Patented Oct. 3, 1939 2,174,919

UNITED STATES PATENT OFFICE

2,174,919

ALLOY

William Marriott Kay, Manchester, England

No Drawing. Application December 3, 1938, Serial No. 243,873. In Great Britain December 10, 1937

4 Claims. (Cl. 75—128)

This invention primarily relates to resistance wire for electric fires, heaters and the like and has for its object to provide an alloy having a very high resistance to oxidation at high temperature and to attack by acids, sulphur and other corrosive agents. The alloy is suitable, among other purposes, for use in the manufacture of electric resistance wires and other articles which have to be exposed to the action of the atmosphere at high temperatures.

More particularly the invention relates to nickel chromium alloys containing 10 to 30% chromium with the balance nickel and to nickel-chromium-iron alloys containing 10–30 parts chromium, and the balance nickel, up to 50% of which is replaced by iron, by iron and tungsten (the percentage of the latter in the composition being up to 10), by iron and molybdenum (the percentage of the latter being up to 10), by iron and cobalt (the percentage of the latter being up to 10) or by iron and manganese, zirconium, aluminium or uranium (the percentage of manganese, zirconium, aluminium or uranium in the composition being up to 2).

In accordance with my invention, during the manufacture of an alloy such as above indicated, there is added to the molten charge

	Per cent
Thorium	.01–2
Silicon	.25–3

with or without additions of rare earth metals such as cerium from .01% to 2%, or alkaline earth metals, such as calcium from .01 to .5%. From .01% to 0.50% Mg may be added for deoxidising purposes.

The combined use of thorium and silicon gives much improved results as compared with the use of thorium only, and the use of this combination of thorium and silicon together with either a rare earth, or an alkaline earth metal gives an outstanding improvement in results.

The following examples will show the effect of the various additions. The hours figure gives the life of a specimen wire of .025" diameter when tested by the Bash and Harsch method with a starting temperature of 1175° C., all tests being carried out under uniform conditions.

Basis metal 80% nickel, 20% chromium.

Example 1

	Hours
Addition of .25% Th	38

Example 2

Additions of .25% Th, 1% Si	128

Example 3

Additions of .25% Th, 1% Si, .15% Ca	242

Example 4

Additions of .25% Th, 1% Si, .15% Ca, .25% Zr	244

Example 5

Additions of .25% Th, 1% Si, .15% Ca, .5% U	263

Example 6

Additions of 0.125% Th, 1% Si, .125% Ce, .125% Mg	279

What I claim is:

1. A heat resisting alloy consisting essentially of 10 to 30% chromium, .01 to 2% thorium, .25 to 3% silicon, .01 to 2% cerium, the balance consisting of iron group metals.

2. A heat resisting alloy consisting essentially of 10 to 30% chromium, substantially .125% thorium, substantially 1% silicon, substantially .125% cerium, the balance consisting of iron group metals.

3. A heat resisting alloy consisting essentially of substantially 20% chromium, .01 to 2% thorium, .25 to 3% silicon, .01 to 2% cerium, balance nickel.

4. A heat resisting alloy consisting essentially of substantially 20% chromium, substantially .125% thorium, substantially 1% silicon, substantially .125% cerium, balance nickel.

WILLIAM MARRIOTT KAY.