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PRODUCING TUNGSTEN ALLOYS

Arthur Linz, New York, N. Y., assignor to Climax Molybdenum Company, New York, N. Y., a corporation of Delaware

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1 Claim. (Cl. 75—133)

The present invention relates to alloying tungsten with ferrous metals and more particularly to a novel and improved process and composition for introducing tungsten into steel during the alloying process.

Objects and advantages of the invention will be set forth in part hereinafter and in part will be obvious herefrom, or may be learned by practice with the invention, the same being realized and attained by means of the steps, processes and instrumentalities pointed out in the appended claim.

The invention consists in the novel steps, processes, combinations and improvements herein shown and described.

Heretofore, tungsten-bearing ferrous alloys have been commercially produced by adding calcium tungstate, ferro-tungsten or some tungsten-bearing mineral such as wolframite, scheelite, ferberite or hubernite to the molten steel. However, due to the relatively great specific gravity of ferro-tungsten, it tends to sink in the molten steel and it is difficult to dissolve and thereby obtain a homogeneous alloy. Many of the alloying materials also have the disadvantage that they are absorbed only slowly into the steel bath, and at the same time introduce undesirable impurities.

In my prior parent application Ser. No. 314,447 filed January 18, 1940, now Patent No. 2,282,486, granted May 12, 1942, I have disclosed and claimed a process of producing tungsten alloys in which briquettes of tungstic oxide and pitch are added to the ferrous material, and after the tungsten has been absorbed into the steel, the chromium and vanadium is reabsorbed into the alloy from the slag by the addition of ferrosilicon. The present application is a division of my said application Ser. No. 314,447.

Such additions of ferrosilicon are not essential, where the alloy is produced in an electric furnace and is covered with a reducing or carbide slag. Where the tungsten alloy steel is produced in an electric furnace, it is usual to cover the ferrous alloy with a reducing slag (carbide slag), and if that be the case, the reduction of the tungstic or other tungsten oxide not only renders the tungsten available for solution in the steel, but also tends to remove certain of the objectionable impurities from the steel.

For convenience in handling, and in order to reduce the amount of oxidation caused by the tungsten oxide, it is preferably prepared for use by mixing it with some carbonaceous, reducing material, such as still-pitch, and by molding this mixture into briquettes each of which may contain a uniform amount of tungsten.

In case only a portion of the desired amount of tungsten is added in the form of tungstic oxide briquettes, the remainder is preferably added in the form of ferro-tungsten and this addition preferably takes place before the addition of the tungstic oxide, so that the vigorous mixing effect accompanying the reduction of the tungstic oxide insures a thorough mixing of the molten ingredients.

Instead of using ferro-tungsten for a portion of the tungsten addition, the lower oxides of tungsten may be employed alone or in combination with tungstic oxide, and where an alloy rich in tungsten is to be produced, this will be advantageous over using tungstic oxide as the boiling will be less vigorous and more easily controlled.

Referring now in detail to the present preferred manner of carrying out the invention, the powdered tungstic oxide is mixed with about one tenth its weight of still-pitch, and this mixture is formed into uniform briquettes each of which may conveniently contain five pounds of tungsten. Where lower oxides of tungsten are used, a lesser proportion of carbonaceous material may be employed, enough being used, however, to completely reduce the oxide.

The alloying ingredients for the desired alloy, excluding only the tungsten oxide briquettes, are charged in the electric furnace, and brought to the proper temperature in the usual manner and covered with the usual carbide slag. Thereafter, after sufficient time has been allowed for the absorption of whatever ferro-tungsten may be used, the remainder of the tungsten requirements is added in the form of the tungsten oxide briquettes. As these are added, the power supplied to the electric furnace may be controlled or reduced so as to control the heat of the mixture and to prevent too vigrous agitation or "boiling" as the tungsten oxide is reduced.

After the reduction of tungsten oxide has been completed, the heating of the alloy is continued.

For usual tungsten alloys, the entire amount of tungsten may be supplied by tungstic oxide briquettes, but for larger amounts of tungsten and where tungstic oxide briquettes alone might cause too vigorous boiling, a part of the tungsten may be added in the form of ferro-tungsten as described above, or some or all of the briquettes may be of one or more of the lower oxides of tungsten, these lower oxides producing less gas and a less vigorous boiling of the molten metal.