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ADDITION MATERIAL FOR FERROUS METALS.

No Drawing. Application filed April 28, 1925. Serial No. 26,521.

Our invention relates to the adding of nickel and other alloying elements to cast irons or steels, and is designed especially to overcome the difficulty arising from the high melting point of such additions, particularly as compared to cast iron and other ferrous metals.

Nickel and other alloying elements are added to cast iron for the purpose of improving its properties in a number of directions, for example, to secure increase of hardness, strength or toughness, improvement of machinability, refinement of grain, etc.

The element nickel affects all of these properties favorably, but for many applications it is found that combinations of nickel with other alloying elements, such as chromium, manganese, molybdenum, tungsten, phosphorus and silicon are superior from the standpoint of properties produced in the resulting iron. Thus, a combination of nickel and sulphur added to iron will provide an iron with a greater percentage of combined carbon and consequently a harder structure, more resistant to wear although with perhaps diminished machinability. On the other hand, through the addition of a mixture of nickel, silicon and tungsten, an iron can be produced with maximum hardness together with very satisfactory machinability.

However, as fully set forth in our co-pending application, Serial No. 698,284, filed March 10, 1924, when ordinary nickel is added to the molten cast iron in the ladle, due to the higher melting point of the nickel as compared with that of the cast iron, it has been difficult to prevent segregation on account of incomplete melting of the nickel, and also in some cases there has been a tendency to produce blow holes. In said co-pending application we disclose a method of overcoming these difficulties, which consists in uniting with the nickel previous to its addition to the ferrous metal a substance or substances, preferably carbon and silicon, which will lower the melting point of the nickel and which will have no deleterious action upon the ferrous metal to which the nickel is added. Preferably from .25 to 2.5 per cent of carbon and from 1 to 10 per cent of silicon are added to the nickel addition for this purpose, although entirely satisfactory results have been obtained using carbon within the range from about .1% to about 3% and silicon from about 1% to about 15%.

Many of the above-mentioned alloying elements besides nickel are not suitable for direct addition to cast iron, however, by reason of their high melting point or of their ready disposition to oxidation by reason of which losses occur. For example, it is difficult to introduce chromium in its various commercial combinations into iron without incurring rather heavy losses. Molybdenum and tungsten in their usual combinations have a rather high melting point and are not readily absorbed in iron.

If these other alloying elements are combined with the carbon-silicon-nickel combination disclosed in our copending application referred to, they will be readily absorbed by the molten iron along with the nickel. If the alloying elements are added to the carbon, silicon and nickel within the ranges of percentages given in the following table, the resultant combination will have a lower melting point than that of the individual constituents or present commercial combinations and in many cases even lower than the carbon-silicon-nickel combination disclosed in our co-pending application.

Nickel	*Silicon*	*Carbon*	
Balance	1–10%	.25–2.5%.	
"	"	"	.1 – 5% aluminum.
"	"	"	1.00–50% chromium.
"	"	"	1.00–50% manganese.
"	"	"	1.00–30% copper.
"	"	"	1.00–50% tungsten.
"	"	"	1.00–50% molybdenum.
"	"	"	.01–15% phosphorus.
"	"	"	.01–25% sulphur.

The above combinations, in the form of ingots of various sizes or in the form of shot, are particularly well adapted for addition to cast iron either in the cupola or in the ladle. Naturally, the combinations to be used for various types of iron to be utilized for different commercial purposes will vary considerably since the qualities desired in cast iron for these different applications also vary. Thus, for one purpose a soft iron machinable in thin sections is required while in another case an iron which is machinable but hard may be required. In the above table we have given the range of percentages

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T. MIDGLEY

BEVELING AND SEALING CLAMP

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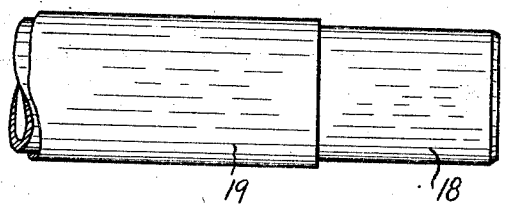


Fig. 1.

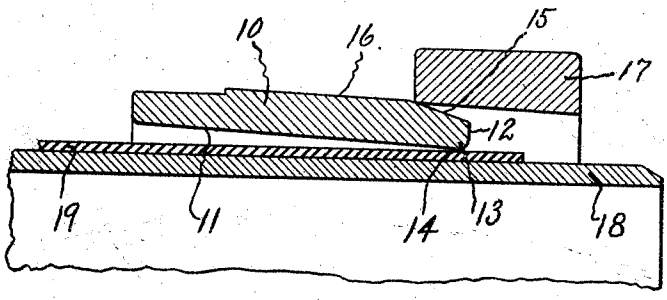


Fig. 2.

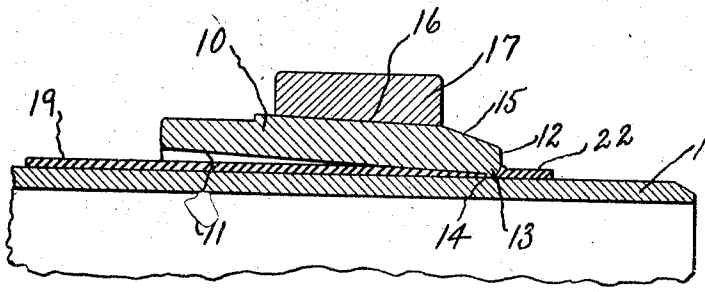


Fig. 3.

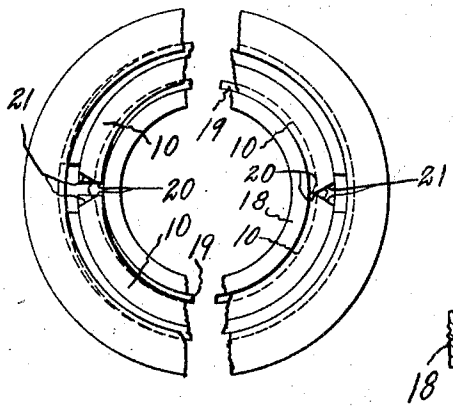


Fig. 5.

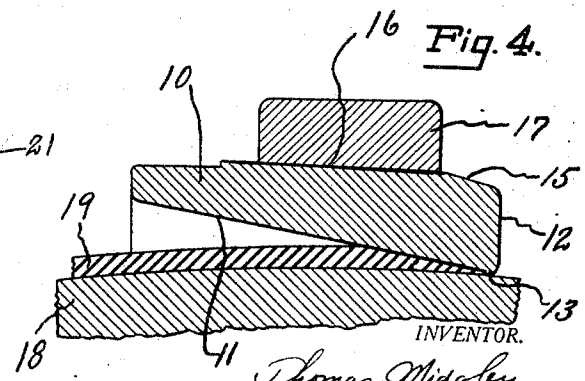


Fig. 4.

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