J. H. BAKER.

PULP WOOD GRINDER.

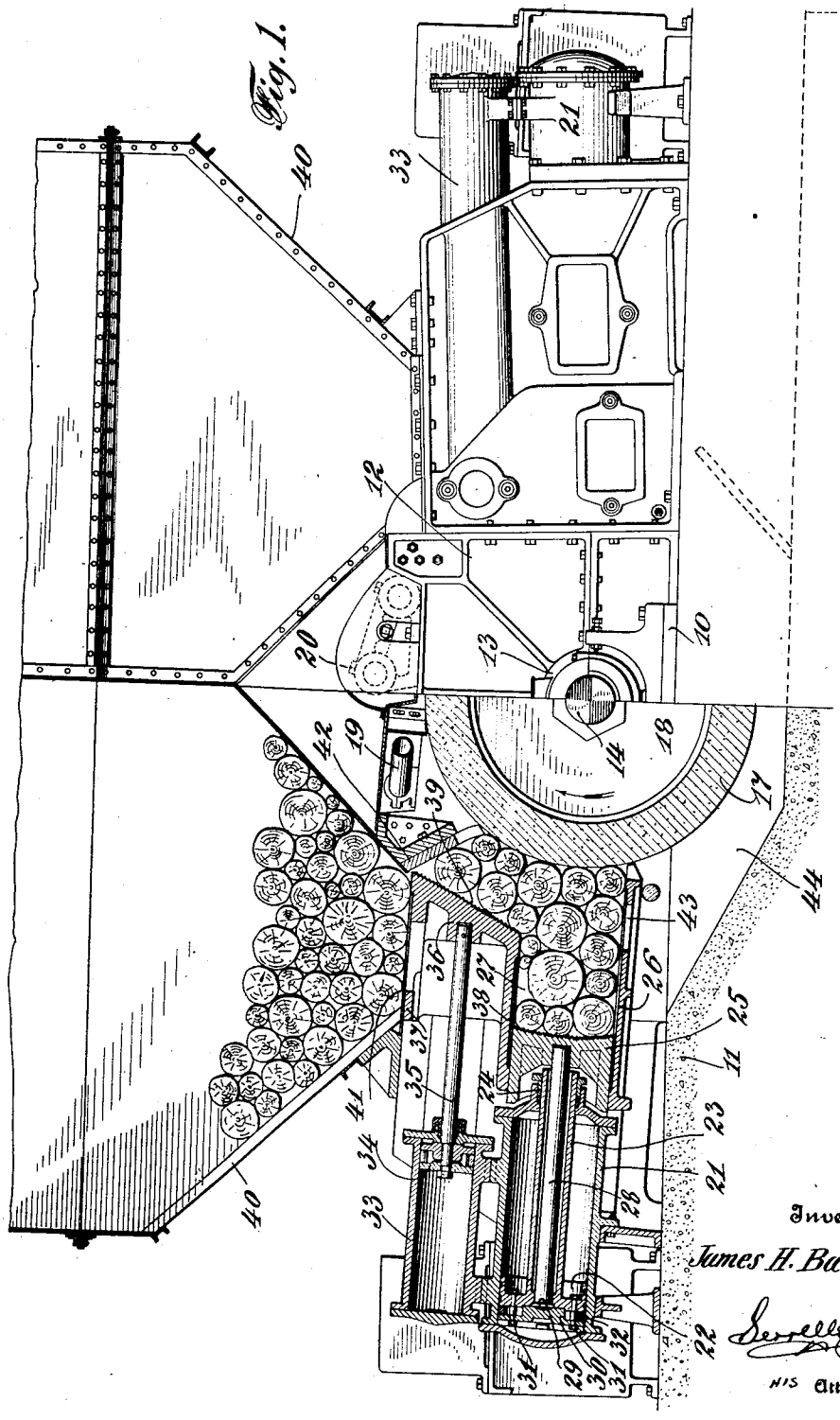
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1,359,016.

Patented Nov. 16, 1920.

4 SHEETS—SHEET 1.

Fig. 1.



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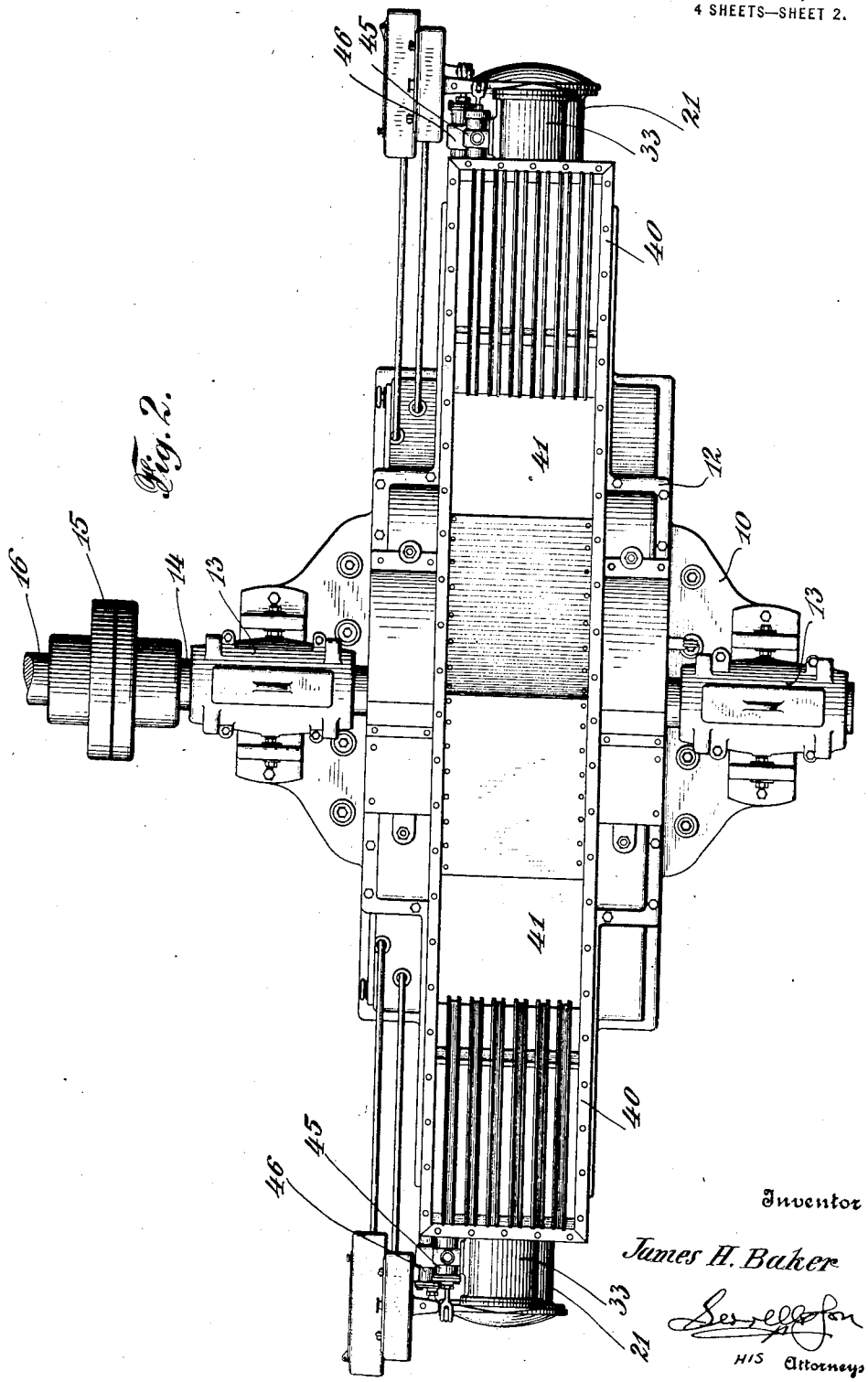
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4 SHEETS—SHEET 2.

Fig. 2.



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4 SHEETS—SHEET 3.

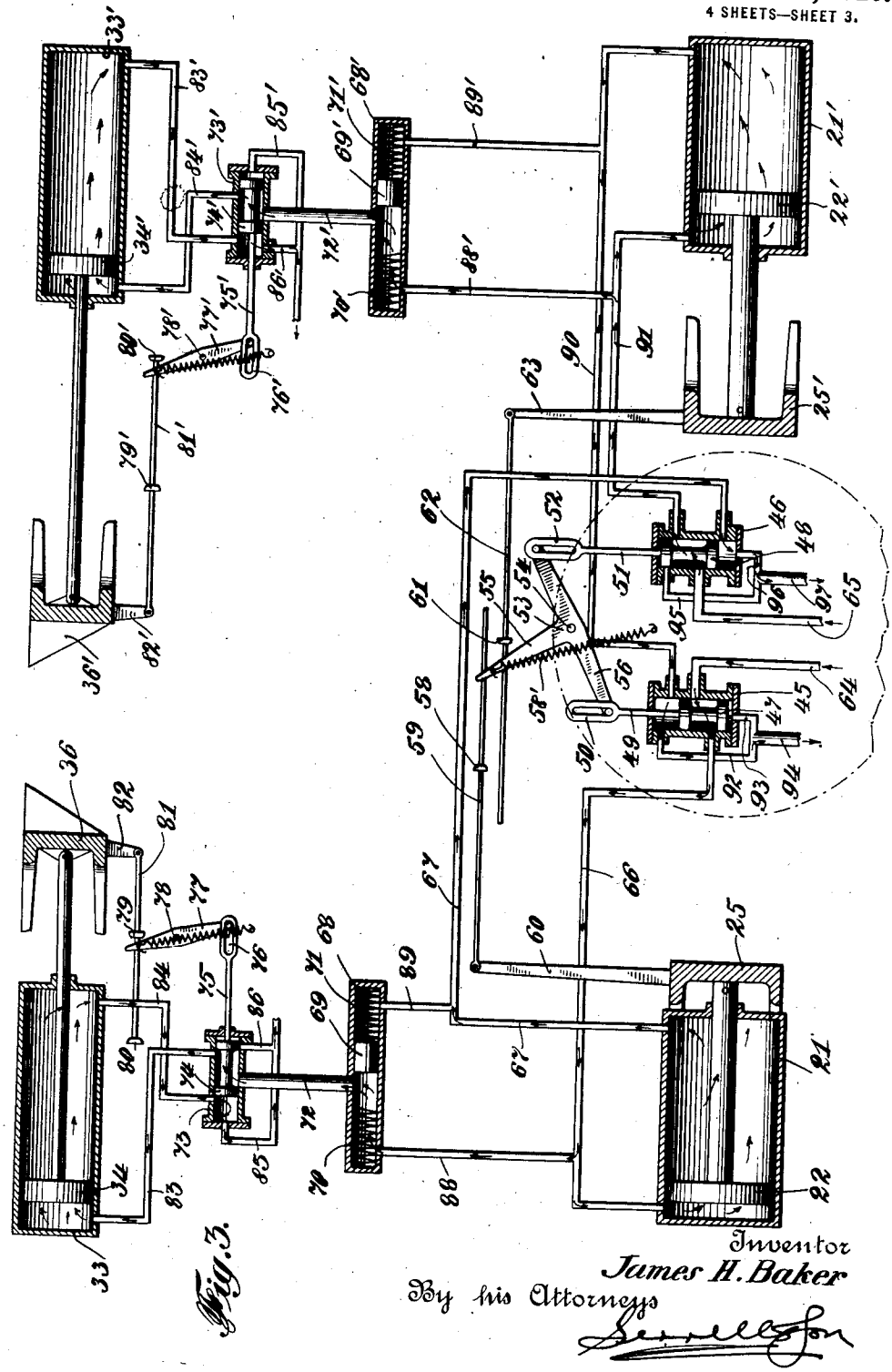


Fig. 3.

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4 SHEETS—SHEET 4.

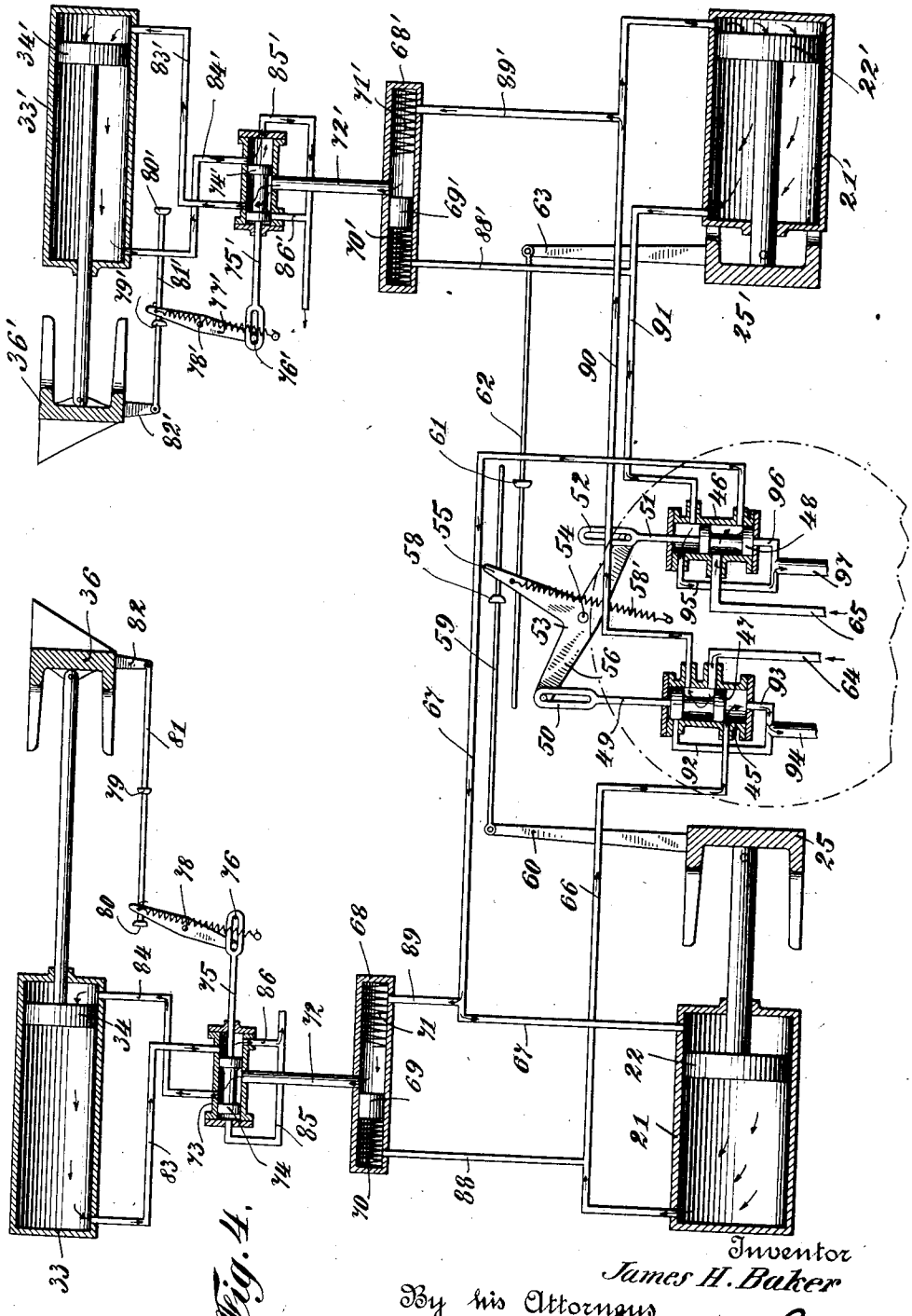


Fig. 4.

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UNITED STATES PATENT OFFICE.

JAMES H. BAKER, OF SARATOGA SPRINGS, NEW YORK.

PULP-WOOD GRINDER.

1,359,016. Specification of Letters Patent. Patented Nov. 16, 1920.

Application filed November 15, 1919. Serial No. 338,164.

To all whom it may concern:

Be it known that I, JAMES H. BAKER, a citizen of the United States, residing at Saratoga Springs, in the county of Saratoga and State of New York, have invented an Improvement in Pulp-Wood Grinders, of which the following is a specification.

This invention relates to a pulp wood grinder and more particularly to that type of machine for grinding wood for making paper pulp in which there is a grinding wheel and suitably operated plungers for forcing the pulp wood against the surface of the grinding wheel to grind the wood into pulp. I am aware that heretofore various forms of pulp wood grinders of this general type have been employed, and in these machines as commonly constructed the pulp wood to be ground is supplied to a grinding chamber in which it is forced against the surface of the grinding wheel and maintained in the grinding position by the weight of the charge of material being ground. This obviously necessitates the supply of material being sufficiently heavy, that is, of sufficient extent to maintain the wood being ground in position in the grinding chamber. One of the objects of my present invention is to overcome this difficulty, and another object of the invention is the construction of the plunger member and the piston by which the same is operated so that the plunger member may yield laterally to relieve the strain which would otherwise be pressed on the stuffing box through which the plunger rod passes.

In carrying out the invention therefore to accomplish the objects hereinbefore specified, I employ an automatically operated pulp wood grinder in which there is a grinding wheel, a plunger for forcing the material to be ground against the surface of the grinding wheel, and a feed plunger for opening and closing the inlet aperture between the hoppers for the material and the grinding chamber, and also maintaining the material in the grinding chamber in position therein without forcing the same back into the hoppers, together with means for operating the plungers, as will be hereinafter more particularly described.

In the drawing:

Figure 1 is a side elevation and partial central longitudinal cross section illustrating my improved pulp wood grinder;

Fig. 2 is a plan of the same.

Fig. 3 is a diagrammatic plan and cross section illustrating the valves and connections for operating the pistons and their plungers, and

Fig. 4 is a view similar to Fig. 3 showing the parts in positions oppositely disposed to those illustrated in Fig. 3.

Referring to the drawing, it will be seen that in carrying out this invention, the pulp wood grinder made in accordance therewith comprises a base 10 mounted on a suitable foundation 11. Secured to the base 10, is a frame 12 in which in suitable positions there are bearing blocks 13. A shaft 14 is journaled in the bearing blocks 13, and at one end is fitted with a coupling 15 by which it is connected to a shaft 16 driven by an electric motor or any other suitable source of power. On the shaft 14 within the frame there is mounted a grinding stone 17, supported and secured therein by suitable flange disks 18 at either side thereof. Above the grinding stone there is a water supply pipe 19 for conveying water to the stone during the grinding operation, and also suitably fitted in the frame above the grinding stone is a jigger 20 for dressing the surface of the stone.

As is usual in machines of the type to which this invention relates, the grinding is effected from opposite sides of the grinding stone and consequently the parts of the apparatus on both sides of the stone are similar, and for this reason, the parts of the apparatus on but one side of the stone will be hereinafter more particularly described, it being understood that these parts as described are duplicated on the other side of the grinding stone. The apparatus includes a cylinder 21 suitably mounted on the base or in the frame of the machine, and in the cylinder 21 there is a piston 22. This piston 22 is provided with a sleeve 23 extending longitudinally through the cylinder and through the gland or stuffing box 24 in the inner head of the cylinder. The cylinder 21 and the piston 22 therein, are employed to operate a plunger 25 which reciprocates in a frame 26 partially inclosing the chamber in which the grinding is effected, the grinding chamber or pocket being indicated at 27. For this purpose, the plunger 25 has connected thereto a plunger rod 28 which extends through the sleeve 23, and at its opposite end is provided with a head 29 which extends through the piston 22. Connected

to the piston 22 is a piston head 30. This piston head is connected to the piston by bolts 31 or otherwise with an intervening packing 32, and the head of the plunger rod as well as the adjacent part of the piston head are so constructed that the plunger rod is permitted to have a slight lateral movement in order to relieve the pressure which would otherwise be brought to bear on the stuffing box in actuating the plunger to effect the grinding operation.

There is also employed a cylinder 33 which, as illustrated, is preferably mounted on the wall of the cylinder 21. In the cylinder 33 there is a piston 34, and connected to the piston 34 is a plunger rod 35. The plunger rod 35 operates a feed plunger 36. This feed plunger 36 is provided with an upper extension 37 and a lower extension 38, while the face of the feed plunger is preferably beveled or inclined as indicated at 39. The lower extension 28 of the feed plunger, as is apparent from Fig. 1 of the drawing, also forms part of the wall of the pocket or grinding chamber 27, and the outer surface of the lower extension 38 of the feed plunger forms one of the guides for the plunger 25.

Suitably mounted in the frame of the machine, there are hoppers 40. In the lower end of each hopper 40 there is a feed aperture 41. The upper extension 37 of the feed plunger operates immediately below the aperture in the corresponding hopper so as to entirely close this feed aperture during the grinding operation, the feed plunger also acting in conjunction with a stop member 42 suitably fixed in the frame of the machine to maintain the charge of material in position in the grinding chamber or pocket during the grinding operation of the left hand cylinder as viewed in the drawings.

The position of the parts as illustrated in Fig. 1 is substantially that at the beginning of the grinding operation in which, as will be understood, the plunger 25 is forced in the direction of the grinding wheel by any suitable source of power, either hydraulic, pneumatic or other movers being employed to actuate the pistons for operating the plungers. It will also be understood that as the wood is forced toward the grinding wheel, the same is ground to pulp and by the action of the water supplied to the wheel, the pulp as ground is run between the end of the casing 26 and the grinding wheel and also through openings 43 in the casing 26 to a sluice way 44 in the foundation beneath the grinding wheel from which it is suitably conveyed to any desired place.

As hereinbefore stated, the parts of my improved pulp wood grinder may be operated hydraulically or otherwise, and in order that the operation of the parts may be understood I have illustrated an apparatus in which the operation is effected hydraulically, it being understood that the plungers are oppositely disposed, that is there is one on either side of the grinding wheel and that when one set of plungers is operating to grind the wood to pulp the other set of plungers is being returned to an initial position and the wood chamber being filled for the next successive grinding operation. By reference to Figs. 3 and 4 it will be seen that in the operation of the pulp wood grinder as herein shown and described, I may employ pressures which differ. That is to say, I prefer to employ a fluid under high pressure and also a fluid under low pressure, the fluid under high pressure being utilized to drive the pistons and their plungers while at work, and the fluid under low pressure being employed to return the pistons and their plungers to their initial positions. To this end, it is necessary to utilize two valve cases and the valves contained in the same. The high pressure valve case is indicated at 45 and the low pressure valve case at 46. In the valve case 45 there is a high pressure valve 47 and in the valve case 46 a low pressure valve 48. The high pressure valve 47 carries a valve rod 49 extending through one head of the valve case and terminating in a slotted end 50. Similarly, the low pressure valve 48 carries a valve rod 51 which extends through one head of the valve case and terminates in a slotted end 52. Associated with these valves and their rods, and for the purpose of operating the same, I employ a T lever 53. This is pivotally mounted in a suitable position in the frame of the grinder as is indicated at 54. The arm 56 of the T valve carries a pin for connecting the same to the slotted end of the valve rod 49, and similarly the arm 57 of the T lever carries a pin for engaging the slotted end of the valve rod 51. The arm 55 of the T lever is adapted to be engaged by a trip 58 fixed on a rod 59 which is pivotally connected to an arm 60 carried by the plunger 25. The arm 55 of the T lever is also adapted to be engaged by a trip 61 fixed on a rod 62 which is pivotally connected to an arm 63 carried by the plunger 25′ of the other cylinder. The T lever 53 is furthermore assisted in its oscillating movements by a spring 58′ which insures the proper travel of the lever and also maintains the same in position when not being moved.

Connected to the high pressure valve case 45 is a high pressure pipe 64, and leading to and connected in the low pressure valve case 46 is a low pressure pipe 65. A pipe 66 connects the lower end of the high pressure valve case with the left hand end of the cylinder 21, and a pipe 67 connects the right hand end of the cylinder 21 with the lower

end of the low pressure valve case 46. In conjunction with each set of pistons and plungers, I also employ an automatic valve and casing therefor so as to provide for the supply of the power to a valve for admitting the fluid under pressure to the cylinder for operating the feed plunger. The automatic valve case associated with the cylinders 21 and 33 is indicated at 68 and contains an automatic valve 69. In the automatic valve case 68 and at either end thereof there are springs indicated at 70 and 71 respectively. A pipe 88 extends between one end of the automatic valve case 68 and the pipe 66 and a pipe 89 extends from the other end of the automatic valve case and is connected in the pipe 67. The pipe 72 extends from a centrally disposed position in the automatic valve case 68 to the feed plunger valve case 73 in which there is a valve 74. The valve 74 carries a valve stem 75 which at its outer end is slotted as indicated at 76. A lever 77 pivotally connected at 78 in the frame of the grinder is provided at one end with a pin for engagement with the slotted end 76 of the valve rod 75, and at its opposite end is adapted to be engaged by either one of the trips 79 and 80 fixed on a rod 81 which at one end is pivotally connected to an arm 82 carried by the feed plunger 36. A pipe 83 connects one end of the cylinder 33 with one end of the valve case 73 and a pipe 84 connects the opposite end of the cylinder 33 with the other end of the valve case 73. An exhaust pipe 85 is connected to one end of the valve case 73 and an exhaust pipe 86 is connected to the other end of the valve case 73.

The pipe 90 extends between the high pressure valve case 45 and the right hand end of the cylinder 21′, and a pipe 91 extends between the low pressure valve case and the other end of the cylinder 21′. The high pressure valve case is fitted with an exhaust pipe 92 leading from one end of the case and an exhaust pipe 93 on the other end of the case, which, as illustrated, may terminate in a joint exhaust pipe 94. Similarly the low pressure valve case is fitted with an exhaust pipe 95 extending from one end thereof and an exhaust pipe 96 from the other end thereof, and these exhaust pipes may unite in a joint exhaust pipe 97. The other parts of the valves and pipe connections associated with the cylinders 21′ and 33′ are similar to those hereinbefore described and consequently the description will not be repeated except in so far as the same may be necessary in reference to the parts in describing the operation of the same.

Referring particularly to Fig. 3, it will be seen that the pistons in the cylinders 21 and 33 are at the beginning of their forward movement for effecting the grinding operation, and that the pistons in the cylinders 21′ and 33′ are at the beginning of their return movement. With the parts in these positions, assuming that the liquid under high pressure is admitted to the high pressure valve casing through the pipe 64 and the low pressure fluid to the low pressure valve casing through the pipe 65, it will now be understood that the high pressure fluid will pass around the parts of the high pressure valve and leave the casing through the pipe 66 and will thus be communicated to the space behind the piston 22 to move the same in the direction of the arrows and consequently effect the grinding operation. Also that the space in front of the piston in the cylinder 21 will be open by way of the pipe 67 to the space beneath the valve in the low pressure valve casing and hence to the exhaust pipe 96. It will also be apparent that the high pressure fluid will be admitted through the pipe 88 to the auxiliary valve case 68 thereby forcing the auxiliary valve 69 against the action of the spring 71 to the position as indicated in this figure. With the automatic valve 69 in this position the high pressure fluid will also be admitted to the pipe 72 and through the same to the valve case 73 where it may pass around the valve 74 and through the pipe 83 to the rear of the piston 34 in the cylinder 33 to move the same in the direction of the arrows and consequently to move the feed plunger 36 to close the opening from the hopper to the grinding chamber. The space in the cylinder 33 forward of the piston will be open by way of the exhaust pipe 84 to the left hand end of the case 73 and from thence by way of the exhaust pipe 85 to the atmosphere or any other suitable place of exhaust. At the same time the low pressure fluid admitted through the pipe 65 will be permitted to pass around the low pressure valve 48 through the pipe 91 to the forward face of the piston 22′ in the cylinder 21′ to return the piston and the plunger 25′ to their initial positions. The space in the cylinder 21′ behind the piston 22′ will then be open by way of the pipe 90 to the upper end of the high pressure valve casing 45 and from thence to the exhaust pipe 92. The low pressure fluid will also pass by way of the pipe 88′ to the other automatic valve case 68′ moving the automatic valve 69′ to the position shown in Fig. 3 so that the low pressure fluid will pass through the pipe 72′ to the valve case 73′ in which it may pass around the valve 74′ to the pipe 84′ and thence to the cylinder 33′ to move the piston 34′ therein in the direction of the arrows in order to return the feed plunger 36′ to its initial or original position. At the same time, the space behind the piston 34′ will be open by way of the pipe 83′ to the left hand end of

the valve case 73′ and thence by way of the exhaust pipe 86′ to the atmosphere. It will furthermore be apparent that when the pistons 22′ and 34′ reach the end of their travel they will remain stationary until the pressure valves are tripped.

After the piston 22 and its plunger 25 have traveled a predetermined distance forward, the trip 58 will come into contact with the arm 55 of the T lever 53, swinging the same against the action of the spring 58 from the position shown in Fig. 3 to that shown in Fig. 4 in order to reverse the positions of the pressure valves. With the positions of the pressure valves as shown in Fig. 4, the high pressure fluid is permitted to pass from the high pressure valve case through the pipe 90 to the space in the cylinder 21′ behind the piston 22′ to move the same for the grinding operation, and the high pressure fluid is also permitted to pass through the pipe 89′ to the automatic valve case 68′ thereby shifting the automatic valve 69′ from the position shown in Fig. 3 to that shown in Fig. 4 so as to permit the high pressure fluid to pass through the pipe 72′. It will be understood, however, that in the return movement of the piston 34′ the trip 79′ comes in contact with the free end of the lever 77′, swinging the same from the position shown in Fig. 3 to that shown in Fig. 4, thereby causing the valve 74′ to be moved to the left hand end of the valve case 73′ as viewed in Fig. 4. The high pressure fluid may then pass around the valve 74′ in the valve case 73′ and through the pipe 83′ to the rear of the piston 34′ to force the same and the feed plunger in a forward direction or in the same direction that the grinding plunger is moved. In this position of the parts, the spaces forward of the pistons 22′ and 34′ are admitted to the exhaust passages as indicated by arrows in the pipes 91 and 84′. Also that the low pressure fluid is permitted to pass by way of the pipe 67 to return the piston 22 to its initial position and also by way of the pipe 89 to move the automatic valve 69 from the position shown in Fig. 3 to that shown in Fig. 4 so as to pass by way of the pipe 72 around the valve 74 in the case 73 and through the pipe 84 to the space behind the piston 34 in order to return the same and the feed plunger 36 to their initial positions, the valve 74 having been shifted by the trip 80 coming into contact with the free end of the lever 77 after the feed plunger reaches the end of its forward travel. It will furthermore be apparent that with the parts thus actuating after the plunger 25′ has reached the end of its forward travel the trip 61 will contact with the arm 55 of the T lever and swing the same to its former or initial position as shown in Fig. 3 and the cycle of the operation is completed and may be repeated continuously.

I claim as my invention:

1. In a pulp wood grinder, a frame, a grinding stone mounted therein, a plunger for forcing material to be ground against the grinding stone, and a plunger for admitting material to a grinding chamber and maintaining the same in position therein during the grinding operation.

2. In a pulp wood grinder, a frame, a grinding stone mounted therein, a plunger for forcing material against the grinding stone, a plunger for admitting material to a grinding chamber and maintaining the same in position therein during the grinding operation, and means for automatically operating the said plungers.

3. In a pulp wood grinder, a frame, a grinding stone mounted therein, a cylinder, a piston in said cylinder, a plunger operated by the piston to force material in a grinding chamber against the said grinding stone, a second cylinder, a piston therein, a plunger operated by the piston in the second cylinder for admitting material to the grinding chamber and maintaining the same in position therein during the grinding operation, and means for automatically operating the pistons in the said cylinders to actuate the said plungers.

4. In a pulp wood grinder, a frame, a grinding stone mounted in the said frame, a hopper supported upon the said frame and having a feed opening in the bottom thereof leading to a grinding chamber, a plunger for forcing material in the grinding chamber against the said grinding stone, and a plunger for opening and closing the feed aperture at the bottom of the hopper and for maintaining material in the grinding chamber in position therein during the grinding operation

5. In a pulp wood grinder, a frame, a grinding stone mounted in the said frame, a hopper supported upon the said frame and having a feed opening in the bottom thereof leading to a grinding chamber, a plunger for forcing material in the grinding chamber against the said grinding stone, a plunger for opening and closing the feed aperture at the bottom of the hopper and for maintaining material in the grinding chamber in position therein during the grinding operation, and means for operating the said plungers.

6. In a pulp wood grinder, a frame, a grinding stone mounted therein, a hopper mounted on the said frame, the hopper being provided with an inlet aperture at the bottom thereof leading to a grinding chamber in the frame, a plunger, means operating the same to force material in the grinding chamber against the grinding stone, and a feed plunger adapted to open and close the

inlet aperture at the bottom of the hopper and to maintain the material in the grinding chamber in position therein during the grinding operation.

7. In a pulp wood grinder, a frame, a grinding stone mounted therein, a hopper mounted on the said frame, the hopper being provided with an inlet aperture at the bottom thereof leading to a grinding chamber in the frame, a plunger, means operating the same to force material in the grinding chamber against the grinding stone, a feed plunger adapted to open and close the inlet aperture at the bottom of the hopper and to maintain the material in the grinding chamber in position therein during the grinding operation, and means for operating the feed plunger.

8. In a pulp wood grinder, a frame, a grinding stone mounted therein, a hopper mounted on the said frame, the hopper being provided with an inlet aperture at the bottom thereof leading to a grinding chamber in the frame, a plunger, means operating the same to force material in the grinding chamber against the grinding stone, a feed plunger adapted to open and close the inlet aperture at the bottom of the hopper and to maintain the material in the grinding chamber in position therein during the grinding operation, a feed plunger having an upper extension adapted when the feed plunger is in one position to close the aperture at the bottom of the hopper and thereby support the material in the hopper, and means for operating the said feed plunger.

9. In a pulp wood grinder, a frame, a grinding stone mounted therein, a hopper mounted on the said frame, the hopper being provided with an inlet aperture at the bottom thereof leading to a grinding chamber in the frame, a plunger, means operating the same to force material in the grinding chamber against the grinding stone, a feed plunger having a lower extension forming one of the walls of the grinding chamber and a guide for the said grinding plunger, and means for actuating the said feed plunger.

10. In a pulp wood grinder, a frame, a grinding stone mounted therein, a hopper mounted on the said frame, the hopper being provided with an inlet aperture at the bottom thereof leading to a grinding chamber in the frame, a plunger, means operating the same to force material in the grinding chamber against the grinding stone, a feed plunger having an inclined forward face, a stop member associated with the said frame adapted to coact with the inclined face of the feed plunger to maintain the material in position in the grinding chamger during the grinding operation, and means for actuating the said feed plunger.

11. In a pulp wood grinder, a frame, a grinding stone mounted therein, a hopper mounted on the said frame, the hopper being provided with an inlet aperture at the bottom thereof leading to a grinding chamber in the frame, a plunger, means operating the same to force material in the grinding chamber against the grinding stone, a feed plunger having an upper extension adapted to close the aperture in the lower end of the corresponding hopper to support the material in the hopper when the plunger is in its forward position, the lower extension forming a wall of the grinding chamber, and a guide for the grinding plunger, the said feed plunger having an inclined face, a stop connected to the frame coacting with the inclined forward face of the feed plunger to maintain the material in position in the grinding chamber during the grinding operation, and means for actuating the said feed plunger.

Signed by me this 31st day of October, 1919.

JAMES H. BAKER.