, a drum within one end of the chain belt at its junction with the pressing-roll, a return-pulley within the opposite end of the chain belt, and supporting-pulleys at intervals beneath the chain belt between such return-pulley and the drum to support the belt, and the material accumulated upon the same before it is pressed by the pressing-roll.

10. A juice-extracting machine having a large pressing-roll, cheeks extended from the opposite ends of the roll to confine the material and form a hopper, a single permeable chain belt propelled between the cheeks, the belt consisting of numerous series or rows of

links all connected together laterally to move in unison, and each resting upon the drum to sustain the pressure, and the spaces between the joints of the links in the rows, and between the rows themselves, permitting the escape of the expressed liquid downwardly, while the pressing-roll prevents any escape of the liquid upwardly, a drum within one end of the chain belt at its junction with the pressing-roll, a return-pulley within the opposite end of the chain belt, and supporting-pulleys at intervals beneath the chain belt between such return-pulley and the drum to support the belt and the material thereon, and means applied to the return-pulleys to maintain the tension of the chain belt.

11. The juice-extracting machine herein described, comprising the cheeks formed integral with the fixed bearings C and extended to form a hopper and housings F′, the roll D having spindle D′ fitted to the bearings C, the bearings F fitted adjustably to the housings F′, the drum H having the shaft H′ fitted to the adjustable bearings, the bearings p' upon the cheeks disposed in a curve laterally and upwardly from the adjustable bearings, and provided with idler-pulleys p, the return-pulley n with means for tightening the same, the endless permeable chain belt extended over all the pulleys and the drum to form a downwardly-converging bed and receptacle for the material at one side of the pressing-roll, the chain belt consisting of numerous links connected laterally, with numerous interspaces for the discharge of the liquid downwardly, means for forcing the material upon the bed between the cheeks, and gearing connecting the roll and the drum to drive the chain belt and roll at the same surface speed.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

JOHN W. HYATT.

Witnesses:
L. LEE,
THOMAS S. CRANE.