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ALLOY FOR GRINDING BALLS

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8 Claims. (Cl. 75-126)

This invention relates to compositions of matter and more particularly to alloys and has for its object the provision of an alloy suitable for use as a wear-resistant and corrosion resistant grinding ball for grinding mills.

Another object is to provide a hard, tough, wear and corrosion resistant grinding ball for ball mills.

Still another object is to provide a grinding ball which is utilizable in grinding operations performed in acid and alkali mediums.

Other objects will be apparent as the invention is more fully hereinafter disclosed.

This application is a continuation-in-part application of my application Serial No. 396,698, filed June 5, 1941, which application is assigned to the same assignee in the same manner as is the present application.

The above mentioned application has matured into United States Patent No. 2,294,834, dated September 1, 1942.

In accordance with these objects I have discovered that an alloy consisting of from 20-30% chromium, from .5-5.0% columbium, from 1-3% carbon, manganese and silicon each from small fractional percentages to 3%, balance iron, is characterized by having a hardness within the range 60 to 70 Rockwell C which hardness is retained on repeated remelting and casting; and by a tough fibrous structure which is also retained on repeated remelting and casting, and by excellent free flowing characteristics which adapt the same for chill casting in a split mold in the form of balls; and that the alloy due to its high chromium content is particularly resistant to erosion and corrosion when employed in the form of such cast balls as the grinding instrument in ball mills even in relatively strong acid and alkali solutions.

The preferred alloy composition consists of chromium 25%, columbium 2.5%, carbon 2.5%, manganese and silicon each 1%, balance iron. The hardness of this alloy approximates 65 Rockwell C. Where higher wear resistance is desired the chromium content of this alloy may be increased to 30% at the expense of the iron balance and where higher hardness together with higher wear-resistance is desired the Cb and C content of the alloy may each be increased to 3%.

It is not generally necessary to increase the Mn and Si content of the alloy above 1% except where it is desired to provide high stability against oxidation on remelting. One percent of each of these metals appear adequate to provide adequate fluidity on melting and casting.

It is preferred to employ a Cb and C content of approximately equal percentages to maintain the Cb content of the alloy in the form of metal carbide during remelting and casting. Carbon in excess of the amount of carbon bound by the

Cb serving to lower the melting point of the iron-chromium alloy and to harden the same on chill casting.

The alloy of the present invention is readily produced by melting down the constituents, preferably as ferro alloys, in an electric arc furnace. Following fusion, the molten metal preferably should be held in the super-heated molten condition for a time interval sufficient to put all of the carbon and metal carbides into solution, following which it may be chill cast in the form of balls in the usual type of split molds heretofore employed in the art.

Following casting, the alloy should be rapidly cooled, as by quenching, in order to develop its maximum hardness.

Having hereinabove described the invention generically and specifically it is believed apparent that the same may be widely varied without essential departure therefrom and all modifications and adaptations of the invention are contemplated as may fall within the scope of the following claims.

What I claim is:

1. A grinding ball alloy, said alloy consisting of chromium 20-30%, columbium, .5-3%, carbon 1 to 3%, manganese and silicon each in amounts ranging from small fractional percentages up to 3%, balance iron.
2. A grinding ball alloy, said alloy consisting of chromium 25%, columbium and carbon each 2.5%, manganese and silicon each 1%, balance iron.
3. A grinding ball alloy, said alloy consisting of chromium 30%, columbium and carbon each 2.5%, manganese and silicon each 1.0%, balance iron.
4. A grinding ball alloy, said alloy consisting of chromium 30%, columbium and carbon each 3.0%, manganese and silicon each 1.0%, balance iron.
5. Grinding balls comprised of an alloy consisting of chromium 20-30%, columbium, .5-3%, carbon 1-3%, manganese and silicon each from small fractional percentages to 3%, balance iron.
6. Grinding balls comprised of an alloy consisting of chromium 25%, columbium and carbon each 2.5%, manganese and silicon each 1%, balance iron.
7. Grinding balls comprised of an alloy consisting of chromium 30%, columbium and carbon each 2.5%, manganese and silicon each 1%, balance iron.
8. Grinding balls comprised of an alloy consisting of chromium 30%, columbium and carbon each 3%, manganese and silicon each 1%, balance iron.

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