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SELF-HARDENING WELDING ROD

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5 Claims. (Cl. 219—8)

This invention relates to alloy steel rods and coatings in connection therewith which, when the coated metal rod center is melted either by oxy-acetylene or electric arc melting an alloy is produced which is hard and tough, of extremely high tensile strength, and capable of forging after deposition upon a base iron metal. The metal may be deposited upon an underlying ferrous base to any desired degree of thickness and the heavier thicknesses may be obtained by depositing the metal in a number of layers. The central rod is of a well known composition sold openly on the market under the designation SAE 4150 steel. The flux coating contains compounds of a metallic nature, the metallic elements of which combine with the iron of the steel rod to produce a deposited alloy having the characteristics and properties which have been stated.

When the rods are melted by an oxy-acetylene flame the coating is made from ingredients in substantially the following proportions: crushed ferro chrome, 35 to 44%; crushed ferro manganese, 35 to 44%, graphite powder 14 to 18%. These provide the dry elements of the coating. They are used with wet elements which consist of sodium silicate and distilled water in proportions of 30% of sodium silicate to 70% distilled water. The dry elements are mixed with the wet elements thus provided in proportions of 60% of the dry elements to 40% of the wet elements.

When the rods are melted by an electric arc the ingredients of the coating are substantially as follows: crushed ferro chrome 25 to 30%; crushed ferro manganese 8 to 10%; titanium 4 to 6%; fluorospar 7 to 10%; marble 16 to 20%; graphite 25 to 30%. The wet elements are the same as before, sodium silicate 30% and distilled water 70%. The elements are mixed in proportions of 37½% wet to 62½% dry. In both cases the weight of the dry elements of the coatings is one-quarter of the weight of the SAE 4150 steel rod upon which the coating is applied so that of the total weight of the rod 20% consists of the coating and 80% of the steel center rod.

The metal deposited when thus coated has combined with the iron 6 to 8% chromium and 2 to 3% manganese. The carbon that is present in the steel ranges from 0.5 to 0.75% and there is present from 0.5 to 1% titanium. Silicon, phosphorus and sulphur are present in exceedingly small amounts or traces and if it was possible to remove them entirely there would be none. For example, silicon varies from 0.01 to 0.02% and both phosphorus and sulphur from 0.001 to 0.002%. Such silicon, phosphorus and sulphur are

negligible and do not affect the deposit in any particular manner and desirably there would be none of such elements if in practical commercial practice it was possible or feasible to entirely remove them. The graphite which is in the coatings serves to maintain the proper amount of carbon in the deposited metal, more graphite being used with electric arc high temperatures than with the lower oxy-acetylene temperatures. The titanium which is used in the coating for electric arc melting where the temperature reached will exceed 3600° F. insures against nitrogen from the air combining with and forming undesired and damaging compounds with the chromium and iron. The small amount of titanium which is in the deposited alloy in the electric arc melting serves to render the alloy more tough and resistant.

The deposits produced after melting and deposition upon a suitable steel base range in hardness from 500 to 565 Brinell. Such deposits are exceedingly tough and have a tensile strength exceeding 185,000 pounds per square inch. They are highly resistant to abrasion even at high temperatures. Such properties make the alloy particularly useful for application to manganese steel bases for rock handling and digging equipment for example, the crushing mantles and jaws of rock crushers, steam shovel teeth and the like. The actual fluxing material used in the coatings is small in amount so that any flux residue left is light and may be readily removed. Such alloy may also be used to build upon a base ferrous metal, a part of the abrasive resisting face of the metal and thereafter a still harder and tougher and more resistant alloy to abrasion, such as described in my copending application filed herewith, applied as the final or outside layer.

When applied to steel bases, the joined together base and alloy deposit may be readily forged at heats ranging between 1700 and 2000° F.

There are many applications of the deposited metal other than those which have been previously stated. It may be used for coating the impellers and liners of centrifugal pumps; for covering large areas that are subjected to impacts and abrasions, particularly in those cases where cost must be kept low; for rebuilding the tracks, guide and thrust rollers, grouser bars, drive sprockets and other parts of caterpillar tractors subjected to abrasive wear; rebuilding wobbler ends and clutches in steel mills; rebuilding cotton gin separator bars; and in general for repairing and increasing the life of most parts

of heavy equipment which are subjected to great wear.

I claim:

1. A rod of steel having a coating of ferro chrome, ferro manganese and graphite powder cemented together and located around the rod, the weight of steel approximating 80% of the completed rod and the coating approximating 20% thereof.

2. A rod of steel and a coating therefor comprised of dry elements of crushed ferro chrome 35 to 44%, crushed ferro manganese 35 to 44%, and graphite powder 14 to 18%, and wet elements comprising sodium silicate 30% and distilled water 70%, the wet and dry elements being mixed in proportions of 40% wet and 60% dry elements, the weight of steel and coating being approximately in the ratio of four to one.

3. A rod of steel having a coating of approximately one-fourth of the steel weight including ferro chrome, ferro manganese and graphite, whereby when said coated rod is melted the melted deposit will have added to the steel 6 to 8% of chromium and approximately 2 to 3% of manganese.

4. A rod of steel which consists principally of iron with approximately one-half to three-quarters

of 1% carbon, combined therewith having a coating comprising ferro chrome 35 to 44% and ferro manganese 35 to 44% and graphite 14 to 18% cemented together, the coating on the completed rod approximating 20% of the weight of the rod and the steel approximately 80% thereof, said rod being adapted to be melted and subjected to temperatures not exceeding approximately 3500° F.

5. A rod of steel and a coating thereupon composed of wet and dry elements, said dry elements including ferro chrome of approximately 20 to 30%, ferro manganese approximately 8 to 10%, titanium 4 to 6%, fluorspar approximately 7 to 10%, marble approximately 16 to 20%, graphite approximately 25 to 30% and forming approximately 60% of the coating, said wet elements comprising sodium silicate 30% and distilled water 70% and providing approximately 40% of the coating, said dry elements in powdered form being cemented together by the sodium silicate and adhering together and to the rod, the weight of the coating comprising approximately 20% of the coated rod and the steel approximately 80% thereof.

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