WOOD PULP DEPARTMENT

THE PROCESS OF MANUFACTURING MECHANICAL WOOD PULP.*

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(Continued from February issue.)

PART III. DESCRIPTION OF THE MACHINERY AND THE PROCESS.

Development of the Water Power.—Before describing the process, a few words may be said with regard to the water power. The installation of turbines, for the purpose of driving wood pulp grinders, presents more difficulties to the designer of the mill than would be found were the power required for ordinary uses. The process of grinding wood for pulp requires a great deal of power. One grinder which would have a capacity of five tons of dry pulp per day would require about 340 horse power, and for a daily output from the mill of 25 tons dry, which

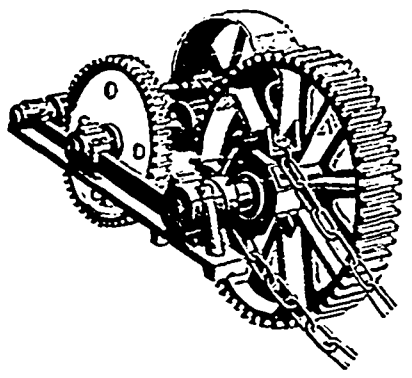

Fig. 1—Log Jack and Conveyor Chain.

is only a moderate sized mill, a supply of 1,700 h.p. for grinding alone will be necessary. About 5 h.p. will be required per ton of output to drive the lighter machinery, or a total for the above mentioned output of over 1,800 h.p. Steam power cannot be used for this service, as the variations in the load are so great that no steam engine could stand it. We must, therefore, use water power, which is eminently suited for the purpose. When such large powers are necessary, it is very important, when a site is decided upon, that the head should be fully developed. If the full head is utilized at first, taking sufficient water to develop the required power, it is comparatively easy to

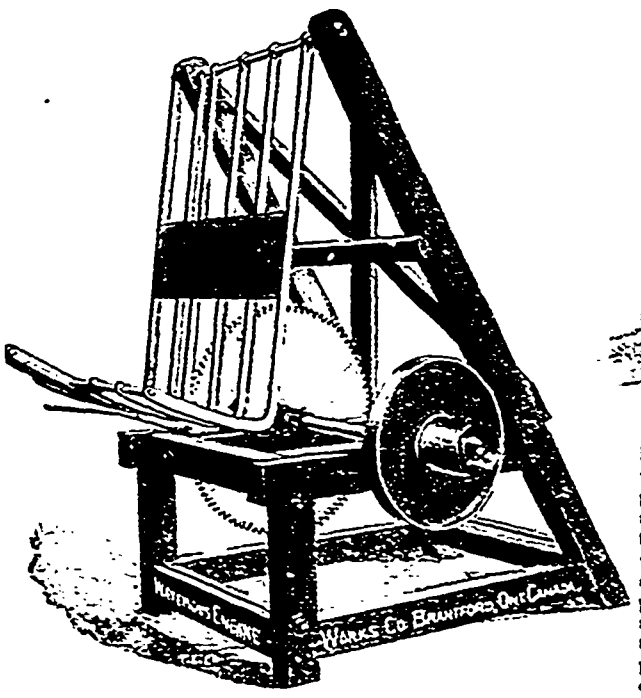

Fig. 2—Swing Frame Pulp Wood Saw.

add to the plant in the future by laying another pipe or otherwise increasing the quantity of water passed per minute, and installing more wheels. To increase the power developed by an increase in the running head will be found in most cases to be a costly remedy. This latter method is very unsatisfactory from the standpoint of a pulp mill owner. If a turbine is installed to run at a certain head, with full gate, and the head is afterwards increased, the wheel will develop more power certainly, but the speed will be higher also. As the turbines are directly connected to the shaft of the grinder, this means that its speed is also increased, which cannot be allowed if the correct speed were given to it at the first installation. If the speed of the grinder is not increased above 200 r.p.m., there is no harm done, but if it is above this to any extent, the wheels will have to run with partial gate, and it is doubtful if, in this case, you will get the efficiency of the wheels.

In almost any other industry the speed of the turbine is of no consequence, as the machinery can be run at any desired speed by means of belts or gearing; but where direct driving is necessary the wheels will have to run at the speed required by the machine. When the head is high, and to get the speed low enough you are forced to put in a large wheel which will give more power than will be required for one grinder, the difficulty may be overcome by coupling another grinder to the shaft of the first, which will, in all probability, take the surplus power. Even three grinders are sometimes connected up in this manner.

Log Handling and Sawing.

Log Handling.—It is important that the logs, when being handled in the yard, should be kept out of contact with the ground as much as possible, as grit and dirt in the bark will cause trouble when the stuff is sawn and barked. If the logs are taken direct from the pond to the saw, it is easy to keep the wood clean by handling the logs with a chain conveyor, driven by a log jack. In Fig. 1 is shown a jack and chain made for this purpose by the Waterous Engine Works Co., of Brantford, Ont. By means of this machinery two men can handle from 60 to 90 cords of wood in a day. In some mills, where the logs have to be piled in the yard, a useful expedient to keep them clear of the ground is made use of. A strong staging is built of logs to a height of a foot or so, on top of which the logs are piled. Skids are sometimes used, but a log staging is better, as the space between the skids soon gets filled up with dirt and refuse. A conveyor can be run at one side of the staging, and when logs are wanted in the mill they are simply rolled off the staging into the conveyor, which carries them in to the saws.

Sawing.—On arriving in the mill, the log is automatically dumped by the conveyor on to the skids. It is next rolled onto the saw bed rollers, which enable it to be easily fed to the saw. In most mills the wood is ground from bolts 24 inches long, though some use wood 16 inches in length. If the wood is supplied to the mill in sticks 4 feet long, it only requires cutting in the middle to make 24-inch bolts. For such work as this, the Waterous Engine Works, of Brantford, make a very good saw, a view of which is shown in Fig. 2. The log is placed in the cradle, which is suspended from the top of the frame. A

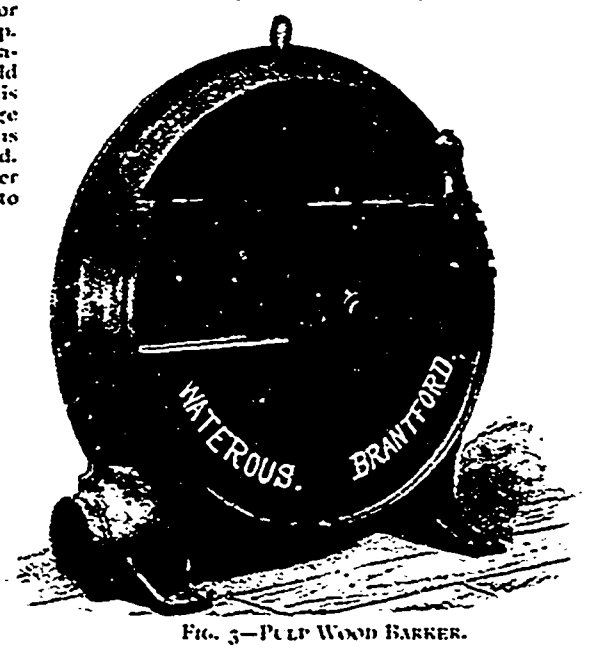

Fig. 3—Pulp Wood Barker.

handle is provided on the cradle, by means of which the wood is swung against the saw. When the logs are supplied in long lengths this saw will not do, and another method has to be used. A swing saw can be used, the frame of the saw swinging on the counter shaft. In this way the saw is brought to the log. The capacity of a 38-inch saw, mounted in this way, would be about one cord per hour. Jump saws are used in some mills. These are run by a steam cylinder and piston. The piston is secured to the saw frame, which slides vertically in guides. On pressing the treadle, steam is admitted into the cylinder, driving up the piston and saw, which cuts through the log from the underneath. One of the mills in the Maritime provinces has installed a very satisfactory system. It consists of 6 or 8 saws, mounted in pairs, and so situated that only two saws can cut at a time. Between each pair of saws is a conveyor chain, running the full length of the saw bed. A log is rolled onto the upper end of the bed, and is caught up by all the conveyor chains at once, and carried to the saws. On passing each pair of saws, two cuts are made in the log, and when past them all the log has been entirely cut up into bolts, each 2 feet long. At the end of the saw table or bed is a chain conveyor which carries the blocks to the barkers. It is tended by one man, and has a large capacity. The saws run at about 800 r.p.m., and are usually 36 and 38 inches in diameter.

Barking and Splitting.

Barking. To procure clean pulp, all bark and d[e]cored parts must be removed from the stock, leaving [o]nly sound clean wood. The bark is cut off by means [o]f a barker, a cut of which is shown in Fig. . This [ma]chine is also built by the Waterous Engine Works, of Brant[f]ord, Ont. It consists in a cast iron disc mounted on a [s]haft and carrying on its face knives placed at regular inter[v]als in a circle. On the reverse side of the revolving disc [a]re bolted cast iron wings or fans of suitable size. The [s]haft, disc, etc., is surrounded by a cast iron frame, which [c]arries the bearings for the shaft. Part of the frame in f[r]ont of the face is cut away, giving access to the knives, [a] suitable rest is provided to support the wood while [it] is being barked. The frame is of large size, and is made [in] two pieces, fitted with planed edges. The knife disc [is] inches in diameter, made of cast iron, with a steel [ba]nd shrunk on its edge, turned perfectly true, and bal[an]ced. The knives are four in number, and are 11½ inches [lo]ng. The shaft is fitted with fast and loose pulleys, or with belt tightener, which is considered by some to be best. The capacity of this machine, when running at 600 r.p.m., will be from 7 to 10 cords per day, though it can be forced up to 14 cords in 24 hours. In operation it is said to work very well. The bolt or log is placed on the rest and pressed against the knives, the end thrust of the cutting action being taken by a roller and stud, mounted on the frame as shown. Each knife, as it passes, cuts

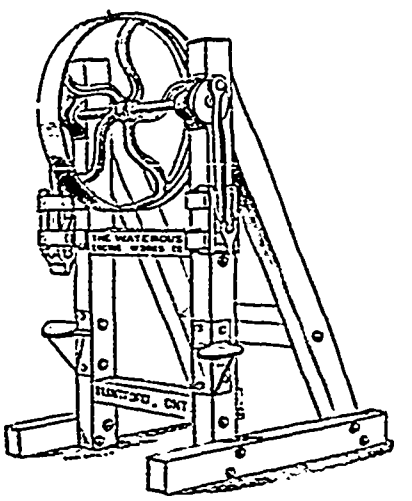

Fig. 4—Pulp Wood Splitter.

strip of bark off the log throughout its whole length. By revolving the wood slowly by the hands, the knives cut the bark completely off. The chips pass through the disc by means of a hole provided in front of the knives, and are caught up by the fans and blown out through the outlet shown in the frame. A pipe is usually connected to this orifice, which carries the chips to a distance. By means of the fans the chips are prevented from lodging in the frame, so that the disc is always running freely. This also serves to automatically remove the shavings to any desired locality.

When the revolving of the wood is done by hand, if it is not done regularly, and the output of the barker will vary considerably, according to the skill and industry of the operator. It would be advisable to revolve the wood automatically, and thereby maintain a constant feed to the knives, which will be independent, to a certain extent, of the operator. Various attachments have been invented for this purpose, all of more or less usefulness. One of the best is Butterfield's, which can be applied to almost any standard barker. By the constant relation of speed between the knives and the surface of the wood, each knife cuts, approximately, the same amount of bark, and in this way the quantity of clear wood removed while barking is materially reduced. It is claimed by the makers of this attachment that from 5 to 8 per cent. more clear wood can be obtained from the same quantity of unbarked logs by using this device than by the ordinary method. The great point of its usefulness, however, lies in its increased speed and regularity of cutting. By the regularity in rate of cutting no time is lost, as the knives are prevented from cutting over the same space, as is frequently the case in hand feeding. The output is thereby increased, it is claimed, by from 80 to 100 per cent. By this means the price of a barker, as well as an operator's wages, can be saved. The power to drive the barker, however, will be increased in almost the same ratio as the output. When the wood is barked, it is thrown into the conveyor running to the grinder room; but if it requires splitting, it is thrown near the splitter. The knives require repeated grinding, especially if the wood has been in contact with the earth. When dull they should be ground on a special stone, used for this purpose and no other.

Splitting.—Where large wood is used, it is necessary to have it split if it is too large to enter the grinder pockets. This operation is done after the wood is barked, and before it is sent to the grinder room. The machine shown in Fig. 4 is a double wood splitter manufactured by the Waterous Engine Works Co. The frame is made of well seasoned wood and strongly bolted together. A shaft carrying a pulley and two disc cranks is mounted on the frame, as shown. From each of these cranks is driven a block, sliding vertically and connected

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