

Workshop Notes.

TO REMOVE RUST FROM IRON.—The easiest method of removing rust from iron is rubbing it with a rag dipped in oil of tartar. The rust will disappear immediately.

PLUMBERS' SOLDER.—One part of bismuth, 5 parts of lead, and 2 parts of tin form a compound of great importance in the arts.

TO MAKE A CEMENT OF A MAHOGANY COLOR.—Take 2 oz. of beeswax, and $\frac{1}{2}$ oz. of rosin, melt them together; then add $\frac{1}{2}$ oz. Indian red, and a small quantity of yellow ochre, to bring the whole to the desired color. Preserve in a pipkin for use.

TO MAKE BRASS.—Place in an earthen crucible a portion of copper filings, mixed with about twice its quantity of finely granulated zinc; cover the whole with charcoal powder, press it well together, and then expose it to the action of a clear fire for some time, the two metals will then combine and form brass.

TO REMOVE FUSIL OIL AND CLARIFY LIQUORS.—A powder is prepared consisting of 30 parts of pure starch, 150 parts of powdered albumen, and 15 parts of sugar of milk. About 7 ozs. of this powder will be sufficient for 2 gallons of liquor, which, when well shaken and allowed to stand for settling, may be decanted free from fusil oil and perfectly clear.

CHIPPING CHISELS will be found to stand best when not hammered (in the forging) after the steel has lost its red heat. The forging on the edge should be done first so that the steel shall give way to the blows without becoming partly disintegrated. The finishing blows should be light ones.

FLAT DRILLS.—The greatest fault prevalent in the use of flat drills is that of having them too thick at the point where the cutting edge is necessarily a very dull one, and has to be forced heavily to make it cut at all. It is a good plan to thin the point by beveling off the flat face on one side.

TURNING GRINDSTONES.—The best thing to turn up a grindstone with is a piece of gas pipe used as a turning tool, using a piece of iron clamped to the face of the grindstone trough so as to form a rest or support for the gas pipe. The stone should be turned when dry and the face beveled off after it is true with a piece of thin sheet iron.

BRASS SOLDER FOR IRON.—Melt the plates of brass between the pieces that are to be joined. When the work is very fine the parts to be brazed should be covered with powdered borax, melted with water so that it may mix with the brass powder which is to be added to it. Expose the piece to a clear fire in such a manner that it shall not touch the coals, and let it remain till the brass begins to run.

CAST-STEEL.—If a piece of cast-steel be made red hot and is quenched in cold water it will become longer, but if the same operation be performed upon a piece of wrought-iron it will become shorter. The precise amount of the alteration, or its variation in different qualities of each metal, has never been determined, although it is of great importance in workshop manipulation.

LEAD EXPLOSIONS.—Many mechanics have had their patience sorely tried when pouring lead around a damp or wet joint, to find it explode, blow out, or scatter, from the effects of steam generated by the heat of the lead. The whole trouble may be stopped by putting a piece of rosin, the size of the end of a man's thumb, into the ladle and allowing it to melt before pouring.

SPEED OF ELEVATORS.—It is not necessary that the speed of an elevator should be in proportion to the diameter of the pulley. The proper speed with a pulley of one size is the proper speed for the elevator with a pulley of any size. Elevators work well at very diverse rates of speed, and hence the fact that the fallacy of giving them speed proportionate to the size of the pulley has been so frequently overlooked.

DIAMETER, ETC., OF WHEELS.—The diameter of a toothed wheel may be found by multiplying the number of teeth by the true pitch and the product by 3.184. The result will give the diameter between the pitch line on one side and the same line on the other side. To compute the number of teeth in a pinion to have any given velocity, multiply the velocity or number of revolutions of the driver by its number of teeth or its diameter, and divide the product by the desired number of revolutions of the pinion or driver.

CEMENT.—Mons. Pollock, of Saxony, has invented a cement, composed of pure oxide of lead and concentrated glycerine, which

is adapted for cementing both iron and woodwork. The mixture is insoluble in acids, hardens quickly, and is not influenced by heat. When this compound is used, and after it has become properly hardened, it is more easy to break the solid stone than to separate the parts thus cemented.

GILT LETTERING ON LEATHER.—The leather is covered with white of egg where the lettering is to be done. A leaf of gold is laid on, and the letter punches heated over gas are picked up and pressed gently on the leather in order. The remainder of the gold leaf is then brushed off by a camel hair pencil.

German-silver is composed of one part of nickel, one part of spelter of zinc, and three parts of copper; but all these substances have to be pure, and must be exposed to a great degree of heat before they will unite. German-silver prepared from pure metal will equalize in whiteness sterling silver, and will not tarnish.

Turpentine varnish may be compounded as follows: Mastic in tears, 12 ozs.; pounded glass, 5 ozs.; camphor, $\frac{1}{2}$ oz.; oil of turpentine, 1 quart; digest with agitation until dissolved; then add Venice turpentine (previously liquified by a gentle heat), $\frac{1}{2}$ oz. Mix well and decant it from the wood the next day.

In bronzing plaster statues the powder is dusted over the statue while it is yet sticky from a coating of turpentine varnish. The best way is first to give a few coats of alcoholic shellac varnish, and then the coating of turpentine varnish, as otherwise the latter is too quickly absorbed. Let it stand till half dry and sticky, and then dust over any color of bronze-powder to suit the taste.

UNIVERSAL CEMENT.—Curdle skim-milk with rennet or vinegar, press out the whey, and dry the curd at a gentle heat as rapidly as possible. When quite dry reduce to a very fine powder. Then take the powdered curd 10 drachms; powdered quicklime, 1 drachm; powdered camphor, 8 grains; mix; keep in tightly-corked phials. To join glass, earthenware, etc., the powder is made into a paste with a little warm water, and applied immediately.

A German periodical is responsible for the following method of making malleable brass: Thirty-three parts of copper and twenty-five of zinc are alloyed, the copper being first put into the crucible, which is loosely covered. As soon as the copper is melted, zinc, purified by sulphur, is added. The alloy is then cast into moulding sand in the shape of bars, which, when still hot, will be found to be malleable and capable of being brought into any shape without showing cracks.

BLACK FINISH FOR BRASS.—Optical and philosophical instruments made in France often have all their brass surfaces of a fine dead black color, very permanent and difficult to imitate. The following, obtained from a foreign source, is the process used by the French artisans: Make a strong solution of nitrate of silver in one dish and of nitrate of copper in another. Mix the two together and plunge the brass into it. Remove and heat the brass evenly until the required degree of dead blackness is obtained.

CEMENT FOR JOINING METALS WITH NON-METALLIC SUBSTANCES.—To obtain a cement suitable for joining metals and non-metallic substances, mix liquid glue with a sufficient quantity of wood-ashes to form a thick mass. The ashes should be added in small quantities to the glue while boiling and constantly stirred. A sort of mastic is thus obtained, which, applied hot to the two surfaces that are to be joined, make them adhere firmly together. A similar substance may be prepared by dissolving in boiling water $2\frac{1}{2}$ lbs. of glue and 2 ozs. of gum ammoniac, adding in small quantities about 2 ozs. of sulphuric acid.

CEMENT FOR FIXING METAL LETTERS ON GLASS WINDOWS.—Copal varnish, 15 parts, drying oil 5 parts, turpentine 3 parts, oil of turpentine 2 parts, liquified marine glue 5 parts. Melt in a water bath, and add 10 parts dry slacked lime.

Zinc plates expand and contract strongly under the influence of change in the temperature, and become quite brittle in the cold. Zinc, therefore, must be allowed plenty of play room. It should be attached either with nails of zinc or of strongly galvanized iron, as iron nails will rapidly rust out.

CARE OF BOILERS.—Whenever the water in a boiler becomes dangerously low, the attendant should immediately draw the fire and allow the boiler to cool. He should not admit any cold water to the boiler, or attempt to raise the safety valve, as this is a dangerous proceeding. It lessens the pressure by allowing the steam to escape from the boiler and thus permits the water to rise and come in contact with the over-heated iron. Probably many explosions have been caused in this way.