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ALLOY ADDITION AGENTS

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The present invention relates to new and useful improvements in alloy addition agents.

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, instrumentalities and combinations pointed out in the appended claims.

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

Heretofore, many different addition agents have been proposed for the addition of alloying elements, such as molybdenum, chromium, tungsten, vanadium to ferrous alloys. Among such addition agents are the ferro-metal agents, such as ferro-molybdenum and ferro-chromium, briquettes formed from the metal oxide and a reducing agents, such as ferro-silicon, silicon, aluminum, calcium silicide and other reducing metals or carbon, bound together with a binder which may be a carbonaceous material such as pitch. Many of these addition agents are relatively expensive to produce, while others introduce a relatively large amount of foreign matter into the alloy and which may appear in the finished alloy as inclusions of slag, while other addition agents give a poor recovery of the alloying metal in the finished alloy and are thus relatively expensive to use.

The present invention has for its object the provision of a novel and improved alloy addition agent which can be produced with very little expense beyond the cost of the alloying metal contained in the addition agent, does not require elaborate equipment for their production, gives good recovery of the alloying metal in the finished alloy, can be used without radical change in alloying technique, and does not result in the addition of abnormal large amounts of foreign material such as slag-forming ingredients. The invention has for a further object the provision of novel and improved alloy addition agents which are economical to produce, are economical to use, are of general application and give excellent results in use.

In accordance with the present invention the alloying addition agent comprises a proportioned mixture of an oxide of the alloying metal to be added to the ferrous alloy and a reducing agent comprising a stable form of calcium carbide, which agent may be formed into convenient briquettes by briquetting under powerful pressure with or without a carbonaceous binder,

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or may be merely packaged in bags of convenient size or in packages and added to the molten iron or steel in the ladle or otherwise as desired. Calcium carbide, as such, is not suitable for use in such alloying addition agents as the calcium carbide contained therein is so unstable and when briquetted, there is a danger that the briquettes will explode or disintegrate due to the accumulation of gas therein caused by the decomposition of the carbide. However, the calcium carbide reducing agent may be economically and effectively protected against premature decomposition without deleteriously affecting its reducing action on the metallic oxide or the effect of the alloying addition agent as a whole on the ferrous alloy to be produced.

In accordance with the present invention this protection is afforded by treating the calcium carbide particles, whether lumps, grains or dust, with a waterproofing material which is preferably a film-forming material and is in itself a reducing agent and generally a binder of sufficient adhesive force to materially assist in holding the metallic oxide and calcium carbide in intimate contact until the reducing action takes place. The quantity of binder used is from about 1% to about 5% based on the weight of the calcium carbide, and the amount of calcium carbide is generally approximately the stoichiometric quantity required to convert the oxygen of the metallic oxide into carbonmonoxide.

Suitable stabilizing agents for the calcium carbide are crude petroleum, refined mineral oil, paraffin and other mineral waxes, drying and non-drying vegetable oils, rosin, asphalt, still pitch, all of which are film-forming and waterproofing carbonaceous materials which in themselves can serve as reducing agents of a mild kind for the metallic oxide. Other carbonaceous reducing agents which are waterproof may also be used, but I prefer to use the petroleum materials, such as crude petroleum, mineral oil or mineral wax, as these materials may be easily applied to the calcium carbide, as by spraying, to completely coat the external surfaces of the calcium carbide particles and serve to impregnate at least the outer portion of the particles sufficiently so that the particles are effectively waterproofed and thus rendered immune to the action of atmospheric moisture, even to the extent that the particles will withstand immersion in water for a considerable period without reacting with the water.

From about 1% to about 5% of the stabilizing agent is added to the calcium carbide, but I