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METHOD OF HARDENING IRON.

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To all whom it may concern:

Be it known that I, DONALD M. SCOTT, a citizen of the United States, residing at Rochester, in the county of Monroe and State of New York, have invented certain new and useful Improvements in Methods of Hardening Iron; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

The invention relates to a method of hardening metal, and more particularly to a method of forming a hard wear-resisting surface or section on a malleable iron casting without the demalleabilization of the portion of the casting surrounding or adjacent to the hard surface or section.

The principal object of my invention, generally considered, is to provide a method of surface hardening malleable iron so as to adapt the same to resist wear, the said hardening being accomplished without changing the character of the adjacent metal. To this end the primary feature of my invention consists in applying to the surface of a malleable casting heat of sufficient intensity to cause the graphitic carbon to pass into solution and at the same time to maintain the opposite surface or section at a sufficiently reduced temperature to prevent any change in the character or chemical composition of the metal.

Another feature of the invention consists in applying to a clean surface of a malleable casting a heating element and applying to the opposite surface of said casting a cooling medium, the heating element being adapted to cause the free graphitic carbon of the adjacent surface to go into solution and the cooling medium being adapted to prevent a rise in temperature of said opposite surface so that no change in composition shall take place therein during the heating operation.

Other features of the method will appear in connection with the more detailed description of the invention.

Malleable iron, owing to its strength and ductility, is largely used in railway car castings, and it is peculiarly adapted, owing to those characteristics, for use in the production of journal boxes for railway cars. It is, however, a relatively soft metal and is consequently subjected to rapid wear when used in connection with a pedestal type of truck where there is a constant relative movement between the journal box and the pedestal. Various means and expedients have been employed to obviate or overcome the detrimental wear upon the journal box in a pedestal type truck, such as the use of liners and casting inserts in the box, lubrication, etc. These expedients have not proved entirely satisfactory in service owing to numerous inherent defects, such as the difficulty of properly renewing wear plates under service conditions, the mixture of grit and dust with the lubricant aggravating rather than remedying the wear upon pedestal ways; and it is the broad purpose of my invention to overcome and eliminate these defects and deficiencies.

The composition of malleable iron is such that it has heretofore been considered impossible to surface harden the same without at the same time demalleableizing the adjacent metal. In other words, any attempt to surface harden malleable iron has resulted in changing the malleable iron adjacent said surface to hard cast iron with the consequent result that the section loses its ductility and becomes exceedingly brittle.

The process is primarily intended for use in connection with blackheart malleable iron, and in carrying out my process I first remove the decarbonized surface, caused by the anneal, by machining this surface, or I employ, during the annealing some carbonizing material, such for instance as charcoal, bone dust or the like, so as to prevent decarbonization during the anneal. I prefer, however, to use the machining process, since by machining, that is, planing, grinding or the like, I am enabled to produce a smooth and uniform surface.

The next step in the process is to apply to the surface or a portion thereof to be hardened, heat sufficient to cause the graphitic carbon to change from a free state and to go back into solution so as to form a compound with the iron. In order to prevent the demalleableization of the entire section it is an essential element in the method to provide means whereby a radical drop in temperature shall take place between the surface which is heated and the opposite surface of the section. An exceedingly simple means to obtain this drop is to subject this opposite surface to a stream of air

or water, or other fluid which will prevent the rapid rise in temperature of this section.

The temperature may be obtained upon the surface treated in a number of ways, such for instance as an electric arc, electric resistance, or by subjecting the same to the flame of an acetylene torch in which the oxygen and acetylene are so combined as to afford a neutral flame, and it is preferable when utilizing this method to treat small sections rather than a large area of surface.

I claim:—

1. The method of hardening malleable iron which consists in eliminating the decarbonized surface from a section thereof, applying to said surface a heating element of sufficient temperature to drive the graphitic carbon into solution and at the same time to apply to the opposite face or surface of the section treated a cooling medium to prevent the demalleabilization of the entire section.

2. The method of hardening malleable iron which consists in removing from the surface to be treated the decarbonized material, applying to said surface a heating medium of sufficient temperature to drive the graphitic carbon into solution and at the same time subjecting the opposite surface of the section to be treated to a cooling medium to provide a radical drop in temperature from the surface treated to the opposite surface of the said section.

3. The method of hardening malleable iron which consists in forming on the surface of the section to be treated a surface free from decarbonized material, subjecting said surface or a portion thereof to a heat sufficient to drive the graphitic carbon into solution and at the same time maintaining a radical drop in temperature between the surface treated and the opposite surface of said section.

4. The method of hardening malleable iron which consists in machining the surface of a section to be hardened so as to remove therefrom the decarbonized material, subjecting said surface or a portion thereof to the flame of an oxy-acetylene torch for a sufficient period to drive the graphitic carbon into solution and at the same time subjecting the opposite surface of the section being treated to a cooling medium so as to provide a radical drop in temperature through the section.

5. The method of hardening malleable iron which consists in machining the surface of a section to be treated so as to remove therefrom the decarbonized material, subjecting said surface to the neutral flame of an oxy-acetylene torch and at the same time subjecting the opposite surface of said section to a cooling fluid so as to provide a radical drop in temperature through the heated surface to the cooled surface of said section.

In testimony whereof I affix my signature.

DONALD McCORMICK SCOTT.