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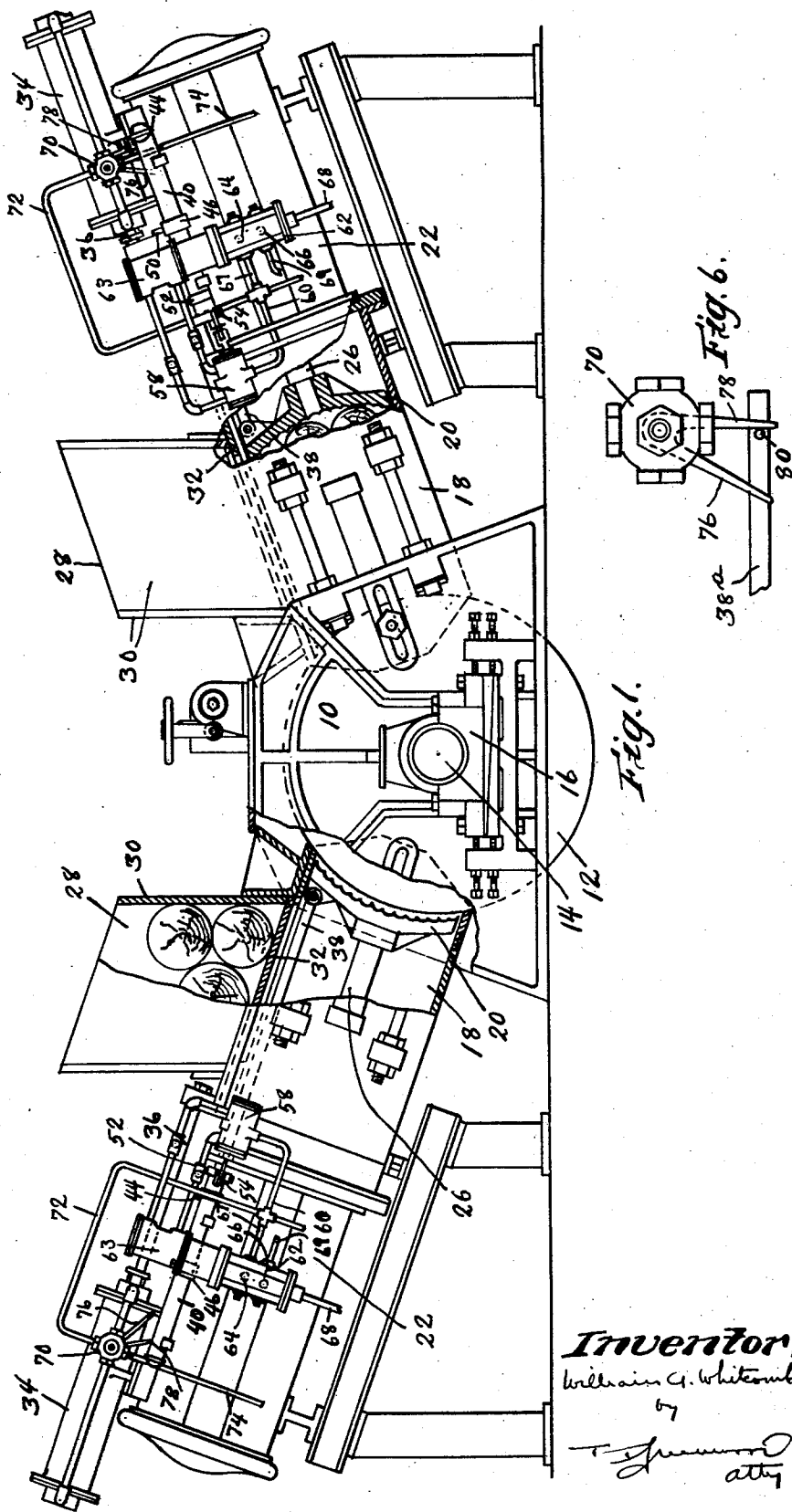
W. A. WHITCOMB

1,757,031

WOOD PULP GRINDING MACHINE

Filed Jan. 15, 1926

3 Sheets-Sheet 1



*Inventor,*  
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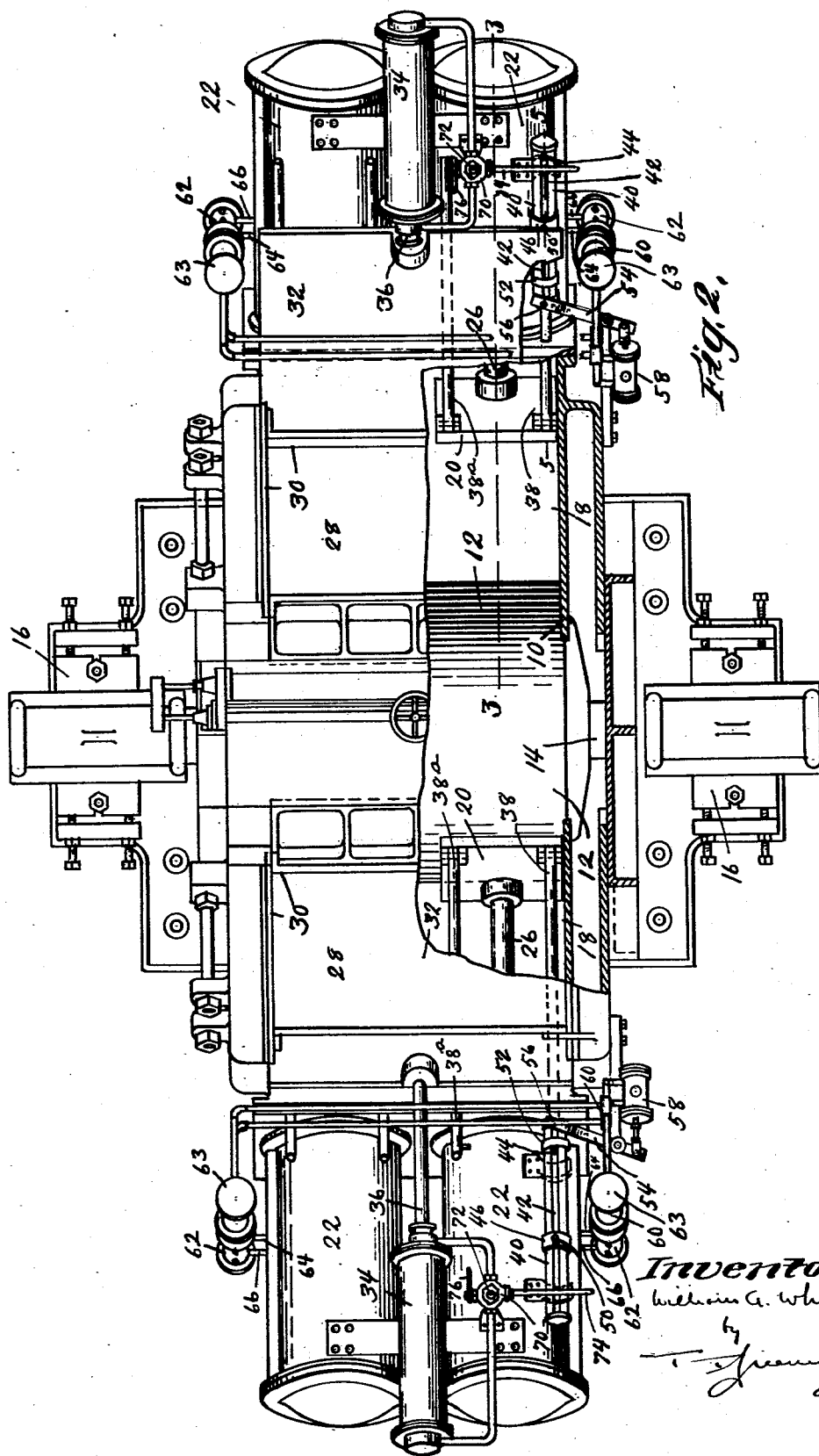
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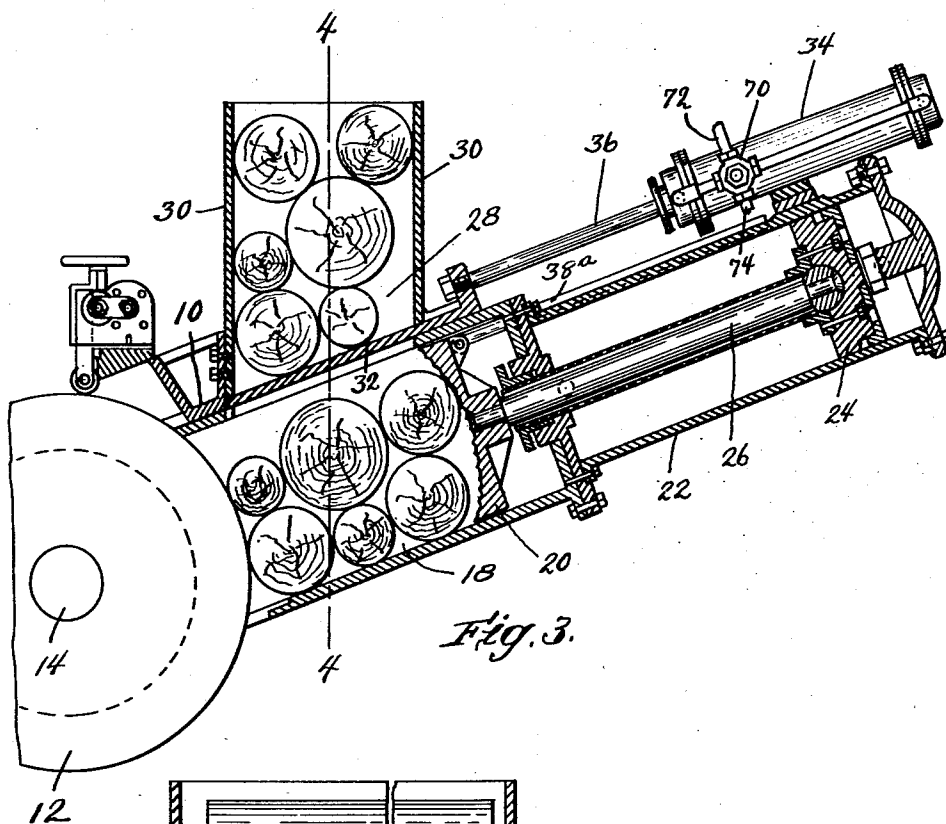


Fig. 3.

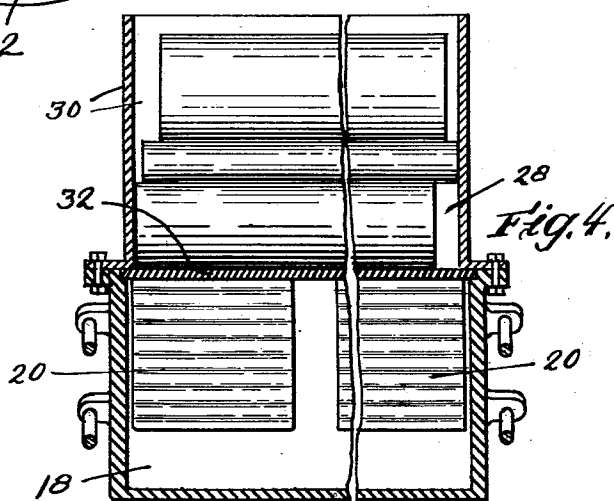


Fig. 4.

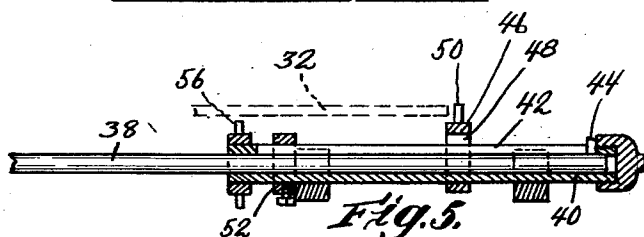


Fig. 5.

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## UNITED STATES PATENT OFFICE

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## WOOD-PULP-GRINDING MACHINE

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This invention relates to paper making and has particular reference to automatic-feed grinding machines for making ground wood pulp.

It has been proposed heretofore to provide wood pulp grinding machines with means automatically to feed wood to the action of the grindstone. Such grinders have not been a commercial success mainly because the wood would form a self-supporting bridge or arch that would prevent further feeding action until the arch-formation was broken up by an attendant. The formation of an arch also prevented the application of pressure on the grindstone, so that the grindstone would race and sometimes burst.

I have found that a grinder can be fed automatically with entire success if the wood is fed in successive and premeasured charges to the action of the grindstone, the machine being fed automatically with a new measured charge only when the previous charge had been about ground out, and each charge being relatively small and fed through a wide opening into the space between the grindstone and the pressure-foot of the pressure cylinder, so that possibility of arching and consequent non-feeding of the charge is almost entirely, if not completely, avoided. This constitutes one of the objects of my present invention.

A further object of this invention is the provision of a magazine-type wood pulp grinder so arranged that successive charges of wood are fed automatically into position to be acted upon by the grindstone, and wherein the main duty of an attendant is to place new charges of wood into the magazine, when it is empty, the machine otherwise being completely automatic in operation.

A further object is to provide a magazine-type grinder with a magazine adapted to hold only a single charge of wood, with automatically-operative means to admit the charge into position between the grindstone and the pressure-foot, and to apply pressure on the charge, following the exhaustion of the previous charge.

A yet further object of the invention is the provision of a double-pocket grinder,

each pocket of which is provided with a magazine adapted to contain a single reserve charge of wood, with automatically-operative means to feed the charges into grinding position, the arrangement being such that the grindstone may always be loaded, and racing prevented.

A yet further object is generally to improve the construction and operation of wood pulp grinders.

Fig. 1 is a side elevation of a magazine grinder embodying my invention, parts thereof being broken away to show certain features of internal construction.

Fig. 2 is a plan view of Fig. 1.

Fig. 3 is a sectional elevation through one of the pressure-cylinders and magazine, taken along line 3—3 of Fig. 2.

Fig. 4 is a sectional detail taken along line 4—4 of Fig. 3.

Fig. 5 is an enlarged sectional detail through the automatic-control rod, taken along line 5—5 of Fig. 2.

Fig. 6 is a detail of the operating mechanism of the door-operating valve.

The magazine-feed wood pulp grinder embodying this invention includes an enclosing housing 10 in which the grindstone 12 is disposed. Said grindstone is carried by a shaft 14 which is journaled in bearings 16 and is driven by suitable means, not shown. A casing 18 of approximately rectangular internal cross-section is secured to each side of said housing 10 and extends upwardly and outwardly therefrom and co-axially with radii of the grindstone. The interiors of said casings form pockets in which the wood is retained while it is being ground and the grindstone forms the end walls of said pockets. Pressure-feet 20 are disposed movably in said pockets, there being two in each pocket. Said pressure-feet are arranged to occupy practically the entire cross-sectional area of said pockets and to apply a pressure on the wood in said pockets. Pressure is applied to said pressure-feet by means of hydraulic cylinders 22 which are secured to the outer ends of said casings and in line therewith. As here shown, a pressure-cylinder is associated with each pressure-foot. Pistons 24

are contained within said cylinders and are connected with said pressure-feet by piston rods 26. When a pocket contains a charge of wood, water at a suitably high pressure is admitted into the outer end of the cylinders. The pistons and pressure feet are thereby moved inwardly toward the grindstone and into pressure-engagement with the wood in the pocket, thereby to force and hold the wood onto the revolving stone and cause it to be ground into pulp fibres. When the charge of wood is about ground out, the pressure-feet are withdrawn into the upper ends of the pockets in position to receive a new charge between them and the grindstone.

The above constitutes the construction and arrangement of the usual wood pulp grinder.

In accordance with my invention I provide means to move the pressure-feet automatically up and down the pocket and means to introduce a premeasured charge of wood into the pocket when the pressure feet are in the upper end of the pocket, whereby automatically to load the machine for further grinding operation.

In carrying out my invention I provide each pocket 18 with a magazine or hopper 28 which is disposed above the pocket and is approximately co-extensive with the width and length thereof. Said hopper is provided with side and end walls 30.

The hopper is open at the top and has approximately the volume of the pocket with which it cooperates so that, when the hopper is full of wood, the charge therein constitutes a suitable charge for the pocket.

The bottom of the hopper is normally closed by a sliding door 32, which door comprises the bottom wall for the hopper and the top wall for the pocket. Said door is arranged to be in the closed position shown in Fig. 3 when the wood in the pocket is being ground. The door is adapted to be slid to the left, Fig. 3, upon the pocket-casing when the pressure-foot is in its upper position, and to uncover practically the entire bottom area of the hopper, whereby to permit the charge of wood contained in the hopper to fall freely into the pocket. Since the hopper has vertical side walls, and is immediately over the pocket and is approximately an extension of the pocket, the charge of wood in the hopper is free to fall freely into the pocket, without arching or jamming in any manner. After the charge of wood is delivered into the pocket the door is adapted to close, and pressure is applied to the wood.

The two pockets and hoppers are adapted to be worked so that there is a charge of wood in one hopper at the time a charge is being loaded into the other hopper. As thus arranged, it is practically certain that there will always be a load on the grindstone and that racing will be prevented.

The hopper-doors are opened and closed by means including hydraulic cylinders 34, which cylinders are mounted upon and between the pair of cylinders 22 associated with each pocket. Piston rods 36 serve to connect the pistons within said cylinders 34 with the doors. The arrangement is such that when water under pressure is admitted alternately to the inner and outer ends of said cylinders, the doors are caused respectively to open and close.

Means are arranged to operate the pressure-feet and hopper-door of each pocket automatically in timed sequence, whereby to effect the automatic operation of the machine, the only necessary manual operation being to load successive charges of wood into the empty hopper. The arrangement of said means is such that when the wood in the pocket has been ground out to a predetermined extent, the pressure foot is caused to operate a hydraulic valve which effects the raising of the pressure foot. When the pressure foot is about in its highest position, it is caused to operate mechanism to open the sliding door. When the door is about in its wide open position it effects the operation of mechanism to cause the pressure foot to move inwardly. The beginning of downward movement of the pressure foot causes the door to close, thereby effecting a cycle of operation. The speed of movement of the door in closing is adapted to be considerably greater than the speed of inward movement of the pressure feet so that the door completely closes before the pressure feet are moved sufficiently to apply any material degree of pressure on the charge of wood in the pocket.

The means for effecting the above described cycle of operation includes a pair of rods 38 and 38<sup>a</sup>, which rods are attached to one of the pressure feet at the upper end thereof and are extended outwardly through the top of the pocket-casing. The rod 38 is provided with a sleeve 40 which is loose on said rod. Said sleeve is provided with a longitudinal slot 42 therein in which a pin 44 fixed to the upper end of said rod 38 can operate. A ring 46 is disposed on an intermediate section of said sleeve and can be fixed in any desired longitudinal position thereon. Said ring provides means by which the opening of the door effects the downward movement of the pressure feet in a manner hereinafter to be further described. Said ring 46 is provided with an internal slot 48 therein which is disposed in line with the slot in the sleeve 40 so that the pin 44 carried by the rod 38 can pass freely from one side to the other of said ring without engaging it. Said ring is also provided with an upstanding pin 50 which is adapted to be engaged by the door in the last part of the opening movement thereof.

A second ring 52 is secured adjustably on said sleeve 40 at the lower end thereof and is

adapted to be engaged by said pin 44 when the pressure foot is about at its innermost position, thereby to move the sleeve downwardly toward the left, Figs. 2 and 5.

5 A lever 54 is pivotally connected by means including pins 56 with the lower end of said sleeve and is adapted to be moved in accordance with the movements of said sleeve. Said lever is arranged to operate a hydraulic valve 58 which receives water under suitably high pressure through the inlet pipe 60. Said valve 58 is arranged to control the movements of the valve-pistons in a pair of valves 62 by admitting water to one side or the other of the pistons in the cylinders 63 associated with said valves. Each of the pair of cylinders is provided with a valve 62 and said valves are arranged to control admission of water to the inner and outer ends of the cylinders 22 whereby to effect, respectively, the outward and inward movements of the pressure feet associated with said cylinders. Each valve 62 is connected by a pipe 64 to the inner end of its cylinder and with another pipe 66 to the outer end of its cylinder, the connections being more or less diagrammatically shown. High pressure water may enter the valves through the pipes 67, connected with the pipe 60, and grinder pressure water through the pipe 69. Exhaust water is adapted to escape through the pipe 68. The arrangement is such that when said lever 54 is moved inwardly or toward the left by the engagement of the pin 44 with the sleeve 52, water is admitted to the cylinders 63 of the valves 62 to move the pressure feet away from the grindstone. When said lever is moved toward the right, the valves 62 are operated to admit water in a direction to move the pressure feet downwardly towards the grindstone.

The door-operating cylinder 34 is provided with a control valve 70 which is connected to the source of high pressure water by a pipe 72 and to the exhaust through a pipe 74. Said valve may be of any suitable type which is arranged when moved in one direction to open the door and when moved in the other direction to close the door. The valve is provided with an operating member having a pair of spaced arms 76 and 78, see Fig. 6. A pin 80 is carried by the pressure-foot rod 38<sup>a</sup> at the upper end thereof. Said pin is adapted to engage alternately with said arms whereby to effect the alternate and opposite operation of said valve, and consequently, the opening and closing of the door.

The complete cycle of operation is substantially as follows: When the pressure foot is about at its lowest point of travel in the pocket, the lever 54 is operated in a direction to admit water to the inner ends of the cylinders 22 and thereby to move the pressure feet upwardly in the pocket. At about the extreme end upward movement of the pressure

foot the pin 80 carried by the rod 38<sup>a</sup> engages the arm 78 of the door-operating cylinder-valve 70 and operates said valve in a manner to open the door and, consequently, to admit the charge of wood from the hopper into the pocket. When the door is about in its extreme open position, its edge engages the pin 50 carried by the ring 46 of the sleeve 40, and causes the reverse movement of the lever 54. This action admits water into the outer ends of the pressure cylinders 22 and thereby starts the inward, or working stroke, of the pressure feet. However, before the pressure feet have moved inwardly any material distance, the pin 80 carried by the pressure foot rod 38<sup>a</sup> is moved inwardly and into engagement with the arm 76 of the door-operating valve 70. Said valve is thereby operated to close the hopper door. The inward movement of the rod 38<sup>a</sup> causes the pin 80 to move from under the arm 76, which arm is adapted to remain in said position, as illustrated in the dotted lines in Fig. 6, until it is again operated in the reverse direction.

While the inward movements of the pressure feet and the hopper door take place simultaneously, the hopper door is arranged to move faster than the pressure feet so that the door is completely closed before any material degree of pressure is exerted on the new charge of wood in the pocket.

During the grinding of the charge of wood in the pocket, an attendant is required to refill the hopper with another charge of wood so that there will always be a full hopper at the time the wood in the pocket is about ground out.

As here shown, both sides of the machine is adapted to operate independently of each other. One side of the machine, however, is adapted to be started up ahead of the other side so that the hoppers are emptied alternately. As thus operated, it is quite improbable that both pockets will be emptied at the same time so that there will always be a load on the grinder and racing will be prevented.

I claim:

1. A wood pulp grinding machine having a grinding pocket, a pressure element movable forwardly and backwardly within said pocket, a hopper associated with said pocket, a door controlling communication between said hopper and pocket, means controlled by said pressure element to operate said door, and means controlled by said door to operate said pressure element.

2. A wood pulp grinding machine having a grinding pocket, a pressure element movable forwardly and backwardly within said pocket, a hopper associated with said pocket, a door controlling communication between said hopper and pocket, and means to move said pressure element backwardly and thereafter to open said door.

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3. A wood pulp grinding machine having a grinding pocket, a pressure element movable forwardly and backwardly within said pocket, a hopper associated with said pocket, a door controlling communication between said hopper and pocket, means governed by said pressure element when at one end of its path of travel to open said door, and means governed by said door to move said pressure element forwardly.

4. A wood pulp grinding machine having a grinding pocket, a pressure element movable forwardly and backwardly within said pocket, a hopper associated with said pocket, a door controlling communication between said hopper and pocket, means actuated by the pressure element in its extreme backward position to open said door, and means actuated by the opening movement of said door to close it and also to move said pressure element forwardly.

5. A wood pulp grinding machine having a grinding pocket, a pressure element movable forwardly and backwardly therein, a hopper associated with said grinding pocket, a door controlling communication between said hopper and pocket, means including a valve controlled by said pressure element and also by said door for moving said pressure element forwardly and backwardly, and means including a second valve controlled by said pressure element alone for opening and closing said door.

6. A wood pulp grinding machine having a grindstone, a grinding pocket at the grindstone, a pair of pressure elements reciprocable in said pocket to press the wood against the grindstone, a hopper disposed above said pocket and opening thereinto, and a longitudinally slidable door at the bottom of the hopper above the pocket operable independently of said pressure elements arranged to open to permit a charge of wood to fall by gravity from the hopper into the pocket and to close above and out of pressure-applying engagement with the charge of wood in the pocket.

7. A wood pulp grinding machine having a grindstone, a grinding pocket at the grindstone, a pressure element reciprocable in said pocket to press the wood against the grindstone, a hopper disposed above the pocket and opening thereinto, and a door at the bottom of the hopper above the pocket operable independently of said pressure element arranged to open to permit a charge of wood to fall by gravity from the hopper into the pocket when said pressure element is withdrawn and to close above and out of pressure-applying engagement with the charge of wood in the pocket.

8. A wood pulp grinding machine having a grindstone arranged to rotate on a horizontal axis, grinding pockets oppositely disposed with relation to the periphery of said grind-

stone, a hopper above each pocket adapted to contain a charge of wood for the pocket, a sliding door between each hopper and pocket arranged to slide open to admit a charge of wood into the pocket and slide shut above the pocket and above and not against the wood to be ground, and pressure means operable independently of said doors to press the wood in the pocket against the grindstone.

9. A wood pulp grinding machine having a grindstone arranged to rotate on a horizontal axis, grinding pockets oppositely disposed with relation to the periphery of said grindstone, a hopper above each pocket adapted to contain a charge of wood for the pocket, a sliding door between each hopper and pocket arranged to slide open to admit a charge of wood into the pocket and slide shut above the pocket without pressing the wood against the grindstone, and pressure means operable independently of said doors to press the wood in the pockets against the grindstone.

10. A wood pulp grinding machine having a grindstone rotating on a horizontal axis, grinding pockets disposed on opposite sides of the grindstone, hoppers disposed immediately above each pocket and having approximately the capacity of said pocket, a sliding door controlling communication between each hopper and its corresponding pocket, and pressure means for each pocket located entirely below the plane of the sliding door of the pocket to press the wood in the pockets against the grindstone, said doors and said pressure means being independently movable.

In testimony whereof, I have signed my name to this specification.

WILLIAM A. WHITCOMB.