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GRINDING APPARATUS FOR THE MANUFACTURE OF WOOD PULP.

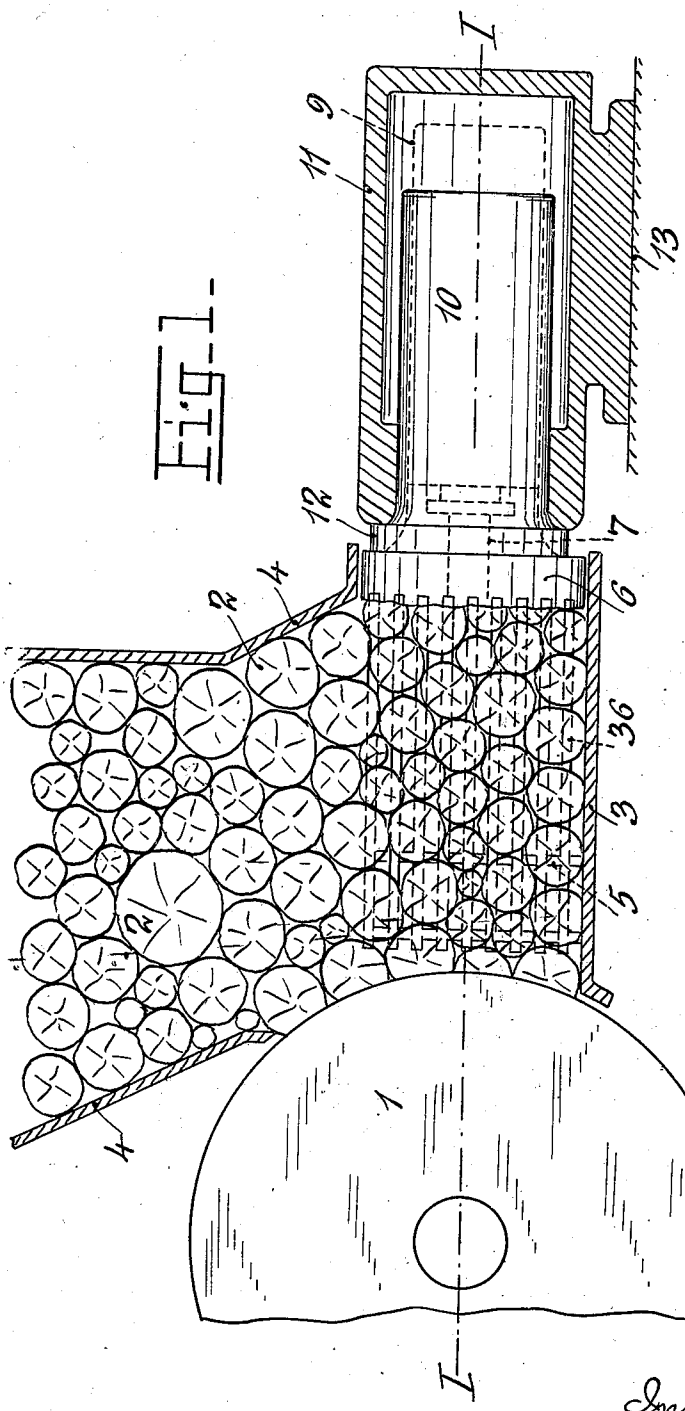
APPLICATION FILED MAR. 27, 1920.

1,342,231.

Patented June 1, 1920.

4 SHEETS—SHEET 1.

Fig. 1.



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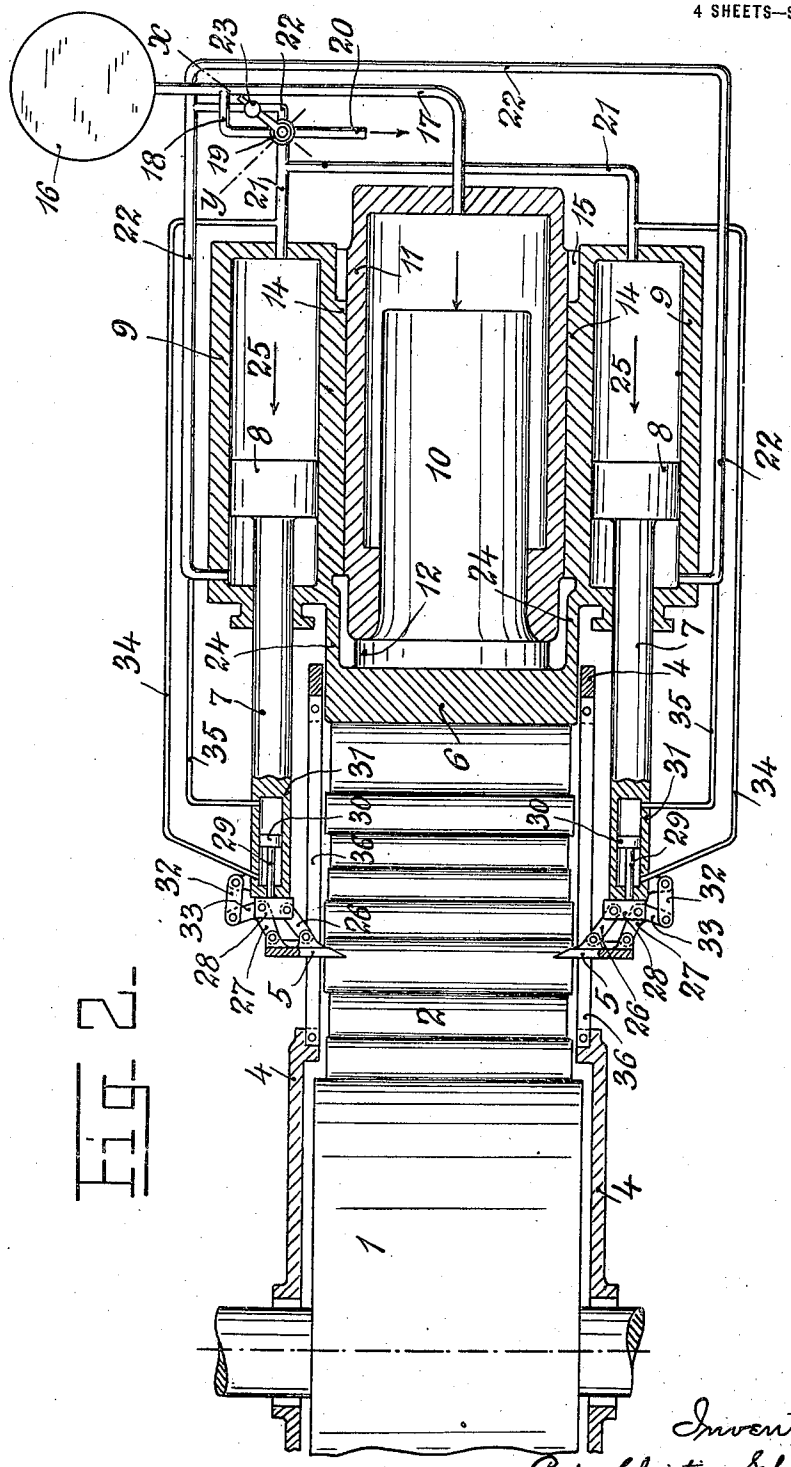

Fig. 2.

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4 SHEETS—SHEET 3.

Fig. 5.

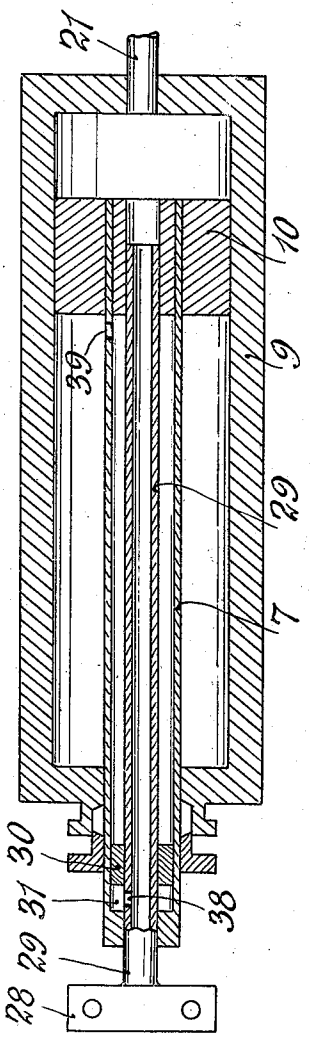
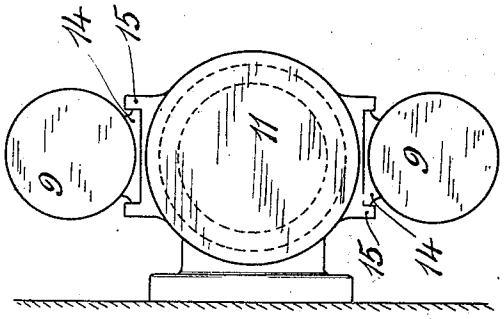


Fig. 4.



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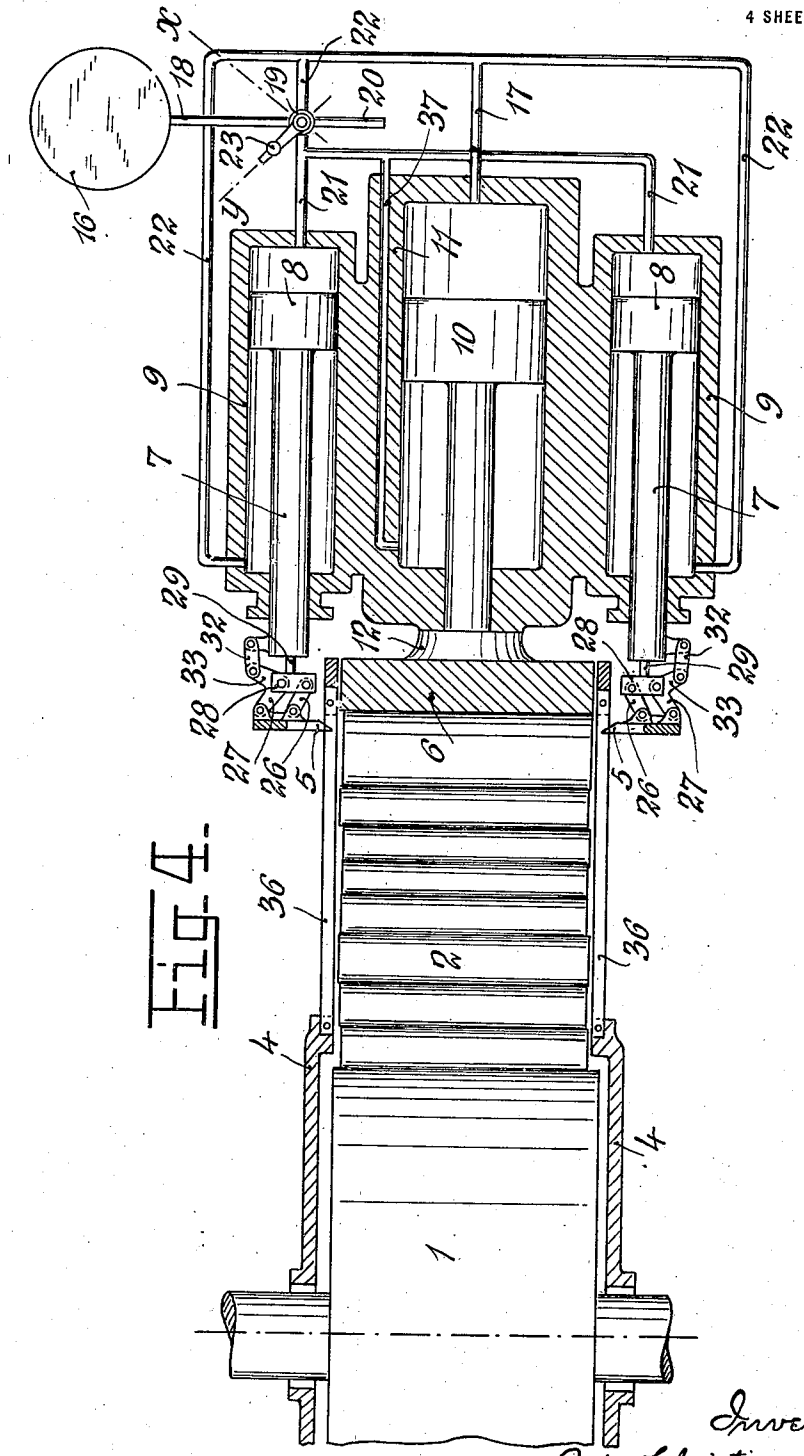

Fig. 4.

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UNITED STATES PATENT OFFICE.

PEDER CHRISTIAN SCHAANNING, OF VESTRE HOLMEN, NEAR CHRISTIANIA, NORWAY.

GRINDING APPARATUS FOR THE MANUFACTURE OF WOOD-PULP.

1,342,231. Specification of Letters Patent. Patented June 1, 1920.

Application filed March 27, 1920. Serial No. 369,323.

To all whom it may concern:

Be it known that I, PEDER CHRISTIAN SCHAANNING, a subject of the King of Norway, residing at Vestre Holmen, near Christiania, Norway, have invented certain new and useful Improvements in a Grinding Apparatus for the Manufacture of Wood-Pulp; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to letters or figures of reference marked thereon, which form a part of this specification.

In ordinary grinding apparatus for the manufacture of wood pulp the wooden blocks are forced against the grinding stone by means of forwardly pressing members acting either upon the end faces of the blocks or upon the rear surface of the whole block column. This is true as regards magazine grinding apparatus and also as regards grinding apparatus provided with intermittently operating, separate pressing boxes. An absolutely safely operating and at the same time simple and cheap construction, is unknown and therefore the magazine grinding apparatus have not given satisfactory results. Consequently, the factories have continued to use the much more simple and, safe, highly developed pressing-box devices in which the grinding within each separate box takes place intermittently, because the box must be placed out of action and be refilled each time a box filling has been ground down. A similar intermittent mode of operation has been present also in known made constructions of magazine grinding apparatus, which during longer or shorter intervals had to be placed out of operation before each beginning of the next grinding period.

It is obvious, however, that the interruptions of the grinding operations which arise, either during a refilling of a pressing box or when disturbances of some sort are to be removed, are connected with losses of manufacture, and in addition thereto the driving plant will be unequally or obliquely loaded, the pressing pistons operate with varying pressures, a non-uniform product is obtained and the several machine parts are strongly stressed and worn. In grinding apparatus having a plurality of pressing boxes arranged around one and the same grinding stone attempts have been made to obtain a constant total pressure of wood blocks against the stone. Such apparatus have not given satisfactory results and moreover they have caused considerable complications of the whole driving machinery giving rise to new sources of interruptions of operations.

According to the present invention all the said drawbacks are removed and a simply constructed apparatus is obtained in which a practically constant pressure of the wood blocks against the stone is present at any time at each pressing place so that the grinding operation can be continuous.

In grinding apparatus where, in well-known manner, blocks forming a column are pressed forwardly against the stone by means of forwardly moved members gripping the end faces of the blocks, I arrange the magazine or a supply channel for the blocks in such a manner that the blocks fall in a direction more or less across to the forward pressing direction down into the space behind the blocks gripped by the said gripping members as the latter travel forward toward the stone, whereby the said space will always remain filled with blocks that form the prolongation of the block column.

Further, in order to make the grinding operation quite continuous, the construction is such that the normally stationary rear wall of the space into which the blocks fall may either itself be moved or is provided with a part which can be moved. Suitable mechanisms coöperate with the feeding mechanisms of the gripping members in such manner that the said wall or part is placed in motion and takes over the feeding of the blocks from the moment at which the forwardly moved gripping members release their grip upon the end faces of the blocks and until the said members have moved back and obtained a new grip at the rear part of the block column prolongation. This alternate operation of the two forward-pressing members operating in different manner and one of which during its work allows new blocks to fall in front of the inopera-

tive second forward-pressing members permits the grinding operation to take place without any interruption and with always the same grinding pressure.

A second main feature, which may advantageously supplement that mentioned above, consists in pressing one of the forward-pressing devices, during its forward-forcing action upon the block column, against an abutment by means of an engaging piece. Through this latter the second forward-pressing device, during its period of operation, transmits its pressure to the block column. A complete automatic operation will be obtained in this case if the engaging piece pressing against the abutment is subjected to a constant pressure acting in the forward-pressing direction and being somewhat smaller than the forward-pressing force of the first forward-pressing device, the said constant pressure automatically places the second forward-pressing device into operation and thus, without any interruption, takes over the forward-driving of the block column at the same moment and to the same degree as the operation of the first device ceases temporarily.

A constructional form of the invention is illustrated in the accompanying drawing in which:

Figure 1 shows a portion of the grinding apparatus in elevation and vertical section.

Fig. 2 is a corresponding plan view shown in section on the line I—I of Fig. 1.

Fig. 3 is an end view of the hydraulic cylinders corresponding to Fig. 2.

Fig. 4 shows a modified construction, and Fig. 5 shows a detail.

In the drawing is shown by way of example a grinding device in which the forward-pressing of the wood blocks is effected by hydraulic mechanism. However, the invention may also be utilized in connection with apparatus, in which the forward-pressing is effected by other sources of force, for instance by weight or spring pressure.

1 is the grinding stone against which the wooden blocks 2 are to be pressed.

The pressing against the stone takes place preferably in a horizontal direction from opposite sides, one pressing device being arranged at either side. The drawing shows only one of the said pressing devices.

As it will be seen, the blocks will fall down upon the bottom 3 of the magazine 4, consequently into the pressing path, according as a space is opened for such falling-down. In order that this may take place the forward-pressing members 5 grip the end faces of the blocks lying in the pressing path. This feature is formerly known *per se*. However, if the blocks are pressed forward horizontally or in an inclined direction and if the magazine is simultaneously disemboguing into the pressing path at an angle to the pressing direction, the blocks will be able to sink by their own weight down into the pressing path behind the blocks which are gripped by the members 5 as the said members move toward the stone. The pressing path therefore will always be filled. In accordance with the present invention, I combine with the end or lateral gripping members 5 a pressing plate 6 which is likewise formerly known *per se* and which can be moved forward with nearly the same pressure as the member 5, so that pressing plate 6 reduces the pressing force during the short period in which the gripping members 5 are withdrawn from the blocks, travel back to take a new grip at the rear end of the pressing path and commence their action anew. By these means the grinding apparatus operates continuously to exert a constant pressure upon the blocks and consequently maintains a constant load on the stone. But of course, this can only be obtained if the pressing plate 6 is brought into full action at the same moment and to the same degree as the pressure from the gripping members 5 ceases *i. e.*, inversely to the reduction of pressure by the latter during their releasing operation. This may be obtained by letting the mechanisms which produce the pressure upon the parts 5 and 6 act alternately in dependence upon each other, so that the total pressure of both parts is at any time constant or nearly so.

This problem may be solved in different ways. The most simple solution, and at the same time the most reliably operating one, is obtained by using hydraulic mechanisms as shown in the drawings.

The gripping members 5 are arranged upon the end of piston rods 7, the pistons 8 of which travel in cylinders 9. The pressing plate 6 has a piston 10, which travels in a cylinder 11 and which can engage the foremost outer end of an engaging piece 12.

The cylinder 11 is fixed upon a frame 13, whereas the cylinders 9 are provided with guiding parts 14 traveling in axial guides 15 at the sides of the cylinder 11 (see Fig. 3).

An accumulator or other source 16 for water under pressure is through a pipe 17 in constant connection with the inner space of cylinder 11, so that the piston 10 is always subjected to the same forward-pressure.

The source 16 is further connected with the inlet 18 of a reversible cock 19, from which one pipe 20 communicates with an outlet and pipes 21 and 22 communicate with top and bottom respectively of the cylinders 9, so that the pistons 8 can be forced forward or back according as the cock arm loaded with a weight 23 is in the position x or in the position y respectively.

The pressing plate 6 is in fixed connection with both cylinders by means of ribs or

walls 24, so that the parts 9, 24, 6, 24, 9 form one integral system.

The total area of the two pistons 8 is slightly larger than the area of the piston 10, so that each of the pistons 8, when water under pressure is supplied through the pipes 21 to the top of the cylinders 9, are pressed forward in the direction of the arrows 25, with for instance 550 kg. (consequently in total 1100 kg.), whereas the piston 10 is pressed constantly forward with 1000 kg. Thus it will be seen that the two cylinders 9 together will react backwardly with a force of 1100 kg. and this force is, through the medium of the pressing plate 6 and the engaging piece 12, compensated by 1000 kg. on the piston 10 plus 100 kg. pressure on the cylinder 11 at the contacting surface between the foremost end of this cylinder 11 and the piece 12.

Consequently, the result will be that the cylinders 9 and the pressing plate 6 remain stationary and that the pressure at the said contacting surface will be only 100 kg. Simultaneously the pistons 8 are forced forward, so that the gripping members 5 force the wooden blocks 2 toward the stone with a total pressure of 1100 kg. The pressing plate 6, however, is inoperative.

When the gripping members 5 have arrived at the end of their forward travel toward the stone, the supply of water under pressure through the pipe 21 is interrupted by reversing the cock 19 into position *y*, so that the pressure upon the pistons 8 and the gripping members 5 rapidly ceases, and is then reversed. The pressing plates 6 will then automatically enter into operation. As soon as the total forward pressure upon the pistons 8 has been reduced to 1000 kg. it will just balance the forward pressure, upon piston 10. Upon further reduction of the forward pressure of the pistons 8 the pressure of the plate 6 against the blocks 2 will increase to exactly the same degree, so that the total pressure received by the blocks located nearest to the stone from the gripping members 5 and from the plate 6 in combination will be constantly 1000 kg. When the forward pressure upon the pistons 8 has ceased completely, the plate 6 alone presses forward the block column with 1000 kg. and it will continue this operation as long as the gripping members 5 are inoperative during their travel back to the rear end of their stroke in order to start again for a new pressing period. When the gripping members 5 again come into operation, they gradually unload the pressing plate until they have again taken over their part completely. The pressing plate, which during this shifting of the position of the gripping members 5 has traveled a short distance (about 10 cm.) forward, is rapidly forced back again until the piece 12 presses against the cylinder 11 with a force of 100 kg.

In the example described above, the stone 1 is always subjected to practically the same pressure from each pressing device, viz., alternately to 1100 and 1000 kg. Of course it is not necessary that the difference be as high as 100 kg. It might be sufficient to have a difference of 50 or even 25 kg., but it will be most practical that the contacting pressure between the parts 12 and 11 be not too low because the piston 10 should be safely brought to return, after its operating period to its engaging position and because the plate 6 should safely not advance simultaneously with the gripping members 5. The latter would besides be obtained by arranging a releasable stopping device (not shown) for the pressing plate 6. In such case I would obtain a constant pressure of 1100 kg. at any time. A difference of 100 kg., however, is without any practical importance, and therefore the arrangement shown in the drawing will be preferable.

It is obvious that just the same operation will be obtained, if the piston 10 (or the plate 6) is under influence of a constant weight or spring pressure of 1000 kg. or if the pistons 8 are under a removable weight or spring pressure of 550 kg.

Further it will be seen that the two cylinders 9 may be combined into one cylinder, which may be of annular cross section or may be arranged behind the cylinder 11. This arrangement, however, would be less suitable.

Finally the connections 24 between the plate 6 and the cylinders 9 may be removed, but in this case I have to use other arrangements in order to bring about the desired condition of dependence between the pressure upon the pistons 8 and the pressure upon the piston 10. An example of such construction is shown in Fig. 4. The top of the cylinders 9 is as before in communication with one side of the cock 19 through a pipe 21, and a pipe 37 conducts from the same pipe 21 to the bottom of the cylinder 11. Further the bottom of cylinders 9 and the top of cylinder 11 are in communication with the other side of the cock 19 through the pipes 22 and 17 respectively. In this manner the pistons 8 will be pressed forward, when the piston 10 is pressed back, and vice versa, dependent upon the position of the cock 19. When the cock is reversed, one of the forward-pressing devices 5 or 6 will be set out of operation about simultaneously with the other device 6 or 5 respectively entering into operation, so that the block column at all events only for a short interval (certainly not more than for 1 second) will be without any pressure against the stone. By reversing the cock rapidly this interval can be considerably reduced.

Although it will not be possible in this construction to prevent a "shock" in the load upon the stone 1 each time the cock 19 is reversed, the construction forms nevertheless a rather nearly perfect solution of the problem "automatic continuous grinding" and one which constitutes an essential progress as compared with constructions formerly known, and this construction would in many cases be preferred to that shown in Fig. 2 on account of its simple arrangement and cheaper manufacture.

In order that the gripping members 5 should be safely forced into the end faces of the blocks 2 and be withdrawn therefrom, the members 5 are mounted on a parallel motion device comprising two parallel links 26, 27 upon a cross head 28. The latter is attached to the outer end of a piston rod 29, the piston 30 of which travels in a cylinder 31 within the front end of the piston rod 7. This cylinder is further connected by a link 32 to a side arm 33 of the link 27. The two last-named parts 33 and 27 thus form a bell crank lever.

The front and rear end of the cylinder 31 is through pipes 34 and 35 respectively connected with the pipes 21 and 22 respectively, consequently with the rear and front ends respectively of the cylinders 9. As soon as the water under pressure is supplied to the pipe conduit 21, it will also be passed to the front end of the cylinder 31, so that the piston 30 forces the cross head 28 backward, whereby the knives 5 will be forced into the end faces of the blocks simultaneously with the forward-pressure beginning to act upon the piston 8.

When the supply of water under pressure is reversed so that the water is passed to the front end of cylinder 9, it is also passed to the rear end of cylinder 31 and thereby forces forward the piston 30 with cross head 28. The knives 5 are thereby withdrawn from the blocks 2.

In order to prevent the difficulty of maintaining the connection to the top and bottom of cylinder 31 through the pipes 34 and 35 notwithstanding the motion of this cylinder in relation to cylinder 9, the construction may advantageously be made as shown in Fig. 5, in which the piston rod 7 is made like a pipe and incloses the similarly pipe-shaped piston rod 29, so that a suitable intermediate annular space is left between them. The piston rod 29 is further extended rearwardly and projects centrally and easily slides into the bored piston 10. Moreover the piston rod 7 is provided directly in front of the piston 10 with a lateral hole 39 and in front of piston 30 the piston rod 29 is provided with a similar hole 38, so that the rear end of cylinder 9 is constantly in communication with the front end of cylinder 31 through the piston rod 29 and the hole 38, and in similar manner the front end of cylinder 9 is in constant communication with the rear end of cylinder 31 (the inner space of piston rod 7) through the hole 39 notwithstanding the shifting positions of the piston rods.

In order to obtain a safe withdrawal of the knives 5 from the blocks without influence upon their position and in order to simultaneously guide the block column and close the magazine at both sides of the pressing path, the side walls of the magazine is here formed of parallel rods 36 similar to a grate, and between these rods the gripping members 5 constructed like knife-shaped teeth, project into the pressing compartment.

Claims:

1. In a grinding apparatus for the manufacture of wood pulp, the combination of a grinding stone, a compartment for receiving wooden blocks to be ground, said blocks forming a column to be pressed against the stone, a reciprocable forward-pressing device operating members gripping the faces of the blocks, and a supplying device or hopper for effecting refilling of blocks into said compartment and arranged to feed the blocks in a direction more or less across to the forward-pressing direction into the space behind the blocks of the column gripped by the gripping members and according to the movement of the latter toward the stone, whereby the said space will remain constantly filled with blocks forming an extension of the block column.

2. In a grinding apparatus for the manufacture of wood pulp the combination of a grinding stone, a compartment for receiving wooden blocks to be ground, said blocks forming a column to be pressed against the stone, a forward pressing device, gripping members operating upon end faces of the blocks, a normally stationary rear wall of the said compartment, means for moving said wall or a part thereof, said means cooperating with the means for moving the gripping members to start said wall or part to take over the forward-pressing of the blocks from the moment the gripping members are withdrawn from the end faces of the blocks and until said members have moved back and taken a new grip at the rear part of the block column extension, and a supplying device or hopper for supplying blocks into said compartment and arranged to permit the blocks to feed in a direction more or less across to the forward-pressing direction behind the blocks of the column gripped by the gripping member and in accordance with the movement toward the stone, whereby the said compartment will remain constantly filled with blocks forming an extension of the gripped block column.

3. In a grinding apparatus for the manufacture of wood pulp, the combination of a grinding stone, a compartment for receiving wooden blocks to be ground, said blocks forming a column to be pressed against the stone, a forward-pressing device, gripping members operating upon end faces of the blocks, a second forward-pressing device acting upon the outer end of the whole wooden block column, and means for placing the two forward-pressing devices into operation alternately.

4. In a grinding apparatus for the manufacture of wood pulp, the combination of a grinding stone, a compartment for receiving wooden blocks to be ground, said blocks forming a column to be pressed against the stone, a forward-pressing device, gripping members operating upon end faces of the blocks, a second forward-pressing device acting upon the outer end of the whole wooden block column, hydraulic cylinders, means for moving the two forward-pressing devices, communications between the top and bottom of said cylinders, and reversible means for controlling the supply of fluid or liquid under pressure to the cylinders to force one forward-pressing device forwardly when forcing the other device backward, and vice versa.

5. In a grinding apparatus for the manufacture of wood pulp, the combination of a grinding stone, a compartment or space for receiving wooden blocks to be ground, said blocks forming a column to be pressed against the stone, a forward-pressing device, gripping members on said forward-pressing device operating upon end faces of the blocks, a second forward-pressing device acting upon the outer end of the whole wooden block column, hydraulic cylinders, means for moving the said two forward-pressing devices, communications between top and bottom of said cylinders, and a reversible cock or valve for controlling the supply of fluid or liquid under pressure to the cylinders to force one forward-pressing device forwardly when forcing the other device backward, and vice versa.

6. In a grinding apparatus for the manufacture of wood pulp, the combination of a grinding stone, a compartment or space for receiving wooden blocks to be ground, said blocks forming a column to be pressed against the stone, alternately operating devices for pressing the blocks against the stone, an abutment, and an engaging piece by means of which one of the said devices reacts against said abutment during the action of one of said devices upon the blocks, and through which piece the second device, during its operating period, transmits its pressure to the block column.

7. In a grinding apparatus for the manufacture of wood pulp, the combination of a grinding stone, a compartment or space for receiving wooden blocks to be ground, said blocks forming a column to be pressed against the stone, a forward-pressing device, operating members gripping upon end faces of the blocks, a second forward-pressing device, acting alternately with the gripping members for pressing the blocks against the stone, an abutment, an engaging piece by means of which one of the said devices reacts against said abutment during the action of said device upon the blocks, and through which piece the second device during its operating period transmits its pressure to the block column, and a supplying device or hopper for effecting refilling of blocks into said space and arranged to supply blocks in a direction more or less across to the forward-pressing direction behind the blocks of the column gripped by the gripping members and as the latter move forward toward the stone, whereby the said space will remain constantly filled with blocks forming an extension of the block column.

8. In a grinding apparatus for the manufacture of wood pulp, the combination of a grinding stone, a compartment or space for receiving wooden blocks to be ground, said blocks forming a column to be pressed against the stone, a forward-pressing device, gripping members operating upon end faces of the blocks, a second forward-pressing device acting alternately with the gripping members for pressing the blocks against the stone, said second device consisting of a normally stationary rear wall of the said space, means for moving said wall or a part thereof and coöperating means for moving the gripping members to start said wall or part thereof and take over the forward-pressing of the blocks from the moment the gripping members are withdrawn from the end faces of the blocks and until said members have moved back and taken a new grip at the rear part of the block column extension, an abutment, an engaging piece by means of which one of the said devices react against said abutment during the action of said device upon the blocks, and through which piece the second device, during its operating period, transmits its pressure to the block column and a supplying device or hopper for feeding blocks into said space and arranged to feed the blocks in a direction more or less across to the forward-pressing direction into the space behind the blocks of the column gripped by the gripping members as the latter move forward toward the stone, whereby the said space will remain constantly filled with blocks forming an extension of the block column.

9. In a grinding apparatus for the manufacture of wood pulp, the combination of a grinding stone, a compartment or space for receiving wooden blocks to be ground, said

blocks forming a column to be pressed against the stone, alternately operating devices for pressing the blocks against the stone, an abutment, an engaging piece, by means of which one of the said devices reacts against said abutment during the action of said device upon the blocks and through which piece the second device, during its operating period, transmits its pressure to the block column, and means for subjecting the engaging piece and the first forward-pressing device to pressure in the forward-pressing direction, said engaging piece and said second device being under a constant forward-pressure of a somewhat less amount than the total forward-pressure upon the first device and places the second device into operation automatically and simultaneously takes over the forward-pressing of the block column and to the same extent when the operation of the first device temporarily ceases.

10. In a grinding apparatus for the manufacture of wood pulp, the combination of a grinding stone, a compartment or space for receiving wooden blocks to be ground, said blocks forming a column to be pressed against the stone, gripping members, a forward-pressing device operating said gripping members upon end faces of the blocks, a second forward-pressing device acting alternately with the gripping members for pressing the blocks against the stone, an abutment, an engaging piece by means of which one of the said devices reacts against said abutment during the action of said device upon the blocks, and through which piece the second device, during its operating period, transmits its pressure to the block column, and means for subjecting the engaging piece and the first forward-pressing device to pressures in the forward direction, said engaging piece and said second device being under a constant forward-pressure of a somewhat less amount than the total forward-pressure upon the first device, whereby this constant pressure places the second device into operation automatically and takes over the forward-pressing of the block column at the same moment and to the same extent as the operation of the first device temporarily ceases, and a supplying device or hopper for effecting refilling of blocks into said space and arranged to feed the blocks in a direction more or less across to the forward-pressing direction into the space behind the blocks of the column gripped by the gripping members as the latter move forward toward the stone, whereby the said space will remain constantly filled with blocks forming an extension of the block column.

11. In a grinding apparatus for the manufacture of wood pulp, the combination of a grinding stone, a compartment or space for receiving wooden blocks to be ground, said blocks forming a column to be pressed against the stone, gripping members, a forward-pressing device operating said members to engage end faces of the blocks, a second forward-pressing device acting alternately with the gripping members for pressing the blocks against the stone, said second device consisting of a normally stationary rear wall of the said space, means for moving said wall or a part thereof, and coöperating with means for moving the gripping member to start said wall or part thereof to take over the forward-pressing of the blocks from the moment the gripping members are withdrawn from the end faces of the blocks and until said members have moved back and taken a new grip at the rear part of the block column extension, an abutment, an engaging piece by means of which one of the said devices reacts against said abutment during the action of said device upon the blocks, and through which piece the second device, during its operating period, transmits its pressure to the block column, and means for subjecting the engaging piece and the first forward-pressing device to pressure in the forward direction, said engaging piece and said second device being under a constant forward-pressure of a somewhat less amount than the total forward-pressure upon the first device, whereby this constant pressure places the second device into operation automatically and takes over the forward-pressing of the block column at the same moment and to the same extent as the operation of the first device temporarily ceases, and a supplying device or hopper for effecting refilling of blocks into said space and arranged to feed the blocks in a direction more or less across to the forward-pressing direction into the space behind the blocks of the column gripped by the gripping members and as the latter move forward toward the stone, whereby the said space will remain constantly filled with blocks forming an extension of the block column.

12. In a grinding apparatus for the manufacture of wood pulp, the combination of a grinding stone, a compartment or space for receiving wooden blocks to be ground, said blocks forming a column to be pressed against the stone, gripping members, a forward-pressing device operating said gripping members upon end faces of the blocks, hydraulically operated mechanisms for pressing forward the gripping members, a normally stationary rear wall of the said space for the purpose of exerting forward-pressure upon the rear end of the whole block column, hydraulic means for moving said wall or part forwardly, a fixed abutment, said wall or part reacting against said fixed abutment and constantly under a

somewhat lower hydraulic pressure than the total forward-pressure acting upon the gripping members and which transmits its pressure inversely to the pressure of the gripping members as they become inoperative.

13. In a grinding apparatus for the manufacture of wood pulp, the combination of a grinding stone, a compartment or space for receiving wooden blocks to be ground, said blocks forming a column to be pressed against the stone, a forward-pressing device, operating members gripping upon end faces of the blocks, hydraulically operated mechanisms for pressing forward the gripping members, a normally stationary rear wall of the said space for exerting forward-pressure upon the rear end of the whole block column, hydraulic means for moving said wall or part forwardly, an abutment, said wall or part reacting against said abutment and constantly under a somewhat lower hydraulic pressure than the total forward-pressure acting upon the gripping members and which transmits its pressure inversely to the pressure on the gripping members as they become inactive, and a supplying device or hopper for effecting refilling of blocks into said space and arranged to feed the blocks in a direction more or less across to the forward-pressing direction into the space behind the blocks of the column gripped by the gripping members as they move forward toward the stone, whereby the said space will remain constantly filled with blocks forming an extension of the block column.

14. In a grinding apparatus for the manufacture of wood pulp, the combination of a grinding stone, a compartment or space for receiving wooden blocks to be ground, said blocks forming a column to be pressed against the stone, a forward-pressing device, operating gripping members upon end faces of the blocks, hydraulic cylinders for transmitting forward-pressure to the gripping members, a normally stationary rear wall of the said space for the purpose of exerting forward-pressure upon the rear end of the whole block column, a hydraulic cylinder for transmitting forward-pressure to said wall, a supply conduit for liquid under pressure, a reversible connection between said conduit and the ends of the first-named cylinders, a constant hydraulic connection between said conduit and the cylinder acting upon the said wall, whereby the latter is started and presses the blocks inversely as the gripping members become inactive preparatory to taking a new grip at the rear part of the column extension, and a supplying device or hopper for feeding blocks into said space and arranged to feed the blocks in a direction more or less across to the forward-pressing direction into the space behind the blocks of the column gripped by the gripping members, whereby the said space will remain constantly filled with blocks forming an extension of the block column.

15. In a grinding apparatus for the manufacture of wood pulp, the combination of a grinding stone, a compartment or space for receiving wooden blocks to be ground, said blocks forming a column to be pressed against the stone, a forward-pressing device, gripping members for engaging end faces of the blocks, a hydraulic cylinder, piston and piston rod, said gripping members mounted on said piston rod, and hydraulic means carried by said piston rod and operating the gripping members just before or simultaneously to the starting of the piston forward, and releasing said members upon a reversal of said piston.

16. In a grinding apparatus for the manufacture of wood pulp, the combination of a grinding stone, a compartment or space for receiving wooden blocks to be ground, said blocks forming a column to be pressed against the stone, a forward-pressing device, gripping members for engaging end faces of the blocks, a second forward-pressing device acting upon the outer end of the whole wooden block column, hydraulic cylinders, pistons and piston rods for moving the said pressing devices, communications between the tops and bottoms of said cylinders, reversible means for controlling the supply of fluid or liquid under pressure to the cylinders to force one forward-pressing device forwardly when forcing the other backward and vice versa, hydraulic means carried by said piston rods for moving the gripping members, and forcing them into the end faces of the wooden blocks just before or at the beginning of the forcing stroke of said piston, withdrawing them from the blocks upon the reversal of the piston.

17. In a grinding apparatus for the manufacture of wood pulp, the combination of a grinding stone, a compartment or space for receiving wooden blocks to be ground, said blocks forming a column to be pressed against the stone, a forward-pressing device, gripping members, a second forward-pressing device acting upon the outer end of the whole block column, a hydraulic cylinder, piston and piston rod transmitting forward-pressure to each gripping member, the latter being mounted upon said piston rod, means for placing the said devices into operation alternately, hydraulic cylinders in mechanical connection with the said piston rods, pistons in the latter cylinders having piston rods, cross heads carried by said latter rods, links pivoted to the cross heads, the gripping members being pivoted to the free ends of said links,

lateral arms forming part of the links, links forming pivotal connection between said lateral arms and the latter piston rod, and communications from the rear and front end of the latter cylinder to the front and rear end respectively of the former cylinder.

18. In a grinding apparatus for the manufacture of wood pulp, the combination of a grinding stone, a compartment or space for receiving wooden blocks to be ground, said blocks forming a column to be pressed against the stone, a pair of forward-pressing devices including a hydraulic cylinder, piston and piston rod, gripping members operating upon end faces of the blocks, a third forward-pressing device acting upon the outer end of the whole wooden block column, a hydraulic cylinder, piston and piston rod, means for placing the said two forward-pressing devices into operation alternately, hydraulic cylinders formed within said piston rods, pistons in said cylinders having hollow piston rods projecting slidably into a bore through the first mentioned pistons, said rods forming an annular chamber between them, said outer piston rod having a hole in front of its piston, and said inner piston rod having a hole in front of its piston, a cross head carried by the latter rod, one or more links pivoted to the cross head, a knife-shaped gripping member pivoted to the free ends of said links, a lateral arm forming part of one of said links and a link pivotally connecting said lateral arm and piston rod.

19. In a grinding apparatus for the manufacture of wood pulp, the combination of a grinding stone, a compartment or space for receiving wooden blocks to be ground, said blocks forming a column to be pressed against the stone, a forward-pressing device, gripping members operating upon end faces of the blocks, said members being constituted by a number of teeth, spaced parallel stationary grate-like bars forming the side walls for the block column space or compartment and between which the said teeth project into said space, and a supplying device or hopper for feeding blocks into said space and arranged to feed blocks in a direction more or less across to the forward-pressing direction into the space behind the blocks of the column gripped by the gripping members as the latter are moved forward toward the stone, whereby the said space will remain constantly filled with blocks forming an extension of the block column.

20. In a grinding apparatus for the manufacture of wood pulp, a compartment or space for receiving the blocks to be ground, a piston behind said blocks, a cylinder for said piston maintaining a constant fluid, a slidable cylinder connected to said piston, a piston therein having a piston rod, gripping devices carried by said rod, and means to supply motive fluid to opposite sides of said latter piston.

21. In a grinding apparatus for the manufacture of wood pulp, a compartment or space for receiving the blocks to be ground, a piston behind said blocks, a cylinder for said piston maintaining a constant fluid, a slidable cylinder connected to said piston, a piston therein having a piston rod, gripping devices carried by said rod, and means to supply motive fluid to opposite side of said latter piston, the maximum total pressure of which is greater than that on the first mentioned piston.

22. In a grinding apparatus for the manufacture of wood pulp, a compartment or space for receiving the blocks to be ground, having grid-like sides, gripping fingers, a parallel motion device for operating said fingers, fluid operated means for imparting a feed movement to said fingers and device, and fluid operated means for operating said device.

23. In a grinding apparatus for the manufacture of wood pulp, a compartment or space for receiving the blocks to be ground, gripping fingers, a hydraulic cylinder, having a piston and piston rod, a parallel motion device mounted on said rod and carrying said fingers, and hydraulic means for operating said device.

24. In a grinding apparatus for the manufacture of wood pulp, a compartment or space for receiving blocks to be ground, reciprocable means acting on the end faces of blocks to feed them forward, and separate reciprocal feed means acting behind the block column in alternation with the aforesaid means.

In testimony that I claim the foregoing as my invention, I have signed my name in presence of two subscribing witnesses.

PEDER CHRISTIAN SCHAANNING.

Witnesses:

EDWARD JOHNSON,

NATH. A. HEDENSCHOU.