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ALLOY

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This invention relates to ferrous alloys, and, more particularly, is concerned with ferrous alloys in the steel range which may be readily cast and which have high wear-resistance and freedom from scale pick-up.

Heretofore, shoes or guides of white or gray cast iron and of cast steel have been employed in bar, strip, and shape mills of various types to position the material, usually hot metal, being worked and to direct it properly into and deliver it from the mill rolls. It is well understood that such cast iron or steel shoes or guides have a comparatively short life and are quite subject to scratches, wear, and deposition of hot scale thereon. Shoes or guides which are scratched or marred, or have their surface covered with a layer of scale, often objectionably mar the bars, strip, or other work being handled. Efforts have been made to treat or harden the cast guides, as by casting them against a chill, all without solving the existing problem. Further, attempts have been made to use other materials as guides. Nevertheless, because of brittleness, lack of wear-resistance, susceptibility to scale deposition, or high cost, none of the experiments with other materials have proven successful and the cast iron or steel guide with all of their faults are generally still employed.

Similarly, materials used heretofore to form piercing plugs and guide shoes on a seamless tube mill have been subject to almost exactly the same difficulties set forth above. Scale collects on the plugs and guides, or the plugs and guides are marred or scratched with the result that the seamless tubing made over or with such plugs and guides may be unsatisfactory for commercial requirements. In all events, the rolling mill guides and the tube plugs or the other members used to guide or form hot metal have only been able to stand so many passes of the hot metal thereover before the guide, plug or other member must be replaced with a new member or taken off and machined. Expensive production delays are thus encountered.

It is the general object of my invention to provide an improved alloy which may be directly and readily cast into members for guiding, forming, or working hot metal or other materials and characterized by toughness, wear-resistance, and lack of susceptibility of metal deposit thereon.

Another object of my invention is the provision of an improved ferrous alloy including chromium, copper, cobalt and molybdenum.

Another object of my invention is to provide improved articles for guiding or forming hot metal or the like which articles have a greatly prolonged life over that of known members now used for this purpose, and characterized by lack of susceptibility to scale pick-up and by wear resistance.

The foregoing and other objects of my invention are achieved by the provision of an alloy including .20 to 2.00 per cent carbon, about 5.00 to about 30.00 per cent chromium, 5.00 to about 15.00 per cent copper, 1.00 to about 10.00 per cent cobalt, .10 to about 3.00 per cent molybdenum, and the remainder substantially all iron.

One typical heat of the alloy of my invention which possesses the improved characteristics of long wear, toughness, and lack of susceptibility to scale deposition comprises the following composition: chromium about 15.00 per cent, carbon about 1.00 per cent, copper about 7.50 per cent, cobalt about 5.00 per cent, molybdenum about .75 per cent, and the remainder substantially all iron except for traces of other materials present as impurities in unobjectionable amounts.

I may add about .40 to about 1.00 per cent manganese to my improved alloy to improve the grain structure, and, also, I may add about .3 to about 1.00 per cent vanadium to the alloy which serves as a scavenger and gives fluidity. The usual percentages of sulphur and phosphorous present in open hearth or Bessemer commercial steels are not objectionable nor are traces of other alloying agents or impurities.

The cobalt and molybdenum present in my alloy are believed to bear a relation to each other whereby when the cobalt content is increased the molybdenum content may be reduced, and, vice versa, when the molybdenum content is increased the cobalt content may be reduced. In any event, it is advisable to keep the combined molybdenum and cobalt contents in the alloy between about 4.00 and about 10.00 per cent of the total alloying ingredients.

From the foregoing, it will be recognized that the objects of my invention have been achieved and that I have provided a castable ferrous alloy particularly adapted to act as a guiding or forming member for hot metal and the like, and characterized by wear-resistance and long life without the deposition of scale thereon.

Although in accordance with the patent statutes, I have particularly described my invention, it will be understood that I am not to be limited thereto or thereby but that the scope of my invention is defined in the appended claims.

I claim:

1. A ferrous alloy having an analysis including

between .20 and 2.00 per cent carbon, about 5.00 to about 30.00 per cent chromium, 5.00 to about 15.00 per cent copper, 1.00 to about 10.00 cobalt, .10 to about 3.00 per cent molybdenum, and the remainder substantially all iron, said alloy being capable of being cast, and being characterized by wear-resistance and freedom from hot metal scale pick-up.

2. A ferrous alloy comprising about 1.00 per cent carbon, about 15.00 per cent chromium, about 7.50 per cent copper, about 5.00 per cent cobalt, about .75 per cent molybdenum, and the remainder substantially all iron, said alloy being characterized by wear-resistance and freedom from hot metal scale pick-up.

3. A ferrous alloy having an analysis including between .20 and 2.00 per cent carbon, about 5.00 to about 30.00 per cent chromium, 5.00 to about 15.00 per cent copper, 1.00 to about 10.00 per cent cobalt, .10 to about 3.00 per cent molybdenum, the total amount of cobalt and molybdenum present in the alloy being between about 4.00 and about 10.00 per cent, and the remainder substantially all iron.

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