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WOOD PULP GRINDING MACHINE.

APPLICATION FILED APR. 5, 1905.

Fig. 1.

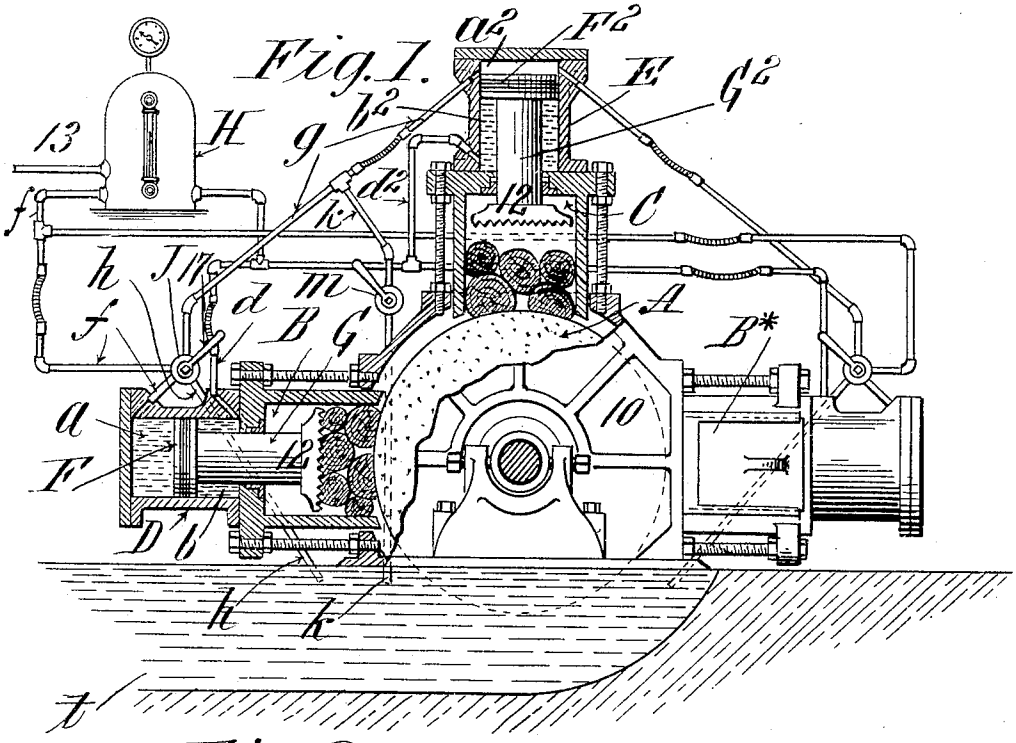


Fig. 2.

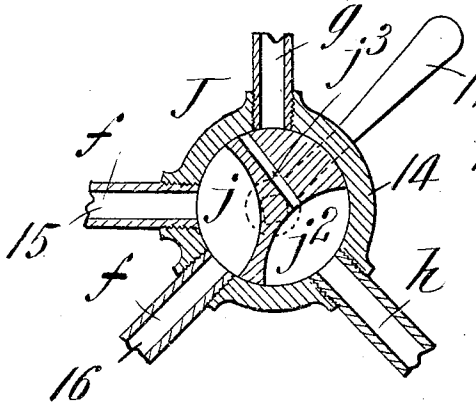
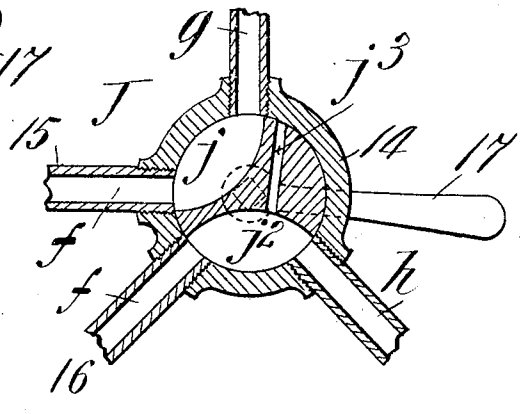


Fig. 3.



Witnesses:

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WOOD-PULP-GRINDING MACHINE.

No. 804,012. Specification of Letters Patent. Patented Nov. 7, 1905.

Application filed April 5, 1905. Serial No. 254,024.

To all whom it may concern:

Be it known that I, BERNHARD KIHLGREN, a subject of the King of Sweden, and a resident of Holyoke, in the county of Hampden and State of Massachusetts, have invented certain new and useful Improvements in Wood-Pulp-Grinding Machines, of which the following is a full, clear, and exact description.

This invention relates to improvements in a machine or apparatus for grinding wood for paper-pulp; and the invention especially relates to that description of machine for the purpose indicated which comprises, in combination with a grinding-wheel, one or more cylinders having pistons therein subject to a pressure thereto and operable to force the billets or portions of wood to be reduced against the grinding-wheel and a secondary or auxiliary piston working in a cylinder therefor and in conjunction with arrangements for causing the secondary piston to force wood to be reduced against the grinding-wheel in intervals intermediate between the times that the piston or pistons in the primary cylinder or cylinders are maintaining the wood to the working action of the grinding-wheel, whereby during a refilling of the wood-receiving chamber or chambers the head of the primary piston or pistons will have grinding operation carried out on the wood supplied between the secondary piston and the grinding-wheel to the end of acquiring the maximum of grinding work by utilizing the time requisite for recharging the machine with new wood at one place by grinding wood supplied at another place in the machine.

The object of the invention is to so organize the machine as to establish a working pressure by one piston against the wood adjacent a primary cylinder, at such time relieving the working pressure from the piston of the secondary cylinder and to acquire a reversal of these conditions, all by the means of a lessened number and simplified arrangement of parts, valves, and conduits than has heretofore been necessary in this class of machines, to produce a machine or apparatus the alternating actions of different portions of which may be controlled more conveniently and by a lessened number of valves than has heretofore been required.

The invention consists in the combinations and arrangements of parts, conduits, and valves, as hereinafter described in conjunction with the accompanying drawings and set forth in the claims.

In the drawings, Figure 1 is a side elevation, with important parts in central vertical section, of a wood-pulp-grinding machine comprising two primary cylinders with working piston therein and one secondary cylinder and working piston. Figs. 2 and 3 are sectional views, on a larger scale, of the transfer-valves shown in their different positions relatively to several conduits having their junctions at such valve.

Similar characters of reference indicate corresponding parts in all of the views.

In the drawings, A represents a rotary pulp-wood-grinding wheel inclosed within a suitable casing 10 and understood as having suitable driving means therefor. Adjacent the grinding-wheel is a primary chambered casing B for pulp-wood opening endwise to the grinding-wheel, and C represents a secondary pulp-wood chamber, shown as having a location similarly adjacent the grinding-wheel, but in a different radial line from the chamber B. The intent is that wood in the chamber B shall be ground with as great continuity as possible and with only intervals of non-working as are occasioned for the replenishment of the wood-supply therein, while the wood disposed in the secondary chamber C is in accordance with the capability of this machine to have pressure exerted thereagainst, forcing it to the grinding-wheel only at such time as the pressure means conjunctive to the primary chamber B is retired and passive or where there is a plurality of the primary chambers at the time when the pressure means for one or another of the primary chambers is retired and passive.

In the machine, shown as organized, two of the primary pulp-wood chambers B and B* are provided with cylinders, pistons, conduits, and valves, respectively and similarly appurtenant thereto, and in the further detailed description the machine will first be set forth in its aspect of comprising one primary and one secondary pulp-wood chamber, with followers for the pulp-wood and instrumentalities for controlling the followers, whereby when one is exerting pressure the other is passive, and vice versa.

Adjoined to and in longitudinal continuation of the chambered pulp-wood casing B and C are the primary and secondary cylinders D and E, having pistons F and F^2, re-

spectively, therein with piston shafts or bars G and G^2, which extend through the inner end wall or partition of each cylinder and constitute with the enlargements 12 the followers for the pulp-wood.

By reason of the considerable bulk or cross-sectional size of the piston-bars G G^2 one of the chambers in each cylinder D and E, divided from the other chamber in each cylinder, is of materially-lessened cross-sectional area, and thereby the pressure fluid in communication at one time from the same source of pressure-supply will be effective in the cylinder-chamber *a* to overpower the opposing pressure in the chamber *b* in the same cylinder, the pressure likewise in chamber a^2 being effective normally to overpower the pressure in chamber b^2 of the cylinder E.

The chambers *a* and a^2 may be properly regarded as working chambers, while those *b* and b^2 have the functions of retracting or piston-retiring chambers.

In the apparatus as here shown the source of pressure-supply is represented as a reservoir H, understood as having a water-supply inlet 13 and in which, as commonly done in apparatuses of this general description, a volume of air is maintained at an ample pressure within the upper portion of the reservoir and above the water therein. The pipe *d* runs from connection with the fluid-pressure supply H to the retracting-chamber *b* of cylinder B, and by a branch d^2 thereof like connection is established with the retracting-chamber b^2 in the cylinder E. A pipe *f* leads from connection with the reservoir H to the working chamber *a* of the primary cylinder D. A pipe *g*, branching from the conduit *f*, leads into the working chamber a^2 of the secondary cylinder E and adjacent the junction of the conduit F and pipe *g*, and there connected by a valve-inclosing fitting 14 is a waste-pipe *h*. Within said fitting connecting the three pipes—that is, *g*, *h*, and the two angularly-disposed sections 15 and 16 of the conduit *f*—is the cock J, having the handle 17 for operating it and having in the plug or body thereof the ways *j* and j^2 and so arranged that open communication may be established from the pressure-supply H to working chamber *a*, the pipe branch *g* being out of connection with the pressure-supply, as represented in Fig. 2, or that by shifted position of the valve J the sections 15 and 16 of the conduit *f* will be closed one from the other, the pipe-section 15 being in open communication with the branch *g* to give fluid-pressure into the working chamber a^2 of the secondary cylinder simultaneously with the making of connection between the section 16 of conduit *f* and the waste-pipe *h*.

A pipe *k* is shown as having a branch connecting from the pipe *g* for waste, here shown as discharging into the pulp channel or canal *t* and having a shut-off cock *m*.

In operation, the pulp-wood chamber B being charged with the wood billets or pieces to be reduced to pulp, the secondary chamber C being likewise charged, the cock *m* will be closed and the cock J placed in the position represented in Fig. 2, whereupon the pressure-fluid supply will have power access from the reservoir into the primary-cylinder working chamber to overpower the opposing pressure exerted constantly from the same source of supply at the other side of the piston F in the chamber *b*, and the communication for pressure in the working chamber a^2 of the secondary cylinder will be suspended. When the wood-supply in the casing B has been reduced and requires replenishment, the valve J will be shifted to the position shown in Fig. 3, whereupon pressure in chamber *a* becomes terminated, the pressure constantly maintained in chamber *b* becomes efficient to retire the piston F and the follower G 12 to the leftward, and the drainage-way is open from working chamber *a* to the relief or waste pipe *h*, and simultaneously with these conditions and actions the fluid-pressure has access from the reservoir by way of conduit-section 15, valveway *j*, and pipe *g* into the working chamber a^2 of the secondary cylinder to secure the forcing downward of the follower G^2 12 for the accomplishment of grinding of the wood in casing C, which grinding will continue while pulp-wood chamber B is being replenished, and then when the valve J is shifted back to the position of Fig. 2 the grinding of the wood in casing B will be resumed and the grinding action in casing C will be substantially discontinued. In order, however, that so soon as the valve J is shifted from the position of Fig. 3 to that of Fig. 2 there will be an instant of open communication between the working chamber a^2 of the secondary cylinder E and the waste-pipe *h* by way of the pipe *g* to slightly relieve the pressure on the follower of the piston F^2, the cock J is shown as having in addition to the ways *j* and j^2 the third somewhat restricted way j^3, which during the shifting or transitory movement of the cock opens communication between pipe *g* and waste-pipe *h*. In this way there is a slight letting up of the follower-head 12 of the piston-shaft G^2 sufficient to compensate for the elasticity of the wood in the casing C, and so that when the wood-forcing motor comprised in the parts D and B resumes its work such resumption may be accomplished without shock or violence in the machine.

Of course there will be times when the piston F^2 in the secondary cylinder must be fully retired, correspondingly fully withdrawing the follower-head for taking a new supply of pulp-wood into the secondary chamber C, and this may be performed by setting the cock J over to the position of Fig. 2 and open-

ing the shut-off cock *m* in the drainage branch pipe *k*, whereupon, as manifest, a discharge-way is established for withdrawal of the fluid from the working chamber a^2 and the constantly-maintained fluid-pressure in the retracting-chamber b^2 becomes efficient for the retirement of the piston F^2 and its follower.

Having now described the organization in the machine of the primary motor and a secondary motor operable relatively to the common grinding-wheel for accomplishing a constant wood-grinding, whether it be at a given time of the billets pressed against the stone by the primary motor or by the secondary motor, it becomes easily apparent that duplication of the primary motor and of its conjunctive conduits and valve equipments, whereby it is likewise coöperative with those of the secondary motor, is a matter of additional provision with no extension, so far as the invention is concerned, of the idea of means, and so in the machine here illustrated primary motors for simultaneous action are included at the right-hand as well as at the left-hand side of the machine, in such a way that when either one is rendered temporarily inactive loss-saving action becomes instantaneously established in and by the secondary motor.

In this wood-grinding apparatus there is as components of all of the instrumentalities and for the establishment of all of the conditions and the performance of all of the actions described an unusually few parts and appliances. It is also true that none of the water effectively utilized in the chambers a^2 b^2 for the retirement of the pistons and followers ever goes to waste, and while the contraction of the cylinder area in the chambers a^2 b^2 by the presence in such chambers only of the piston-shafts enables the employment of motor fluid from a common source and at the pressure at which it may be found in connection with the retracting-chambers, as well as with the working chambers *a b*, the effectiveness of the motive fluid becoming variable by reason of the differences in the cylinder areas, this invention is not to be limited in all respects to this highly-desirable, though non-essential, arrangement, for it is quite practicable to effect the retirement of the piston by having the retracting-chambers in connection with a source of low-pressure supply.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In a wood-pulp-grinding machine, a grinding-wheel, primary and secondary casings for the wood, said casings being endwise open adjacent the wheel, and cylinders, combined with said casings, having pistons therein, dividing the cylinders into working and retracting chambers, and followers, connected with the piston-shafts and located in the wood-chambers, a source of pressure-supply, and pipes extending therefrom to the retracting-chambers in both cylinders, a conduit connecting said supply and the working chamber of the primary cylinder, a conduit branching from the aforenamed conduit and connecting into the working chamber of the second cylinder, and a pipe branching from said first-named conduit for waste, and said branching pipes having, in connection therewith and at their junction, a valve having plural ways.

2. In a wood-pulp-grinding machine, a grinding-wheel, primary and secondary casings for the wood, said casings being endwise open adjacent the wheels, and cylinders, combined with said casings, having pistons therein, dividing the cylinders into working and retracting chambers, and followers, connected with the piston-shafts and located in the wood-chambers, a source of pressure-supply, and pipes extending therefrom to the retracting-chambers in both cylinders, a conduit connecting said supply and the working chamber of the primary cylinder, a conduit branching from the aforenamed conduit and connecting into the working chamber of the second cylinder, and a pipe branching from said first-named conduit for waste, and said branching pipes having, in connection therewith and at their junction, a valve having plural ways, and a waste-pipe, in communication with the second cylinder working chamber, having a cock.

3. In a wood-pulp-grinding machine, a grinding-wheel, primary and secondary casings for the wood, which are endwise open adjacent the wheel, and cylinders, combined with said casings, having pistons therein, dividing the cylinders into working and retracting chambers, and followers, connected with the piston-shafts and located in the wood-chambers, a source of pressure-supply, and pipes extending therefrom to the retracting-chambers in both cylinders, a conduit connecting said supply and the working chamber of the primary cylinder, a conduit branching from the aforenamed conduit and connecting into the working chamber of the second cylinder, and a pipe branching from said first-named conduit for waste, and said branching pipes having, in connection therewith and at their junction, a valve having the ways, j j^3, and having a way j^3 for giving in its shifting movements an instant of communication between the conduits *g* and *h* for a slight relief of the established pressure in the second cylinder working chamber for the purpose set forth.

4. In a wood-pulp-grinding machine, a grinding-wheel, a chambered wood-receiving casing and an adjoined cylinder having a

piston therein and a piston bar or shaft extending from one side of the piston, into the wood-chamber and carrying a wood-follower and said piston-shaft, by the presence of its portion within the cylinder to the one side of the piston, establishing a cross-sectional cylinder area less than the cylinder area at the other side of the piston, a source of pressure-supply and conduits extending therefrom to the full-sized and reduced chambers in the cylinder, means for shutting off the fluid-supply connection with the working chamber of the cylinder and means for opening said chamber for relief or waste.

5. In a wood-pulp-grinding machine, a grinding-wheel A, primary and secondary casings B, C, for the wood, which are endwise open adjacent the wheel, and cylinders, D, E, combined with said casings, having pistons F, F^2, therein, dividing the cylinders into working and retracting chambers *a b*, a^2 b^2, and followers, G G^2 connected with the piston-shafts and located in the wood-chambers, a source of pressure-supply, H, and pipes *d* d^2 extending therefrom to the retracting-chambers in both cylinders, a conduit *f* connecting said supply H and the working chamber *a* of the primary cylinder, a conduit *g* branching from the aforenamed conduit *f* and connecting into the working chamber a^2 of the second cylinder, a pipe *h* branching from conduit *f* for waste, and said branching pipes *f g h* having, in connection therewith and at their junction, a valve J having plural ways *j* j^2, and said valve also having the way j^4 to give, in the valve-shifting movement, an instant of communication, for pressure-relief, between working chamber a^2 and waste-pipe *h*, and a pipe *k*, leading from said conduit *g* between the valve J and the second cylinder working chamber, having a cock *m*, therein.

Signed by me at Springfield, Massachusetts, in presence of two subscribing witnesses.

BERNHARD KIHLGREN.

Witnesses:
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G. R. DRISCOLL.