This invention relates to the manufacture of molds for casting type metal and the like and it is particularly concerned with the provision of satisfactory type matrices made from aluminum and aluminum alloys.

The ease with which aluminum and its alloys may be formed or machined into intricate and ordinarily difficult shapes has created a demand for type matrices or molds made of this metal. It is an essential property of such a mold that it retain, during the casting process, the sharp outline of the mold cavity so that the type made therein will be of standard size and feature and will not have defects which are so often caused by the wearing action of the hot metal on the mold or matrix. Extensive use of matrices made from aluminum and its alloys, and particularly those alloys which are termed "strong aluminum alloys", has shown that after a few type have been cast in the mold, the mold often fails in the sense that the mold cavity loses its sharp outline and the type cast therein is therefore imperfect. Although various aluminum alloys have been experimented with in an effort to overcome this difficulty and various standard heat treatments have been applied to those alloys which respond to such treatments, the above-mentioned difficulties have never been entirely overcome and therefore the use of aluminum alloys in type matrices has been curtailed because of the lack of a uniform product.

It is the object of this invention to provide aluminum type matrices or molds which are uniform in character and from which a large number of casts may be obtained without failure.

To accomplish this result, I provide an aluminum or aluminum type matrix coated with a non-metallic coating or what is generally termed as an "oxide" coating. I have discovered that these coatings, when properly applied, increase the life of an aluminum type matrix to a very appreciable extent and that the application of these coatings to the aluminum matrices insures that each matrix will have a long useful life and will produce during that time a type of uniform character.

In order to provide type molds according to my invention, I may use any aluminum alloy which has a sufficient hardness and such other well known metallurgical characteristics as are necessary for this purpose, but since the material from which type matrices are made should be of some considerable metallurgical hardness, I prefer to use those aluminum alloys which are susceptible to heat treatment and in which, by means of such heat treatment, a high metallurgical hardness is produced. The term "aluminum", as used herein and in the appended claim, refers to aluminum base alloys containing more than about 80 per cent of aluminum and one or more of those various alloying constituents such as copper, manganese, magnesium, zinc, silicon, nickel, iron, chromium, etc. which are added to aluminum, as is well known to the art, for the purpose of producing alloys of a hardness greater than that of aluminum.

In providing such aluminum type matrices as above mentioned with a non-metallic coating, I have used several of the processes by which non-metallic or oxide coatings have heretofore been formed on aluminum. These processes which, for the most part, depend upon the action of chemical solution on the aluminum surface with or without the further application of external electrical energy are well known to those experienced in the art producing such coatings. The main desideratum to be observed is the attainment of a hard adherent coating of glassy appearance on the metal. To accomplish this purpose, I have preferred to use a solution containing about 3% sodium bicarbonate and 0.2% of potassium dichromate since I have found that of the known solutions this one appears to best produce the coating desired. Into such a solution, which has been brought to a temperature of about 95° Centigrade, the aluminum type matrix is dipped for a period of about 1 to 5 minutes, at the end of which time the coating desired is produced. The term "oxide coating", as used herein and in the appended claim, is a well known designation of the art which describes a layer of aluminum oxide artificially produced on
aluminum or aluminum alloy surfaces by treatment of the metal surfaces with acids, such as sulfuric, chromic, etc., or alkalies, such as sodium carbonate or the alkali sulfates and acid sulfates such as sodium sulfate or sodium acid sulfate, etc., all with or without the addition of other substances and with or without the use of externally-applied electrical energy. The term "oxide coating" does not include the very thin film of aluminum oxide which is naturally formed upon that metal or its alloys by reason of contact with the air.

Aluminum type matrices which have been coated according to the above procedure have been found to be very satisfactory. For instance, a number of matrices which were so treated withstood the action of the hot type metal for a total of 5,000 casting operations without showing signs of failure. The significance of this remarkable performance will be readily understood when it is realized that matrices made from aluminum alloys and uncoated rarely produced over about 100 to 150 casts without failure and many of them failed after only a few casts.

Having thus described the nature and benefits of my invention and the methods by which it may be performed, I claim:

A type matrix made of aluminum and provided with a hard adherent oxide coating.

WELKER WALLACE WENTZ