cutting a log at a time. If more than one saw is made to cut a log at one time, that log is liable to jam between the saws, damage them and fly out, especially if three saws or more are used. By this method, illustrated in Figure 11, when a log has passed across the whole table, it is all cut up into the required lengths which fall near by, or are conveyed to the barkers.

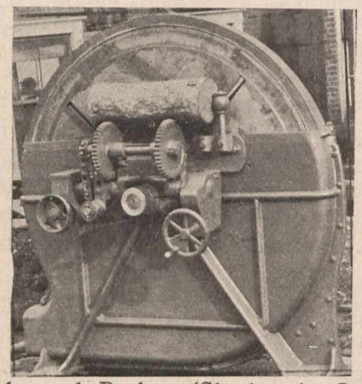

Fig. 14—Pulpwood Barker (Sherbrooke Iron Works.)

BARKING.—The type of barker most frequently employed is that represented by Figure 14. In consists of a disk about 52 inches in diameter in which four knives are so set as to cut a thin slice off the wood stick at a time. That disk is surrounded by a cast iron frame open to give access to the knives, and a table to support the wood is attached to it. The bolt or stick is pressed against the revolving knives and the bark and chips, falling behind the disk, are blown by fans acting like a centrifugal pump, through a pipe to a convenient place, usually to the boiler to be utilized in steam generation. The wood is usually pressed and revolved against the cutting knives, by hand. Various arrangements (such as the one represented in cut), have been invented to revolve the wood automatically against the knives, but the writer is doubtful if such a plan is useful and economical. The speed of revolution of the stick, in these automatic revolving appliances, depending as it does on that of the knives, they ought to do good work and save labor if the bark is of uniform thickness, but in cases where logs are brought long distances by water and through rapids, the thickness of the bark is very irregular, and in fact, parts of the stick have no bark at all; hence if these sticks are put into an automatic revolving apparatus some good wood will be cut unnecessarily, whereas if revolved by hand the bark only will be cut away. The capacity of an ordinary barker running at about 600-R.P.M., is usually from six to ten cords a day, varying with the skill of the operator.

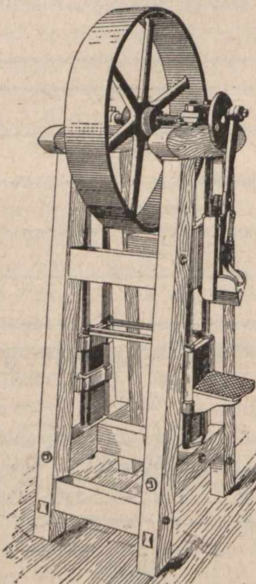

Fig. 16—Wood Splitter.

SPLITTING.—When sticks are too large to enter conveniently into the pockets of the grinders they are split by hand or by a machine, such as represented in Fig. 16. In these cases, which frequently occur where pulp mills are provided with a carriage and saw for turning large logs into lumber for the market instead of utilizing them to produce pulp, little splitting is required after barking. It is usually found convenient to have the sawing, barking and splitting operations all performed in a separate building, as shown in general plan, Fig. 10. Power for this purpose may be derived from one of the turbines or from a steam engine, the bark and small butts being used as fuel. From the barkers the wood is conveyed to the grinders.

(To be continued.)

GRAIN-PRESSURE IN DEEP BINS.*

By J. A. JAMIESON, C.E., MONTREAL.

(Continued from April issue.)

It is quite safe to state that very few engineers would make the mistake of applying the fluid pressure theory to grain or other granular substances stored in deep bins. To do this it is necessary to ignore the well-known fact that strictly granular materials when placed on a level floor, will form a pyramid or cone with sloping sides, at a considerable angle from the horizontal, clearly indicating considerable friction within the mass. It would be also necessary to ignore all the known published data in regard to friction between different solids and granular substances, and also the many structures throughout the country which have been safely used for years for the storage of grain, coal, etc., but which would not stand the tests of fluid pressures.

With a view to showing the difference between designing a bin or series of bins for the storage of grain or for the storage of a fluid, if we take a bin say 12 feet square and 72 feet deep, with a co-efficient of friction between grain and the bin walls of .468 when filled with grain, the vertical pressure will be only 15 per cent. and the horizontal pressure only 9 per cent. of the pressure that would be produced by a fluid of the same specific gravity as grain. Therefore the bin bottom will only require to be 15 per cent. of the strength to carry the vertical load and the walls to resist the horizontal pressure only 9 per cent. of the strength. The walls, however, require to have sufficient strength acting as a column to support over 86 per cent. of the total weight of grain in the bin, while if used for the storage of a fluid, the walls would have no load to carry beyond their own weight. On the other hand it is quite practicable to design and build a tank or standpipe that will have an ample margin of safety when filled with water, and that would undoubtedly fail when used for the storage of grain.

In order to show the importance of the question from a financial standpoint, it may be stated that if the bin structure of the Montreal Harbor Commissioners' elevator was designed and built to safely withstand fluid pressure and at the same time safely carry the grain loads, the cost would be at least $200,000 greater than if designed for the storage of grain with a factor of safety of 4. It would, therefore, seem that in cases where so much money was involved, and when the question of the proper design to meet the requirement of an important link in the transportation problem was at stake, the question would have been worthy of careful investigation. We, therefore, have as the two extremes, tanks apparently designed to hold chaff, and those of the expert fluid pressure theorist, who would have grain storage bins designed to hold water.

In view of the wide divergence of opinion and the lack of accurate published data on which to base calculations for the strength of grain storage bins, the serious losses that have occurred and the consequent lack of confidence caused thereby, the author believes that all engineers and owners interested in grain elevators and the storage and handling of grain, will agree that a full investigation and systematic series of tests to ascertain the manner in which grain loads are carried and the pressures produced by grain, are very urgently required. The author, therefore, proposes to present as clearly and briefly as possible the information gained by con-

*From a paper read before the Canadian Society of Civil Engineers.