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Contents:

(Illustrated articles are marked with an asterisk.)

HAND-TOOLING---ITS ADVANTAGES TO THE MACHINIST.

With the improvement in automatic or self-acting tools the acquirement of skill in manipulation has not preserved the importance to which it is justly entitled. The hand tool for turning does not preserve the high position which it formerly occupied, yet its use is exceeding valuable, and even necessary, in many instances. There is an extensive class of work in machine building on which it can be advantageously employed; yet we are not aware that in this country its use is generally taught as a part of the apprentice's education. It ranks next in importance to the file, and a machinist who can handle it with facility is always an important hand in a shop.

Curved and irregular forms, which must be turned, may be finished much more readily by the hand tool, if judiciously and properly used, than by the fixed lathe tool. For instance, common iron washers, which are placed under the head of a screw or a nut, may be turned and water polished by the hand tool very rapidly. We can hardly imagine any other method of finishing them. The washer is driven on an arbor with just sufficient force to retain it in place, then the arbor put upon the lathe centers, with a dog to engage with the face plate, and revolved as rapidly as a drill—almost as rapidly as a piece of wood to be turned. A diamond pointed tool, made from a triangular file, will speedily remove the scale, when another tool, used with water, will give a splendid finish, the washer so treated presenting an elegant appearance. So in "skinning" or lightly turning a small shaft or arbor the hand tool is invaluable; and in finishing out curves and bevels on a shaft.

The formers for brass musical instruments, which taper for much of their length and then expand by a gradual but varying curve into the "bell" can be more easily and rapidly finished to the gage by the hand tool than by any automatic lathe however perfect and complicated.

The heads of steam engine cylinders are often beaded and ornamented by projecting rings. No ordinary engine lathe with its fixed tool, however handy the operator, can so rapidly and elegantly finish these ornaments as the hand tooler with his simple implements. So in hundreds of cases a practical knowledge of the hand tool is an immense advantage to the workman and profit to his employer.

Sometimes it is necessary to "chase" a screw thread instead of finishing it with the ordinary tool in a screw lathe. By the use of the chaser—which is but a modification or another application of the common hand tool—a screw thread can be finely finished and all its irregularities and roughness removed. Screws of odd sizes may thus be cut which would otherwise perhaps require dies made for that special purpose and occasion.

Skill in the use of the hand tool can be easily acquired; judgment and discretion are as necessary to its successful use as practice. The tools required are cheaply and easily made; the small tools being formed either from old files or bars of steel, and the shoulder tool being merely a stock of wood with a handle transversely attached, and carrying in a groove a straight steel bar properly shaped at the point and held by a screw. Machinists of foreign education at present excel in this specialty, but there is no reason why our American mechanics should not become adepts in hand tooling.

ECONOMY IN COKE MAKING---THE UTILIZATION OF THE WASTE GASES.

The only use that has heretofore been made of the gases driven off from bituminous coal during the prcess of coking has been to supply the heat necessary to make the coke. It will require but a glance to show that even with a coal with but a small proportion of gaseous matter in its composition, only a portion of its gas is really necessary to give the heat required to completely perform the operation of coking. The only attempt that we are aware of that has been made to utilize all the gases driven off is by the process of Messrs. Carver & Co., of St. Entienne, in France, and they issued a small pamphlet which was given to visitors to the show of articles made from the gases driven off in coking exhibited by the *Société de Carbonization de la Loire* in the Paris Exhibition. This pamphlet was explanatory of their process which is eminently successful. The gases from the coking coal are collected and drawn off through pipes, and cooled sufficiently to condense the tar, ammonical liquids, etc., contained in them; this purifies the gas and it can be used for the same purposes as that made by the ordinary illuminating gas works. From the tar and liquids thus condensed, benzine, napthaline, sulphate of ammonia, a number of artificial manures, and a number of dye stuffs, are made; fabrics are also exhibited colored by these dyes. All these valuable products are, therefore, made from the gases which are permitted to be wasted by the usual process.

This company estimate that the profit they net from these substances is 2½ francs for each tun of coal coked. And to give an accurate estimate of the profits which accrue from this source it is only necessary to say that the coking ovens of the company, and which have been in operation for over nine years, use annually upward of 80,000 tuns of coal in making coke. The pamphlet of Messrs. Carver & Co. contains a calculation that some three and a half million tuns of coke are made annually in France; this amount corresponds to some four millions of tuns of coal, a large portion of the volatile constituents of which are wasted and from this it is estimated that between twelve and thirteen million of francs are lost annually by the ordinary wasteful method. On the whole this is one of the most eminently successful examples of the application of practical chemistry to the arts that we have had the pleasure to record. It is a striking example of the benefits of the technical and industrial education which has been followed for many years in France, and indeed on the continent generally. We trust that before many years our practical men may enjoy equal advantages with respect to the application of theory to practical operations connected with the industrial arts not only as regards chemistry alone but in all other branches. To effect this we must have schools of a decidedly practical nature, and text books devoid of speculation and so clearly composed that the facts that they are written to convey may be clear to the average understanding of those seeking instruction from them. A traveller in Europe with any mechanical perceptions, cannot fail to be impressed with the importance of the continental system of technical instruction by the superb engineering and the wonderfully perfect metallurgic operations to be seen on every side.

THE PETROLEUM FUEL---WILL IT SUPERSEDE COAL?

The petroleum excitement reached its climax immediately after the trials with the retort apparatus on the U. S. S. *Palos*, in Boston Harbor. The results after these experiments were proclaimed on all sides as eminently successful; "the days of coal were numbered," so said one of the experts at a Babylonian banquet given in Boston in honor of "the great event of the age." A commodore in the U. S. Navy was so impressed with these trials that he forthwith petitioned the Department to order an extended trial at sea. There is a point in connection with the *Palos* matter that should not be ommitted, and that is that the report of the Board of Naval engineers, who were ordered to attend the trials and to strictly investigate them, has not, to our knowledge, been made public. It would seem that if this report was a favorable one, it would have been placed before the public long ago, and that too in a very conspicuous manner; if this had been the case it is pretty clear that it would have carried much more weight, and would also have influenced stock subscriptions to an extent considerably greater than the parade of the after-dinner speeches of the *savans*, sailors, and engineers who made an excursion on the *Palos* in Boston Harbor.

Since this event in the petroleum world the excitement has been gradually subsiding and the dying embers are only kept at a dull-red heat by skillful letter-writing by the correspondents of the New York press, in other cities. The Cunard line have not adopted it, neither is it used on railroads and it would seem that if the petroleum companies themselves have any confidence in the wares they are trying to persuade the public to buy, they would be introduced practically so that there might be a fair comparison with coal, particularly as it is claimed by them that the apparatus can be put in any furnace with very little labor.

The Dental Vulcanite Question.

We recently published a judicial decision in the vulcanite question which was adverse to the dentists. A meeting of dentists was held at Cincinnati, on the 7th inst., to take into consideration the dental vulcanite question, and the following resolution was adopted:

Resolved, That we approve of the action of the executive committee and all they who have been active for the dental profession of the West, in contesting the claims of the Goodyear Dental Vulcanic Company against the profession, and that we request them to continue the defense to the ultimatum, believing, notwithstanding the decision of Judge Wilson, of New York, that the importance of the subject demands full and final investigation by the best tribunal in the country.

ANTI-FRICTION METAL FOR RAILWAY AXLES.

Nothing interferes more with the success of mechanical inventors than the element of friction. Not even the law of gravitation offers such obstacles to the intentions of inventors. To overcome the resistance of friction, especially on shaft journals, there have been devised several combinations of different metals which together should give the greatest resistance to pressure and heat. One of the most notable successes in this line has been that of the well-known Babbitt metal, which even now holds a high place in the estimation of mechanics.

But, it is claimed that there are compositions which far surpass this in the points which are sought to be obtained. There is reason for this claim in the case of one, at least, and we are doing but an act of simple justice to call the attention of our railway men to the advantages of the "Star Metal," which is manufactured largely by the Star Metal Company at their establishment in Brooklyn, N. Y., and Chicago, Ill.

We lately visited the former concern and witnessed the various processes of manufacture, except the actual mixing of the metals, which is preserved a profound secret. The basis, however, of the Star metal is spelter or zinc. In this foundery are employed, at present, seventeen furnaces, in constant operation. The patterns are molded in ordinary furnace sand in iron flasks. The metal box is held in a shell of brass, as by experience it was found preferable to a box made entirely of the Star metal. The metal is run into the brass shell, with which it is united by partial fusion. The box is then cleaned and dressed to exact size by the file. The bearing is trued and polished by vulcanite emery rollers which form the half circle to a gage so that the bearings are as perfect as they could be made by boring or turning. The use of emery for this purpose will prove at once to the practical mechanic that this metal differs greatly from Babbitt, which if ground with emery would become filled with the flinty particles. The metal is, in reality, very hard, instead of being soft, and is so brittle that it does not clog the file any more than iron and much less than hard brass. This quality of hardness may seem to be an objection, as it is commonly believed that bearing metal should be soft, but the manufacturers claim that this very quality is one of the peculiar advantages of the metal. Its resistance to heat is remarkable, its melting point being but a trifle lower than that of ordinary brass, and it is very difficult to heat it by friction. It will not cut the journal when hot, as brass does, and it will outwear either brass or the Babbitt composition.

These boxes are in use on a large number of our most extensive railroads in the country, and have received in all cases the most unqualified commendation. The company say in their circular that "in the examination of the actual comparative wear between Star metal and other (solid brass or Babbitt) bearings, upon the roads in this country testing Star metal, we find, taking the difference in wear and in weight into the calculation, that those roads should pay but 14⅝ cents per pound for their (solid brass or Babbitt lined) bearings, to compete in price with Star metal bearings. We therefore claim that those roads lose, per pound, in using brass or Babbitt lined bearings, the amount they pay for same over 14⅝ cents per pound; that it is more economical to use Star metal bearings costing 37 cents per pound than others, even at 14⅝ cents, on account of less wear upon the journal by the Star metal, and for the reason of its not cutting the same when hot; that it requires less power to draw a train running with Star metal bearings from the fact that where the journal and bearing wear least, there is less friction."

When tested against the brass or Babbitt lined boxes the Star metal bearings have invariably proved superior in the relation of from 40 to 75 per cent. The tests have been made by placing equal numbers of the Star metal boxes and of others under the same car, so that each should have the same amount of wear, and travel the same distance.

New Facts in Spectrum Analysis.

A very curious observation, on the spectrum of a terrestrial flame closely resembling that of certain yellow and red stars, has been communicated to the Italian society—called the Forty—of Modena, by M. Secchi. This flame is that which proceeds from a converter in which Bessemer steel is being made and at the time when the iron is completely decarbonized. The spectrum presents a series of very fine and very numerous lines, similar to those of *a* Orionis and *a* Herculis only reversed. This results from the great number of metals burning in the flame, and is the only flame comparable with the colored stars. There is nothing improbable in this fact when we consider the composition of ærolites in which as is well known, iron predominates.

M. Secchi had formerly ascertained that the spectrum of the color of sea water is deprived successively of its red, yellow and green as its depth increased, and at the greatest depths it appears of a violet blue. He tried to ascertain if the same fact held true in the case of glaciers, and has made experiments in an artificial grotto some three hundred feet deep, in the Grindenwald glacier. The ice wall was nearly fifty feet thick, the solar light that penetrated through was of a fine blue tint, so that human countenances had a cadaverous aspect almost alarming. On looking toward the entry at a certain distance, the cavern appeared to be lit up with a