Metallurgical Comment

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Correspondence and Discussion Invited

ALUMINUM BRONZE.

Aluminum bronze is one of the best alloys and superior to manganese bronze provided it is properly cast. The reasons for this superiority are to be found in the following considerations: We can obtain a greater resistance and strength. Aluminum bronze is more homogeneous and less liable to take on crystalline structure in the interior of the casting. It has greater tenacity and with the same tensile strength is more pliable.

The difficulties in pouring the casting are of two kinds; namely, contraction and oxidation. Contraction is easily explained since all alloys possessing great strength contract considerably in pouring the casting. Aluminum bronze contracts more than manganese bronze. The oxidation when the slag forms is not greater, however, than in manganese bronze.

The best alloy for casting in sand molds is 90 per cent. copper and 10 per cent. aluminum. If greater tenacity is desirable, the percentage composition of aluminum can be reduced to 90 per cent. and the copper increased correspondingly to 91 per cent. A harder alloy can be obtained by increasing the aluminum to 11 per cent. For general machine parts, valves, bolts, etc., a 10 per cent. aluminum alloy is efficient. In making sheets of the alloy, the aluminum percentage is lowered so that the alloy becomes softer and can be rolled without trouble. The highest possible percentage in this connection is 8 per cent. The tenacity of aluminum bronze is greater than that of any other metal except steel.

A further characteristic of aluminum bronze is the color. The 5 per cent. alloy has the color of 18-carat gold, that of the 4 per cent. alloy is 14-carat gold color. The use of this alloy is very extensive and lately seamless tubes have been placed on the market made by the "Mannesmann" process.

To make castings with the 10 per cent. alloy, molds of green sand must be used. For such an alloy we use 9.9 lbs. copper and 1.1 lbs. aluminum. As very little aluminum is lost in the casting process, it is not necessary to use more than the amounts quoted. For very accurate work about 0.20 per cent. might be allowed.

The copper should be of the best quality and electrolytic copper is perhaps better than scrap copper. The aluminum should also be as pure as possible; commercial aluminum with 99 per cent. aluminum is best. The copper is melted in a graphite crucible without any aggregate except the wood charcoal which is used to cover up the metal thoroughly. This is very important as it prevents oxidation, which would take place during the melting process, if the metal was exposed. The same holds true for the melting of copper.

After all the copper has melted, which can be discovered by an iron or graphite stirring rod, the aluminum is added. This was first warmed for drying purposes and after adding and melting it rises to the surface. After all the aluminum has melted, and is floating on the surface, the mass is stirred with a graphite stirring rod. Aluminum bronze is immediately formed, as soon as it is heated to a white heat.

Scrap metal should be added to lower this heat and then the alloy may be poured. The aluminum bronze should not be used, however, in the first state after melting to make castings, as such castings will be full of flaws.

After the first metal has been poured into the form of bars, it must be remelted and then poured into molds, which will then give a perfect casting. The remelting is again done in crucibles, which must be carefully covered by wood charcoal.

Correct melting methods are necessary to obtain good castings. If the metal is heated too high, or if the fused metal is allowed to stand in the crucible for some time without pouring, gases are absorbed from the combustion product and these gases form blow-holes in the casings. The proper way is to keep the metal covered with charcoal till thoroughly fused and then pour it into the molds at the right temperature. It is important that the molds should be ready as soon as the metal is ready to be poured as any delay due to the molds not being ready or from other causes will result in poor castings.

Dry sand should not be used for a 10 per cent. alloy. It is too hard and does not allow the casting to contract without leaving cracks and flaws. Green sand is soft and has no bad influence on the contraction. The molds should not be rammed too solid and must be dry to a certain extent. A mold too tightly rammed prevents uniform contraction of the alloy, forms cracks, and causes spots and bubbles on the surface. Risers should be used in great numbers, as otherwise blow-outs will result.

The matter of slag is also of importance. To prevent the slag from entering into the casting with the metal itself, the alloy should be cast at as low a temperature as possible. A long gate will also be of value in this respect, and when this is used the slag will be retained in the gate and will not enter the casting. The metal should be poured in an even, quiet stream. Hurried and rapid pouring will result in the formation of slag.—Giesserei Zeitung.

THE HISTORY OF THE SHEFFIELD STEEL INDUSTRY.*

Professor J. O. Arnold.

The first beginnings of the steel industries of Sheffield, now so vast and in their metallurgical range so comprehensive, are to a great extent shrouded in historical darkness. This mystery may be traced to two chief causes. As to the first, the rude Saxons who founded on a puny scale these now gigantic industries were ignorant of the fact that the material development of modern civilization was to be largely brought about by the increasing efficiency of those weapons by means of which they slaughtered their kind in the fight for mere existence or the beasts of the forests and the field for bare sustenance; and beyond the question of survival there was to follow metallurgical progress an evolution of rapid means of transit of which they could have no conception.

The Paleolithic Age of the rudest forms of flint instruments is associated with the rudest form of man who, speaking in terms of geological time, had just emerged from the anthropoid apes. In the Neolithic Age, when the weapons of man, both for war and for domestic purposes (there are cynics who assert that the terms are synonymous), had assumed a higher finish and polish, there is evidence suggesting that man had reached a higher plane of development. Then came the Bronze Age, in which the flint hardness of the implements of the Stone Age was somewhat less efficiently reproduced on the edge of bronze weapons by plastic

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