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ALUMINUM—A FIELD FOR SCIENTIFIC EFFORT.

The comparatively new metal, aluminum and its alloys, which have lately attracted considerable attention and awakened some curiosity, seem to afford a promising field for the investigations and experiments of scientific men and inventors. It is singular that since its discovery, as a metallic oxide existing in aluminous earths, no cheap and rapid method of extracting it has been discovered. All clays contain it, some in a less pure state than others, but all in large proportions; in fact it forms the basis of clay. It might be supposed that chemical science, aided by mechanical ingenuity, might, before this, have found a means of producing this metal in unlimited quantities and at a low cost. The process, however, of its extraction is somewhat complicated and quite expensive. Its cost, at present, confines its use to small articles and the purposes of ornamentation. Some of its alloys make it a substitute for silver and gold, to the former of which it is superior in several respects. It is not affected by air containing sulphur; pure, it is whiter than silver and is capable of as high a polish; it is very ductile and malleable, and its tenacity is wonderful. But, perhaps, its most remarkakle quality is its elasticity. When wrought by the hammer rollers, or in any other manner, and fashioned into a hollow vessel it will withstand violent blows which would permanently indent other metals.

Cryolite a species of clay found abundantly in Greenland and also in the Ural, is preferred as a material for the extraction of alumina. It is a compound of sodium, fluorine, and aluminum. In its color it is snow white. It is not unjustly called native fluoride of aluminum, and contains thirteen per cent of metallic aluminum. Fluor spar is frequently employed in combination with cryolite, for the purposes of reduction, because of its value as a flux. The emerald, the topaz, and some other valuable stones contain a large percentage of aluminum or aluminous oxide, and the metal, aluminum has been extracted from the emerald, ruby, garnet, topaz and from corundum. Of course such scientific experiments are costly, and cannot, in themselves be of immediate practical advantage; yet it would seem that so valuable a metal as aluminum distributed (in the form of an oxide) more generally and plentifully over the globe than iron is, might be procured with no greater expenditure of labor, time, and money than iron. The fact of its being presented only in the form of an oxide need not militate against its reduction from its matrix in a metallic form. Some of the best of iron—that cheapest, but most valuable of metals—is produced from its oxide. To be sure, we cannot apply the same crude means to the reduction of aluminum from its base, mother clay, that we can use in the reduction of iron; and this is just where scientific knowledge and practical talent is needed. We want the metal; the exigences of the times demand its general use. It will readily combine with other metals, as copper iron, gold, etc., and with them forms very valuable alloys. With iron three parts, and aluminum one part, the composition will not oxidize when exposed to moisture; with copper, ninety, and aluminum ten, a beautiful metal is produced, harder than the best bronze, whiter than copper and capable of being wrought under the hammer. One part of aluminum, to one hundred parts of gold, gives a fine greenish gold color, more agreeable to the eye than that of gold, and much harder. Some of these qualities seem to recommend this metal or its alloys as a material for minting, and others stamp it as of vast value in the arts.

What we now need is its production in sufficient quantities and cheap enough to be employed in the arts.

THE VALUE AND USES OF WORN-OUT FILES.

Although the invention and use of machines for finishing work in metals has, to a large extent, superseded the employment of files, it is difficult to believe the day will ever come when the file will cease to be an important tool to the metal worker. We have planing machines, shaping machines, milling machines, and their adaptations, which do a large proportion of the work formerly performed through the medium of the cold chisel and file, directed by the expertness and skill gained by long experience; but still the file is one of the most necessary and valuable tools of the machine shop. Numerous attempts have been made to cut files by machinery, and we understand some of the later have been successful, but have had no opportunity to test the correctness of the statement. Generally, however, files are cut entirely by hand, and the skill required in their production affords one of the most beautiful illustrations of the capacity of the workman to reproduce indefinitely the results of acquired experience.

But "what shall I do with my worn-out files? shall I have them re-cut? will it pay?" asks one of our correspondents. During an experience of fifteen years we had many opportunities to solve this question. Over and over again we sent our old, unbroken, files to be recut, with the assurance, each time, that they would last nearly as long as new, but each trial confirmed the conviction that it was all "vexation of spirit." If there is any annoyance more aggravating to the machinist than another, it is a file that fails him when engaged on a nice job. It requires some little time for the hand of the workman to become habituated to a new file, and to have it break or refuse to cut just when his whole mind is intent upon his work, is very vexatious. We never yet used a re-cut file with any satisfaction. If one can be re-cut to give good after service, it must be a heavy finishing file, the teeth of which are fine, and the stock of which is sufficient to withstand the manipulation necessary to reproduce it. We have little faith in re-cut files; they are tender, apt to break, quickly worn, and altogether unprofitable.

Yet old files have a use. They make excellent hand turning tools. For this purpose the end merely has to be ground to the proper shape. Probably to the hand-tool turner no implement is susceptible of a greater variety of adaptations than a turning tool made from a triangular or three-cornered file, while the flat files make superior chisels for finishing plain work, and the square file becomes both a roughing and finishing tool. Old files make good scrapers. For this purpose they must, sometimes, be partially forged, enough to turn their ends at an angle to the file. In this case—and in all others where files are subjected to the action of the hammer—the portion to be forged should be ground until every mark of the teeth is obliterated. No matter how careful the heating and the hammering, if a vestige of the teeth is left the result will be a weak place, a "cold shut," or a crack in the tool. It is useless to attempt to forge a good tool, as a cold chisel or turning tool, from an old file, unless the teeth of the file and their marks are all obliterated by the grindstone; the indentations seem to enlarge and expand by the heat and show themselves in serious fractures at the most inappropriate time.

Treated in this way, old files may be wrought into dies for screw cutting, punches, small cold chisels, keys, and many other articles and appliances continually needed in the shop. The work of grinding can employ the leisure hours of apprentices, and if judiciously performed, it will, at the same time, tend to true the face of the grindstone. Any of these ways of utilizing old files we believe to be preferable to the mistaken economy of paying for their re-cutting and worrying over their unsatisfactory after performance.

IMPORTANCE OF STUDYING CAUSE AND EFFECT.—A HINT TO INVENTORS.

A very large proportion of the time, labor, and money usually spent in perfecting new inventions is often needlessly expended in the trial of experiments to determine facts which should be determined without any experiment at all. We have in mind two remarkable instances of this kind, which have come under our own observation. One was the attempted construction of an air gas light machine, in which the object to be attained was the supplying of the material (gasoline) to a reservoir in which revolved a device for charging the air with the vapor of the fluid. The condition to be observed was, that a given level of the fluid in the reservoir was to be maintained. To do this a second reservoir of the fluid was placed over the first, communicating with it by means of a tube passing from the lower part of the upper reservoir, and opening into the lower reservoir at the precise point at which the level was to be maintained. The upper reservoir was filled at the top, the communication between the two chambers being meanwhile interrupted by a stopcock, and when filled, securely seated by a stopper screwed down upon a washer of leather. It was expected that this arrangement would operate as follows: When the fluid in the lower chamber was exhausted, so as to uncover the mouth of the tube, a bubble of air would pass into it, and rising to the upper reservoir, displace a small portion of the fluid, and this operation repeated would produce the required result.

Now had the fluid been glycerin, or sperm oil, or any other non-volatile substance, the result anticipated would have been attained; but the gasoline volatilized so rapidly in warm weather, that the fluid was forced entirely out of the upper reservoir when the stopcock in the tube was left open, a result which should have been foreseen, and which was predicted by us before the apparatus was set in operation.

Even at this stage the radical fault of the device was not discovered, but the inventor strove to overcome the difficulty by the use of siphons, tubes bent in the form of the letter S, etc.

The faults of this inventor are not, we are sorry to say, rare ones. They were his imperfect knowledge of the material with which he had to deal, and his tinkering when he should have been thinking, and searching for the information which he lacked. How much time and money have been thus wasted upon the futile attempt to construct the so-called perpetual motion! And have we not heard somewhere of a man who was to revolutionize ideas of motive power by pumping water with a diminutive steam engine upon a gigantic overshot wheel? Yes, we have not only heard of that individual, but have seen him expending his money, regardless of the warnings of those who saw and realized his folly, until a reasonable competence, which he had accumulated through a steady and industrious life, had melted away, and left him a poverty-stricken and disappointed old age. This individual is by no means a natural fool. He is capable of attaining and applying knowledge. He failed in that he substituted tinkering for thinking, and supposed himself competent to force nature to yield him obedience, without a knowledge of her mysteries. The folly of this man forms the second instance of useless and vain experiment above alluded to.

He only need expect to avoid such follies who thoroughly informs himself in regard to what has been done in the particular department to which his proposed improvement belongs; who can distinguish principles, and avoid confounding them with mechanical details; and who has mastered the philosophy of all the natural phenomena with which he has to deal. To such a man, speedy and sure success will be the reward of his efforts, or the speedy and not valueless knowledge that success is, from the nature of the case, impossible.

GREAT REDUCTION IN COST OF FOREIGN PATENTS.

The increasing disposition on the part of American inventors to secure their inventions abroad, has induced us to reduce our fees for obtaining patents in all foreign countries to the lowest maximum price. Hereafter we shall solicit patents in England, France, Belgium, Prussia, Austria, Spain, Cuba, Russia, Saxony, Norway and Sweden, Australia, and in every other country which has patent laws, at greatly reduced prices, making our terms most favorable to the inventor. We have agencies established among the oldest and most reliable foreign solicitors, with some of whom we have had business relations for nearly a quarter of a century.

It is important to the owners, that patents in foreign countries be solicited through some old established and well known agency. We have known parties to meet with great discouragement in trying to introduce their inventions in England, from the fact that the patent was solicited through obscure agents unknown to the manufacturers. The English people are very peculiar in this respect, and on the continent the same prejudice exists against patents not obtained through well established houses.

We have in press, which will be issued in June, a comprehensive work on the patent laws of all countries. A pamphlet on foreign patents with terms for obtaining them, may be had by addressing this office.

ETCHING GLASS—ONE OF THE USES OF FLUOR SPAR.

The mineral known as fluor spar or Derbyshire spar from Castleton, Derbyshire, England, where it is found in large quantities, is largely employed in the form of fluorine or hydrofluoric acid, for the ornamental etching of glass. The acid is obtained by heating the fluor spar, coarsely pounded, with sulphuric acid in a leaden vessel; glass will not do, as the acid acts powerfully on that substance. Glass to be operated upon is coated with beeswax, or a resisting substance of which beeswax is the principal component. By means of a pointed instrument, as a needle, the design is sketched so as to expose the glass where the lines have been made. A mixture of spar and sulphuric acid is placed in a leaden tray and the glass with the side on which the design is sketched suspended over the mixture, when a gentle heat, as that from a spirit lamp, is applied to the under side of the tray. The vapor of the combined acid and mineral rises and attacks the glass, producing in a short time the design with as much delicacy and distinctness as could be done with the glass cutter's wheel. If desired, the figures or tracery may be left bright and the ground etched, simply by sketching with a camel's hair pencil, dipped in melted wax, the pattern or design on the glass. The effect is very fine.

This mineral is quite extensively manufactured into articles of use and ornament, it being readily wrought in the lathe by skilled workmen. Very handsome specimens of cups, vases, boxes, etc., are produced from the Derbyshire spar, which is frequently found of a rich blue, green, red, or purple color. The pure white variety is found in large quantities in Hardin county, Ill., and in other localities in this country, the colored specimens are quite plentiful.

"THE WHEEL."

Our readers are aware that we design shortly to print, under the title of "THE WHEEL," such new or surplus correspondence on the Wheel-question as the writers desire to place in print at their own expense. The new publication will be issued May 15th, in handsome magazine style, price 25 cents. In addition to the above correspondence, "THE WHEEL" will contain a large amount of other valuable scientific matter. For example, among its contents will be found the whole of the recent splendid series of lectures by Prof. John Tyndall, upon "HEAT AND COLD," profusely illustrated. These lectures are replete with rare and instructive information, given in most attractive style. To lovers of