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BRIQUETTE FOR THE ADDITION OF TUNGSTEN TO FERROUS ALLOYS

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The present invention relates to a novel and improved addition agent for the production of tungsten containing ferrous alloys.

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 compositions, steps, processes and instrumentalities pointed out in the appended claims.

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

The present invention has for its objects the provision of a novel and improved tungsten containing alloying agent which is generally useful for the production of tungsten containing ferrous alloys. The invention further provides a novel and improved tungsten briquette which can be economically produced and contains a minimum of foreign material. The invention has for another object the provision of an improved tungsten containing briquette which can be used practically all places where other tungsten addition agents have heretofore been used, and which is superior in one respect or another to all of the previous tungsten addition agents.

Heretofore tungsten has been added to ferrous alloys, by a large number of different processes involving a wide variety of different addition agents. Tungsten ores and concentrates as well as calcium tungstate have been proposed and used as an addition agent but have proved to be of very limited application due to the relatively large proportion of slag and other undesirable constituents contained therein and introduced thereby into the ferrous alloy. Tungsten trioxide, dioxide and other oxides have all been used as addition agents, but their use has almost invariably been attended by excessive loss of tungsten, resulting in increased cost of producing the alloy, and furthermore their use has been limited to the production of ferrous alloys to contain a small amount of tungsten.

Ferro-tungsten has also been widely used for the production of tungsten-bearing ferrous alloys, and while there is no limit to the amount of tungsten which may be contained in the alloys produced therewith, this type of addition agent has necessarily increased the cost due to the added operations required for the manufacture of ferro-tungsten. Furthermore, ferro-tungsten has the disadvantage that it sinks to the bottom of the ladle and the resulting ferrous alloy is rendered homogeneous only with difficulty. Briquettes of tungstic oxides with carbon have been widely used, and while they avoid many of the disadvantages of the other alloying agents, they produce a boil, and when large percentages of tungsten are to be added in this way, the gas evolution may be excessive. Tungsten silicides have also been used as addition agents where a fairly high silicon content in the resulting alloy is unobjectionable.

In general, the various ways in which tungsten has been added to ferrous alloys have been substitutes for the universally usable ferro-tungsten, which has its relatively high cost and its relatively high specific gravity, as its principal commercial disadvantages.

In addition to the foregoing, there have been other minor ways proposed for the addition of tungsten to ferrous alloys, but these have not met with any considerable commercial use.

The present invention provides an economical tungsten addition agent for ferrous alloys, which eliminates the use of any relatively expensive reducing agents, the availability of which may be restricted, such as aluminum, silicon, magnesium and calcium, requires a minimum of equipment for its production, eliminates the objections which have existed with respect to all of the commercially used addition agents set forth above, and does not result in the introduction into the molten ferrous metal of any foreign material.

Thus, the tungsten addition agent of the present invention provides a universally acceptable tungsten containing compound for the introduction of tungsten into ferrous alloys which can be used, with considerable savings, as a substitute for any of the tungsten addition agents heretofore found useful, thereby simplifying the production of tungsten addition agents in general, as well as reducing the variety of such addition agents which must be carried on hand by the manufacturer or steel maker.

In accordance with the present invention, crude tungstic oxide is partially reduced to form crude lower tungsten oxides, or crude tungsten metal powder containing some of the lower tungsten oxides as impurities, and this oxide is mixed intimately with relatively fine powdered, granular or flake-like iron. The resultant intimate mechanical mixture of these substances is highly compressed to form briquettes which are preferably of uniform size. Due to the peculiar and dissimilar characteristics of the tungsten compound and the iron particles, no foreign binder is needed for the coherence of this mixture, and