

THE DEVELOPMENT OF WOOD-WORKING MACHINERY.*

By JOHN RICHARDS.

As has been explained, forest sawing, or green sawing, as it is sometimes called, is in Europe a less important process in timber-covering than it is in the United States. Log sawing is carried no further than the reduction of timber to merchantable shape by removing the surplus wood and waste, so that the balks and deals will be in suitable form for transportation and for re-sawing at the timber yards, where they are reduced to finished dimensions as wanted.

This is, in several respects, a rational way of proceeding, which will, no doubt, be introduced into the Ameri-

careful support of saw plates of all kinds; and a wide use of machines for dressing saws.

The thickness of a saw is to a great extent determined by its size, or length, and this is governed by the dimensions of the logs to be sawn. The writer, on first visiting timber yards in Northern Europe, could not get rid of the impression that the round timber was all culls or waste. A raft load of logs in the Gotha river in Sweden was thought to consist of telegraph poles. It happened to be a collection of small timber even for there, and a visit to the Pacific coast of North America, soon after, still further emphasized the enormous difference in the timber resources of the two countries. Soon after arriving in San Francisco there was encountered in the street a squared beam of fir more than a hundred feet in length, being hauled to a factory in course of erection. Following this beam to its destination—a woolen factory then being built—it was a matter of astonishment to find all the longitudinal beams, or "stringers," of the same length. This astonishment was increased when the contractor said: "We never bother about dimensions, and just order what we want." A section eight feet in diameter, cut from a redwood tree, completed a new impression of American forest timber.

The care of saws, mentioning as a distinguishing feature of European practice, is a refinement. For twenty years past there has been but little use of files for this purpose. About twenty years ago there were in-

free from complication, quickly adjusted, and when a number of cuts or kerfs are three or more with a single machine, or four to six with a double machine, the speed of performance is such as to meet all the requirements of economic and other, that arise in practice.

The gang of saws can be changed from one dimension to another in a few minutes, and when there are several machines available, as is common in the larger timber yards, a list of "stuff" can be cut out as fast as it is measured or wanted and loaded on wagons.

With the equilibrium type of machines having two frames that move oppositely, the speed can be from 100 to 400 strokes per minute, which, with only four knives, gives a cutting movement of the teeth equal to a thousand feet per minute. Both circular and band saws are employed in re-sawing, but not to a great extent. The evolution of the latter, which has taken twenty years more in the United States under what may be called "high pressure effort," has not proceeded so fast in Europe, where the timber is more obdurate and experiments are more dreaded.

Why reciprocating re-sawing machines, or deal frames as they are called in England, have not gained a place in American practice is not easy to explain; the probable reason is that, if in large cities some timber-yard owner were to provide a set of such machines and cut out to order for his customers such sizes as are wanted, the business would be profitable. It would, for one thing, save much expense and waste in planing, as planing would be unnecessary except for surfaces to be painted or varnished.

Prominent among wood-working machines, and the first to relieve workmen of heavy drudgery, are the benches—machines consisting essentially of a bed with a circular saw projecting through the top and adjustable to a wide range of purposes.

In these machines, as in most other classes, there is wide divergence between American and European practice, and in the uses to which the machines are applied. Practice or design arises out of uses or adaptation, and this accounts for many differences between the machines, as will be explained further on.

Saw benches in the United States are commonly made for light work, such as cross cutting and ripping boards and planks; but in Europe they are employed for heavy

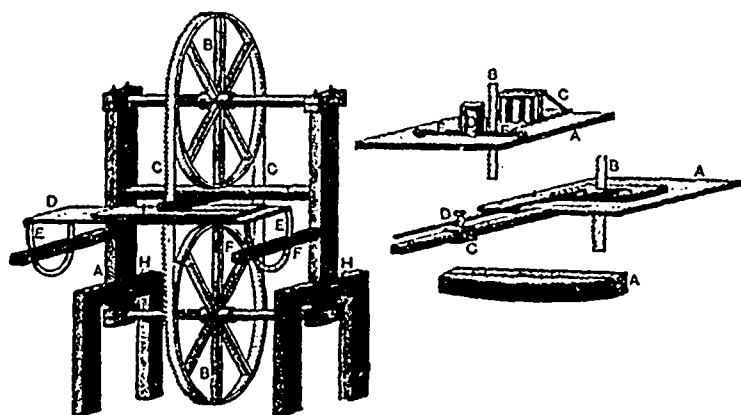


FIG. 1.—THE FIRST BAND-SAW MACHINE.

(Patented by William Newberry in 1808.)

Has tipping table for sawing bevels, and feed roll and radius gauge, showing a complete grasp of the capabilities of the invention.

can continent when timber becomes scarcer and dearer than it is now, and when the market and methods of selling are adjusted to such a system. The advantages are that the timber is not injured in transportation by breakage or exposure, and can be handled at half the cost when proper tackle is employed; there are no grit, dust, and season cracking to contend with, and the re-sawn timber can be furnished to customers bright and clean, and with accurate dimensions. Deals, which seems to be a name for any kind of squared pieces whose section is a parallelogram, form a unit from which two-thirds of common lists can be cut out with but little waste, as is proved by the small amount of debris found about saw mills in European cities.

It is commonly assumed that any sharp wood-cutting implement driven by steam power will displace enough shavings or sawdust to supply fuel for the power consumed, but this depends in a great measure upon circumstances. A coarse or thick saw may do this, but a thin one will not, especially when cutting slowly and accurately; but, setting aside rules, it is obvious that the waste of timber is measurable by the debris of offal in any kind of a wood-working establishment.

It may be remarked here, as a further digression, that furnaces for burning the dry debris from wood-working establishments are usually operated in a wasteful manner by attempting to control the fires, or the amount of steam generated, by the rate at which the fuel is applied to the fires. This is not the best manner, or the most economical one. The furnaces should be kept full of fuel, and the rate of combustion should be regulated by a damper. This dispenses with a great amount of care—not always exercised, however—otherwise required in order to keep a regular supply of steam; it also avoids bare grates—a common means of balancing the spasmodic effort of shovelling light fuel into a furnace under full draught.

A strong draught is required to open up the fires in case of choking, also in burning wet sawdust; but the draught should be continually under control, and its full force should be employed only in emergencies. It is an advantage in burning small debris, such as sawdust and fine shavings, to place on the grates a layer of refractory stone, broken into pieces small enough to prevent the unburned fuel from falling through the grates. These stones become red-hot, and serve to ignite fresh fuel, after the manner of a bed of live coals, and are no impediment to clearing the grates.

The characteristics of European log-sawing machines are, in most cases, massive framing; provision for sawing crooked timber; thin saws and slower feeding; a more

vented and put in use various modifications of machines for sharpening saws, both straight and circular, that saved a good deal in the expense of sharpening; but this was not the chief end attained. The main thing was the truth of the saws, which divided the work equally between the teeth.

It would be difficult to convey in words an idea of the difference in working between a saw that is perfectly round or straight and one that is not. A sawyer knows by the "feel," the moment a saw touches the wood, whether the teeth are true. The sound is different; so also is the result; and even the greatest care in hand-filing will not produce an effect like that of machine-grinding, because the teeth are separately dressed, depending on sight, and require frequent jointing, or grinding off of the points, while the saw is in motion.

The steel thus wasted is commonly a good deal more than that consumed by the wear of cutting, so that half the cost of saws is lost; besides this, hand-filing is commonly done at points of the teeth alone. The gullets, or spaces between the teeth, soon become too shallow to hold the sawdust, and the saws require "gumming"—formerly done by punching out between the teeth, which left the saws with inherent strains and frequently with cracks.

The grinding of saw teeth with emery wheels is no doubt extensively practised everywhere now, but the filing process continues to a great extent where machines would be much better. Such machines, when well made and provided with the required adjustments, cost a good deal, but when the waste of files and of the steel lost in jointing is taken into account, it is seen that the cost of a good machine is soon saved.

So much has been already explained respecting the importance and manner of re-sawing timber in European yards that but little remains to be added, except illustrations of the machines; and even this requires but little in the way of explanation or remark, because the machines in common use are practically of one type—light gang saws adapted to run at high speed.

Such machines are the result of "natural selection,"

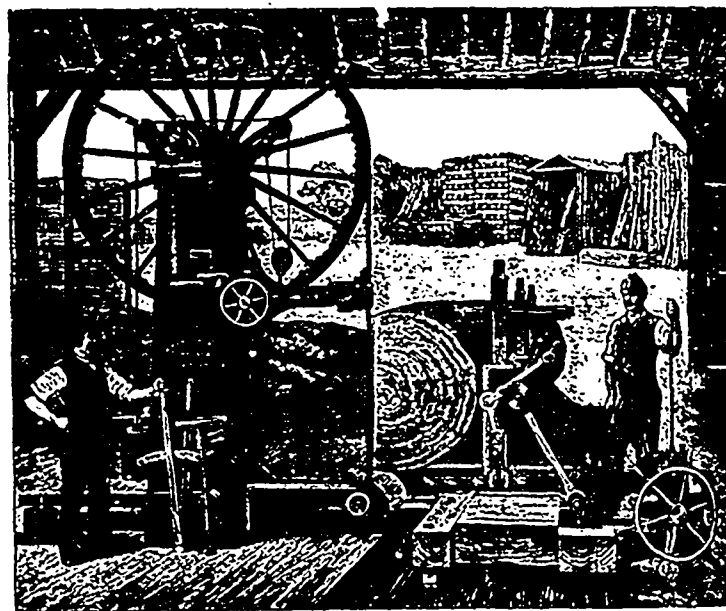


FIG. 2.—LOG BAND SAWING MACHINE.

One of the most complete log band mills built in England, closely modelled after American designs, representing good English and American practice.

work and are provided with saws four, and sometimes five feet in diameter. American saw benches are nearly all for hand-feeding, and in Europe nearly all have some kind of gearing to feed or advance the timber—an indispensable feature for large and heavy pieces, such as round logs up to 18 inches diameter, which are sawn there on benches.

This term saw bench is a flexible one in its application in Europe, and is applied to machines that in America would be called "saw mills;" in fact, the term bench is applied to almost any kind of a machine for operating circular saws. Saw benches are made in a heavy substantial manner, the spindles being large and fitted with gun-metal bearings, and the frames being cast in one piece.

* From Engineering Magazine, London, Eng. Several illustrations included in original article are here omitted.