ROTARY CUTTERS FOR METALS.

It would seem, to the experienced machinist, that the manners, and methods and means of working metals cold has been reduced to an exact science. The planer, the lathe, the drill, the shaping machine, the milling machine, and other general and special tools are usually considered to have covered the ground of reducing and sizing metallic objects; the abrading and abolishing of the work being relegated to another branch.

But somehow the different manipulations on and processes of working metals seems to be so intimately connected that in many instances one department and one method overlaps and engages with another.

It is hard to point out the dividing line between turning (cutting) and finishing and polishing; it is difficult to determine where drilling and milling are separate; to say what difference there is in the resultant action of the shaping-machine and the profiling machine, although one acts with a fixed cutter and the other with a rotary cutter. The result of file finishing and corundum, or emery, finishing may show apparent difference to the mechanical eye, but the object sought may be equally gained by one method as well as by another.

The uses of these natural abrading materials are yet in their infancy. To make a turning or planing tool requires stock—the best of steel—and hand labor, and dulness and wear of the cutting edge requires additional labor and considerable skill to put the tool in shape again. Whereas, the emery wheel is a constant, requiring only occasional dressing, easily made. It is noticeable that most of the improvements in the working of metals cold drift toward the application of rotary contrivances, and that the emery wheel is largely superseding the chisel edge and the serrated edge, as represented by the turning and planing tool and the file. In fact, the milling machine has stolen a large share of old time lathe, planer and vise work, and almost rules in the shop, its control being shared by the stone and emery wheel.

All this movement is in one direction, and it is not surprising that advanced mechanics insist that the movement has not reached its maximum. These improvers assert that a large amount of the work now done by the lathe and the planer with fixed tools should be done by modifications of these machines with rotary tools; and recently an ingenious and progressive mechanic has given proof of the advantages of substituting rotary for fixed cutters in the lathe and on the planer. His idea is to use mills of small diameter in place of the cutters in general use. A quotation from his own statement is better than a synopsis of his plan.

"All fixed and stationary cutting tools are merely chisels, driven either by percussion or by pressure; the percussion must be regular and equal or the work will be ridgy and 'chattered.' The pressure must be uniform, a condition impossible where the object to be turned is suspended on centers, which allows more or less recessi on from the cutting point as the circumferential resistance is greater or lesser. But with a rapidly revolving cutter there is no time for recovery from the attack of the abrading cutter, and no chance of any projection or prominence overcoming the attack of the tool. So on the planer the spring and 'action' of the fixed tool leaves the surface in a series of transverse ridges; the finishing cut being only a reduction of this fault but not a removal of it. There is no planed surface but is a series of ridges; no smooth surface is possible with a fixed tool in a planer head. So in the lathe, it is impossible to turn a journal except its surface be left in ridges, which cannot be ground down and will not wear down. I insist that better work can be done on the lathe and the planer by rotary cutters than by any fixed cutter. The improvement will be as much as the sliding cut of the planer chisel over the percussion cut of the cold chisel. The only known means of producing an equal surface on metals is by a rotary motion. This is seen in our means of polishing and our methods of finishing. No true surface is expected by longitudinal or transverse motions. In either case the ridges must be removed by rotary motion. So in the lathe and the planer, the fixed cutter in one produces longitudinal ridges, and the other transverse ridges, to be removed after the work is done by rotary polishing or rotary wear. I claim that the only proper way of sizing metals is by rotary tools."

This mechanic has made some tests that appear to favor his plan. He rigged up a lathe with a rotary mill in place of the ordinary fixed chisel and turned a shaft of two and a half inches from the rough to size with one going over of the mill. The shaft was revolved at a rate somewhat less than for ordinary turning, and the mill driven by an overhead belt at as rapid a rate as it could stand, being fed with soda water.

The mill was only one and a half inches diameter with between 30 and 40 teeth, and was fed with a feed of about 30 to the inch. It should be stated that this was as rapid a feed as he could get on the lathe, and he thought a feed of 20 or 22 would give better results. The specimen showed excellent work, very true as to circumference and very smooth as to surface.

On the planer he introduced a similar mill in place of the chisel cutter, but he had to run his platen at a lower speed than with the chisel cutter. The result, however, was very fine, a smooth surface apparently needing little more than ordinary stoning to make a good finish.—*Boston Jour. Com.*

Another Departure in Locomotive Building.—There seems to be an inclination of late to depart from the long existing and uniform style of locomotive building. We have already described a locomotive with a double set of driving wheels, the one over the other, the lower ones being actuated by friction; and here comes the description of still another departure, which we clip from a cotemporary: A locomotive of rather unusual shape is building at the Concord railroad repair shop at Concord, N. H. The boiler, instead of being round is flat—some 2 ft thick by 7 ft. wide and 12 ft. long—the tubes running horizontally, this boiler rests over the fire-box and in the middle of the locomotive, the engineer's position being in a little cab, similar to a wheelhouse on a steamer, at the forward end, while the fireman's position is at the opposite end as now, the whole "machine" being considerably longer than the largest used at present. The inventor is a young man by the name of Stevens, whose name this novel locomotive will bear. The greatest idea is the economy of fuel, the boiler being flat, and covering over so much of the fire-box, while the water will in no case be to any great depth as now. The invention was shown by J. H. Pearson, one of the largest shareholders, who was so pleased with it that he made arrangements to have one built for trial. It will be several weeks before this engine will be finished, and should it meet the expectations of its friends it will be quite a departure from the present style of locomotive.

Mining Under the Sea.—A number of English coal mines are being worked under the ocean. In Northumberland, Eng., the net available quantity of coal under the sea is estimated at 403,000,000 tons, and on the Durham coast under the sea, including a breadth of 3½ miles with an area or 71 square miles, 734,500,000 tons. The latter mine is in a vein of an aggregate thickness of 30 feet, distributed in 6 seams. Engineers are considering how it can be worked successfully in the future.

Malleable Cast-Iron.—According to Mr. L. Forguignon, malleable cast-iron appears as an intermediate body between steel and gray pig-iron, from which it differs by the special nature of its amorphous graphite and by its great tenacity. It is distinguishable from steel by its slight extensibility and its large proportion of graphite.

SAWS.

The grand secret of putting any saw in the best possible cutting order consists in filing the teeth at a given angle to cut rapidly, and of a uniform length, so that the points will all touch a straight-edged rule without showing a variation of 100th part of an inch. Besides this there should be just enough set in the teeth to cut a kerf as narrow as it can be made, and at the same time allow the blade to work freely without pinching. On the contrary, the kerf must not be so wide as to permit the blade to rattle when in motion. The very points of the teeth do the cutting. If one tooth is a twentieth of an inch longer than two or three on each side of it, the long tooth will be required to do so much more cutting than it should, that the sawing cannot be done well. Hence the saw goes jumping along, working hard and cutting slowly. If one tooth is longer than those on either side of it, the short ones do not cut, although the points may be sharp. When putting a cross-cut saw in order, it will pay well to dress the points with an old file, and afterwards sharpen them with a fine whetstone. Much mechanical skill is requisite to put a saw in prime order. One careless thrust with a file will shorten the point of a tooth so much that it will be utterly useless, so far as cutting is concerned. The teeth should be set with much care, and the filing should be done with great accuracy. If the teeth are uneven at the points a large flat file should be secured to a block of wood in such a manner that the very points only may be jointed, so that the cutting edge of the same may be in a complete line or circle. Every tooth should cut a little as the saw is worked. The teeth of a handsaw, for all sorts of work, should be filed fleaming, or at an angle on the front edge, while the back edges may be filed fleaming or square across the blade. The best way to file a circular saw for cutting wood across the grain is to dress every fifth tooth square across and about one-twentieth of an inch shorter than the others, which should be filed fleaming at an angle of about 40°.

Spontaneous Combustion of Wood.—The *American Journal of Science* gives a remarkable instance of the spontaneous combustion of wood. A Mr. Adam Reigart, two years previous to the occurrence, received a piece of wood, supposed to be cedar, detached from a large piece dug up 39 ft. below the surface, near Lancaster, Penn. The piece weighed a few ounces, and it was broken in two and laid upon a white pine shelf in Mr. Reigart's counting room. About four days before the discovery of the fire he had occasion to wipe the dust from the shelf and from the piece of cedar, with a wet cloth. Three days after it was discovered that the piece of wood had ignited and combustion was proceeding so rapidly that in a few minutes the shelf would have been on fire. Probably another prolific source of our forest fires is to be sought in the liability of decayed wood, not only to spontaneous combustion, but from the direct rays of the sun. At Winchester, Conn., some years since some workmen, about 2 P. M., on August 5, discovered smoke arising from a barren upland. The sun was excessively hot at the time. When they went to seek the origin of the smoke they found that the remains of an old decayed hemlock log had burst into a blaze, and were burning fiercely.

An Electric Watch.—A watchmaker at Copenhagen, of the name of Sonderberg, is reported to have made a watch which requires no winding up, inasmuch as it performs that work itself by means of an electric current. An electric magnet fixed inside the watch keeps the spring perpetually in a state of tension. All that is required to keep the watch running is to preserve the battery in proper working order, for which purpose one or two inspections in a twelve-month are said to be sufficient.