E. HUTCHINS.

GRINDER FOR THE PRODUCTION OF WOOD PULP.

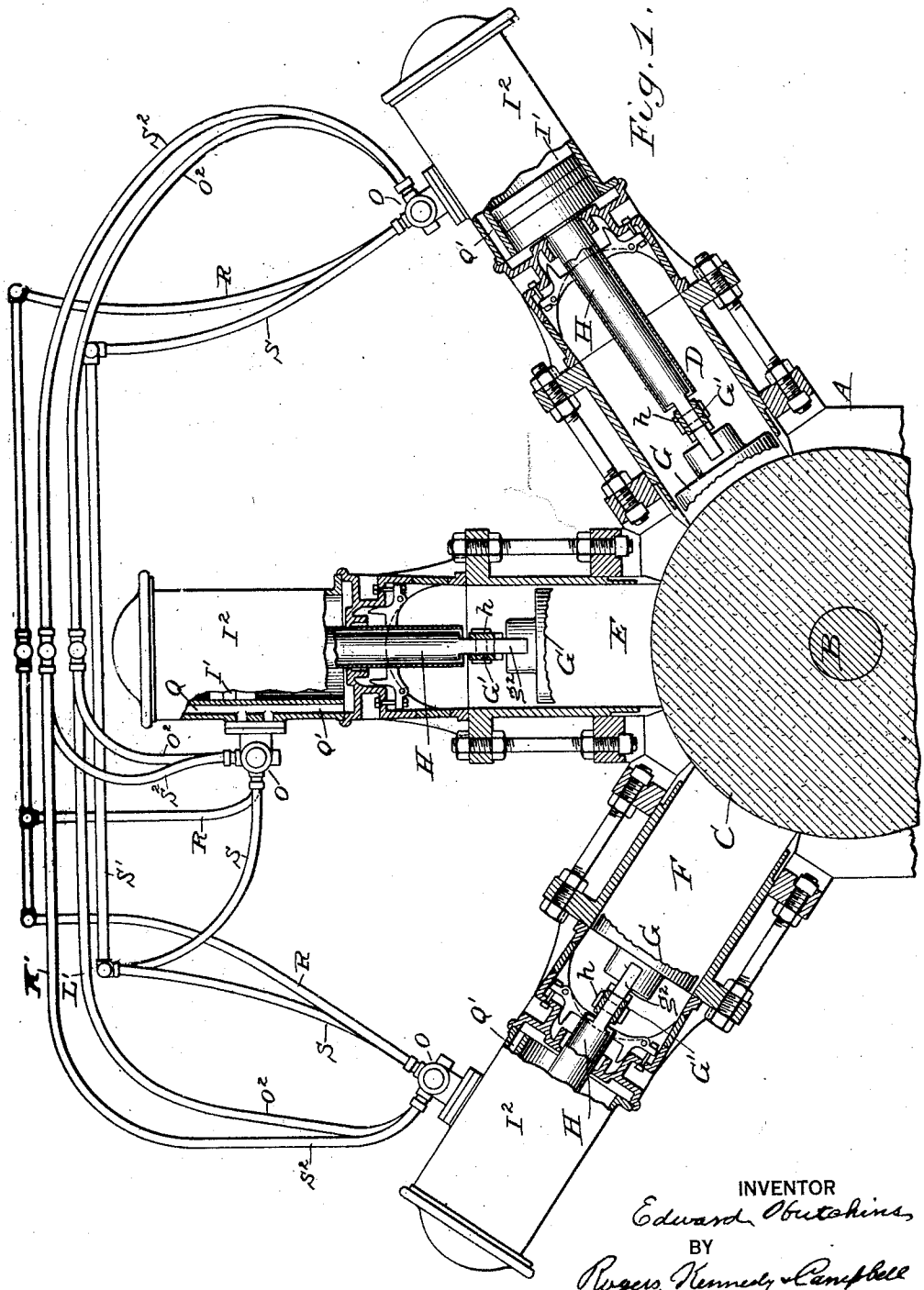
APPLICATION FILED NOV. 30, 1918.

1,333,659.

Patented Mar. 16, 1920.

6 SHEETS—SHEET 1.

Fig. 1.



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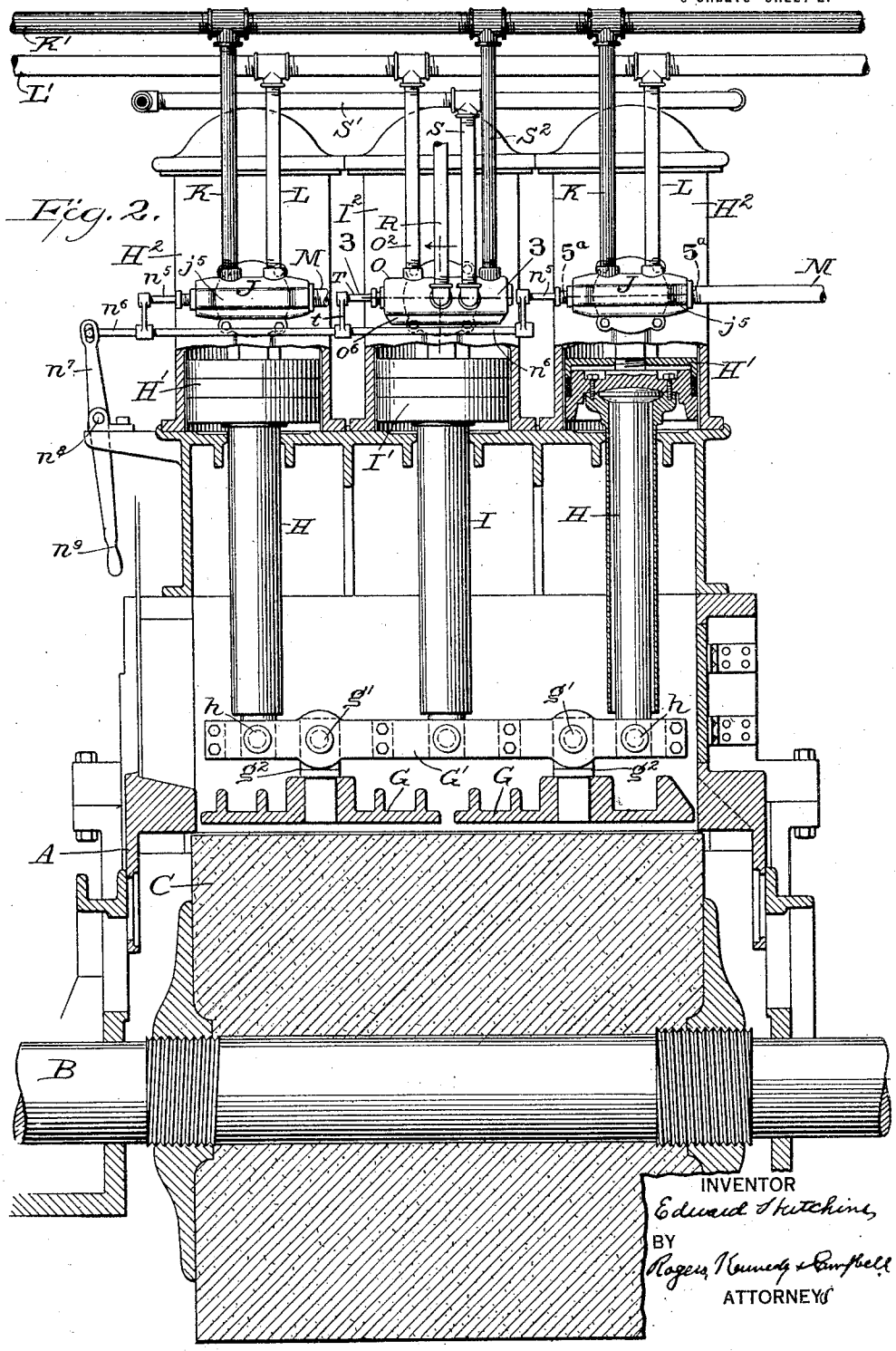


Fig. 2.

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6 SHEETS—SHEET 3.

Fig. 4.

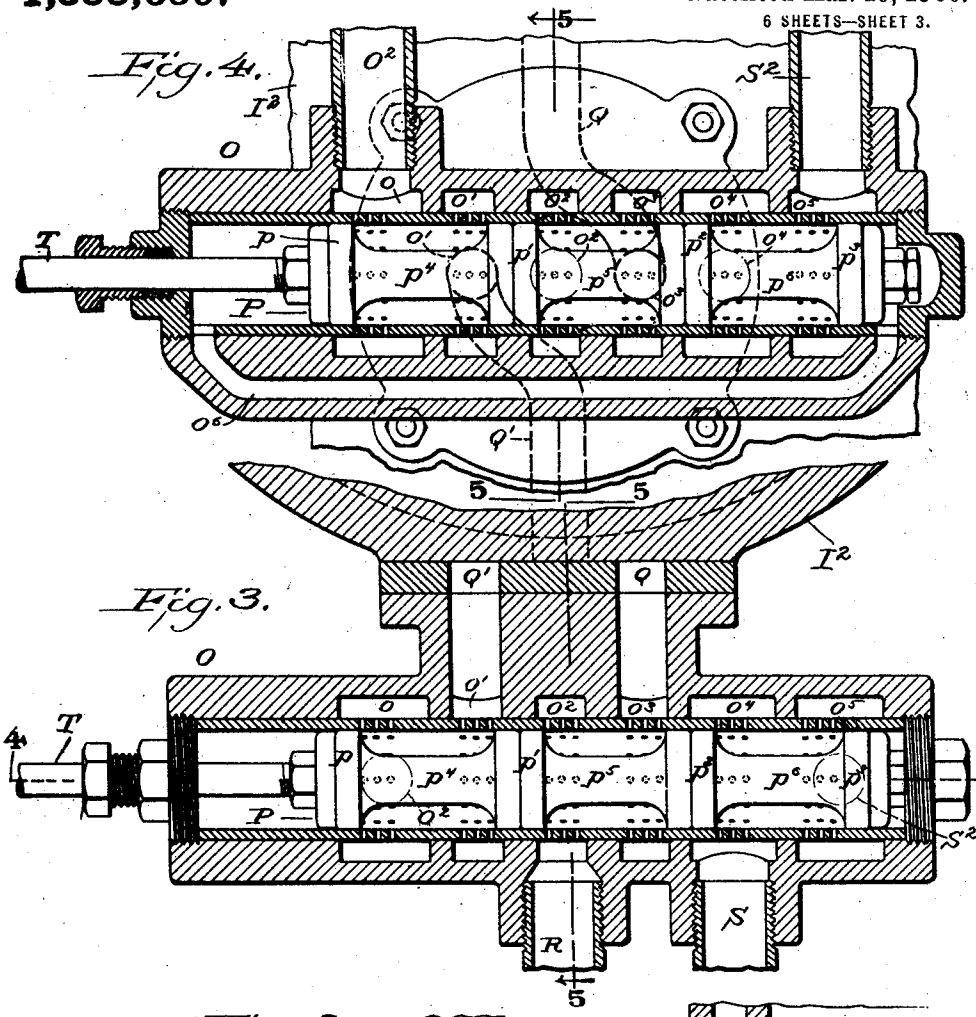
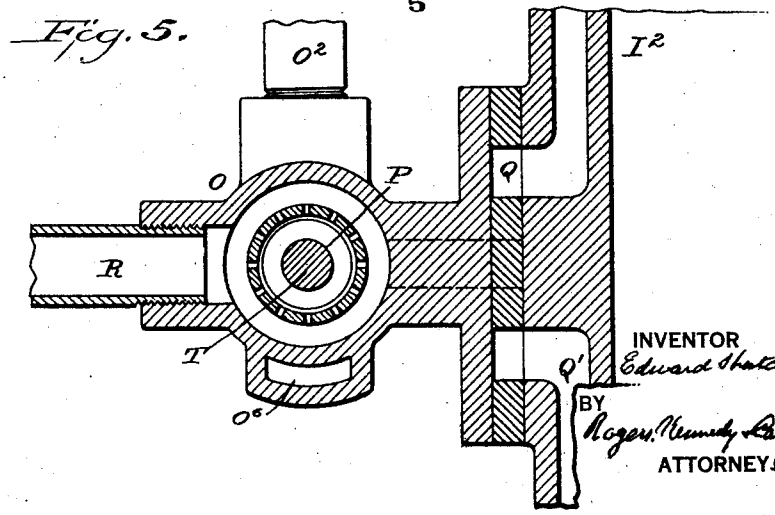


Fig. 3.

Fig. 5.



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6 SHEETS—SHEET 4.

Fig. 5a.

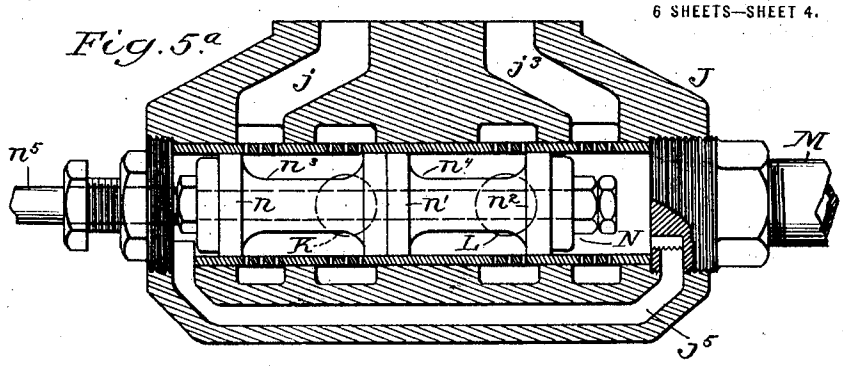


Fig. 8.

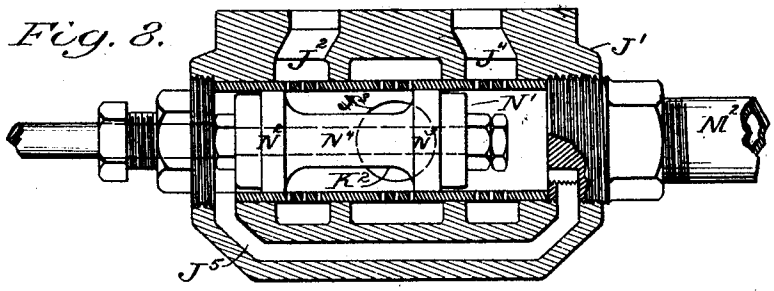
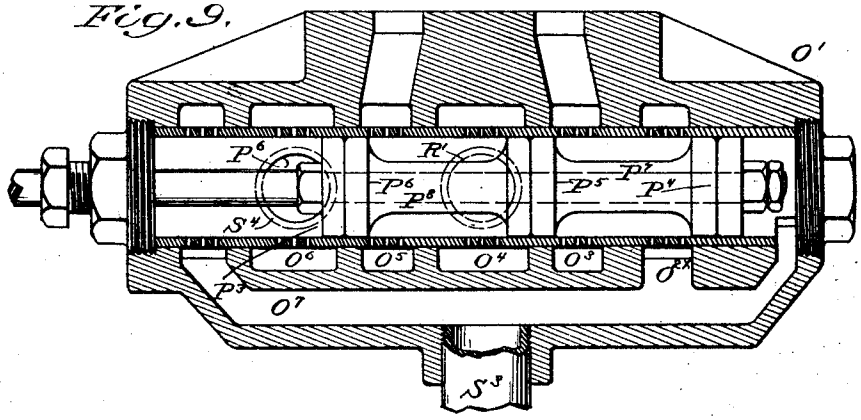


Fig. 9.



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6 SHEETS—SHEET 5.

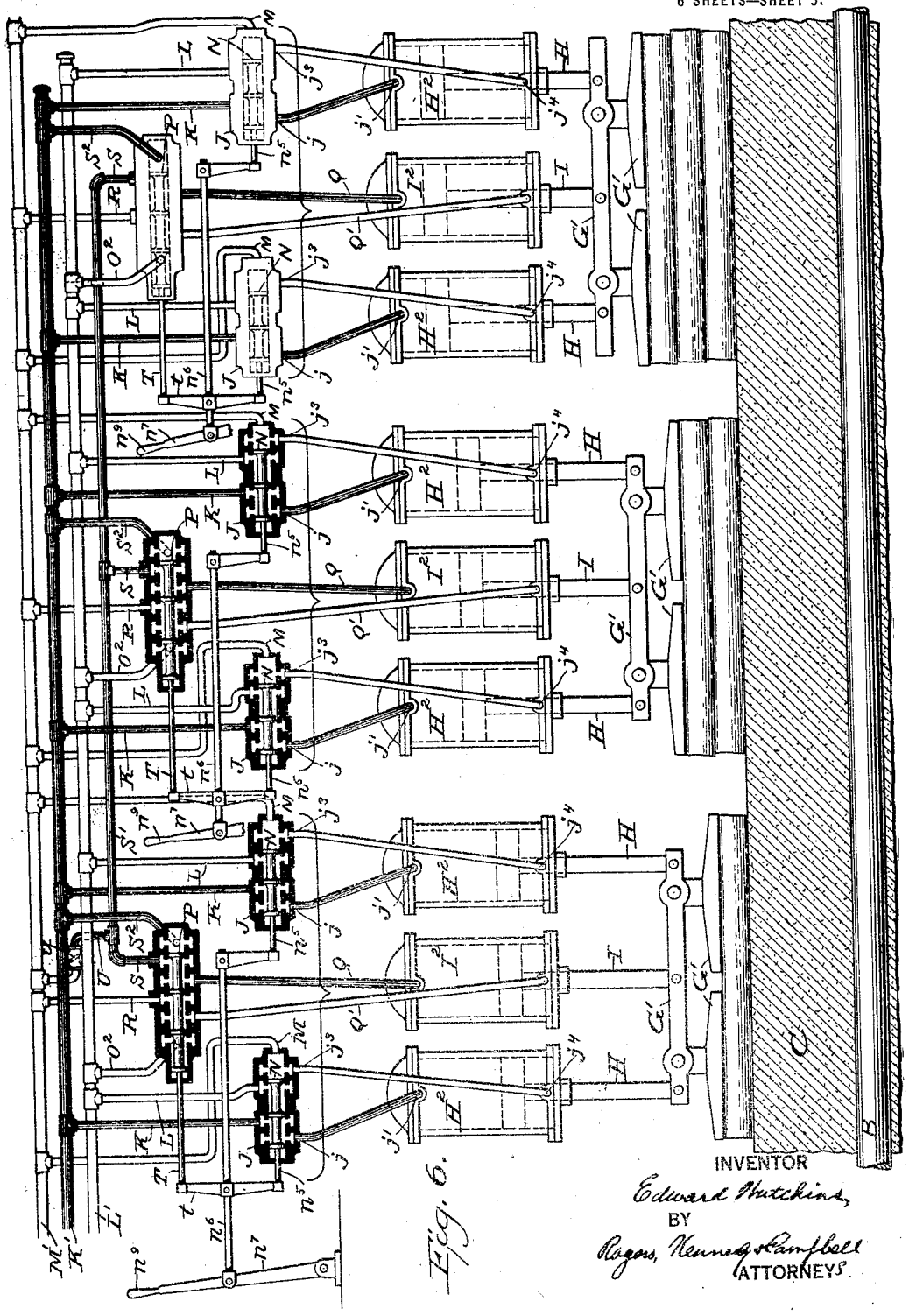


Fig. 6.

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6 SHEETS—SHEET 6.

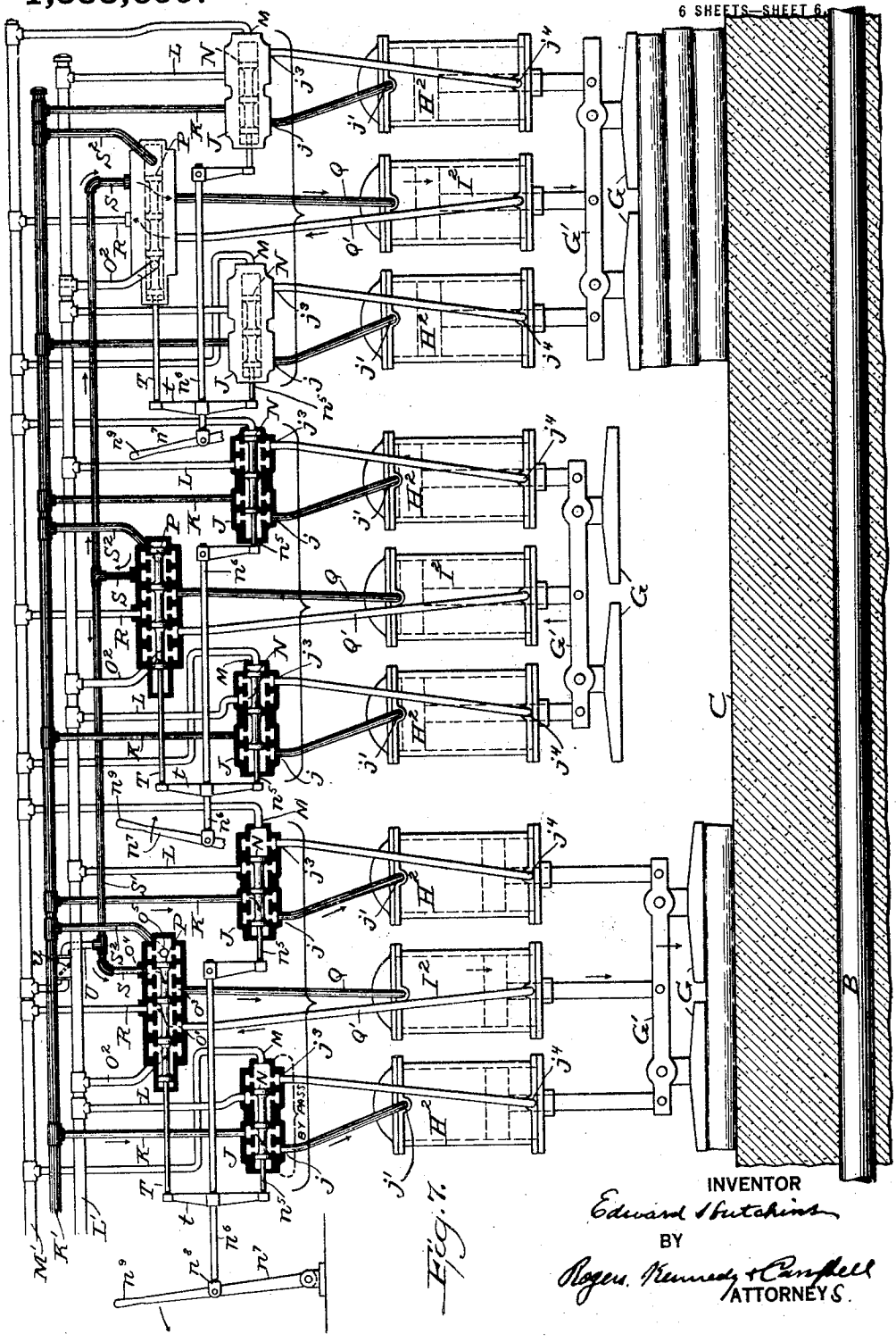


Fig. 7.

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UNITED STATES PATENT OFFICE.

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GRINDER FOR THE PRODUCTION OF WOOD-PULP.

1,333,659. Specification of Letters Patent. Patented Mar. 16, 1920.

Application filed November 30, 1918. Serial No. 264,779.

To all whom it may concern:

Be it known that I, EDWARD HUTCHINS, a citizen of the United States, residing at New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Grinders for the Production of Wood-Pulp, of which the following is a specification, reference being had therein to the accompanying drawings.

This invention relates to certain new and useful improvements in wood grinding mechanism for the production of wood pulp, more particularly for use in the manufacture of paper, such mechanism embodying a grinder, usually in the form of a rotary grindstone, against which the wood held in the pockets in a suitable housing or frame, is forced by power pistons.

In the operation of wood grinders of this type, a number of pockets is provided for the wood, which in the grinding operation bears with considerable pressure against the periphery of the stone at different points in its circumference, such pressure of the wood acting with a braking effect on the stone and insuring such rate of speed of rotation as to produce the most effective grinding action and the most economical application of the driving power. When, however, the wood in one of the pockets is completely ground and the pocket is to be furnished with a fresh supply, the pressure on the stone at this point is relieved, and consequently the total braking action on the stone is reduced, with the result that the stone will speed up. This action is very objectionable by reason of the waste of power, the ineffective grinding action on the wood in the pocket or pockets remaining in operation, and for other reasons unnecessary to enumerate.

The present invention aims to obviate this objectionable action, and it consists broadly in means for increasing the pressure on the wood in one pocket, when the pressure on the wood in another pocket is relieved.

In machines of the type above mentioned, the pressure on the wood is applied by means of pressure devices or elements usually in the form of shoes, to which are connected power pistons operating in power cylinders, to which cylinders, pressure fluid under "grinding" pressure is admitted to one side of the pistons to advance the same in the grinding action, and to which cylinders, pressure fluid under "backing-off" pressure is admitted to the opposite sides of the pistons to retract the same when the grinding operation is completed and the pocket is to be furnished with a fresh supply, the control of the admission of pressure to the cylinders being effected by suitable manually-operated valve mechanisms in the connections from the sources of pressure supply to the respective cylinders.

In the specific embodiment of my invention to such machines, I provide for each of the plurality of pockets, a plurality of power cylinders and pistons, preferably two main cylinders and pistons, and an intermediate auxiliary cylinder and piston, all of which pistons for a given pocket are connected with the pressure device therein, and I provide valve mechanisms for controlling the admission of pressure fluid to the several cylinders, the valve mechanisms for the auxiliary cylinders being of such form and construction that normally they will cut off the pressure to the auxiliary cylinders, which cylinders, under normal conditions with the wood being ground in all the pockets, will be free from pressure, and their pistons consequently exerting no pressure on the pressure devices; and I provide connections between the valve mechanisms of the auxiliary cylinders, of such form and construction that when one of the auxiliary valves is operated, as when the wood in its pocket is all ground and the "grinding" pressure is cut off and the pistons are retracted, pressure will be admitted to the auxiliary cylinders of the pockets remaining in operation, thus adding to the pressure on the wood in those pockets, a degree of pressure corresponding to that cut off from the empty pocket. As a result, the total pressure acting on the stone is maintained and the latter will be prevented from speeding up.

In the accompanying drawings I have illustrated my invention as applied to a grinding mechanism, in which three pockets are provided for holding the wood to be ground, the operation of any one of the three auxiliary valves, admitting pressure fluid to the other two auxiliary cylinders of the other pockets, so that the additional pressure imposed on the wood in these two

pockets will compensate for and equal that of the two main cylinders in the empty pocket. But it will be manifest that the invention is applicable as well to cases wherein but two wood holding pockets are employed, each provided with one main cylinder and one auxiliary cylinder, in which case the additional pressure imposed on the operative pocket by the action of the auxiliary valve of the empty pocket, will compensate for and equal that of the single main cylinder of the empty pocket.

Referring to the drawings:

Figure 1 is a transverse sectional view of a wood grinding mechanism having my invention embodied therein, parts being shown in elevation.

Fig. 2 is a longitudinal sectional view of the same, with parts in elevation.

Fig. 3 is a horizontal section through one of the auxiliary valves and adjacent portion of its associated auxiliary cylinder, the section being taken on the line 3—3 of Fig. 2.

Fig. 4 is a section through the same on the line 4—4 of Fig. 3.

Fig. 5 is a similar section on the lines 5—5 of Figs. 2, 3 and 4.

Fig. 5^a is a horizontal section through one of the main valves on the line 5^a—5^a of Fig. 2.

Fig. 6 is a diagrammatic view showing the several sets of power cylinders for actuating the pressure devices, the connections to the cylinders for the pressure fluid supply, and the valve mechanisms for controlling said supply, the parts being shown in normal grinding position with all the pressure devices acting on the wood.

Fig. 7 is a similar view showing the pressure device of the central pocket retracted and inactive, and its auxiliary valve adjusted to supply additional pressure to the auxiliary cylinders of the other pressure devices.

Fig. 8 is a longitudinal section through one of the main valves in modified form, for controlling the pressure fluid from a single source of supply, for both advancing and retracting the piston.

Fig. 9 is a similar view of one of the auxiliary valves, in modified form, for controlling the pressure fluid from a single source of supply.

Referring to the drawing, A designates a frame or housing in which is mounted a rotary power shaft B having fixed to it a grindstone C. Bolted to the housing are a number of pockets for holding the wood to be ground, there being, in the present instance, three of these pockets D, E and F, as usual. The pockets are open at one end for the reception of the wood and are provided with sliding doors or gates d for closing the open ends. In each of the pockets is a pressure device or element, preferably in the form of two pressure shoes G, to act on the wood and force the same against the stone, which pressure shoes are flexibly connected together by means of a connecting member in the form of a bar G′ pivoted as at g' to heads g^2 extending upwardly from the pressure shoes. Two outer piston rods H and an intermediate piston rod I are pivoted at their lower ends, as at h, to the connecting bar, and have fixed to their upper ends, power pistons H^1, I^1, and H^1, respectively, the outer pistons H^1 sliding in main power cylinders H^2, and the intermediate piston I^1 sliding in an auxiliary power cylinder I^2. These cylinders are bolted to the upper ends of the pocket, it being understood that there is a similar equipment for each of the three pockets.

As a result of the flexible connection of the two pressure shoes by the connecting bar, and the connection of the power pistons to this bar, the pressure on the wood will be exerted uniformly and evenly at both ends, the shoes being permitted to adjust themselves to the wood and produce a uniform and equalized contact between the wood and periphery of the stone, notwithstanding the unevenness of the wood.

As shown more particularly in Figs. 2 and 5^a, each main cylinder H^2 has applied to it a main valve casing J provided with an annular port j, adapted to communicate with a port j^1 extending longitudinally through the wall of the cylinder and opening into its upper end on the upper side of the piston, through which ports the pressure fluid is admitted to the cylinder for producing the "grinding" pressure on the piston and consequently on the pressure device. Similarly, each main valve casing is provided with a second annular port j^3 which is adapted to communicate with a port j^4 extending longitudinally in the wall of the cylinder and opening into its lower end on the lower side of the piston, and through the ports j^3 and j^4 the pressure fluid is admitted for producing the "backing-off" pressure on the piston to retract the same and consequently the pressure devices, when the wood is completely ground and a fresh supply is to be placed in the pocket. Branch pipes K lead from the ports j of the several main cylinders of the three pockets to a distributing pipe K′, connected to a suitable source of pressure fluid supply for producing the "grinding" pressure; and branch pipes L lead from the ports j^3 of the several main cylinders of the three pockets, to a distributing pipe L′ connected to a suitable source of pressure fluid supply for furnishing "backing-off" pressure. Also each main valve casing communicates at one end with a branch exhaust pipe M, which pipes of the several casings lead to a main exhaust pipe M′. The valve casings J are further

provided each with a by-pass port j^5, which leads from one end of the casing to the other and which is adapted, as will be presently described, to be placed into communication with the upper end of the main cylinder, so that the exhaust may pass therefrom when the pistons move up in retracting the shoes.

In each of the valve casings J a slide valve N is mounted which is provided with three spaced heads n, n^1 and n^2 and intermediate reduced portions or annular cavities n^3 and n^4, the form and construction of these parts and their relations to the several ports in the valve casing being such that when the valve is moved to the lefthand end, as shown in Figs. 5ª and 6, communication will be established between the "grinding" pressure fluid supply and the upper end of the cylinder through the ports j and j^1 and valve cavity n^3 to force the pistons down and apply "grinding" pressure to the shoes, and communication between the "backing-off" pressure fluid supply and lower end of the cylinders will be cut off by the valve head n^2, and communication to the said lower end will be established with the exhaust port in the end of the casing, whereby the exhaust from the cylinder will pass out through exhaust pipe M. When, however, the valve is moved to the right, as shown in the middle of Fig. 7, the "grinding" pressure will be cut off from the upper end of the cylinder by valve head n and said end will be placed in communication with the by-pass to permit the exhaust from this end of the cylinder to pass to exhaust pipe M, and communication will be established between the "backing-off" pressure and the lower end of the cylinder by the ports j^3 and j^4 and valve cavity n^4 whereby the pistons will be moved up and retract the shoes, as shown in Fig. 7.

It will be understood that there are three pairs of these main valve casings and main valves, one pair for each pocket, and I propose to arrange for the operation of the valves of a pair in unison, one pair independently of the other, so that the pressure device of each pocket may be operated independently of the others. To effect this object, each valve has connected with it a stem n^5 which extends outwardly through the end of the casing, the stems of a pair being connected with a reciprocating bar n^6, pivoted at one end to an operating lever n^7, which in turn is pivoted between its ends to the frame l, as at n^8, and provided with a handle n^9 for operating it. By the operation of this lever, both valves will be shifted in unison in the respective casings, it being understood that there is a similar operating mechanism for the pairs of valves of the other main cylinders.

In the operation of the mechanism so far described, by the actuation of the hand levers n^7 the pressure devices in the several pockets may be independently controlled, and may be caused to advance and force the wood against the periphery of the grindstone, or may be retracted, when the grinding operation in a pocket is completed and a fresh supply of wood is to be placed in the pocket, these actions being effected by admitting the fluid pressure medium to one end or the other of the main cylinders by means of the several main valves.

The several auxiliary cylinders and pistons before alluded to are designed to cooperate with the main cylinders and are normally inactive, that is, when the wood is being ground in all of the pockets and is subjected to the pressure of all of the main power pistons, but when the "grinding" pressure in any pocket is relieved and the pressure device in that pocket retracted, as when the wood in the pocket is completely ground and a new supply is to be furnished, the pressure fluid under "grinding" pressure will be automatically admitted to the auxiliary cylinders of the pockets remaining in action, and the wood in these pockets will be subjected to additional pressure, in degree equal to that which was cut off from the empty pocket. Consequently the total pressure of the wood on the stone will be maintained, notwithstanding the reduction of pressure in the empty pocket, and therefore speeding up of the stone will be prevented.

In accomplishing this action of the parts, each auxiliary power cylinder has applied to it an auxiliary valve casing O containing an auxiliary slide valve P, and as these parts are the same for the three auxiliary cylinders, a description of one set will suffice. The valve casing, as shown more particularly in Figs. 3, 4 and 5, is fixed to the side of the cylinder and is provided with internal annular ports o, o^1, o^2, o^3, o^4, and o^5, and with a by-pass port o^6 extending longitudinally in the wall of the casing and communicating at its ends respectively with the ends of the casing to permit the unimpeded movement of the valve. The port o^3 communicates with a port Q extending in the wall of the cylinder and opening into its upper end at the upper side of the piston, and through these ports the pressure fluid medium is admitted for producing grinding pressure on the piston. Port o^1 communicates with a port Q^1, which extends in a wall of the cylinder and opens into its lower end at the under side of the piston, the backing off pressure fluid being admitted to the cylinder through these ports from the port o to retract the piston, which ports o of the several casings receive their supply of "backing off" pressure fluid through branch pipes O^2 which lead to and connect with the main distributing pipe L^1, before alluded to.

Port o^2 is connected with a branch exhaust pipe R and is situated between ports o^1 and o^3, and is adapted by the movement of the valve P, as will be presently described, to be placed into communication with either of the ports o^1 or o^3 to permit either end of the cylinder to be exhausted, the several branch exhaust pipes R being connected with the main exhaust pipe M^1 before alluded to. The ports o^4 in the several auxiliary valve casings are connected respectively together by means of branch pipes S which lead to a connecting pipe S^1; and ports o^5 in the several casings communicate with branch pipes S^2 which lead to and connect with the main distributing pipe K^1, before alluded to, for supplying the "grinding" pressure.

The auxiliary slide valve P is formed with four heads p, p^1, p^2, p^3, and with intervening annular cavities p^4, p^5, p^6, the relations of the heads and cavities, to the several ports being such that when the several auxiliary valves are adjusted to the lefthand end of the casing, as shown in Fig. 6, both the "backing off" pressure fluid and the "grinding" pressure fluid will be cut off from the several auxiliary cylinders, and these cylinders will be rendered inactive. In this position of the valves, the "grinding" pressure fluid admitted to the valve casings by the branch pipes S^2 will be blocked by the heads p^3 of the valves, while the "backing off" pressure fluid from the branch pipes O^2 will be blocked by the heads p and p^1 of the valves, the upper ends of the cylinders will communicate with the connecting pipes S through ports o^3 and o^4 and valve cavity p^6, and the lower ends of the cylinders will communicate with the branch exhaust pipes R through ports o^1 and o^2 and valve cavity p^5. This is the normal condition of the parts with the main cylinders and pistons in the several pockets active and supplying pressure to the respective pressure shoes. When, however, the auxiliary valve of any one of the pockets is thrown to the right, as shown in Figs. 3, 4 and 7, the pressure fluid medium entering through pipe S^2 will pass into the valve cavity p^6 and thence out through branch pipe S to connecting pipe S^1, and through the connecting pipe it will pass to the other two auxiliary valve casings, and flowing into the valve cavities p^6 therein will enter the upper ends of the two auxiliary cylinders. In this position of the auxiliary valve of the particular pocket, "backing off" pressure fluid is admitted to the lower end of the auxiliary cylinder through ports o, o^1 and valve cavity p^4, and the upper end of the cylinder is placed in communication with the exhaust through ports Q, o^2, and o^3 and valve cavity p^5.

It is seen, therefore, that in the normal grinding operation, with all of the main pistons in operation in the several pockets and applying "grinding" pressure to the wood therein, the several auxiliary pistons are inactive, but when any one of the auxiliary valves is operated when the wood in its pocket is all ground, it will act to admit "grinding" pressure fluid to the other two auxiliary cylinders remaining in action to increase the "grinding" pressure on the wood in these pockets.

The respective auxiliary valves are adapted to be operated in coördination with their associated main valves, so that when the main valves of a pocket are operated to cut off the "grinding" pressure fluid and retract the pressure shoes, the auxiliary valve of that pocket will be also operated to admit "grinding" pressure fluid to the auxiliary cylinders of the other two pockets remaining in action. To effect this action, the auxiliary valves are each provided with a valve stem T, which stems extend outwardly through the ends of the casings and are connected respectively with arms t, which arms in turn are connected with the several reciprocating bars n^6 before alluded to. As a result of this connection of the stems of the auxiliary valves with the operating mechanism of the associated main valves, when any one of the hand levers n^7 is operated in one direction to shift the main valves to the right from the position shown in Fig. 6 to that shown in Fig. 7, the auxiliary valve will be likewise shifted, with the result that "grinding" pressure fluid will be cut off from the main cylinders, and "backing off" pressure fluid admitted to retract the pressure shoes, while at the same time "grinding" pressure fluid will be admitted to the auxiliary cylinders of the other two pockets remaining in action; and when the lever is operated in the other direction, the three valves of that pocket will be restored to their former positions, thereby cutting off pressure to all of the auxiliary cylinders, and again admitting "grinding" pressure fluid to the main cylinder of the particular pocket to cause the main piston to resume "grinding" pressure on the new supply of wood. It will be understood that the three valves of a given set are operated in coördination with each other as described, and the valves of one set are operated independently of those of the other sets, so that the pressure devices of the different pockets may be controlled independently of each other to enable the empty pocket to be refilled without disturbing the grinding action taking place in the other pockets.

The diagrammatic view of Fig. 6 shows the mechanism under normal operating conditions, that is, with the three pockets supplied with wood and acted on by the pressure devices in the pockets, and the various valves adjusted to the left, thereby supplying "grinding" pressure to the several pairs

of main cylinders, and cutting off both "grinding" and "backing off" pressure to the several auxiliary cylinders, with the result that the pressure of the main pistons will be applied to the wood and the latter will be forced into grinding relation to the periphery of the grindstone. Assume now that the grinding operation on the wood is completed in the central pocket first. The operator actuates the hand lever n^7 connected with the several valves of this pocket and shifts the valves to the right as shown in Fig. 7. By this actuation of the main valves, "grinding" pressure is cut off from the main cylinders and "backing off" pressure admitted to retract the pistons and connected pressure device, so that a new supply of wood may be inserted in the empty pocket. Simultaneously with this actuation of the main valves, the auxiliary valve of this pocket is operated and shifted to the right, whereby "grinding" pressure is admitted through the connecting pipe S^1 to the two inactive auxiliary cylinders of the two pockets remaining in action, thereby imposing on the wood in each of these pockets, additional pressure, in the aggregate corresponding to that which was before acting in the empty pocket. When the empty pocket has been furnished with a new supply of wood, the hand lever n^7 thereof is shifted to its former position, thereby restoring the several valves to their former positions, with the result that the "backing off" pressure will be cut off from the main cylinders of the empty pocket, "grinding" pressure will be admitted thereto, and "grinding" pressure cut off from the auxiliary cylinder of this pocket and also from the two auxiliary cylinders of the other pockets. The mechanism is now again in its normal operative condition, and when the grinding is completed in any one of the other pockets, the valves of that pocket are manipulated in the same way to retract the pressure device and supply additional pressure to the auxiliary cylinders of the pockets remaining in action.

Due to the fact that in the descent of the main pistons in the normal operation of the mechanism, the auxiliary pistons are carried down with them, and due to the fact that in the normal operation of the parts, the pressure fluid, usually water, is cut off from the auxiliary cylinders, unless some means are provided to prevent it, the auxiliary cylinders above their pistons will be insufficiently supplied with water, and consequently the pressure admitted to them will not act promptly on the operation of the auxiliary valves. In order to meet this contingency and insure that the auxiliary cylinders will always be completely filled with water, I provide a communicating connection U between the pipe S^1 and the exhaust pipe M^1, as shown more particularly in Figs. 2, 6 and 7. This connection is in the form of a pipe containing a check valve u which opens in a direction toward the pipe S^1 so as to permit water to flow into said pipe and thence into the auxiliary valve casings and finally into the upper ends of the auxiliary cylinders, when the pistons of the latter descend. This check valve closes the connecting pipe U against the escape of water therethrough to the exhaust pipe, so that when the pressure fluid is admitted to the auxiliary cylinders through the connecting pipe S^1, it will be prevented from escaping into the exhaust pipe and will exert its pressure on the auxiliary pistons.

In the particular form of mechanism hereinbefore described, and illustrated in the accompanying drawings as embodying my invention, the pressure fluid is taken from two distinct sources, and conducted to the cylinders through two distinct pipe connections, one pressure being for the purpose of advancing the pistons for applying grinding pressure to the wood, and the other for the purpose of retracting or "backing off" the pistons. The employment of two such pressures possesses advantages, mainly in the respect of the more even "grinding" pressure which is attainable, but the advantages of my invention may be realized by employing but a single source of pressure fluid and applying the same to the cylinders so as to operate the pistons both to advance them for the grinding operation, and retract or "back off" the same. The only change necessary in the apparatus to bring about this result is in the specific form of the controlling valves for the main cylinders and the auxiliary cylinders respectively. This is illustrated in Figs. 8 and 9 of the drawings, wherein it will be seen that the main valve casing J^1, illustrated particularly in Fig. 8, has three annular ports J^2, J^3 and J^4, and a by-pass port J^5, which latter communicates at its ends with the two ends respectively of the valve casing. The port J^2 communicates with the upper end of the main cylinder, and the port J^4 communicates with the lower end of the same. The port J^3 communicates with a single source of fluid pressure supply through a pipe K^2, and the end of the valve casing communicates with the exhaust through the pipe M^2. The valve N^1 has two valve heads N^2 and N^3, and an intermediate cavity N^4; and when adjusted to the left, as shown in Fig. 8, for the grinding operation, pressure is admitted to the upper end of the cylinder through port J^3, valve cavity N^4, and port J^2, the lower end of the cylinder being opened to the exhaust through port J^4 and exhaust pipe M^2. When now the piston is to be retracted so as to "back off" the pressure device from the wood, the valve is shifted to the right, with

the result that pressure will be admitted to the lower end of the cylinder through port J^3, valve cavity N^4 and port J^6, and the upper end of the cylinder will be opened to the exhaust through port J^2, by-pass J^5, and exhaust pipe M^2.

It is seen, therefore, that a single fluid pressure supply entering the valve casing through pipe K^2, is utilized both for applying "grinding" pressure to the pistons to advance the pressure devices against the wood, and for applying "backing off" pressure to the pistons to retract the pressure devices when the wood in a pocket is completely ground.

In the modified form of auxiliary valve casing and valve shown in Fig. 9, the valve casing O^1 is provided with the annular ports O^2, O^3, O^4, O^5, O^6, and with the by-pass port O^7, which latter communicates with the ends of the casing and with the port O^2, and which by-pass port receives the pressure fluid from a single source through pipe S^3. The ports P^6 of the several auxiliary valves are connected together by branch pipes S^4 and a connecting pipe, similar to the branch pipe S and to the connecting pipe S^1 of the mechanism first described, while port O^4 is connected with exhaust branch pipe R^1. Port O^3 communicates with the lower end of the auxiliary cylinder, and port O^5 communicates with the upper end of the same. The auxiliary valve P^3 is provided with three valve heads P^4, P^5, P^6, and with intervening valve cavities P^7 and P^8. In the normal grinding operation with all of the main pistons under "grinding" pressure, the several auxiliary valves are adjusted to the lefthand end of the casings, with the result that pressure fluid entering the casings through the pipes S^3 will be blocked in each casing at the lefthand end by valve head P^6, and will be blocked at the right by valve head P^6, so that the several auxiliary pistons will be inactive and free from pressure. In this position of the valves, however, port O^6 will communicate with the upper end of the cylinder through valve cavity P^8 and the lower end of the cylinder will communicate with the exhaust through port O^3, valve cavity P^7 and port O^4, so that all of the auxiliary cylinders are ready to receive "grinding" pressure whenever the auxiliary valve or any particular one of the auxiliary cylinders is operated when its pocket becomes empty. In such an event, the auxiliary valve of that pocket is adjusted to the right to the position shown in Fig. 9, without, of course, disturbing the other auxiliary valves of the pockets remaining in action, the result being that the pressure fluid entering the by-pass port will pass to the lower end of the cylinder by port O^2, valve cavity P^7 and port O^3 and will exert "backing off" pressure on the piston. The pressure fluid will also pass from the by-pass port to port O^6, and thence to the other auxiliary cylinders by branch pipes S^4, and the connecting pipe leading to the other auxiliary valve casings. Also in this position of the valve, the upper end of the auxiliary cylinder is opened to the exhaust through the port O^4, valve cavity P^8 and port O^5, thereby permitting the upper end of the cylinder to exhaust as the piston is moved up by the pressure acting on the other side.

It will be understood that these two modified forms of main and auxiliary valves of the several pockets will be connected up similar to the connection of the form of valves first described, the only difference being that there is a single connection to each valve casing for furnishing the pressure fluid, instead of two separate connections to each casing as first described.

It will be noted from the description above given that the fluid pressure medium is under a constant initial pressure, and that the increase of pressure to which the pressure devices in the respective pockets is subjected, is obtained not by varying the initial pressure or the pressure medium, but by admitting said medium to an additional or auxiliary pressure cylinder. In other words, the same pressure medium is caused to act on an increased pressure area with which each pressure device is provided, which area is constituted by the piston of the additional or auxiliary cylinder in each pocket, thereby imposing greater pressure on the pressure device or shoe, and consequently greater pressure on the wood against which the shoe acts.

In the foregoing description and accompanying drawings I have set forth my invention in the particular detailed form and construction which I prefer to adopt, but it will be understood that these details may be variously changed and modified without departing from the spirit of the invention, and further it will be understood that the invention is not to be limited to any particular form or construction of the parts, except in so far as such limitations are specified in the claims.

Having thus described my invention, what I claim is:

1. 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, a fluid pressure medium under constant initial pressure acting on said pressure devices to cause them to normally force the wood against the grinder under grinding pressure, and means for controlling said fluid pressure medium, said controlling means acting, when operated to relieve the

pressure of the pressure device in one active holding means, to automatically increase the pressure of another pressure device in another active holding means without varying the initial pressure of the fluid pressure medium.

2. In a wood grinding machine, the combination of a grinder, a plurality of pockets for holding the wood to be ground at different points on the grinder, a pressure device operable on the wood in each pocket and each pressure device provided with a normally active pressure surface and with a normally inactive pressure surface, a fluid pressure medium acting on the active pressure surfaces and acting to normally force the wood in the several pockets against the grinder under grinding pressure, and controlling means for the fluid pressure medium, acting when operated to relieve the pressure in one active pocket, to automatically admit the fluid pressure medium to the inactive pressure surface of the pressure device of the other active pocket, and thereby increase the pressure on the wood in that pocket.

3. In a wood grinding mechanism, the combination of a grinder, a plurality of pockets to hold the wood to be ground, a pressure element in each pocket to act on the wood therein, a plurality of cylinders for each pocket and pistons in said cylinders connected with each pressure element, means for supplying pressure fluid to the cylinders, valve mechanisms for controlling the admission of the pressure fluid to advance the piston and retract the same, said valve mechanisms being operable independently of each other to admit pressure to one of the cylinders of one set to advance its piston, when the valve mechanism of another set is operated to admit pressure to a cylinder of that set to retract its piston.

4. In a wood grinding mechanism, the combination of a grinder, a plurality of pockets to hold the wood to be ground, a pressure element in each pocket to act on the wood therein, a plurality of cylinders, and pistons in said cylinders connected with each pressure element, connections for supplying pressure fluid to the opposite sides of the pistons respectively, to advance and retract the same, and valve mechanisms in said connections to control the pressure to the cylinders, the said valve mechanisms being operable independently of each other to admit pressure to one of the cylinders of one set to advance its piston, when the valve mechanism of that set is actuated to admit pressure to the cylinders of the other set to retract their pistons; whereby the pressure on the wood by the pressure element of one pocket will be increased, when the pressure element of the other pocket is retracted.

5. In a wood grinding mechanism, the combinatioon of a grinder, a plurality of pockets to hold the wood to be ground, a pressure element in each pocket to act on the wood therein, a main cylinder and an auxiliary cylinder, and pistons in said cylinders connected with each pressure element, connections for supplying pressure fluid to the opposite sides of the pistons of each cylinder to advance and retract the same, and valve mechanisms in said connections to control the admission of pressure to the cylinders, said valve mechanisms normally cutting off the pressure to the auxiliary cylinders, and being operable independently of each other to admit pressure to the auxiliary cylinder of one set to advance its piston, when the valve mechanism of another set is actuated to admit pressure to the cylinders of that set to retract their pistons; whereby the pressure of the pressure element on the wood in one pocket will be increased, when the pressure element of the other pocket is retracted.

6. In a wood grinding mechanism, the combination of a grinder, a plurality of pockets associated with the grinder to hold the wood to be ground, pressure shoes in each pocket to act on the wood, a connecting member flexibly connecting together the pressure shoes of each pocket, two main cylinders and an intermediate auxiliary cylinder, and pistons in said cylinders connected to each connecting member, connections for supplying pressure fluid to the opposite sides of the respective pistons to advance and retract the same, and valve mechanisms in said connections, said valve mechanisms normally cutting off the pressure to the auxiliary cylinders and being operable to admit pressure to the auxiliary cylinder of one set to advance its piston, when the mechanism is actuated to admit pressure to the cylinders of the other set to retract their pistons.

7. In a wood grinding mechanism, the combination of a grinder, a plurality of pockets associated with the same for holding the wood to be ground, pressure elements in the respective pockets to act on the wood therein, a main cylinder and an auxiliary cylinder, and pistons in said cylinders connected with each pressure element, two sources of pressure fluid supply for furnishing "grinding" pressure and "backing off" pressures, and auxiliary valves in the connections from said sources of supply to the opposite sides of the pistons respectively to advance and retract the same, main valves in the connections from the sources of pressure to the respective main cylinders to control said pressures, and auxiliary valves in the connections from the sources of pressure to the auxiliary cylinders, said auxiliary valves normally cutting off pressure to the auxiliary cylinders, and the auxiliary valve of one auxiliary cylinder being operable, when

actuated to admit "backing off" pressure to that cylinder, to admit "grinding" pressure to the other auxiliary cylinder.

8. In a wood grinding mechanism, the combination of a grinder, a plurality of pockets associated with the grinder for holding the wood to be ground, pressure elements in the respective pockets to act on the wood therein, a main cylinder and an auxiliary cylinder, and pistons in said cylinders connected with each pressure element, two sources of pressure fluid supply for furnishing "grinding" pressure and "backing off" pressure to the several cylinders, connections from said sources of pressure to the opposite sides of the pistons respectively, to advance and retract the same, main valves in the connections from the sources of pressure to the respective main cylinders to control said pressures, auxiliary valve casings in the connections from the sources of pressure to the auxiliary cylinders, said casings communicating with each other, auxiliary valves in the respective casings normally cutting off pressure to the auxiliary cylinders and controlling the communication of the auxiliary valve casings with each other, and connections between the main and auxiliary valves of each set; whereby when the several valves of one set are operated to admit "backing off" pressure to the main cylinders of that set, the auxiliary valve of that set will be operated to admit "grinding" pressure to the auxiliary cylinder of the other set.

9. In a wood grinding mechanism, the combination of a grinder, a plurality of pockets associated therewith for holding the wood to be ground, pressure elements in the respective pockets to act on the wood therein, a main cylinder and an auxiliary cylinder, and pistons in said cylinders connected with each pressure element, a source of pressure fluid supply for furnishing "grinding" pressure to the several cylinders, and independently operable means for controlling the pressure to said cylinders, said means normally cutting off pressure to the auxiliary cylinders, and each of said means being operable, when actuated to cut off "grinding" pressure to its main cylinder, to admit "grinding" pressure to the other auxiliary cylinder.

10. In a wood grinding mechanism, the combination of a grinder, a plurality of pockets associated therewith for holding the wood to be ground, pressure elements in the respective pockets to act on the wood therein, a main cylinder and an auxiliary cylinder, and pistons in said cylinders connected with each pressure element, a source of "grinding" pressure fluid connected with the main cylinders, means for controlling the admission of said pressure to the cylinders, a valve casing associated with each auxiliary cylinder, a communicating connection between said casings, independently movable valves therein, a communicating connection between each casing and its associated cylinder, and communicating connections between the source of pressure and the respective casings, said valves normally cutting off pressure to the respective cylinders, and each valve acting when moved, to admit pressure to the other auxiliary cylinder.

11. In a wood grinding mechanism, the combination of a grinder, a plurality of pockets associated therewith for holding the wood to be ground, a pressure element in each pocket to act on the wood therein, a main cylinder and an auxiliary cylinder, and pistons in said cylinders connected with each pressure element, a source of pressure fluid supply connected with the respective cylinders, means for controlling the admission of pressure to the main cylinders, and two valve mechanisms in the connections between the source of pressure and the auxiliary cylinders, said valve mechanisms normally cutting off the pressure to the auxiliary cylinders, and each mechanism being operable when actuated, to admit pressure to the other auxiliary cylinder.

12. In a wood grinding machine, the combination of a grinder, a pocket associated therewith for holding the wood to be ground, a plurality of pressure shoes adapted to act on the wood in said pocket, a member connecting said shoes flexibly together, two main power cylinders, pistons therein connected with said connecting member respectively adjacent its opposite ends, an intermediate auxiliary power cylinder, and a piston therein, connected with said connecting member between the points of connection of the other pistons therewith.

13. In a wood grinding mechanism, the combination of a grinder, a pocket associated therewith for holding the wood to be ground, two pressure shoes in said pocket adapted to act on the wood therein, a connecting member pivoted to said shoes, a plurality of power cylinders, and pistons in said cylinders pivoted to said connecting member.

14. In a wood grinding mechanism, the combination of a grinder, a pocket associated therewith to hold the wood to be ground, a pressure device in the pocket to act on the wood, a main power cylinder, a piston therein connected with the pressure device and normally active to apply pressure to said device, an auxiliary power cylinder, a piston therein connected with the pressure device and normally inactive to apply pressure, and means for admitting fluid under pressure to the auxiliary cylinder to apply additional pressure to said pressure device.

15. In a wood grinding mechanism, the combination of a grinder, a pocket asso-

ciated therewith to hold the wood to be ground, two pressure shoes in the pocket adapted to act on the wood therein, a connecting member pivoted to said shoes, two main power cylinders, power pistons therein pivoted to the connecting member and normally active to apply pressure to the shoes, an intermediate auxiliary power cylinder, and a pressure piston therein pivoted to the connecting member and normally inactive.

In testimony whereof I have affixed my signature hereto.

EDWARD HUTCHINS.