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(Illustrated articles are marked with an asterisk.)

THE USE AND CARE OF EDGE TOOLS.

It is said that Yankees are the most inveterate whittlers in existence, and we once heard one of our Yankee friends remark that the most valued and indispensable of his personal possessions were a pocket knife, pocket comb, and watch, with true national or natural instinct placing the knife at the head of the inventory. We say "national" instinct, because no American thinks of going without his pocket knife, which is to him a *vade mecum*, applicable to a hundred purposes and continually in demand. Yet comparatively few who consider the pocket knife a necessary adjunct seem to understand its care. It is seldom one can borrow a sharp knife from an acquaintance. It is either left as it came from the manufacturer, or has its edge rounded so its cross section is a conical wedge, or it is abraded to tenuity by the action of the coarse stone of the street grinder's machine, one of the most ruinous contrivances for sharpening knives or razors. But beside the neglect of the edge of a knife blade, the heel, which acts on the back spring, and the rivet in which the blade turns are seldom oiled, and it requires an effort not only to open a blade but also to close it.

As the pocket knife comes from the manufactory or store its edge is unfit for use; it may cut butter or cheese, possibly soft wood, but it will not pare finger nails nor sharpen lead pencils. It needs the hone and strop to produce an effective edge. And in the proper use of the hone or oil stone many are quite ignorant. First, nothing but a good oil stone is fit for sharpening a knife blade. Ordinary "whet stones," mere sand stones to be used with water, or dry, are too coarse; they are but fixed grindstones and rapidly abrade the substance of the blade without giving it an edge. The Turkish oil stone is greatly affected by some, but it is quite hard, and fit only for giving the finishing touch to very delicate tools. The Wachita, or Ouachita stone we prefer for pocket knives and for ordinary tools. The philosophy of whetting or honing is a gradual and mutual abrasion of the particles of the stone with those of the steel. The oil, with its glutinous quality, holds these commingled particles so that by the movement of the blade they act on the steel and abrade it very gradually. If the stone is too hard it quickly glazes and the blade slips over a perfectly smooth surface, producing no action on the hardened steel; if too soft, the stone allows the edge of the blade to disintegrate its surface and heap up a ridge of quartz-like or flinty particles, which produce a round or "stunt" edge, that in time must be removed by the action of the grindstone. One accustomed to sharpening knife blades can easily tell when the operation of honing is going on properly, and only experience can fully teach the process. There should be a certain feeling of resistance in the operation. The motion for whetting or honing should be circular; not as in stropping a razor, merely back and forth. The educated fingers will readily feel when the blade bears properly on the surface of the stone, and will guard against the mere abrasion of the back and the cutting in of the edge. This art can be only acquired by practice.

Few can hone a razor. Some barbers have the happy faculty, but generally it is an art little understood. The stone should be a fine Turkish stone perfectly clean and the oil used should be purified porpoise or nice sperm oil; pure olive oil is good. The blade of a razor is concave. The wedge like edge extends in its bevel but a little way back. In honing a razor the fingers should feel the back as well as the edge of the blade bearing; the back protects the edge. The motion should be the same as in honing a knife blade, circular. Few can hone a razor properly on the first trial.

In stropping razors most people fail. They will use a too yielding medium which rises suddenly as the edge passes over it and undoes what has just been done. Many turn the razor or knife blade on its edge. Unless the blade is lifted clear from the strop, just before turning, the tendency is to strop off the edge already on. A blade should be drawn from heel to point, starting at the heel and drawing it diagonally to the point, and should be always turned on its back.

Oil stones, as seen in the shops, are frequently worn concave. It is unnecessary to say that stones in this form will not produce a true edge. If the workman has not acquired skill enough to wear the stone evenly, as much at the ends as in the middle, he should occasionally grind the oil stone and reduce its surface to a level.

In the machine shop and the carpenter's shop—wherever edge tools are used—the oil stone is invaluable. It should, however, be used with discretion. If the tool is soft a short bevel should be given to the edge; if hard, it will stand a very thin edge, but the practice of producing a temporary edge by honing or whetting will not give even the best present result, and will necessitate a frequent resort to the grindstone, the office of which is only preparatory to the production of a good cutting edge.

The use of rapidly abrading substances, as fine quartz, emery, etc., is ruinous to good tools; and the continual employment of the grindstone not less so; while a judicious use of a good oil stone will keep tools in order until they are almost worn out.

START RIGHT.

In the construction of newly invented machines there is difficulty found very often in the practical application of theory. Theory generally takes in the most important principles, but it is rare that it includes all of the minor details. Delays and disappointments are the results of these deficiencies. To avoid these evils entirely is perhaps too much to expect, nor would we be so bold as to assert that it is possible so to avoid them; but by a proper method of proceeding they may be greatly lessened, and the progress of the work proportionably facilitated.

We will here give what we think to be the best mode of working out a new mechanical idea, premising that the remarks we shall make upon the subject are intended for those of our readers who are novices in invention, and to whom they may be found the means of smoothing the path which has proved to so many a path beset with thorns.

After due consideration to the general principles which underlie a new invention, and where the subject will admit of it, a mathematical demonstration of their truth, or (if that should be through the want of educational qualifications, or from the nature of the case impracticable), an experimental demonstration of them; the machine should be drawn to scale. In this drawing all the parts should be represented in section and in elevation. If the inventor has not sufficient skill to do this accurately for himself, he should make a sketch of his invention and employ a good mechanical draftsman to do it for him. The drawing of a new device accurately to scale, will generally disclose most of the practical difficulties which will be met with in applying theory to practice. If any doubt exists in the mind as to difficulty in making any adjustment for want of space in any of the parts, full allowance should be made for it in the drawing, as it will be found much better to have a little room to spare than not to have enough.

The next step is the making of the patterns, and here the experience of a good pattern maker will be found necessary, if the castings are of complicated form, more especially if they necessitate the use of cores. Very few persons not accustomed to this kind of work would be likely to make patterns which would be of any service; they would probably be totally worthless.

After the castings are obtained the machine should be finished in a workmanlike manner. If it is intended to do work that requires nicety of movement, a rude construction will only prove a useless expenditure of time and money. The expression, "It will do well enough to test the principle," is often heard from young inventors, but the truth is, more frequently, that it will *not* do well enough, and the work has all to be done over again, because of the unsatisfactory nature of the test. In all machines built for the purpose of testing a theory, it will be found to be the most economical to have the work done from the outset in the most complete manner.

These remarks are applicable to those inventions which require a working model to prove their value, and as the most important and difficult inventions are of that class, it is in their construction that an attention to the method of proceeding which we have described will be found of the greatest benefit. We assure such as are making their first efforts in invention, that we have learned the lesson we here inculcate in the "dear school of experience," and that although it may cost more in the first instance to do the work well, in the end the great economy of the course will be fully apparent.

PRESERVATION AND RESTORATION OF PAINTINGS.

Many of the finest of the old paintings were executed on panels of wood. Wood is a perishable material, and as a consequence it became in years worm eaten, or rotten, threatening the destruction of the picture, which, of course, was but a coat of paint, more or less thick, on the wood. How to preserve the painting while removing its rotten base appeared to be a problem hardly susceptible of solution; but the ingenuity of man has triumphed over what would seem to be an almost insuperable obstacle. Modern paintings are on linen canvas, almost indestructible by the lapse of time and ordinary contingencies, except from intended violence or accident. The linen wrappings of mummies, some of them over 3,000 years old, are found of good texture and sound, and the use of linen will probably be a means of preserving our modern paintings in a more perfect state for the admiration and interest of our posterity.

Paintings may be copied by skillful artists by the square inch, but if the copy is done by another hand than that of the artist himself, it loses somewhat of its original force and character; and even the painter cannot always reproduce indefinitely his original painting so that the life and freshness of the first picture shall be found in the copies. This may appear to be hardly credible, but it is an acknowledged fact well known to artists, and it will hardly appear to be strange when we consider how difficult it is for the mechanic to duplicate a machine, making it in all respects precisely like another, even with the aid of exact gages and the almost perfect operation of tools specially designed for the purpose.

The preservation, then, of original paintings becomes a matter of great consequence. When painted on panels the operation of removing the back and substituting another, either of wood or canvas, is perfectly feasible and is largely practiced by experts. It consists of securing the painting, face downward, on a table and planing the wooden back down to as near the paint as is safe, then carefully scraping with suitable tools until the paint itself is reached. When the wood is completely removed there remains a coat of paint, which is the priming and the superstrata, together forming the painting proper. A sheet of canvas, or, if preferred, a a backing of wood, is prepared with some adhesive cement and carefully placed on the back of the painting, pressed to place, and allowed to dry perfectly before the picture is lifted from its position. This process is, of course, a work of time, requiring skill, patience, and good judgment. In this country we believe it is not practiced to any great extent, but in Europe it is quite a business, and is very successfully practiced in several of the art centers of the old world.

SUAVITER IN MODO.

"Would it not have been more prudent, as well as more becoming, to have left to our readers the task of forming their own judgments upon the evidence on both sides brought before them in the course of this discussion?"

The passage which we here quote is taken from the close of an article by David Forbes, F. R. S., it being one of a series discussing "Some Points in Chemical Geology," which have been published in late numbers of *The Chemical News*. It is a caustic though we must consider it, when we take into consideration the provocations under which it was written, a very patient reply to a paper contributed to the February No. of the *Geological Magazine*, by Dr. Sterry Hunt, and also a review of Dr. Hunt's system of Chemical Geology.

Without intending to here enter into the merits of the discussion, we have thought as we have followed it during its progress, with a pleasure which has been marred by its frequent discourtesies, that other instruction might be drawn from it than was intended by either of the disputants, and the pithy words with which we have chosen to begin this article, seemed to us an excellent text from which to indite a short homily to all public or private disputants.

One of the very first of modern English essayists is Matthew Arnold, and although he has been attacked, and his opinions have been made a mark for the shafts of keenest satire, it is absolutely refreshing to witness the good humor with which he defends himself, and the modest and courteous language in which he refers to, and characterizes the opinions of his opponents. With what weapon can the armor of such a man be pierced? The vituperation and the ill natured personalities in which too many are prone to indulge, fall upon his unruffled temper like rain upon the plumage of a water fowl. It does not even create temporary discomfort, much less wound. Mr. Arnold's method of conducting a discussion is all the more admirable because it presents such a striking contrast to that which we are so often pained to notice. If the sole object of discussion is not to arrive at truth, and by comparison of views to ascertain error, it had better be avoided altogether; and no discussion should be made public which does not contain elements of instruction. Those then who assume the character of public disputants may be fairly supposed to believe that the views which they set forth are such as will throw light upon obscure points, or otherwise instruct and improve those who peruse, or listen to their arguments. They are then public teachers, and should remember that it is no part of the duty of an instructor to mix with good mental food, the bitter and nauseating gall of personal spite and animadversion.

The annals of science are, alas! too often stained with such bickerings. The scalpel of ridicule, and the microscopical examination and exposition of personal character, are too apt to usurp the place of calm investigation, and dispassionate interchange of ideas. Who can remember without pain the bitter contentions of Newton and Halley, with Flamsteed; or other instances which might be mentioned of later date but no less intense in their bitterness, which have been and will remain a disgrace to the cause of science. All earnest seekers after truth are, and should regard themselves as the children of one family, and should remember that charity and humility are not more becoming than they are conducive to the progress of sound science and learning.

We have observed with pain the eagerness with which scientific periodicals seize upon trivial salient points, in the pages of their cotemporaries, to make invidious comparisons and to charge upon them ignorance and inefficiency. To such the quotation above cited is applicable. Is it truth we seek, or self-aggrandizement at the expense of others' mishaps? Are there not enough means at hand to display our wisdom, without laboring to prove that others are ignoramuses? If we answer these questions affirmatively, let us