Oct. 5, 1926. 1,602,211

R. E. READ

WOOD GRINDER

Filed Sept. 10, 1925 9 Sheets-Sheet 1

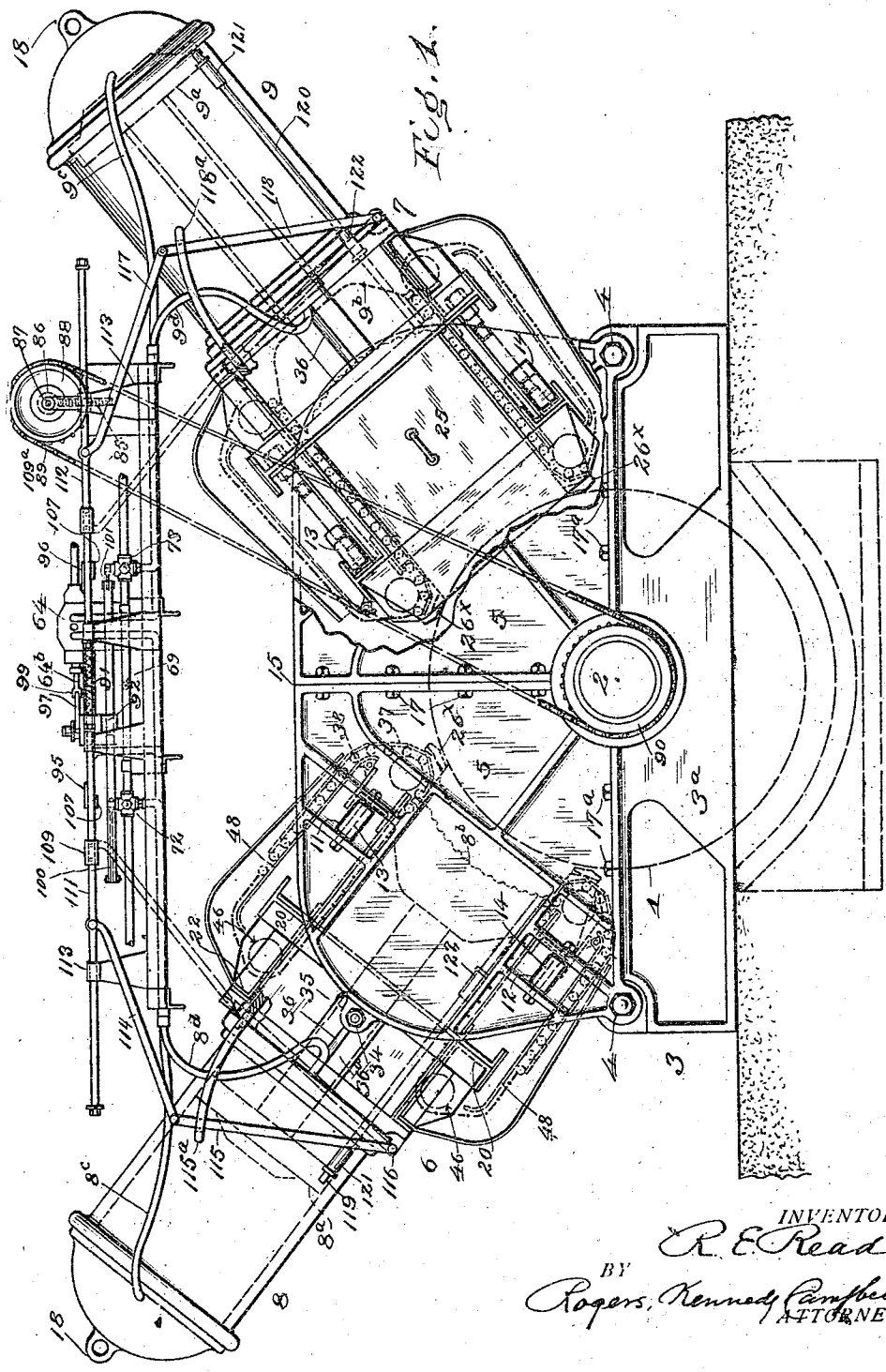


Fig. 1.

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WOOD GRINDER

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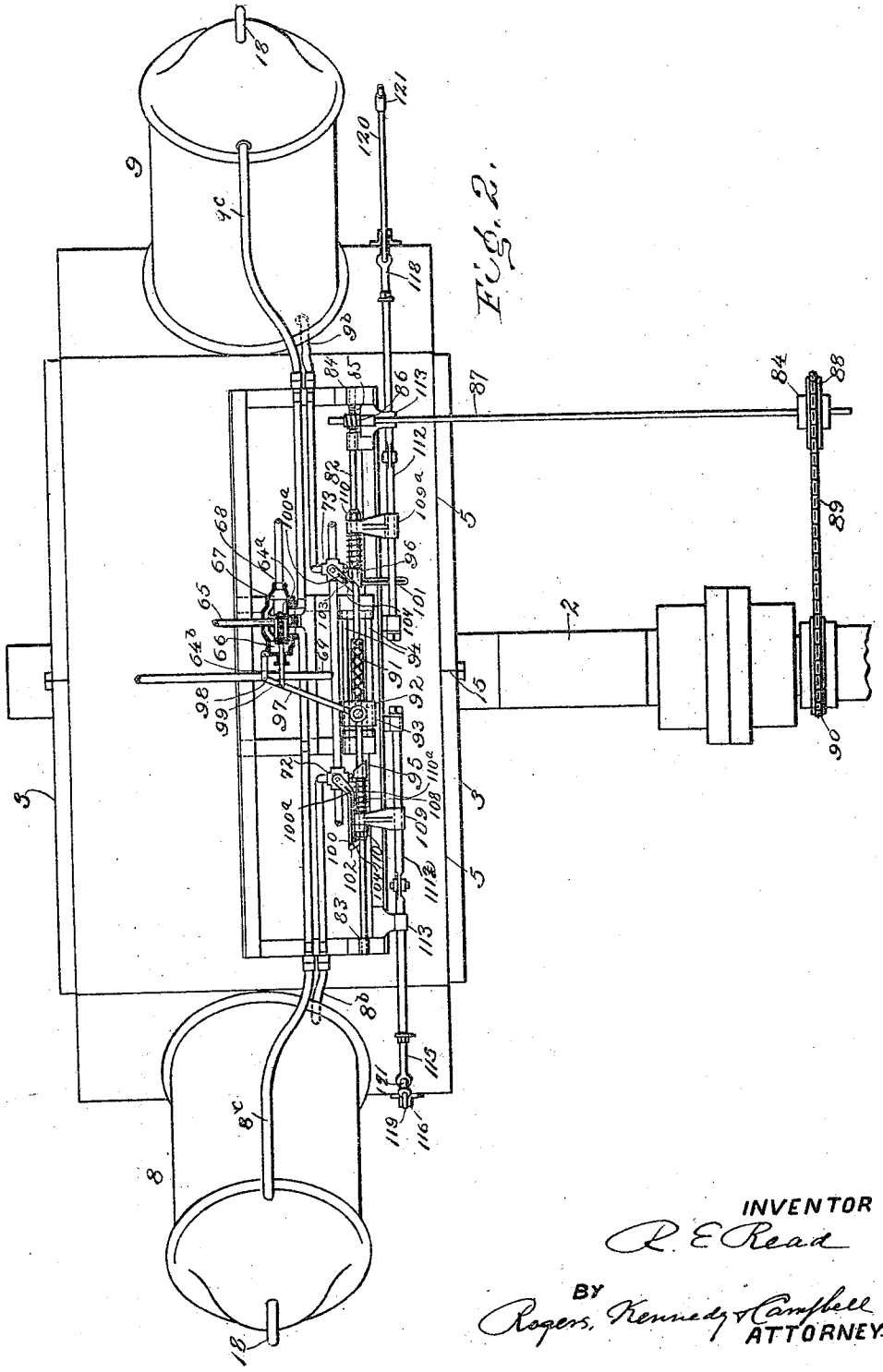


FIG. 2.

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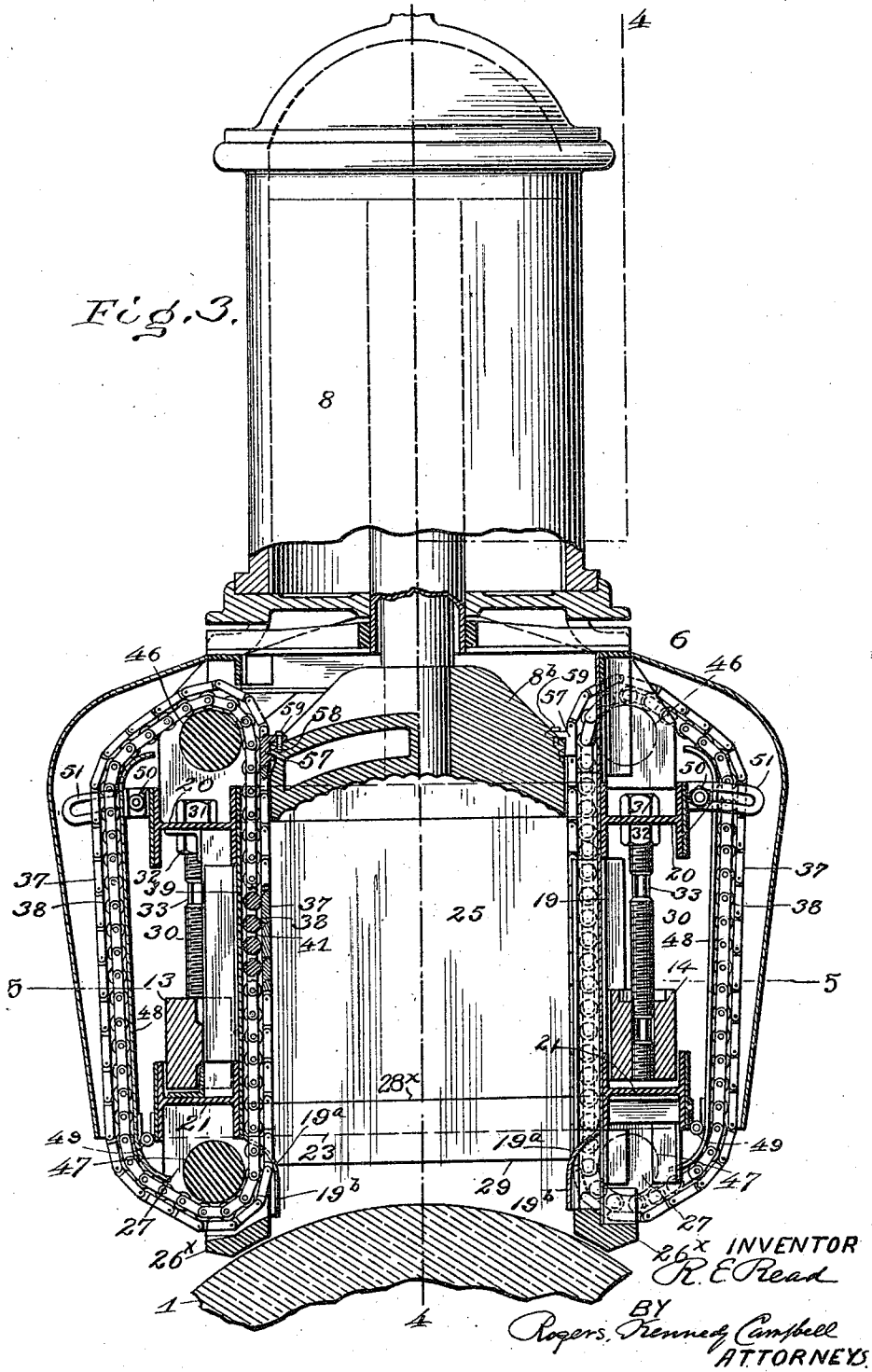
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Fig. 3.



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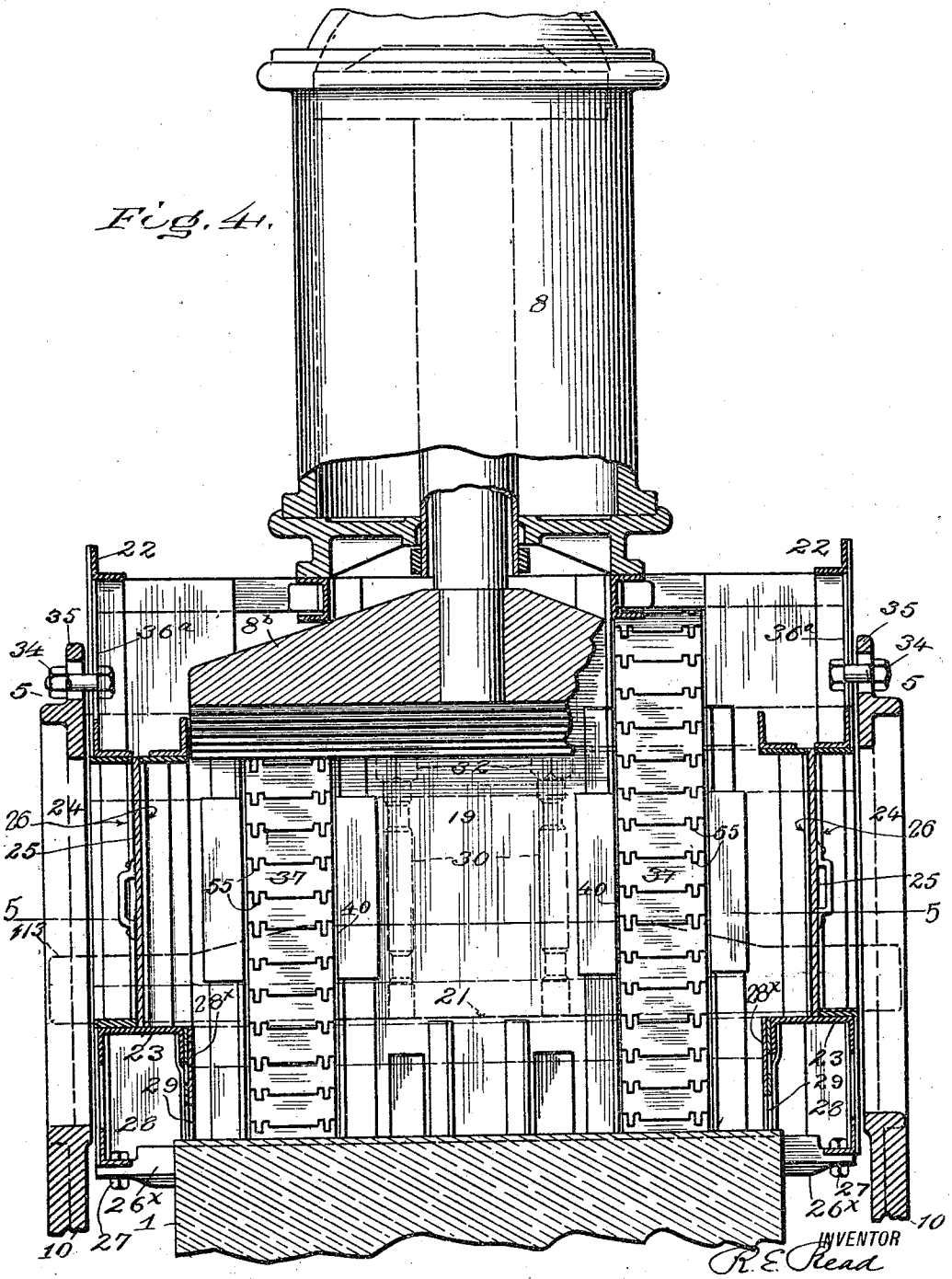
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Fig. 4.



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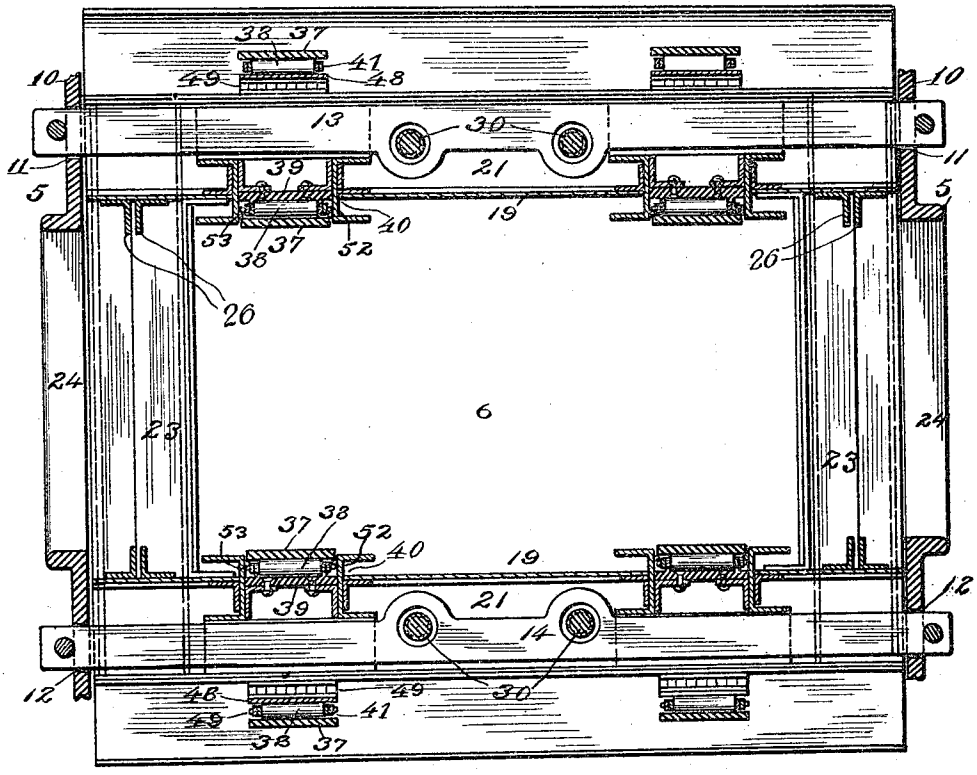
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Fig. 5.



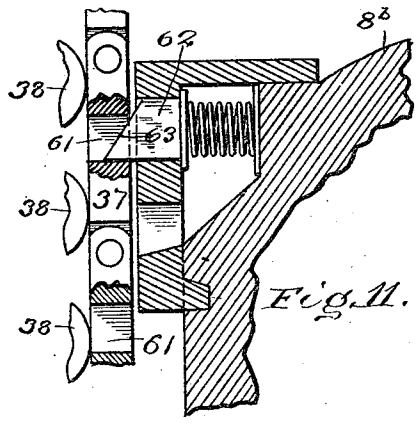
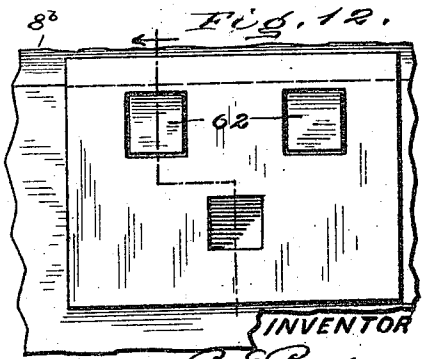


Fig. 11.

Fig. 12.



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WOOD GRINDER

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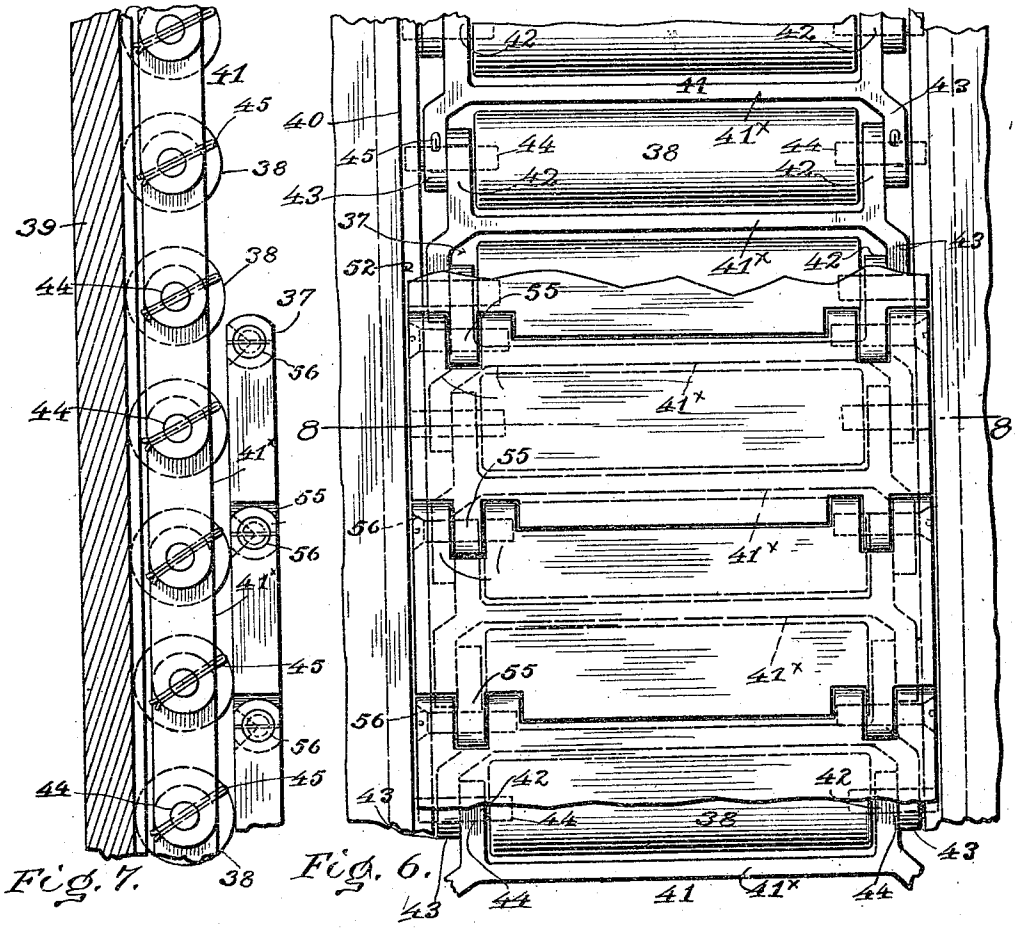
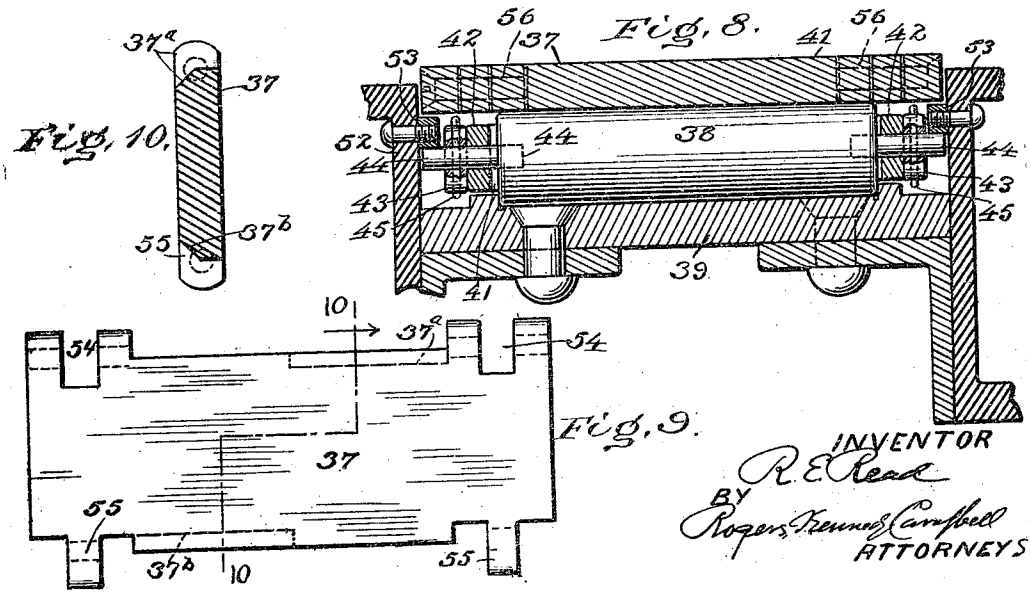


Fig. 7. Fig. 6.



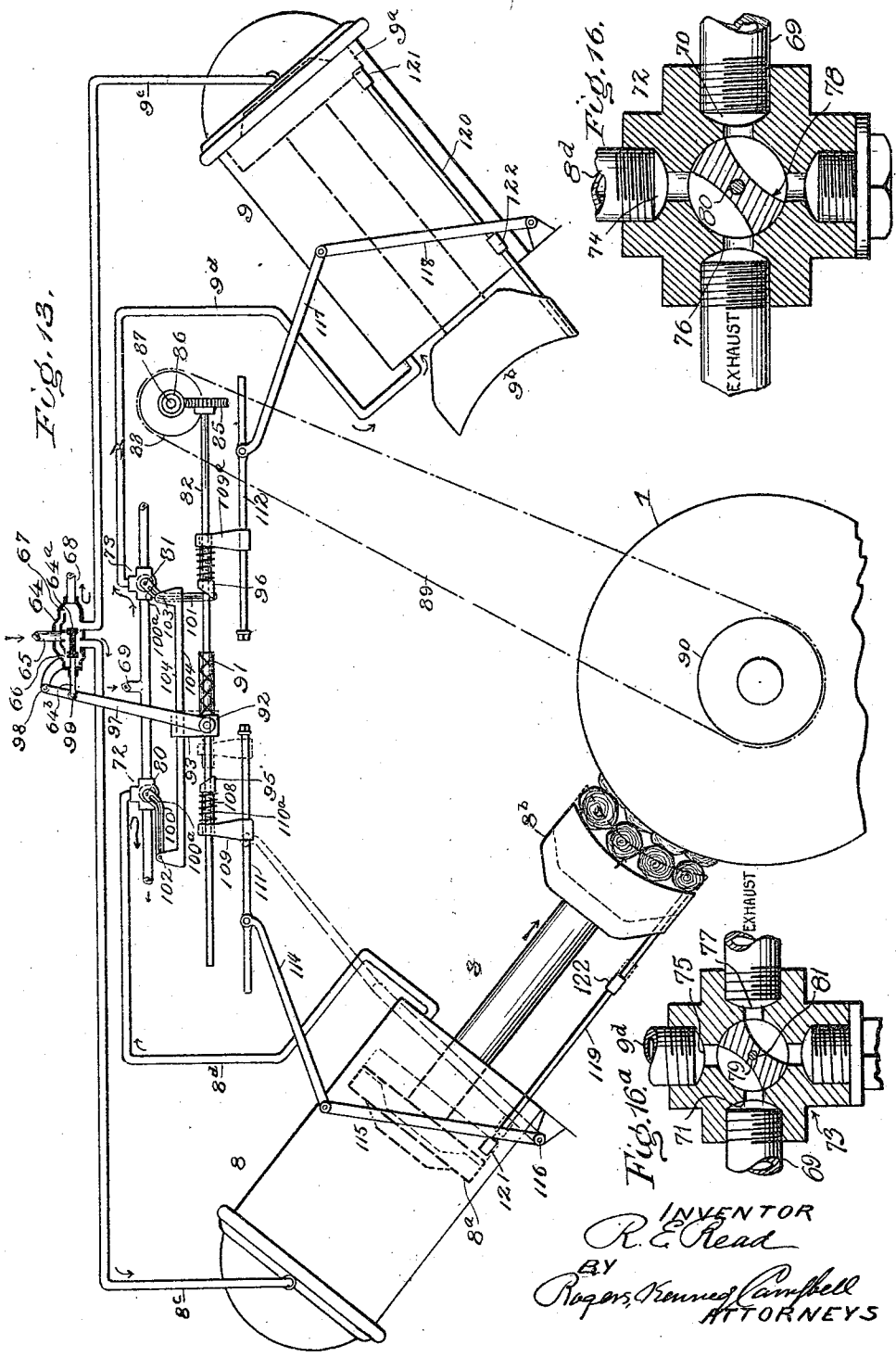
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WOOD GRINDER

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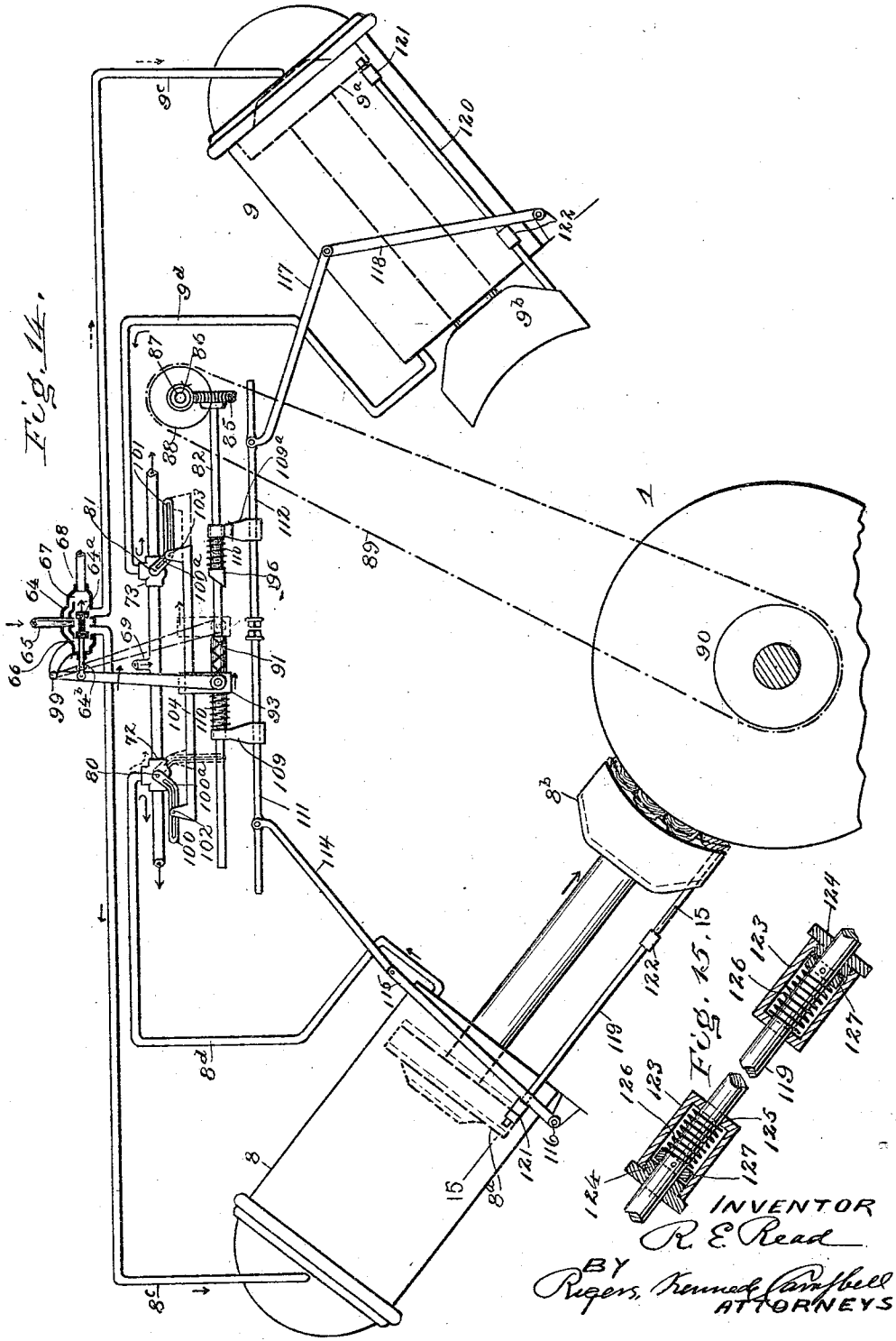
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WOOD GRINDER

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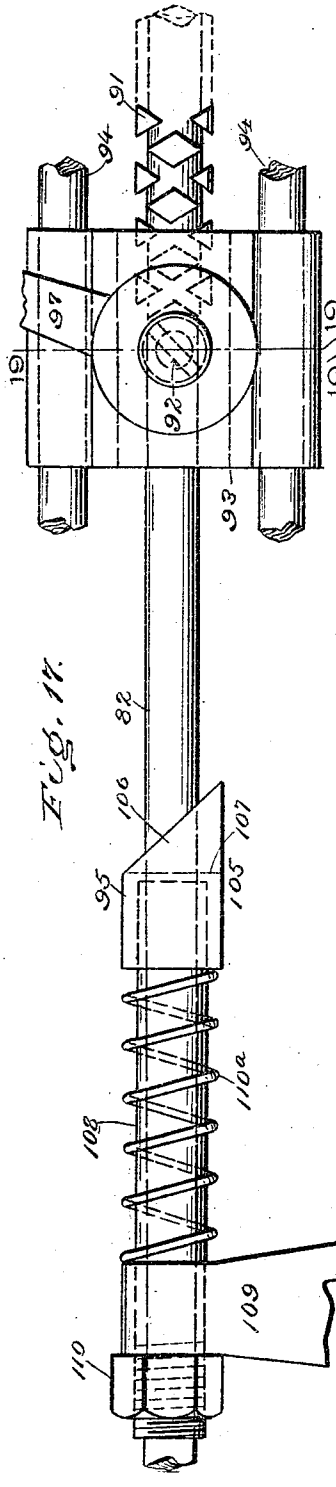


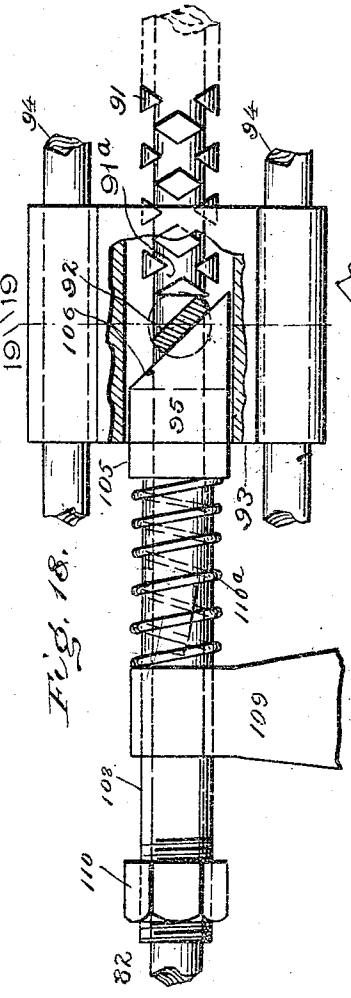
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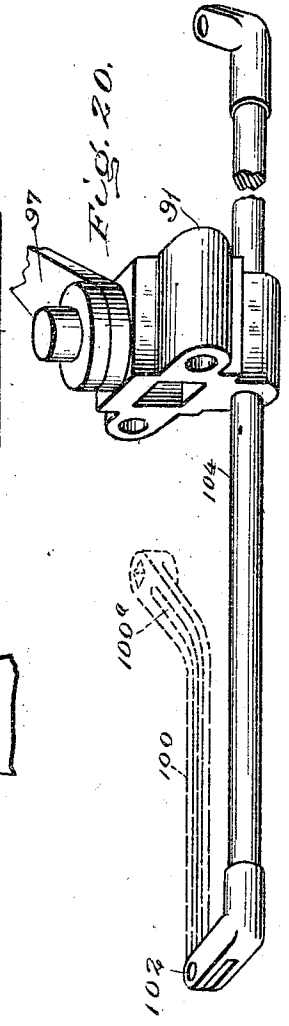
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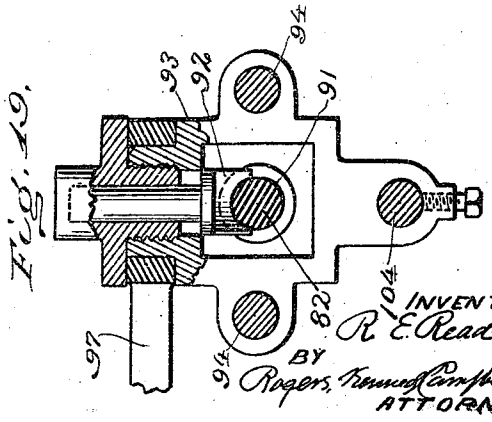
WOOD GRINDER

Filed Sept. 10, 1925 9 Sheets-Sheet 9









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Patented Oct. 5, 1926. 1,602,211

UNITED STATES PATENT OFFICE.

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WOOD GRINDER.

Application filed September 10, 1925. Serial No. 55,502.

This invention relates to machines for grinding wood to produce wood pulp for use more particularly in the manufacture of paper, machines for this purpose comprising usually a rotary grindstone against the periphery of which the wood, held in pockets, is forced by means of power pistons operated by pressure fluid. The wood placed in the pockets is in the form of billets or blocks, and the mass of wood is advanced to the action of the grindstone by means of a so-called pressure foot which is connected with the power piston. In the operation of the machine, it frequently happens that, due to the different positions assumed by the billets and their engagement with the relatively fixed walls of the pocket, arches will be formed in the mass of wood, which will interfere with or retard the uniform advance of the mass under the constantly acting pressure exerted thereon by the pressure foot. As a result, the wood will either be prevented from being pressed against the stone, or will be pressed with varying degrees of force. Such objectionable action of the wood will interfere with the uniform and automatic operation of the machine, and the disintegrating action of the stone on the wood will vary, and wood pulp will be produced which will not be uniform in character, but will vary as to grade and quality.

One of the aims of the present invention is to obviate this objectionable action, and the invention consists in providing in the pocket, means which will be engaged by and support the mass of wood in its advance by the pressure foot, and which means will be advanced by the pressure foot so as to travel with and at the same speed as that of the mass of wood; whereby there will be no relatively fixed portions or surfaces engaged by the wood in its travel, and the formation of obstructing arches or other obstructing positions of the individual billets will be prevented.

A further object of the invention is to insure a uniform pressure of the wood against the stone when two or more pockets are employed, and with this end in view, the invention consists of means of improved form and construction which will act automatically, when all of the wood in one or a series of pockets has been ground, to start the feed of wood in another pocket or series and simultaneously retract the pressure foot or feet of the empty pocket or pockets to permit refilling, one only of the pockets or a series of them being thus in operation at the same time, and thereby insuring a uniform pressure of the wood on the stone and avoiding any danger of racing or wastage of power.

The invention consists also in the improved details of construction and combination of parts hereinafter described and claimed.

In the accompanying drawings:

Fig. 1 is a side elevation of a wood grinding machine having my invention embodied therein.

Fig. 2 is a plan view of the same.

Fig. 3 is a longitudinal section on an enlarged scale through one of the wood holding pockets.

Fig. 4 is a similar view on the line 4—4 of Fig. 3.

Fig. 5 is a sectional plan view on the line 5—5 of Figs. 3 and 4.

Fig. 6 is a plan view of a length of one of the endless chains of rollers, and of one of the endless chains of plates supported thereby.

Fig. 7 is an edge view of the same.

Fig. 8 is a cross section through the same on the line 8—8 of Fig. 6.

Fig. 9 is a plan view of one of the plates of the chain of plates.

Fig. 10 is a horizontal section through the same on the line 10—10 of Fig. 9.

Fig. 11 is a cross section through a portion of the chain of plates and through one side of the pressure foot, illustrating a modified form of connection between the two.

Fig. 12 is an elevation of the pressure foot in its modified form.

Fig. 13 is a diagrammatic view illustrating the operation of the mechanism controlling the alternate action of the wood feeding mechanisms.

Fig. 14 is a similar view showing the parts in a different position.

Fig. 15 is a sectional elevation on an enlarged scale on the line 15—15 of Fig. 14.

Fig. 16 is a sectional view of one of the valves for controlling the admission of the "backing off" pressure to the lower end of the cylinder and the exhaust of the same.

Fig. 16[a] is a similar view of the other of said valves.

Fig. 17 is a plan view on an enlarged scale

of certain details of the mechanism for the automatic control of the feed of the wood in the two pockets.

Fig. 18 is a similar view with the parts in a different position.

Fig. 19 is a cross section on the line 19—19 of Figs. 17 and 18.

Fig. 20 is a perspective view of a detail of the mechanism for the automatic control of the feed of the wood in the two pockets.

Referring to the drawings:

Referring more particularly to Figs. 1 to 5, 1 designates a rotary grindstone mounted as usual on a horizontal drive shaft 2 journalled in bearings in a base or bed frame 3 consisting of two end frame members 3^a connected together and maintained in spaced relations by suitable cross connecting bars not shown. Pivotally mounted on horizontal transverse axes on the outer ends of the bed frame as at 4, 4, are two open frames 5 sustaining respectively two wood holding pockets 6 and 7 and their associated power cylinders 8 and 9, which parts are supported on either side of the perpendicular center line of the grinder at opposite angles thereto, in the present instance at an angle of about 55°.

Each of the frames 5 consists of a pair of frame plates 10 formed with upper and lower aligned openings 11 and 12 through which extend upper and lower bars or bridgetrees 13 and 14 respectively, which bars are firmly fixed at their ends, as by means of bolts, to the frame plates so as to connect the frame plates together in spaced relations as a unitary open frame.

The open frames thus pivotally mounted, meet at their inner edges along a vertical central line as at 15, and at their inner lower corners they are formed with segmental cavities 16 to surround the shaft 2, the two frames when in their operative position shown in Fig. 1 being detachably connected together along their meeting edges by removable bolts 17 and being bolted along their lower edges to the base frame by bolts 17^a by which the two frames are firmly connected together and to the base frame so as to sustain the two wood holding pockets in operative relation to the periphery of the grindstone. This method of sustaining the pockets and their associated power cylinders, I deem of importance and advantage, in that by removing the bolts 17 and 17^a the two frames 5 and the parts sustained thereby, can be swung outwardly and downwardly on their axes 4, thereby leaving a free open space between the frames through which the grindstone and its supporting shaft can be lifted vertically and removed when desired, as for instance when the stone has become worn and is to be replaced by a new one. To enable the parts to be thus swung downwardly the power cylinders are provided on their upper ends with rings or eyes 18 or similar devices for the attachment of suitable tackle or hoisting means, by which the cylinders and the attached frames can be lowered to inoperative position to permit the removal of the grindstone or for inspection of the parts, and can be raised again to their operative positions. It will be observed that the relation of the pockets and attached cylinders to the pivotal axes of the carrying frames is such that the centers of gravity of the pockets and attached parts will be disposed outwardly of the pivots, so that when the fastening devices are released, the frames will swing outwardly and downwardly by gravity and automatically.

The power cylinders are equipped as usual with power pistons 8^a and 9^a provided with piston rods having connected to their lower ends pressure feet 8^b and 9^b respectively, adapted to act on the mass of wood in the pockets and force the same against the grindstone, pressure fluid being admitted to the cylinders on the upper sides of the pistons through pipes 8^c and 9^c respectively to apply grinding pressure to the wood, and pressure fluid being admitted to the cylinders through pipes 8^d and 9^d to the lower sides of the pistons to apply "backing off" pressure to retract the pressure feet when the pockets are to be refilled. The several pipes are connected to a source of pressure fluid, and the admission of the pressure fluid to the cylinders and its exhaust therefrom is controlled by valves, operated automatically as will be presently described, to apply the grinding pressure to the cylinder of one pocket when all of the wood in the other pocket has been ground, and simultaneously to apply "backing off" pressure to the cylinder of the empty pocket, and vice versa, thereby bringing about the operation of the two pockets alternately.

The wood holding pockets 6 and 7 consist each of two side plates 19 which extend lengthwise of the pockets and are fastened near their upper ends to the inner flanges of horizontal H-beams 20, and near their lower ends to the inner flanges of similar horizontal H-beams 21, which H-beams extend between the two frame plates 10 and are disconnected therefrom. The plates 19 are connected together at their ends by cross connecting angle bars 22 and 23 fixed to the ends of said plates near the top and bottom and connected at their ends to the webs of the H-beams, respectively, the pocket thus presenting two opposing connected walls disposed between the frame plates 10, which latter are formed with openings 24 through which the wood is introduced into the pockets between the

walls. The pocket is closed at its ends by vertically movable doors 25 sliding in suitable vertical guides or sills 26 fixed to the plates 19 near the ends of the same and extending between the bars 22 and 23 as best shown in Figs 4. and 5.

Finger bars 26× extend along the lower edges of the side plates 19 of the pockets as shown in Figs. 3 and 4, the lower surface of which bars is shaped to follow generally the contour of the peripheral surface of the stone and to lie closely thereto along axial lines, which finger bars are detachably bolted at their ends as at 27 to brackets 28 fixed to and depending from the lower channel bars 23 at the ends of the same.

The finger bars extend as usual beyond the ends of the stone, and between the finger bars the pocket is contracted at its bottom so as to lie within the longitudinal limits of the peripheral surface of the stone, plates 28× being fastened to the inner flanges of the channel bars 23 and extending downwardly to within a short distance of the stone so as to leave spaces 29 for the escape of the water and ground wood from the pockets down and around the ends of the stone.

The pockets are mounted in the sustaining frames 5 in such manner that they may be adjusted to and from the stone and firmly fixed and held in their adjusted position, the purpose being to maintain the proper operative relation of the bottom of the pockets to the surface of the stone notwithstanding the reduction in diameter of the stone resulting from wear. To effect this object, the pocket is supported from the cross trees 13 and 14 before referred to by means of two pairs of screw bolts 30 at opposite sides of the pocket, which are threaded at their lower ends in the cross trees at the opposite ends of the same and which at their upper ends are rotatably mounted in the webs of the two H-beams 20 and held against endwise movement with respect to said webs by means of nuts 31 and 32 pinned to the bolts and bearing against the opposite sides of the webs, which latter are formed with openings which will permit the bolts to turn freely therein. The bolts are formed with hexagonally shaped portions 33 for the application of a wrench for turning them, and when the bolts are turned they will screw or unscrew in the cross trees, as the case may be, and will thereby move upwardly or downwardly and by the swivelling engagement of their upper ends with the upper H-beams, the pocket connected with said H-beams will be moved up and down as the case may be, relatively to the sustaining frame 5 and to and from the stone. The pockets are fixedly held in their adjusted position by means of locking bolts 34 mounted in lugs 35 projecting upwardly from the upper edges of the frame plates 10, which bolts engage in slots 36 formed in plates 36ª extending upwardly from the channel bars 22 as shown in Figs. 1 and 4.

In the advance of the mass of wood in the pocket by the pressure foot, the individual billets of which mass are arranged lengthwise of the pockets, the mass of wood, in accordance with my invention, is engaged with and supported at its sides by supporting means which are advanced by the pressure foot and travel at the same speed as that of the mass of wood, so that the latter in its travel will not engage any relatively fixed portions of the pocket and will not offer any obstruction to its uniform advance to the grindstone. These supporting means in the present instance are in the form of opposing pairs of endless chains of supporting members or plates 37, which travel on and are supported by pairs of endless chains of friction rollers 38, which latter travel on vertical fixed runways in the form of plates 39 mounted in vertical slots 40 in the two side plates or walls 19 of the pocket.

Each of the chains or friction rollers is made up in the present instance of links 41 of the form shown in Figs. 6, 7 and 8, the said links consisting each of a cross bar 41× from the ends of which extend in one direction two parallel arms 42, and in the opposite direction two parallel arms 43, the spacing between the arms 43 being such as to receive the arms 42 of the adjacent link. The rollers 38 are mounted between the arms 42 of the links and are formed in opposite ends with sockets to receive pivot pins 44 which latter extend through aligned holes in the arms 42 and 43 of adjacent links and thereby pivot said links together, the pins being retained in position and prevented from escape by means of cotter pins 45 extending through the arms 43 and through the pins.

These chains of rollers travel around upper guide rolls 46 journalled in bearings at the upper end of the pocket, and around lower guide rolls 47 journalled in bearings at the lower end of the pocket, the outer stretches of the chains traveling on and being guided by upright tracks in the form of plates 48 pivoted at their lower ends as at 49 to the lower H-beams 21, and adjustably connected at their upper ends by bolts 50 to slotted brackets 51 fixed to and projecting outwardly from the upper H-beams 20, so that by the adjustment of the plates 48, the tension of the chains of rollers may be controlled and regulated. The inner stretches of the chains travel between vertical plates 52 fixed to and extending inwardly from the side walls 19 and inwardly of the runway plates 39, the chains being prevented from sagging and the rollers be-

ing maintained in traveling contact with the runway plates by means of vertical rails or shoulders 53 fixed to the inner sides of the plates 52, behind which shoulders the outer ends of the pins 44 travel in contact therewith as best shown in Fig. 8.

The endless chains of plates 37 are made up of plates of the specific form shown in Figs. 9 and 10, where it will be seen that each plate is formed in one edge with notches or recesses 54 and is provided on its opposite edge with tongues 55, which latter enter the notches in the adjacent plate and are pivotally confined therein, and the plates pivotally connected together, by means of pivot screws 56 screwed into the outer ends of one plate and through the tongues of the adjacent plate.

The chains of plates thus made up surround the chains of rollers and travel thereon and are supported thereby, the said chains of rollers constituting in effect antifriction means for supporting the chains of plates from the runways with the minimum of friction. The inner faces of the plates of each chain present conjointly a practically continuous surface, which surfaces at the opposite sides of the pocket, extend in planes slightly inward of the planes of the guiding plates 52, so that a series of moving bearing supports is afforded for the wood, which supports are free and inward of the walls of the pocket. These bearing supports are movable with the pressure foot and at the same speed of advance as that of the mass of wood, so that there will be no liability of the wood billets arranging themselves in arches or other obstructing positions such as frequently results when the wood in its advance engages the fixed walls of the pocket. To accomplish this action of the bearing supports constituted by the chains of plates, the several chains in a pocket are connected with the pressure foot as shown in Fig. 3, where it will be seen that one of the plates in each chain, as shown by the plate designated by the numeral 57, is recessed in its inner side to receive a lug 58 projecting from the side of the pressure foot, the several lugs being fastened in the recesses of the links 57 of the respective chains by means of fastening screws 59 tapped in the plates and extending through the lugs. As a result of this connection of the pressure foot with the chains of plates, the latter will be positively moved by the pressure foot and at the same speed of travel of the same, and the mass of wood advanced by the pressure foot will be given a support at its opposite sides in the pocket, which supports will travel with the wood with the functional action and advantages above pointed out.

As a result of this construction, in the advance and retraction of the pressure foot in the pocket the opposing chains of plates will be moved in rectilinear paths back and forth and will be supported by the chains of anti-friction rollers which will travel with the minimum of friction, so that the chains of plates will move freely and will give moving support to the mass of wood in its advance to within a very short distance of the active surface of the stone. This action is made possible by the small pitch diameter of the chains of plates, which latter are as shown in Figs. 9 and 10 bevelled outwardly along opposite edges at opposite ends as at 37^a and 37^b, the said bevelled portions extending for a portion only of the length of the plates and being disposed out of line with each other or staggered. This construction of the plates permits the edges of adjacent plates to align closely to each other at the inner side of the chain in the travel of the latter in a rectilinear path along the side of the pocket, so that the plates of the chain will present a practically continuous supporting surface, but by reason of the bevelling of the plates as described, the latter will be allowed, in passing over the lower guide roll 47, to pivot sharply and make a short turn around the roll and thereby support the mass of wood close down to the grinding surface of the stone. With the parts in the proportions illustrated, the pitch of the chain of plates is such that moving support will be given by them to the wood to within about four inches of the stone, thus practically eliminating all possibility of the wood bunching in the pocket.

It will be observed on reference to Fig. 3 that the lower portions of the side walls or plates 19 of the pocket extend inwardly towards each other on a bevel 19^a to a point slightly inward of the planes of the chains of plates, and then extend to the finger bar in parallel planes 19^b, the junction of the bevelled portions and parallel portions being just above the axis of the lower guide rolls 47. As a result of this form and construction of the parts, the support and pressure of the mass of wood advanced by the pressure feet is taken off the chains of plates and transferred to the sides of the pocket as the grindstone is approached and before the axis of the guide rollers is reached, thereby relieving the bearings of the guide rollers of dangerous or injurious stresses.

When the pressure foot is permanently connected with the chains of plates as just described, only a limited stretch of the chains will be active in giving support to the advancing wood as will be seen from an examination of Fig. 3, which shows the pressure foot at the upper end of its stroke, and the active stretch of the chains confined to that portion of the same extending from

the under face of the foot to the bottom of the pocket. To enable all portions of the chains of plates to be brought into action and thereby prevent the wear on the chains from being confined to one portion thereof, I may arrange and construct the parts so that in the successive advancing movements of the pressure foot, it will advance the chains intermittently and progressively, the latter remaining at rest on the retraction of the foot between its advancing movements. This action may be accomplished by the construction shown in Figs. 11 and 12 by providing the plates of the chains each with two holes 61 adapted to receive spring actuated retractible latch bolts or dogs 62 mounted on the pressure foot, there being four pairs of such bolts on the pressure foot, two pairs on each side of the same to cooperate with the two pairs of chains of plates on each side of the pocket. The outer ends of the bolts are bevelled outwardly and downwardly as at 63 so that they will enter the holes in the plates on the advancing movement of the foot and will thereby advance the chains, the bevelled sides of the bolts being on the retraction of the pressure foot, engaged with the upper walls of the holes in the plates, whereby said bolts will be retracted against the pressure of their actuating springs and withdrawn from the holes so that the pressure foot will be retracted without affecting the position of the chains. In this way the chains of plates are advanced progressively and intermittently in the successive advancing movement of the pressure foot, whereby all portions of the chains will be brought into action in supporting the advancing mass of wood and the wear on the chains thus distributed equally and uniformly throughout the length of the same. The retractible bolts on the pressure foot cooperating with the chain of plates as above described, constitute in effect a clutch connection between the pressure foot and chains, operating to clutch the parts on the advancing movement of the foot and operating to unclutch the parts on the retracting movement of the foot.

It will be understood that while I have illustrated the feature of the invention so far described, as applied to two pockets cooperating with a single grindstone, the invention is applicable as well with all its functional advantages in connection with a single pocket, as will be obvious to those skilled in the art.

As before stated another feature of my invention is concerned with the automatic control of the operation of the pockets when a plurality of the same is employed, in such manner that only one pocket or series of them will be in operation at the same time, and when all the wood in one pocket or series of pockets is ground, the feed of the wood in another pocket or series will be started. The mechanism for bringing about this operation is shown as applied in connection with two pockets only, with the result that the pockets are operated alternately, but my invention may be carried out when more than two pockets are employed in which event the pockets would be brought into action one at a time or one series at a time to insure that the grindstone will not be subjected to uneven or varying degrees of pressure exerted by the wood.

The mechanism for thus controlling the operation of the pockets automatically is best shown in Figs. 1, 2, and 13 to 20, in which it will be seen that the pressure fluid, in the present instance water, for applying "grinding" and "backing off" pressures is supplied from separate sources, the water for supplying the higher "grinding" pressure being admitted to a so-called Ramsay valve mechanism 64 by means of a pipe 65 adapted to be connected with a suitable source of fluid under the higher pressure, and entering the upper ends of the cylinders above the pistons by the pipe 8^e leading to the cylinder 8, and the pipe 9^e leading to the cylinder 9, which pipes are connected respectively with ports 66 and 67 in the valve casing. The pipes 8^e and 9^e serve also for the flow of the exhaust from the upper ends of the cylinders when the pistons move upwardly in "backing off", such exhaust leaving the casing of valve mechanism 64 through an end exhaust port 68 therein, the flow of the water in opposite directions through said pipes to thus apply the "grinding" pressure and to permit the cylinders to exhaust, being controlled by a piston valve 64^a movable in the valve casing and provided with a valve stem 64^b extending outwardly through the end of the valve casing and operated automatically by a mechanism presently to be described.

The water for applying the "backing off" pressure is supplied to a pipe 69 from a suitable source of supply of fluid under a relatively lower pressure, which pipe 69 is connected at its opposite ends to supply ports 70 and 71 respectively in the casings of two three-way valve mechanisms 72 and 73, which valve casings are provided with discharge ports 74 and 75 to which are respectively connected the pipes 8^d and 9^d before alluded to as entering the lower ends of the cylinders. The pipes 8^d and 9^d serve also for the flow of the water from the lower ends of the cylinders in exhausting the same, which water will find its escape through exhaust ports 76 and 77 in the casings. The flow of water through the three-way valve mechanisms is controlled by plug valves 78 and 79 oscillatable in the valve casings and provided with valve stems 80 and 81 extending outwardly

through the casings and adapted to be operated automatically as will be presently described, the said plug valves operating when in one position to permit the water to flow from the supply pipe through the valve casings and thence to the cylinders on the lower side of the pistons, and when in another position cutting off the flow of the water from the supply pipe, and opening the lower ends of the cylinders to exhaust. Such three-way valve mechanisms are shown in Figs. 16 and 16[a], Fig. 16 illustrating the valve mechanism 72, and Fig. 16[a] illustrating the valve mechanism 73. The valve 78 of valve mechanism 72 is shown cutting off communication of the backing-off pressure with the lower end of cylinder 8, and opening said end of the cylinder to the exhaust; and valve 79 of valve mechanism 73 is shown in position admitting backing-off pressure to the lower end of cylinder 9 and shutting off said end of the cylinder to the exhaust.

The operation of the three valve mechanisms 64, 72 and 73 is controlled automatically by power-operated mechanism actuated from a constantly rotating shaft 82, which shaft is controlled in its operation by the movements of the two pressure feet 8[b] and 9[b]. As best shown in Figs. 1 and 2, the shaft 82 is mounted for rotation in suitable bearings 83 and 84, and is provided with a worm wheel 85 engaged by a worm 86 on a countershaft 87 having fixed to it a sprocket wheel 88 driven by a sprocket chain 89 receiving its motion from a sprocket wheel 90 on the shaft 2 of the grindstone, the shaft 82 being thus rotated constantly from the grindstone. At its middle portion, the shaft 82 has fixed to it a double reversed pitch feed screw 91 which is adapted to be engaged by a reversing head 92 swivelled in an open rectangular frame or slide device 93 reciprocating back and forth on fixed guide rods 94. The reversing head is adapted when in one oblique position, as shown in Fig. 18, to be engaged by one of the threads of the feed screw, whereby the screw in its rotation will feed the slide in one direction, and is adapted when in its reverse oblique position to be engaged by the other thread of the feed screw, whereby the slide will be moved by the screw in the opposite direction, the reversal of the position of the swivelling head being effected by two reversing members or "kickers" 95 and 96 mounted loosely on the shaft 82 respectively at the opposite ends of the screw, and movable relatively to the shaft longitudinally thereof as will be presently described.

The slide 93 is operatively connected with the stems of the three valve mechanisms 64, 72 and 73 for operating said mechanisms, and the movements of the slide by the feed screw are controlled automatically by the movements of the pressure feet, these several mechanisms cooperating with each other in such manner as will be now described, that when all of the wood in one pocket has been ground, the grinding pressure to the cylinder of that pocket will be shut off and the upper end of the cylinder opened to the exhaust and "backing off" pressure admitted to the cylinder to retract the pressure foot and approximately at the same time, grinding pressure will be admitted to the upper end of the cylinder of the other pocket, and the lower end of the cylinder opened to the exhaust, and these operations repeated in alternation.

The operative connection of the slide 93 with the stem of the piston valve 64[a] is effected by means of a lever 97 pivoted at one end to the slide 93 and fulcrumed at its opposite end to an arm 98 fixed to the casing of the valve mechanism 64, the said lever being pivoted between its ends as at 99 to the end of the valve stem, whereby the movement of the slide 93 by the feed screw in opposite directions will move the piston valve in its casing correspondingly.

The operative connection of the slide 93 with the stems of the two plug valves 78 and 79 is effected by means of two slotted arms 100 and 101 fixed at their inner ends respectively to the stems of the two plug valves, the inner portions of the slots in the arms extending at an oblique angle to the outer portions as at 100[a], the purpose of which will presently appear. The slots in the arms loosely receive pins 102 and 103 fixed to the opposite ends respectively of a rod 104 which is fastened rigidly to the slide 93 as shown in Fig. 20. The construction and relative form of these parts is such that when the slide 93 is at the left hand end of its movement as shown in Fig. 13, the pin 102 will be at the outer end of the slot in the arm 100 and said arm will be held in a horizontal position with the plug valve 78 in a position which will cut off the backing off pressure to cylinder 8 and will open the lower end of the cylinder to exhaust, in which position of the parts the pin 103 will be at the inner end of the outer portion of the slot in arm 101 and said arm will be held in a vertical position which will hold plug valve 79 in a position to shut off communication of the lower end of cylinder 9 with the exhaust and will admit backing off pressure to said cylinder. When the slide 93 is at the right hand end of its movement, the arm 100 will be held in a vertical position and the arm 101 in a horizontal position, in which position of the parts, the two plug valves 78 and 79 will be reversed in position in their valve casings and backing off pressure will be admitted to the lower end of cylinder 8, and the lower end of cylinder 9 opened to the exhaust.

The feed of the slide 93 in opposite directions is as before stated controlled by the position of the pressure feet and this control is effected through the medium of the two kickers 95 and 96 before alluded to, which are operated by the pressure feet in the following manner. As shown in Fig. 18 the kickers are each in the form of a plate 105 provided with a forward inclined edge 106, which plate is fixed to a block 107 formed with a horizontal opening therethrough in which is fixed the forward end of a tube 108. The tubes of the two kickers surround the shaft 82 and extend loosely at their outer ends respectively through brackets arms 109 and 109[a], the outer ends of the tubes having nuts 110 screwed thereon and adapted to bear against the outer sides of the bracket arms. Spiral springs 110[a] encircle the tubes between the blocks and the bracket arms, and bear at their opposite ends against said parts, the said springs acting to give yielding support to the kickers in the direction of their movement on the shaft. It will be understood from the construction described that when either of the bracket arms 109 or 109[a] is moved toward the double feed screw, the associated kicker will be correspondingly moved and the inclined edge of the kicker plate entered in the opening in the slide 93, and engaging the swivelling head 92, will turn the same to an oblique position corresponding to the inclination of the edge of the kicker plate, thereby setting the head so that in the rotation of the double thread screw, the head will be received between the threads thereof and will be fed by the screw. Such action of the kicker 95 is illustrated in Fig. 18, the swivelling head having been turned by the engagement of the kicker plate therewith, so that as the kicker is moved further inwardly, the swivelling head will enter the correspondingly inclined thread 91[a] of the screw, and the head and consequently the slide 93, will be fed to the right. When the other kicker 96 at the opposite end of the screw is similarly operated, it will engage the swivelling head fed out by the screw at that end and will reverse the position of the head, and by the continued inward movement of the kicker plate, the head will be caused to enter into the other oppositely inclined thread 91[b] of the screw, whereby the head and consequently the block, will be fed back to its original position, the direction of movement of the block being thus reversed by the alternate action on the swivelling head of the two "kickers".

The bracket arms 109 and 109[a] are carried respectively by rods 111 and 112 mounted to slide endwise in suitable fixed guides 113 as shown in Fig. 1. The rod 111 has pivoted to it the outer end of a link 114 whose inner end is pivoted to the inner end of a link 115 which has it outer end pivoted as at 116 to the pocket structure, the two links 114 and 115 thus forming in effect a toggle connection between the pocket and the endwise movable rod 111, said toggle connection operating when extended as shown to the left in Fig. 14 to shift the rod 111 to the right, and when contracted as shown at the left in Fig. 13 to shift the rod to the left. The endwise movable rod 112 is similarly connected with the pocket at that side by a toggle connection constituted by links 117 and 118 pivoted together at their inner ends and pivotally connected at their outer ends respectively with the rod 112 and a bracket on the pocket structure, this toggle connection operating when straightened out to shift the rod 112 to the left and when contracted, to shift the rod in the opposite direction. These toggle connections are extended and contracted by means of operating rods 119 and 120 fixed at their lower ends respectively to the pressure feet 8[b] and 9[b] and extending loosely through holes in the respective links 115 and 118. Each of the rods has applied to its upper end an abutment 121 and has applied near its lower end an abutment 122, which abutments are disposed respectively on opposite sides of the associated toggle link, and in such relative positions that when the pressure foot nears the lower end of its movement in the wood holding pocket, the upper abutment will engage the toggle and will straighten out the toggle connection as shown to the left in Fig. 14, and when the pressure foot reaches the end of its upper movement, the lower abutment will engage the toggle and the toggle connection will be contracted as shown to the right in Fig. 13. For reasons which will later appear in the description of the operation of the mechanism, the two abutments 121 and 122 are made yielding, and this is effected by constructing each abutment as shown in Fig. 15 where it will be seen that the abutment is in the form of a sleeve 123 loosely surrounding the operating rod and provided at its opposite ends with inwardly extending annular flanges 124 and 125. The sleeve is yieldingly supported by a coiled spring 126 which surrounds the rod within the sleeve and bears at one end against a stop washer 127 fixed to the rod and at its other end against the flange 125. The sleeve is limited in its movement on the rod under the influence of the spring by the inwardly extending flange 124 which comes up against the washer 127. The strength of the spring is such that it will hold the abutment to its work when the abutment engages the toggle, and the latter will be moved without compressing the spring; but on the continued movement of the operating rod as the pressure foot finishes its movement, the further movement of the sleeve being arrested by the straightened out condition of

the toggle connection, the spring 126 will be compressed, thereby permitting the foot to finish its movement without further effect on the toggle connection and the parts operated thereby.

The outer links 115 and 118 of the toggle connections slide and are guided in slots in bracket arms 115[a] and 118[a] respectively as shown in Fig. 1, the outer ends of the slots limiting the folded condition of the links, and the inner ends of the slots limiting their extended condition.

It will be understood that the yielding sleeves of the two abutments on the operating rods face towards each other so that the upper abutment will yield upwardly on the downward movement of the operating rod, and the lower abutment will yield downwardly in the upward movement of the operating rod.

Due to the form and to the relation of the toggle links to their associated pocket and to the kicker operating rod, and due to the provision of the spring between the kicker and the bracket on the operating rod, the adjustment of the pocket and consequently the associated cylinder to and from the grindstone, will not require any change or adjustment of the valve-mechanism operating-parts to insure their proper operation under the changed position of the pocket. For instance, if the pocket 6 and its associated cylinder 8 is adjusted closer down to the grindstone, the two toggle links will be moved with the cylinder, and the kicker operating rod 111 and the bracket thereon shifted to the right, the yield of the spring 110[a] permitting the parts to accommodate themselves to their changed positions, and insuring the operation of the various parts in their proper sequence as above described.

The operation of the controlling mechanism above described is as follows:

It will be assumed that as shown by the full lines in Fig. 13 the pressure foot in pocket 8 has not arrived at the limit of its advancing movement and is still under grinding pressure, the pressure foot of pocket 9 being at the limit of its upward movement and under "backing off" pressure, this pocket of course being filled with wood and for the time being idle but ready to be brought into action when all the wood in pocket 8 has been ground.

Piston valve 64[a] is at the left hand end of its stroke and is admitting grinding pressure through pipe 8[c] to the upper end of cylinder 8, and pipe 9[c] leading from the upper end of the cylinder 9 is in communication with the exhaust through port 68. Valve 78 of the three-way valve 72 is in a position cutting off the "backing off" pressure to the lower end of cylinder 8, and opening the same to the exhaust through pipe 8[d], and finally through exhaust port 76, this position of the valve being shown in Fig. 16; and valve 79 of three-way valve mechanism 73 is in a position admitting backing off pressure to cylinder 9 and cutting off communication with the exhaust port 77, such position of the valve being shown in Fig. 16[a]. The slide 93 is at the left hand end of the screw with lever 97 in a position holding the piston valve in the position above mentioned, and rod 111 is at the left hand end of its movement holding kicker 95 disengaged and distant from the reversing head 92 and held in this position by the folded condition of the toggle links 114 and 115. The other rod 112 carrying kicker 96, is at the right hand end of its stroke holding the kicker retracted and the parts are so held by the folded condition of the toggle links 117 and 118.

As the pressure foot 8[b] continues its advancing movement, the upper abutment 121 on operating rod 119 will come into engagement with toggle link 115 and will act to straighten out the toggle connection as shown by dotted lines to the left in Fig. 13, in which action rod 111 will be thrust to the right and will move kicker 95 into engagement with the swivelling head 92, which latter will be engaged by one of the two threads of the constantly rotating feed screw and will be fed to the right, thereby carrying the slide 93 with it. As the slide begins its movement it will start the movement of piston valve 64[a] to the right, and likewise the movement of the two pins 102 and 103 in the slotted arms 100 and 101. This movement of the piston valve will begin to cut off grinding pressure to cylinder 8, and will at the same time admit grinding pressure to cylinder 9 in which action of the parts pin 102 will move idly in the slot in the horizontally positioned arm 100 without affecting the three-way valve mechanism 72, but the operation of the three-way valve mechanism 73 will begin at once owing to the angular relation of the arm 101 to the rectilinearly movable pin 103, with the result that backing off pressure will be continued to be cut off from cylinder 8 so that the associated pocket will continue in operation, while backing off pressure will be cut off from cylinder 9 so that the associated pocket of this cylinder may begin its grinding operation. This condition of the parts is shown in Fig. 14 where by full lines the pressure foot 8[b] is shown nearly to the end of its advance and still operating under grinding pressure, while pressure foot 9[b] is shown at the beginning of its advance with the grinding pressure being admitted to cylinder 9 and the lower end of the cylinder opened to the exhaust. By this sequence of operations the action of the two pockets overlap slightly, grinding pressure to the cylinder of pocket

8 not being cut off until the other pocket is brought into action so that there will be no interruption in the pressure on the grindstone and consequently no racing of the latter. In practice the period of overlap of the two operations is about one-half minute, in which time, grinding pressure is admitted to the cylinder of the inactive pocket, and cut off from the cylinder of the other pocket, and the backing off pressures correspondingly controlled.

As the slide continues its advance under the feeding action of the screw, piston valve 64^a is moved further to the right until the parts reach the position shown by dotted lines in Fig. 14, in which position of the parts, grinding pressure is entirely cut off from cylinder 8 and is fully admitted to cylinder 9, pin 102 having by this time reached the outer end of the oblique portion of the slot in arm 100 and having turned this arm down to a vertical position and thereby shifted plug valve 80 of three-way valve mechanism 74 and admitted backing off pressure to cylinder 8. Pin 103 in these operations having, after the operation of valve 81 as described, moved arm 101 to a horizontal position as shown in Fig. 14, and continuing its movement to the right to the dotted line position, moving idly in the slot in arm 101 without effecting further movement of the valve. The advance of pressure foot 9^b having thus been started it will continue to advance and feed the wood against the stone, the pressure foot 8^b in the meantime having been "backed off" and held in backed off position by the backing off pressure, so that the pocket can be refilled, the reversing head being fed out at the right hand end of the feed screw and being left in position there ready to be reversed for the next operation. In the retraction of the pressure foot 8^b the lower abutment 122 on the rod 119 comes into contact with toggle lever 115 and folds the toggle links, thereby retracting the kicker 95 to its former position ready for the next operation. The parts remain in this position until all the wood in the pocket operated by cylinder 9 has been ground, whereupon upper abutment 121 on rod 120 will come into engagement with toggle lever 118 and will straighten out the toggle joint, thereby shifting rod 112 to the left and correspondingly shifting kicker 96, with the result that the reversing head will be changed in its position and engaged by the other thread of the constantly rotating feed screw, and will be carried back again to the left. In this feed of the reversing head, the slide, and consequently the valve mechanism operating devices, will be shifted in the opposite directions to those described, and the operation of the various parts will be reversed, thereby admitting grinding pressure to the cylinder 8 of the refilled pocket to start its operation, and a moment thereafter cutting off grinding pressure to cylinder 9 and admitting backing off pressure to enable the pocket of cylinder 9 to be refilled. These operations are repeated automatically by the constantly rotating feed screw 91 controlled by the position and operation of the pressure feet in the two pockets, the pockets being brought into action alternately according to the amount of wood in the active pocket as determined by the position of its pressure foot, so that while only one pocket will be in operation at one time, yet there will be no cessation in, or interruption of the pressure of the wood against the stone, the pressure on the latter being uniform, with the result that the stone will operate on the wood with the greatest advantage in producing a uniform grade of pulp, and wastage of power or variation in the grade and grinding of the pulp will be avoided.

Having thus described my invention, what I claim is:

1. In a wood grinding machine, the combination of a grinder, a pocket for holding the wood to be ground, pressure means movable in the pocket to advance the wood against the grinder, and means moved by the pressure means and giving lateral support to the wood in its advance.

2. In a wood grinding machine, the combination of a grinder, a pocket for holding the wood to be ground, means movable in the pocket to advance the mass of wood against the grinder, and supporting means for the wood movable along the sides of the pocket and engaged by the mass of wood in its advance, said supporting means being positively moved by the movable means with the wood.

3. In a wood grinding machine, the combination of a grinder, a pocket for holding the wood to be ground, chains of supporting members extending along the opposite sides of the pocket in position to be engaged by the mass of wood and to support the same, and a pressure foot movable in the pocket and adapted to advance the mass of wood against the grinder, said pressure foot being operatively connected with the chains of supporting members and operating to positively advance the same with the wood.

4. In a wood grinding machine, the combination of a grinder, a pocket for holding the wood to be ground, endless chains of supporting members having their inner stretches extending along the opposite sides of the pocket in position to be engaged by the mass of wood and to support the same, and a pressure foot movable in the pocket and adapted to advance the mass of wood against the grinder, said pressure foot being operatively connected with the chains of

supporting members and operating to positively advance the same with the wood.

5. In a wood grinding machine, the combination of a grinder, a pocket for holding the wood to be ground, pressure means movable in the pocket to advance the wood against the grinder and retractible to permit the pocket to be refilled, endless chains of supporting members having their inner stretches extending along the opposite sides of the pocket in position to be engaged by the mass of wood and to support the same in its advance, and means whereby said chains are advanced intermittently and progressively by the successive advancing movements of the pressure means.

6. In a wood grinding machine, the combination of a grinder, a pocket for holding the wood to be ground, a pressure foot movable in the pocket to advance the wood against the grinder, and retractible to permit the pocket to be refilled, endless chains of supporting members having their inner stretches extending along the opposite sides of the pocket in position to be engaged by and to support the mass of wood in its advance, and a clutch connection between the pressure foot and chains operable, on the successive advancing movements of the pressure foot, to advance the chains intermittently and progressively.

7. In a wood grinding machine, the combination of a grinder, a pocket for holding the wood to be ground, a pressure device movable in the pocket for advancing the wood against the grinder, fixed runways along the sides of the pocket, chains of supporting members supported from the runways in position to be engaged by the mass of wood and to support the same in its advance, and anti-friction devices between the runways and chains of supporting members.

8. In a wood grinding machine, the combination of a grinder, a pocket for holding the wood to be ground, a pressure device movable in the pocket for advancing the wood against the grinder, chains of supporting members extending along the opposite sides of the pocket and supported thereby, said chains being in position to be engaged by the mass of wood and to support the same in its advance, and anti-friction devices between the chains of supporting members and the sides of the pocket.

9. In a wood grinding machine, the combination of a grinder, a pocket for holding the wood to be ground, a pressure foot movable in the pocket for advancing the wood against the grinder, endless chains of anti-friction devices having their inner stretches extending along the opposite sides of the pocket, endless chains of plates supported by and traveling on said chains of anti-friction devices, and means whereby on the advance of the pressure foot, the chains of plates will be positively moved thereby with the advancing wood.

10. In a wood grinding machine, the combination of a grinder, a pocket for holding the wood to be ground, a pressure foot movable in the pocket for advancing the wood against the grinder, endless chains of anti-friction rollers sustained by the pocket with their inner stretches extending along the sides of the same, endless chains of supporting plates surrounding and supported by the chains of rollers in position to be engaged by and support the mass of wood in its advance, and means whereby on the advance of the pressure foot, the chains of supporting plates will be positively moved thereby along with the wood.

11. In a wood grinding machine, the combination of a grinder, a pocket for holding the wood to be ground, a pressure device movable in the pocket to advance the wood against the grinder, endless chains of supporting devices mounted on the pocket with their inner stretches extending along the sides thereof in position to be engaged by and support the mass of wood in its advance, tracks sustained by the pocket on which the outer stretches of the chains travel, and means for adjusting the tracks to regulate the tension of the chains.

12. In a wood grinding machine, the combination of a grinder, a pocket for holding the wood to be ground, a pressure foot movable in the pocket to advance the wood against the grinder, runways on the side walls of the pocket, tracks sustained by the pocket outward of the runways and adjustable to and from the same, endless chains of supporting members surrounding and supported by said runways and tracks with their inner stretches in position to be engaged by and to support the wood in its advance, and operative connections between the pressure foot and chains of supporting members adapted to positively advance the latter with the wood,

13. In a wood grinding machine, the combination of a grinder, a pocket for holding the wood to be ground, a pressure foot movable in the pocket to advance the wood against the grinder, runways on the side walls of the pocket, tracks sustained by the pocket outward of the runways and adjustable to and from the same, endless chains of anti-friction rollers surrounding and supported by said runways and tracks, endless chains of supporting plates surrounding and traveling on the chains of anti-friction rollers and having their inner stretches in position to be engaged by and support the mass of wood in its advance, and operative connections between the pressure foot and chains of supporting plates adapted to cause the positive advance of the latter by the pres-

sure foot in the advancing movements of the same.

14. In a wood grinding machine, the combination of a grinder, a pocket for holding the wood to be ground, a pressure device movable in the pocket to advance the wood against the grinder, runways along the sides of the pocket, endless chains of anti-friction rollers sustained by the pocket with their inner stretches traveling on the runways, the said rollers having studs projecting axially from the opposite ends of the same, shoulders at the sides of the runways engaged by said studs and acting to prevent the chains from sagging from the runways, and chains of supporting members supported by the inner stretches of the roller chains and adapted to be engaged by and give support to the wood in its advance.

15. In a wood grinding machine, the combination of a grinder, a pocket for holding the wood to be ground, a pressure device movable in the pocket to advance the wood against the grinder, and supporting devices for the wood movable along the sides of the pocket inward of the walls thereof and adapted to be engaged by and support the mass of wood in its advance, the said walls being extended at the ends adjacent the grinder, inward of the planes of the supporting devices; whereby the pressure of the advancing mass of wood will be transferred from the movable supporting devices to the side walls of the pocket as the grinder is approached.

16. In a wood grinding machine, the combination of a grinder, a pocket for holding the wood to be ground, a pressure device movable in the pocket to advance the wood against the grinder, guide rolls at the end of the pocket adjacent the grinder, endless chains of supporting members passing around said guide rolls with their inner stretches extending along the opposite sides of the pocket inward of the walls thereof, and adapted to be engaged by and support the mass of wood in its advance, the said walls of the pocket being extended inward of the planes of the supporting members at a point at or adjacent the axis of the guide rolls; whereby the pressure of the advancing mass of wood will be transferred from the movable supporting members to the walls of the pocket and the guide rolls thereby relieved of said pressure.

17. In a wood grinding machine, the combination of a grinder, a pocket for holding the wood to be ground, a pressure device movable in the pocket to force the wood against the grinder, guide rolls at the end of the pocket adjacent the grinder, and endless chains of pivotally connected supporting plates traveling around said guide rolls and along the sides of the pocket in position to be engaged by and support the mass of wood in its advance, the edges of adjacent plates being bevelled outwardly in opposite directions to permit them to pivot sharply around the guide rolls and thereby give moving support to the wood close up to the grinder.

18. In a wood grinding machine, the combination of a grinder, a pocket for holding the wood to be ground, a pressure device movable in the pocket to force the wood against the grinder, guide rolls at the end of the pocket adjacent the grinder, and endless chains of pivotally connected supporting plates traveling around the guide rolls and along the sides of the pocket in position to be engaged by and support the mass of wood in its advance, the edges of the plates being bevelled outwardly at opposite ends, and the bevelled portions of adjacent plates disposed in staggered relations to each other; whereby the plates will pivot sharply around the guide rolls and give moving support to the wood close up to the stone.

19. In a wood grinding machine, the combination of a bed frame, a drive shaft mounted therein and carrying a grindstone, two pocket carrying frames movably mounted on said bed frame and separable from each other to permit access to the drive shaft and grindstone, wood holding pockets carried by the respective frames, and releasable means for fastening said frames fixedly together to sustain the parts in operative relations to the grindstone; whereby by releasing the fastening means the frames may be separated from each other to permit access to the drive shaft and grindstone.

20. In a wood grinding machine, the combination of a bed frame, a drive shaft mounted in bearings therein and carrying a grindstone, two pocket carrying frames pivoted at their outer ends to the bed frame on opposite sides of the shaft, wood holding pockets fixed to said carrying frames respectively on opposite sides of the shaft and provided with operating cylinders and pistons, and means for fastening said carrying frames detachably together and to the bed frame, the relation of the pockets and attached parts to the pivotal axes of the frames being such that the centers of gravity of the pockets and attached parts will be disposed outwardly of said pivotal axes; whereby when the fastening means are released, the carrying frames will swing down by gravity and permit access to the drive shaft and grindstone.

21. In a wood grinding machine, the combination of a grinder, a plurality of means for holding the wood to be ground at different points on the grinder, a pressure device operable on the wood in each holding means to force the wood against the grinder, and means controlled automatically by the amount of wood in the holding means to

cause the operation of the pressure devices in alternation.

22. In a wood grinding machine, the combination of a grinder, a plurality of means for holding the wood to be ground at different points on the grinder, a pressure device operable on the wood in each holding means to force the wood against the grinder, said pressure devices being adapted to be operated in alternation, and means operated automatically when the wood in one holding means or series is ground, to bring into action the pressure device of the other holding means or series.

23. In a wood grinding machine, the combination of a grinder, a plurality of means for holding the wood to be ground at different points on the grinder, a pressure device operable on the wood in each holding means to force the wood against the grinder, and means controlled automatically by the pressure devices to cause their operation in alternation.

24. In a wood grinding machine, the combination of a grinder, a plurality of means for holding the wood to be ground at different points on the grinder, a pressure device operable on the wood in each holding means to force the wood against the grinder, said pressure devices adapted to be operated in alternation, and means acting automatically to start the operation of the pressure device in one holding means or series before the operation of the pressure device in another holding means or series is stopped.

25. In a wood grinding machine, the combination of a grinder, a plurality of means for holding the wood to be ground at different points on the grinder, a pressure device operable on the wood in each holding means to force the wood against the grinder, and means controlled automatically by the pressure devices to cause their operation in alternation, with a short period of overlap at the end of one operation and the beginning of the next.

26. In a wood grinding machine, the combination of a grinder, a plurality of means for holding the wood to be ground at different points on the grinder, a pressure device operable on the wood in each holding means to force the wood against the grinder and adapted to be operated by a fluid pressure medium, a valve mechanism for controlling said fluid pressure medium, and valve operating mechanism acting automatically to actuate said valve mechanism to start the operation of one pressure device or series when the operation of another pressure device or series ceases.

27. In a wood grinding machine, the combination of a grinder, a plurality of means for holding the wood to be ground at different points on the grinder, a pressure device operable on the wood in each grinder to force the wood against the grinder and adapted to be operated by a fluid pressure medium, a valve mechanism for controlling the said fluid pressure medium, and automatically operating mechanism controlled by the pressure devices and acting to actuate said valve mechanism to cause the operation of the pressure devices in alternation.

28. In a wood grinding machine, the combination of a grinder, a plurality of means for holding the wood to be ground at different points on the grinder, a pressure device operable on the wood in each holding means to force the wood against the grinder and adapted to be operated by a fluid pressure medium, a valve mechanism for controlling said fluid pressure medium and operable to cause the operation of the pressure devices in alternation with a short period of overlap at the end of the one operation and the beginning of the next, and means for actuating said valve mechanism.

29. In a wood grinding machine, the combination of a grinder, a plurality of means for holding the wood to be ground at different points on the grinder, a pressure device operable on the wood in each holding means to force the wood against the grinder and adapted to be operated by a fluid pressure medium, a valve mechanism for controlling said fluid pressure medium and operable to cause the operation of the pressure devices in alternation, power means for actuating the valve mechanism, and means acting automatically when the wood in one holding means or series is ground, to cause the operation of the valve mechanism by the power means.

30. In a wood grinding machine, the combination of a grinder, a plurality of means for holding the wood to be ground at different points on the grinder, a pressure device operable on the wood in each holding means to force the wood against the grinder and adapted to be operated by a fluid pressure medium, a valve mechanism for controlling said fluid pressure medium and operable to cause the operation of the pressure devices in alternation, constantly operating power means for actuating the valve mechanism and normally disengaged therefrom, and means acting when the wood in a holding means or series is ground to connect the power means with the valve mechanism to actuate the same.

31. In a wood grinding machine, the combination of a grinder, a plurality of means for holding the wood to be ground at different points on the grinder, a pressure device operable on the wood in each holding means to force the wood against the grinder, said pressure devices being adapted to be operated by a fluid pressure medium, a valve mechanism for controlling said fluid

pressure medium and operable to cause the operation of the pressure devices in alternation, constantly operating power means for actuating the valve mechanism, and means controlled by the pressure devices for governing the action of the power means on the valve mechanism.

32. In a wood grinding machine, the combination of a grinder, a plurality of means for holding the wood to be ground at different points on the grinder, a pressure device operable on the wood in each holding means to force the wood against the grinder, said pressure devices adapted to be operated by a fluid pressure medium, a valve mechanism for controlling said pressure fluid medium and operable to apply "grinding pressure" and "backing off pressure" respectively to the pressure devices to cause them to be operated in alternation, and valve operating mechanism acting automatically to actuate said valve mechanism to start the operation of one pressure device or series, when the operation of another pressure device or series is stopped.

33. In a wood grinding machine, the combination of a grinder, a plurality of means for holding the wood to be ground at different points on the grinder, a pressure device operable in each holding means to force the wood against the grinder and adapted to be operated by a fluid pressure medium, a valve mechanism for controlling the fluid pressure medium, a reciprocating device operably connected with the valve mechanism for actuating the same to cause the operation of the pressure devices in alternation, power means for reciprocating said device, and means governed by the amount of wood in the holding means and operating automatically to control the action of the power means on the reciprocating device.

34. In a wood grinding machine, the combination of a grinder, a plurality of means for holding the wood to be ground at different points on the grinder, a pressure device operable on the wood in each holding means to force the wood against the grinder and adapted to be operated by a fluid pressure medium, a valve mechanism for controlling the fluid pressure medium, a constantly operating feed screw, a slide movable back and forth by said screw and operably connected with the valve mechanism to actuate the same, and means controlled by the pressure devices for governing the movements of the slide by the screw.

35. In a wood grinding machine, the combination of a grinder, a plurality of means for holding the wood to be ground at different points on the grinder, a pressure device operable in each holding means to force the wood against the grinder and adapted to be operated by a pressure fluid medium, a valve mechanism for controlling said medium, a rotary double reversed pitch feed screw, a slide operatively connected with the valve mechanism for actuating the same, a reversing head on the slide adapted in its different positions to engage respectively the threads of the feed screw to effect the reciprocation of the slide, kicker devices adapted to engage the reversing head and position the same for engagement with said threads, and means controlled by the amount of wood in the holding means for operating the kicker devices.

36. In a wood grinding machine, the combination of a grinder, a plurality of means for holding the wood to be ground at different points on the grinder, a pressure device operable in each holding means to force the wood against the grinder and adapted to be operated by a pressure fluid medium, a valve mechanism for controlling said medium, a rotary double reversed pitch feed screw, a slide operably connected with the valve mechanism for actuating the same, a reversing head on the slide adapted in its different positions to engage respectively the threads of the feed screw to effect the reciprocation of the slide, kicker devices adapted to engage the reversing head and position the same for engagement with said threads, and means controlled by the pressure devices for operating the kicker devices.

37. In a wood grinding machine, the combination of a grinder, a plurality of means for holding the wood to be ground at different points on the grinder, a pressure device operable on the wood in each holding means to force the wood against the grinder, said pressure devices being adapted to be operated by a pressure fluid medium, a valve mechanism for controlling said medium to admit "grinding pressure" to the pressure devices, a plurality of valve mechanisms for controlling said medium to admit "backing off pressure" to the pressure devices, a reciprocating device operably connected to said valve mechanisms to actuate the same to cause the operation of the pressure devices in alternation, and means governed by the amount of wood in the holding means and acting automatically to control the operation of the reciprocating device.

38. In a wood grinding machine, the combination of a grinder, a plurality of means for holding the wood to be ground at different points on the grinder, a pressure device operable on the wood in each holding means to force the wood against the grinder, said pressure devices being adapted to be operated by a pressure fluid medium, a valve mechanism for controlling said medium to admit "grinding pressure" to the pressure devices, a plurality of valve mechanisms for controlling said medium to admit "backing off pressure" to the pressure devices, a reciprocating device oper-

ably connected to said valve mechanisms to actuate the same to cause the operation of the pressure devices in alternation, and means governed by the pressure devices and acting automatically to control the operation of the reciprocating device

39. In a wood grinding machine, the combination of a grinder, a plurality of means for holding the wood to be ground at different points on the grinder, a pressure device operable on the wood in each holding means to force the wood against the grinder, and adapted to be operated by a pressure fluid medium, a valve mechanism for controlling said medium, power means operative on the valve mechanism for actuating the same to operate the pressure devices in alternation, and mechanism for automatically controlling the action of the power means on the valve mechanism, said controlling mechanism including toggle links, and means movable with the pressure device and adapted to operate the toggle links.

40. In a wood grinding machine, the combination of a grinder, a plurality of means for holding the wood to be ground at different points on the grinder, a pressure device operable in each holding means to force the wood against the grinder and adapted to be operated by a pressure fluid medium, a valve mechanism for controlling the pressure fluid medium, a reciprocating device operatively connected with the valve mechanism for actuating the same to cause the operation of the pressure devices in alternation, power means for reciprocating said device, and means operating automatically to control the action of the power means on the reciprocating device, said controlling means including toggle links and a member movable with the pressure device and adapted, when the pressure device approaches the end of its pressure stroke, to straighten out the toggle links and effect the connection of the power means with the reciprocating device.

41. In a wood grinding machine, the combination of a grinder, a pocket for holding the wood to be ground, a cylinder and piston associated with the pocket, a pressure device connected with the piston and operable on the wood in the pocket to force the same against the grinder, said pocket being adjustable to and from the grinder, means for the supply of a pressure fluid medium to the cylinder, a valve mechanism for controlling said pressure fluid medium, a reciprocating device operatively connected with the valve mechanism, power means for operating said reciprocating device, a shiftable rod, yielding means operated by the rod for controlling the operation of the power means on the reciprocating device, a link system operatively connected respectively with the pocket and shiftable rod for operating the latter, and means movable with the pressure device for operating the link system; whereby in the adjustment of the pocket, the yielding means will accommodate itself to the changed position of the parts.

42. In a wood grinding machine, the combination of a grinder, a pocket for holding the wood to be ground, a pressure device movable in the pocket for advancing the wood against the grinder, supporting means extending along the sides of the pocket in position to be engaged by the mass of wood and adapted to support the same in its advance, and anti-friction devices between said supporting means and the sides of the pocket.

In testimony whereof, I have affixed my signature hereto.

ROBERT E. READ.