UNITED STATES PATENT OFFICE.

ROBERT B. CARNAHAN, JR., OF MIDDLETOWN, OHIO, ASSIGNOR TO THE INTERNATIONAL METAL PRODUCTS COMPANY, OF NEWARK, NEW JERSEY.

ALLOY.

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To all whom it may concern:

Be it known that I, ROBERT B. CARNAHAN, Jr., a citizen of the United States, residing at Middletown, Butler county, Ohio, have invented certain new and useful Improvements in Alloys, of which the following is a specification.

The present invention comprehends an iron alloy (by which is meant an alloy containing at least 80 per cent. of iron) slagless and crystalline and deoxidized and degasified, the alloy containing not less than 99.80 per cent. of iron with its alloying metal or metals taken together, and containing not over .14 per cent. of silicon, sulfur, phosphorus, carbon and manganese when taken in the aggregate, and containing not over .05 per cent. of oxygen.

Notwithstanding the teachings of authorities that pure iron is without utility in the arts owing to its extreme susceptibility to corrosion I have discovered that this is not correct. Having produced, as I believe, the purest iron yet commercially produced, I have ascertained that the greater its purity the greater its resistance to corrosion and the greater its capacity for all of the general useful purposes of iron.

In my present invention I purify molten iron to such extent that its silicon, sulfur, phosphorus, carbon and manganese will not exceed .14 per cent. when taken in the aggregate and I so reduce the oxygen that it will not exceed .05 per cent. in the finished product and I combine with the iron an alloying metal, or metals, of a character which, in conjunction with the iron, will produce an alloy having greater corrosion-resisting qualities than the unalloyed iron. While it may be generally true that the alloying metal will of itself be of higher corrosion-resisting quality than the unalloyed iron, I am not sure that this is true in all cases, my intention being, however, that the alloy when produced shall have higher corrosion-resisting qualities than the iron alone even if it should be proved that the alloying metal was of itself of lower corrosion-resisting quality than the iron alone.

The improved alloy is to contain not less than 80 per cent. of iron, and not less than 99.80 per cent. of iron and alloying metal or metals taken together. As a type of the alloyed iron I would mention an iron-nickel alloy containing 99.30 per cent. of iron and .50 per cent. of nickel, and containing not over .14 per cent. of silicon, sulfur, phosphorus, carbon and manganese when taken in the aggregate and containing not over .05 per cent. of oxygen. The improved alloy may be made in a basic open-hearth furnace by refining iron till silicon, sulfur, phosphorus, carbon and manganese do not exceed .14 per cent. when taken in the aggregate; then partially deoxidizing the bath by the addition of, say, 5 per cent. of pig-iron to the bath; then tapping the charge into a ladle or other receptacle along with a deoxidizing and degasifying agent, say aluminum at the rate of two and one-half pounds per ton; the alloying metal or metals being combined with the iron either in the furnace or ladle, it being essential however that deoxidizing action take place after the alloying element has been incorporated with the iron, since the alloy itself should be subjected to the deoxidizing action in contradistinction to the deoxidizing of the iron or major component of the alloy alone. After the deoxidation the molten alloy is poured into molds to form alloy castings or to form ingots for rolling mill or bloomery purposes. Such ingots may be rolled and forged with facility and the microscope has thus far failed to discover slag-lines in the ingots or their products.

As a standard from which the oxygen content is to be determined reference is here made to the Ledebur method of oxygen determination.

The proportion of the alloying metal employed with the iron will be determined largely by the quality wanted when considered in connection with the cost. In a nickel-iron alloy, for instance, if the high cost will be justified by the results, an alloy can be produced which would be practically proof against corrosion. The nickel in the above case not only enhances the corrosion-resisting quality of the alloy but is itself of higher corrosion-resisting quality than the iron alone, and also enhances the strength of the iron.

I claim:—

1. An alloy slagless and crystalline and deoxidized and degasified and containing not over .14 per cent. of silicon, sulfur, phosphorus, carbon and manganese taken in the aggregate, and containing not over .05 per

cent. of oxygen, and containing at least 99.80 per cent. of iron and alloying metal or metals taken in the aggregate, and containing at least 80 per cent. of iron, substantially as set forth.

2. An alloy slagless and crystalline and deoxidized and degasified and containing not over .14 per cent. of silicon, sulfur, phosphorus, carbon and manganese taken in the aggregate, and containing not over .05 per cent. of oxygen, and containing at least 99.80 per cent. of iron and alloying metal or metals taken in the aggregate, and containing at least 80 per cent. of iron, such alloying metal or metals being of a character to enhance the corrosion-resisting quality of the metal, substantially as set forth.

3. An alloy slagless and crystalline and deoxidized and degasified and containing not over .14 per cent. of silicon, sulfur, phosphorus, carbon and manganese taken in the aggregate, and containing not over .05 per cent. of oxygen, and containing at least 99.80 per cent. of iron and alloying metal or metals taken in the aggregate, and containing at least 80 per cent. of iron, the alloying metal or metals having a higher corrosion-resisting quality than the unalloyed iron, substantially as set forth.

ROBERT B. CARNAHAN, JR.

Witnesses:
G. W. JOHNSON,
M. S. BELDEN.