# UNITED STATES PATENT OFFICE.

ROBERT LOUIS SENTINELLA, OF LONDON, ENGLAND.

## METALLIC FLUX FOR USE IN REFINING IRON OR STEEL FOR CASTING.

SPECIFICATION forming part of Letters Patent No. 506,799, dated October 17, 1893.

Application filed January 6, 1893. Serial No. 457,527. (No specimens.) Patented in England February 23, 1892, No. 3,493.

*To all whom it may concern:*

Be it known that I, ROBERT LOUIS SENTINELLA, brass molder, a subject of the Queen of the United Kingdom of Great Britain and Ireland, residing at No. 2 North Street, Kennington Road, London, England, have invented certain new and useful Improvements in Metallic Fluxes for use in Refining Iron and Steel for Casting, (for which I have obtained a patent in Great Britain, No. 3,493, dated February 23, 1892;) and I do hereby declare that the following is a full, clear, and exact description of the invention, which will enable others skilled in the art to which it appertains to make and use the same.

The present invention relates to improvements in metallic fluxes for cast iron or for cast steel and the special object of it is to produce one which is an alloy of either metal with sodium in conjunction with sodium chloride and iron chloride or chlorides diffused through it. This alloy is intended to be used as a flux for iron or steel in either furnace or crucible, for the purpose of eliminating the sulphur phosphorus and silicon and producing a truly homogeneous, dense, fine grained, soft, easily worked metal of superior electrical properties.

In carrying the invention into effect, the iron or steel which is intended to form the base of the alloy is melted in a crucible till it is plastic as distinguished from fluid. Chloride of sodium, either in lump or in powder, is thoroughly stirred into the metal so as to incorporate it with it, care being taken that the stirring in is effected before the chloride is fused. The result is an intimate mixture of plastic metal and chloride of sodium. The exact proportion of chloride varies between ten and twenty pounds to one hundredweight of metal. The crucible is next covered and gradually and carefully subjected to a more intense heat until the reaction between the metal and the chloride sets in. The mixture of metal and sodium chloride becomes ebullient under the rise in temperature and the following chemical reaction sets in. A portion of the chloride is decomposed, its chlorine uniting with the necessary complement of iron to produce ferric chloride, and the dissociated sodium is diffused through the iron, becoming alloyed therewith. The production of the ferric chloride is accompanied by the development of a considerable quantity of heat. This reaction has gone far enough and effected the bulk of the metal sufficiently by the time the sodium and the ferric chloride vapors are seen to be burning upon the surface of the metal. At this stage the crucible is withdrawn from the furnace and its contents well stirred, and poured as cool as practicable. The cooling stops the chemical reaction. Less than half the sodium chloride has been affected by the reaction. A convenient way of dealing with said contents is to cast them into ingots of a convenient weight.

It must be pointed out that it is absolutely necessary that the above process of alloying be conducted in a crucible for if it were attempted under circumstances where—as in a blast furnace—air is present, the chemical reaction above described would be spoiled and the production of the alloy rendered impracticable.

The alloy itself may be used in either crucibles, blast furnaces or open hearths.

The proper proportion of alloy to use varies from one to ten per cent. of the weight of the metal to be run down. Much of course depends upon the quality of the latter, and the relative quantities of scrap and new pig, but I have found that from five to ten per cent. of alloy gives good results with ordinary scrap and a fair allowance of new pig.

The alloy may be fed in with the metal to be run down or after the latter is in a molten state. As it and the iron melt, that portion of the sodium chloride which was not decomposed during the production of the flux in the crucible, is decomposed now, its chlorine uniting with the proper complement of iron to form ferric chloride, while the dissociated sodium is diffused through and alloyed with the iron. The increased temperature occasioned by and incidental to the formation of the ferric chloride assists such diffusion. The alloyed iron and sodium are diffused throughout the molten iron, the sodium purifying it of all its impurities and effecting their collection in the form of slag.

The thoroughness of the penetration of the alloy and of the union of the sodium with the metal is demonstrated by the fact that the

yellow sodium flame will still show, even after repeated remeltings, on the surface of molten metal which has been purified by my improved alloy.

It is to be understood that it is the sodium in the alloy that is the active agent in effecting the elimination of the sulphur, phosphorous and silicon in the form of slag.

It is to be further understood that I rely upon the presence of ferric chloride, and regard that of ferrous chloride as accidental, or at any rate, as non-essential to the present invention.

I claim—

1. The hereinbefore described alloy adapted to be used as a flux for the purification of iron or of steel, and consisting of iron, sodium, sodium chloride and iron chloride or chlorides.

2. The hereinbefore described process of effecting the alloying of sodium and iron, consisting of heating iron or steel in a crucible to a semi fluid or plastic condition, stirring chloride of sodium into the mass, and increasing the heat until a portion of the chloride is decomposed, ferric chloride formed and the dissociated sodium alloyed with the iron.

In witness whereof I have hereunto affixed my signature, in presence of two witnesses, this 23d day of December, 1892.

ROBERT LOUIS SENTINELLA.

Witnesses:
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