

LEAD BULLION.

Sample.	1.	2.
	Per cent.	Per cent.
A.....	97.75	97.75
B.....	97.06	96.83
C.....	95.68	95.44
D.....	95.22	95.68

E, volumetric determination = 96.27 per cent.

E, gravimetric determination = 96.36 per cent. (from PbSO_4).

ALLOY SAID TO CONTAIN LEAD EIGHTY PER CENT., ANTIMONY FIFTEEN PER CENT., AND TIN FIVE PER CENT.

Sample A (thoroughly oxidized), volumetric = 79.7 per cent., gravimetric = 79.79 per cent.

Sample B (thoroughly oxidized), volumetric = 80.6 per cent., gravimetric = 80.44 per cent.

Sample C (not completely oxidized), volumetric = 77.7-77.9 per cent., gravimetric = 75.56-75.41 per cent.

In using this method it will be found very convenient to employ the "equivalent weight" system, so that the percentage of metallic lead in the sample may be read directly upon the burette.

MANUFACTURE OF PHOSPHOR BRONZE.

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Received March 18, 1897.

PHOSPHOR bronze is bronze containing a small amount of phosphorus, varying from a few hundredths of one per cent. to over one per cent. The phosphorus is added mainly to deoxidize the metal. It may be added to the bronze in substance as phosphorus, or in the form of a high phosphorus alloy.

At the brass foundry of the Chicago, Burlington & Quincy Railroad Company, at Aurora, Ill., we use the latter method. The alloy we call "hardener" and it contains six per cent. of phosphorus with copper and tin, in the ratio of 8 to 1.

Manufacture.—Our method of making this "hardener" is as follows: Ninety pounds of copper are melted in a No. 70 crucible (which holds about 200 pounds of metal when full), under charcoal, eleven pounds of tin are added, and the whole allowed

to become hot. The pot is then taken from the furnace and placed upon the floor. Then seven pounds of phosphorus are added in the following manner: A three-gallon stone jar half full of dilute solution of blue vitriol is weighed; phosphorus in sticks about four inches long is added until the weight is increased by seven pounds. The phosphorus remains in this solution half an hour or longer and is by this means given a coating of metallic copper, which prevents ignition when it is dried and exposed to the air. The phosphorus is then transferred from the vitriol solution to a pan (Fig. 1) to dry. The pan is made

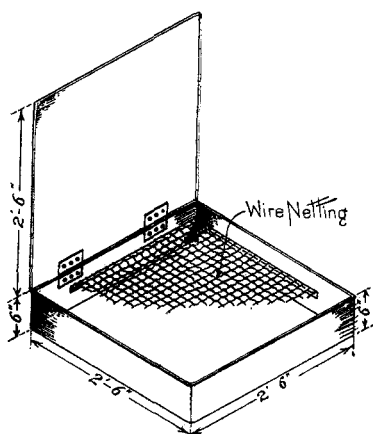


FIG. 1.

of galvanized iron about thirty inches square and six inches high. It contains about two inches of water. Over the water is wire netting supported from ledges along the inside of the pan. On the netting is blotting paper and on this the phosphorus is placed to dry. The pan has a lid which may be put down in case the phosphorus takes fire.

The phosphorus is introduced into the metal by means of a cup-shaped instrument called a retort or phosphorizer (Fig. 2), made of the same material as the graphite crucibles. The joint A is made tight with a cement of mineral paint mixed to a stiff paste with boiled oil. The metal having been melted and placed on the floor, one man holds the retort over the brim of the crucible, as shown in Fig. 2. Another workman takes

about three pieces of phosphorus and throws them into the retort. The first workman then immediately plunges the retort into the metal before the phosphorus can fall or flow out. The phosphorus of course immediately melts and begins to volatilize

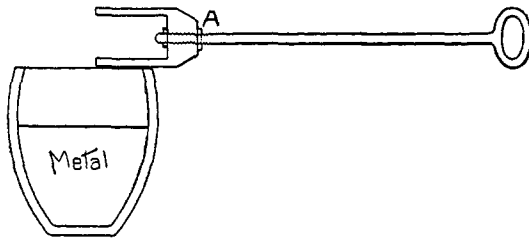


FIG. 2.

and as it comes in contact with the metal combines with it. This operation is repeated until the seven pounds of phosphorus have been added to the metal. Then the metal is poured into thin slabs about one inch by three inches by four inches. It is so hard that a greater thickness would make it difficult to break. Analysis shows this alloy to contain six per cent. of phosphorus. Ordinarily when we wish to add phosphorus to metal, we do it by adding a little of this high phosphorus alloy.

Our method of making phosphor bronze bearing metal is as follows :

COMPOSITION OF METAL.

	Per cent.
Copper.....	79.7
Tin	10.0
Lead	10.0
Phosphorus	0.3
	100.0

The copper is melted under charcoal, the tin and lead added, and enough "hardener" to get a sufficient amount of phosphorus.

Phosphorus has the effect of hardening bronze and it also makes it more fluid. The important property of phosphorus is however to deoxidize the metal, and it does this effectively.