

UNITED STATES PATENT OFFICE.

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MANUFACTURE OF IRON-NICKEL-COPPER ALLOYS.

965,871.

Specification of Letters Patent.

Patented Aug. 2, 1910.

No Drawing.

Application filed August 19, 1909. Serial No. 513,538.

To all whom it may concern:

Be it known that I, GUILLIAM H. CLAMER, a citizen of the United States, and a resident of Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in the Manufacture of Iron-Nickel-Copper Alloys, of which the following is a specification.

The principal object of the present invention is to provide for making, direct from ore containing nickel and copper and iron in the form of sulfids, a homogeneous alloy of the metals named which is of whitish color, practically non-corrosive, possessed of a low co-efficient of expansion and of great mechanical strength, which can be rolled into sheets, rods and the like, and which can be comparatively cheaply produced.

The alloy can be made within the following range of proportions by weight:

Nickel	25 to 50%
Copper	5 to 20%
Iron	30 to 70%

There may be present a small amount of impurities, such as would ordinarily exist in commercial steel, copper and nickel and the presence of carbon in limited proportion does not cause separation. The strength of the alloy depends upon the carbon content, so that in each case the carbon content is to be determined by providing enough carbon content to insure the required mechanical strength, yet not enough carbon content to produce hard metallic nodules.

For the sake of a further description it may be stated that an alloy containing 65% of iron, 25% nickel and 10% copper and $\frac{2}{10}$ of one per cent. of carbon has the following approximate physical properties: On a test bar one-half inch in diameter and two inches between shoulders, strain per square inch in pounds 96,100, limit of elasticity per square inch in pounds 51,750, elongation per cent. of original length 42%, reduction of area per cent. of original section 53.7, but the above is given without intending to limit my patent to such proportions.

To make the alloy directly from ore containing nickel, copper and iron in the form

of sulfids, the ore is first melted with fluxes to form a slag with the gangue and the production at the same time of an iron-copper-nickel matte. This matte may be of varying composition and, if the iron in the matte is higher than desirable, the matte can be bessemerized, so that approximately the desired amount of iron is removed by the resulting oxidation, and the amount of iron desired for the finished alloy remains. This matte is then calcined to remove sulfur and convert the nickel-copper and iron into oxids. These oxids are reduced with carbon or other suitable reducing agent, whereby there is produced a homogeneous alloy of the three metals in the same relative proportions in which they existed in the matte before calcining; the carbon should not be present in amounts sufficient to produce hard metallic nodules.

The addition of any of the three metals, copper, nickel or iron may be made to bring the alloy to the desired proportions which are those within the limits above given. In the finished alloy there is present some or all of the iron which was present in the ore. The desired method of production is comparatively inexpensive, simple and expeditious.

The alloy described is not claimed herein, as it is described and claimed in my co-pending application Serially Numbered 513,537, filed Aug. 19, 1909.

What I claim is:

1. The method of making an iron-nickel-copper alloy which consists in making an iron-copper-nickel matte from a sulfid ore containing iron, copper and nickel, bessemerizing the matte to the extent required, retaining the iron content desired in the finished product, calcining the matte to convert the sulfid into oxids, and reducing the oxids thereby making an alloy of copper, nickel and iron, substantially as described.

2. The method of making an iron-nickel-copper alloy which consists in making an iron-copper-nickel matte from a sulfid ore containing iron, copper and nickel, bessemerizing the matte to the extent required, retaining the iron content desired in the finished product, calcining the matte to convert the sulfid into oxids, reducing the oxids

thereby making an alloy of copper, nickel and iron, and adding copper, iron or nickel as desired, substantially as described.

3. The method of making an iron-nickel-
5 copper alloy which consists in making an iron-copper-nickel matte from sulfid ore containing iron, copper and nickel, calcining the matte to convert the sulfids of iron, nickel and copper into oxids, and reducing

the oxids thereby making an alloy of the 10 metals named containing iron of the original ore, substantially as described.

In testimony whereof I have hereunto signed my name.

GUILLIAM H. CLAMER.

Witnesses:

M. McGARVEY,

J. CECIL BRIGHTHILL.