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Contents:

(Illustrated articles are marked with an asterisk.)

UTILIZATION OF WASTE.

The man who first used the word "waste" as a designation for the residues that accumulate in many industrial processes, would probably have bethought himself of some more appropriate appellation if he had been able to foresee the many and various uses to which they are now applied, and the importance which they have attained in the community. Let us cite a few examples.

The refuse ore which formerly used to obstruct the entrance to some German mines, to the great annoyance and disgust of the workmen, who considered themselves haunted by evil spirits, have become highly valuable since it was discovered that they contain metals so important as nickel and cobalt. The liquor which the manufacturers of soap formerly allowed to run off as useless, is the only source from which we derive the all-important glycerin. The sulphuric acid which used to poison the atmosphere and to destroy vegetation in the neighborhood of the works devoted to the roasting of sulphurets, is now carefully saved and converted into sulphuric acid. The "soda waste," which was permitted to accumulate in mountains in the respective factories, is now made to yield quite a number of useful products, such as sulphur, hyposulphite of soda, and others. We might continue to almost any length the enumeration of such articles, that are manufactured out of materials which were formerly rejected as useless, and the utilization of which has always enriched the fortunate discoverer, by lessening the cost of the principal article, and thus enabling him to drive competitors who were without this advantage out of the market.

What we want to impress upon the minds of our readers, and of all those concerned, is the certainty that in many instances still, products, solid, liquid, and gaseous, are wasted, permitted to escape with the atmosphere, to fill the sewers, or to decay out of doors, which would yield a rich reward to the man who would turn them to serve some useful purpose. The greatest success must be his who can, at the lowest price, make the most of any given article. Nothing ought to be thought too insignificant for consideration. Let us remember the example of Lafitte, who, by picking up a pin before the office of a banker who had rejected his services, laid the foundation for a fortune of millions. Who knows but what even the carbonic gas which we are now glad enough to get rid of by our chimneys, may hereafter be conveniently rendered useful in the economy of our households. We would, therefore, advise all manufacturers to let nothing leave their premises without examination and investigation; if you are unable to deal with the subject yourselves, consult some scientific expert with regard to it. Mines of gold, more reliable and more easily worked than those of California, may be nearer home than you imagine.

WROUGHT-IRON FENCES—SETTING IRON FENCE POSTS.

The first iron fence we ever saw was set up between fifty and sixty years ago. It was entirely of wrought iron and cost much labor and money. For many years only wrought iron was used in the construction of fences, railings, balustrades, etc., at least in this contry; and even now a neater, lighter, less costly, and more durable fence can be made of wrought iron than of cast iron. The latter may be made in more elaborate forms, but the fragile character of cast iron as compared with wrought iron makes the latter preferable in this climate. A very neat wrought-iron fence may be built by any blacksmith with but little forging. The lower and upper rails may be of flat bar iron three-eighths by one and a quarter inches, or heavier if desired. These should be drilled or punched with holes at equal distances apart, from two to four inches. Then take round iron and bend it in the form of an arch, either gothic or semi-circular, and pass the ends through the top and bottom rails, riveting the ends in the lower rail or furnishing each end with a nut.

When the sizes of the round iron vary and the arches are made concentric the effect is very fine. For instance; let the holes in the rails be made four inches apart and there be three arches; the outer one may be made of half-inch round iron, the span of the arch being twenty inches. The next may be made of seven-sixteenths or three-eighths iron, with a span of sixteen inches, and the inner arch of three-eighths or quarter inch iron with a span of four inches. The fence will be very neat and elegant. The arches may be bent cold and the holes may be drilled on a common foot lathe, so that the fence may be made and put up by any one without the aid of steam or water power. The posts are merely uprights of iron similar to the rails, and they are fastened into stone pedestals in the usual way, the fence being strengthened by diagonal braces at proper intervals.

Iron fences are usually set on stone foundations, although some have iron bases, which, when the posts are secured to the bases by bolts, appears to be fully equal if not superior to fences resting on stone foundations. Melted lead is commonly used to fasten the iron to the stone, and, so far as our experience and observation extend, is better than anything else. Brimstone cannot be tamped, and it is unhandy to use, as it cannot be remelted without becoming viscid and refusing to run freely. Beside, it will absorb moisture, and combining with the iron it deteriorates the latter rapidly. Nor is lead entirely harmless in contact with iron; atmospheric air or water will oxidize the iron. The only protection is a coat of paint to exclude all moisture.

A cheap, durable and effective cement for securing wrought and cast-iron work to stone would prove a fortune to its inventor.

POPULARIZE SCIENCE

The necessity of a knowledge of scientific principles for the workingman cannot be insisted upon too often and too urgently, for it is this knowledge alone which makes him really the master, instead of the slave, of the implements of his profession. But although this principle is now so universally recognized that it would be a mere waste of time to expatiate upon it at greater length, it is an undeniable fact that almost nothing is being done to put it into practice. The artisans and mechanics of Europe are in this respect, infinitely more favored than those of our own country, and if it is claimed as an offset, that the latter, as a class, are superior in intelligence to their continental brethren, it should be remembered that this is only one reason more for furnishing them the opportunities which shall enable them to maintain and perpetuate this superiority. In this large and wealthy metropolis there is only a single institution—the Cooper Institute—which reaches the classes alluded to and, excellent as it is, it can only accommodate those that live within a given distance from it, while a half dozen of similar institutions, scattered throughout the whole city, would hardly be adequate to supply the instruction which the masses are craving. But it must always be borne in mind that there is a class of men of mature age, who have outgrown the school-room, who cannot bind themselves to a regular attendance and who after the fatigue of a day's hard labor find it impossible to listen to lectures with enjoyment and substantial profit; and yet it is just there men to whom such knowledge is most necessary and indispensible. No one who has seen the *"Conservatoire des Arts et Metiers"* or similar institutions in Paris and the crowds of intelligent mechanics and artisans surging through these galleries during the hours set apart for the reception of the public, can fail to be struck with their immense utility, and if an American, with the void which in this respect exists in our own country. A museum is what is wanted, a collection of instruments and machines from the most simple to the most complicated, representing every variety of trade and manufacture, exhibiting all the latest improvements and open to the free inspection of all from morning till midnight. Lectures might be delivered at this establishment to explain the articles on exhibition, at a time which would render them convenient and agreeable to those who are expected to attend them. Of course, a long time would elapse before such an undertaking could be completed, but if a determined effort be made, it must succeed; and some of our wealthy philanthropists could perhaps be interested in the scheme by the consideration that such an establishment would do more toward dethroning King Whiskey, and improving the moral tone of the community than all other enterprises together which seek to improve men without offering them some attractive and useful way of spending their idle hours.

ALUMINUM BRONZE—ITS PROPERTIES AND USES.

The metal aluminum has certainly found its most useful application in the alloy known as aluminum bronze, a name perhaps somewhat inappropriately given, inasmuch as the term bronze has always been applied to compositions of copper, tin, and zinc. The alloy we propose to describe is composed of copper and aluminum in the proportion of 90 parts by weight of the former and 10 parts of the latter, or, when estimated by bulk, of 60 parts of the copper and 40 of aluminum. The color of the bronze closely resembles that of 18-carat gold, but is far superior in beauty to any gilding. Morin believes it to be a perfect chemical combination, as it exhibits, unlike the gun metal, a most complete homogeneousness, its preparation being also attended by a great development of heat, not seen in the manufacture of most other alloys. The specific gravity of this bronze is 7·7. It is malleable and ductile, may be forged cold as well as hot, but is not susceptible to rolling; it may, however, be drawn into tubes It is extremely tough and fibrous, which is proved by the fact that when drawn into wire it supports a weight more than three times that of the iron used for suspension bridges, and as to its elasticity, it is stated by Prof. Tresca that "the coefficient of elasticity of the aluminum bronze, the cast metal, is half that of the best wrought iron. This coefficient is double that of brass, and four times that of gun metal, under the same conditions."

Aluminum bronze, when exposed to the air, tarnishes less quickly than either silver, brass, or common bronze; and less of course, than iron or steel. The contact of fatty matters or the juice of fruits do not result in the production of any soluble metallic salt, which highly recommends it for various articles for table use. Prolonged contact of strong vinegar will undoubtedly exert some action, but then it must be remembered that even silver, under similar conditions, is also attacked.

The uses to which aluminum bronze is applicable are various. We have seen spoons, forks, knives, candlesticks, locks knobs, door handles, window fastenings, harness trimmings, and pistols, made from it; also objects of art, such as busts, statuettes, vases, and groups. In France aluminum bronze is used for the works of watches, as also watch chains and ornaments for ladies. The cost of these articles is less than that of the best plated ware, and the additional expense of replating is avoided. Its application to machinery would have been greater were its cost less, but for certain parts, such as journals of engines, lathe head boxes, pinions and running gear, it has proved itself superior to all other metals.

We have already referred in these columns to the fact that Hulot, director of the Imperial postage stamp manufactory in Paris, uses it in the construction of a punching machine. It is well known that the best edges of tempered steel be come very quickly blunted by paper. This is even more the case when the paper is coated with a solution of gum arabic and then dried, as in the instance of postage stamp sheets. The sheets are punched by a machine the upper part (head) of which moves vertically and is armed with 300 needles of tempered steel, sharpened in a right angle. At every blow of the machine, they pass through holes in the lower fixed piece which correspond with the needles and perforate five sheets at every blow. Hulot now substitutes this piece by aluminum bronze. Each machine makes daily 120,000 blows or 180,000,000 perforations, and it has been found that a cushion of the mentioned bronze was unaffected after some months use, while one of zinc bronze is useless after one day's work.

The time may not be far distant when it will become possible to construct the screws of steamers of this metal, of which the great strength and toughness will be considered more than equivalents for the increased cost. Yet even this latter may not be an objection, for aluminum bronze screws might be made for about one half the weight of those now in use.

ON FORGING, HARDENING, AND TEMPERING MILL PICKS.

Mr. Isaac B. Hymer, of Indiana says that his experience as a builder of French burr mills, and as a miller, for many years, has convinced him that the plan he has adopted and followed in forging and tempering mill picks, is excellent. He says:

In the first place, get double refined cast steel made expressly for mill picks. Be careful in drawing out the pick not to heat the steel higher than a cherry red. Use an anvil and hammer with smooth faces. When finishing the pick do not strike it on the edge, but hammer the pick on the flat side, striking light and often, until the steel is quite dark, letting the blows fall so as to close the pores of the steel. If the last blows strike the edge of the steel, the pick will fly and "spawl" off. When a dozen picks are ready to temper, get two gallons of rain water, from which the chill should be taken if in winter, by dipping a hot iron in it, add two pounds of salt, which dissolve, and your bath is complete. Heat your picks gradually from the center, and let the heat run to the point, and when it is a dark cherry red, dip the point of the pick vertically into the bath and hold it still, not moving it about to find a cool place. When the heat has left the part immersed, take it out and cool the balance of the pick in ordinary water used in the shop. This process should be repeated on the other end of the pick. When taken out of the tempering bath the pick will look silvery white. The use of the salt is to clean the scale from the steel and make it tough. With the edge made by this process the pick will cut clean, clear, and fine, such a cut as millers need for "cracking."

The whole secret is in the heating and hammering. If not hammered enough the steel will spawl off, and if heated too hot it will crumble.

DYNAMITE OR GIANT POWDER.—Prof. Nobel, of Hamburg, not entirely content with his former discovery, nitro-glycerin, has brought out another explosive, to which he has given the above name. Instead of being an oily liquid, liable to leak from the vessel in which it is confined, and produce a spontaneously inflammable mixture with rags, shavings, and other packing material, this powder resembles snuff in appearance, and in a loose, non-compressed condition, does not explode, but burns slowly with but little smoke, the latter an invaluable property in working closed mines or tunnels. A detonating cap is required to explode it. Late California papers contain accounts of the prodigious power of this powder, as shown in some experiments tried in that state. They recommend it highly as being vastly more explosive, and requiring much less drilling or preparation of the rock, than gunpowder.