ICE-PERIOD IN AMERICA.

The last number of *The Atlantic Monthly* contains an article by Prof. Agassiz on the glacial epoch in America. Remains of tropical plants and animals found in the rocks of the polar regions prove that at one time the heat of the tropics extended over the whole globe, but at a period long subsequent to this —long even as geologists reckon time—the temperate zones of the earth were far colder than they are at present. The glacial epoch was next to the last before the advent of man, while it was preceded by forty-one others that have been examined and named, and perhaps each of these was as long in duration as itself.

In his article in the *Atlantic* Agassiz presents the proof that at the glacial epoch the continent of North America, as far south as the Ohio river in its middle portion, was covered with a mass of ice six thousand feet in thickness. This vast field of ice was constantly moving southward, with a slow motion, but with irresistible power, crushing the rocks, grinding down the hills, plowing furrows through the ledges, and covering the continent with a confused mixture of sand, gravel, and boulders.

This burying of the continent in ice to the depth of more than a mile, destroyed, of course, all life, both animal and vegetable, and through long ages the solitude and desolation of an Arctic winter prevailed over the land. After a time the returning warmth of the earth melted away the ice, and the retreating glacier was slowly followed by springing plants, and by swarms of insects, birds, and quadrupeds.

Agassiz thus presents the evidence of the glacier's thickness, extent, and use:—

"The slopes of the Alleghany range, wherever they have been examined, are glacier-worn to the very top, with the exception of a few points; but these points are sufficient to give us data for the comparison. Mount Washington, for instance, is over six thousand feet high, and the rough unpolished surface of its summit, covered with loose fragments, just below the level of which glacier-marks come to an end, tells us that it lifted its head alone above the desolate waste of ice and snow. In this region, then, the thickness of the sheet cannot have been much less than six thousand feet, and this is in keeping with the same kind of evidence in other parts of the country; for, wherever the mountains are much below six thousand feet, the ice seems to have passed directly over them, while the few peaks rising to that hight are left untouched. And while we can thus sink our plummet from the summit to the base of Mount Washington and measure the thickness of the mass of ice, we have a no less accurate indication of its extension in the undulating line marking the southern termination of the drift. I have shown that the moraines mark the oscillations of the glaciers in Europe. Where such accumulations of loose materials took place at its terminus, there we know the glacier must have held its ground long enough to allow time for the collection of these *debris*. In the same way we may trace the southern border of our ancient ice-sheet on this continent by the limit of the boulders; beyond that line it evidently did not advance as a solid mass, since it ceased to transport the heavier materials. But as soon as the outskirts of the ice began to yield and to flow off as water, the lighter portions of the drift were swept outward; and hence we find a sheet of finer drift-deposit, sand and gravel more or less distinctly stratified, carried to greater or less distances, and fading into the Southern States, where it mingles with the most recent river-deposits.

"One naturally asks, What was the use of this great engine set at work ages ago to grind, furrow, and knead over, as it were, the surface of the earth? We have our answer in the fertile soil which spreads over the temperate regions of the globe. The glacier was God's great plow; and when the ice vanished from the face of the land, it left it prepared for the hand of the husbandman. The hard surface of the rocks was ground to powder, the elements of the soil were mingled in fair proportions, granite was carried into the lime regions, lime was mingled with the more arid and unproductive granite districts, and a soil was prepared fit for the agricultural uses of man. Therefore I think we may believe that God did not shroud the world He had made in snow and ice without a purpose, and that this, like many other operations of His providence, seemingly destructive and chaotic in its first effects, is nevertheless a work of beneficence and order."

BORING TOOLS.

NUMBER 1.

There are two specific classes of tools for cutting metals. These are roughing and finishing tools. Others for different purposes, such as scraping, forming by pressure, and manifold uses, cannot properly be included under the head of cutting tools. To simplify this article we have considered the machinist's boring tools as divided into two kinds only, those for roughing and those for finishing.

A small hole can be more quickly made with a good drill than any other instrument, but this tool is only available for ordinary work. When we come to more exact and complicated jobs, the lathe must be used instead of the drill machine, and the boring tool, in one form or another, supplant the drill. With all roughing tools the object is to remove as much iron as possible in the shortest space of time with economy. The question of economy is not confined to merely driving the tool through the hole quickly, but also relates to the number of times the workman is obliged to go to the stone to renew the edge, or to the tool-dresser to have the same drawn down or tempered. If it be admitted that the fibers of wrought-iron, or the crystals of cast metals, must be cut and not abraded in working them, it is evident that there is but one mechanical power that will do this. That one is the wedge. To the wedge then is due all of the credit in accomplishing the object in question, but on the workman rests the responsibility of so placing the wedge that it will work to the best advantage. In this point lies all the difference between a good and a bad tool. This assertion must be strengthened by the supposition that the quality of the steel of both tools is the same and the workmanship identical in all other respects than the shape of the cutting edges. In one position the wedge cleaves particles asunder, in another it abrades, or does its work by scraping. These qualities are shown in the annexed diagrams, Figs. 1 and 2. It is not claimed as any original discovery of our own, but is only presented as a palpable and acknowledged truth among good mechanics.

Fig. 1

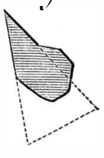
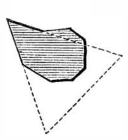


Fig. 2



In Fig. 1 we have a mere sectional elevation of a common boring tool. The dotted lines show the direction of the acute end of the wedge; Fig. 2 is a scraping-boring tool, which also shows the application of the principle alluded to. Very often the improper application or construction of boring tools makes the hole bored out taper, or small on the back end. The unskillful workman charges the lathe with the difficulty when the fault is often his own. A good boring tool will cut free, soft metal just as well inside of the hole as a turning tool properly made will out of it, but there are very many who are content to look on and see a boring tool grate a few miserable scraps of iron out of a hole. The process bears the same relation to cutting that rasping on a grater does to shaving with a razor.

Fig. 3

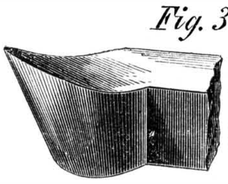
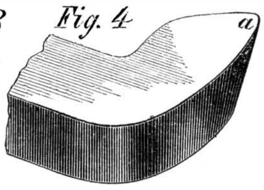
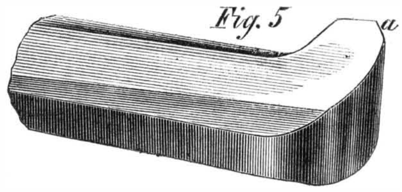


Fig. 4



Of these tools—respectively Figs. 3, 4, and 5, the mechanic will readily select the one which will cut the best, and on all metals, except brass, do the most work. The round, acute, sloping-edge draws into the work, instead of springing from it, and holds on to the metal, producing in wrought-iron and tough brass, long curling chips that leave the tool with but little heat or compression. Some workmen we are sorry to say, are so shiftless, or indifferent, that they would take the badly-made tool in preference to the proper one' Fig. 3. If a man be judged by the company he keeps a machinist may be rated by the character of his tools, and his work will show faithfully whether they be of a proper or improper shape. The shank of Fig. 3 is made square or as nearly so as possible. In that form it is stiffer than in any other, and the only rounded part of it is the angle furthest from the edge. This is rounded to clear the work, for sometimes when a boring tool rubs at this point the cutting edge is forced in, the size enlarged, and the job spoiled. This is not the case with the other tool, Fig. 5. It is one of a class in common use and is not well adapted to the work required of it. An angle at the cutting edge (as at *a*), tends to force the tool off its cut, and to make the hole taper, as explained in a previous paragraph. The strength of the shank is lessened by being made octagonal, and the clearance in front is so slight that the tool often rubs at this point and produces a bad surface. The chips from it are stiff and corrugated and look as if they were (as they are), ground out instead of being cut, and the whole form is objectionable. How much pleasanter it is to work with a tool like that shown in Figs. 3 and 4; to have it well tempered, dressed and sharpened, and to drive it through the hole as fast as the nature of the work will allow it to go!

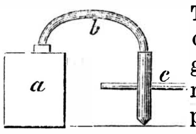
Fig. 5



A STEAM ENGINE FOR THIRTY-ONE CENTS.

One of our learned professors tells us that when he was a boy he made a working steam engine at an expense of thirty-one cents, and perhaps some of our young readers would like to know how it was done.

He took an empty powder canister, *a*, and inserting a perforated cork into the opening, pressed the end of a small lead pipe, *b*, into the hole in the cork. The lead pipe terminated at the opposite end in a Barker-mill engine, *c*. The construction of this mill by a tinman was the principal cost of the machine. It was made by soldering a horizontal tube across a vertical tube so that the interiors of the two were in open communication with each other; the ends of the tubes being closed. The lower end of the vertical tube terminated in a conical step, and where the pipe entered at the upper end it was surrounded by tow or picked rope, stuffed in steam-tight and greased so that the tube could revolve with little friction. A minute opening was made in the side of each arm of the horizontal tube near the end—the holes being in opposite sides. The canister was nearly filled with hot water before the cork was inserted, and when the water was made to boil by placing a lamp under it, the engine revolved with great velocity.



A mill like this might be made to turn a spit or to grind coffee. A saw mill in this city was driven nearly twenty years by a mill of this form, though constructed, of course, of more substantial materials.

SURGICAL INSTRUMENTS CONSTRUCTED OF ALUMINUM BRONZE.—M. Morel-Lavalle has recently made a very favorable report to the Paris Society of Surgery upon a pocket-case of instruments fabricated by MM. Robert & Collin of aluminum bronze, consisting of ninety-five parts of copper and five of aluminum. All the instruments except the blades are made of this material, and they may advantageously replace silver in many cases, and in others iron or even steel. The alloy is not oxidizable, and preserves its brightness amidst the various agents it is brought in contact with in daily practice.

A SMALL CRAFT.—The brig *Vision*, the smallest craft that ever attempted to cross the ocean, sailed on the 26th of June for Liverpool. The dimensions of the vessel are: length of keel, 15 feet; breadth of beam, 4 feet 6 inches; depth of hold, 2 feet 6 inches,