Patented Sept. 5, 1950

2,521,273

UNITED STATES PATENT OFFICE

2,521,273

NICKEL BASE ALLOY

William A. Wissler, Niagara Falls, N. Y., assignor, by mesne assignments, to Union Carbide and Carbon Corporation, a corporation of New York

No Drawing. Application April 15, 1948, Serial No. 21,302

9 Claims. (Cl. 75—134)

1

The invention is a hard, wear-resistant nickel base alloy of relatively low melting point suitable for use in hard facing operations. The invention also includes a welding rod fabricated from the alloy.

The alloy of the invention contains 5% to 18% silicon; 5% to 30% cobalt; 10% to 30% copper; the remainder nickel and incidental impurities. With the nickel may be associated iron up to about 15% of the alloy, and preferably the alloy contains 3% to 10% iron. The alloy may also contain up to 15% chromium, replacing nickel, without materially affecting the properties of the alloy, but the sum of chromium and iron should not exceed 20% of the alloy. The nickel content should be not less than 35% and not more than 65% of the alloy, and the sum of nickel and iron should not exceed 65%.

A preferred range of compositions for the alloy of the invention is 10% to 14% silicon; 15% to 25% cobalt; 15% to 25% copper; 3% to 10% chromium; remainder nickel, together with 3% to 10% iron.

Alloys within the foregoing composition ranges generally have a melting point between about 1000° C. and 1100° C. Their hardness, as measured on the Rockwell "C" Scale is between about 45 and 55. The wear-resistance of alloys of this composition is excellent, and they have a fairly high degree of resistance to corrosion and are therefore suitable for use where corrosion resistance and hardness are both desirable, for example as trim for certain types of valves.

The alloy of the invention may be cast into any desired shape and is well suited to the production of welding rods for use in hard-facing operations.

For hard-facing, the alloys may be applied in the conventional manner by deposition from a welding rod, or the alloy may be laid in place on an article to be hard-faced and the entire assembly heated until the alloy melts and forms a coating. Where extreme resistance to abrasion is required, the alloy may be used as a carrier or bond for tungsten carbide or other types of diamond substitute.

In the following table are listed several specific compositions typical of alloys of the invention, together with their melting points and hardness, the latter being measured on the Rockwell "C" Scale.

2

Per Cent Composition						Melting Point °C.	Hardness
Si	Co	Cu	Ni	Cr	Fe		
12	20	20	48	Nil	Nil	1,045	54–55
11	18	18	43	10	Nil	1,045	53–55
12	20	20	43	5	Nil	N. D.	51–54
10	18	19	38	15	Nil	N. D.	53 max.
12	20	20	43	Nil	5	N. D.	51–55
12	20	20	38	Nil	10	N. D.	48–52
12	20	20	38	5	5	N. D.	50–53
12	20	20	33	5	10	N. D.	48–54
10	10	18	42	10	10	1,090	52–55
10	15	15	60	Nil	Nil	1,110	47–52
14	25	25	36	Nil	Nil	1,125	51 max.
8	10	10	72	Nil	Nil	1,130	41–42
8	10	20	62	Nil	Nil	1,095	47–49
8	20	10	62	Nil	Nil	1,125	43–44
8	20	20	52	Nil	Nil	1,065	47–49

N. D.—not determined.

The data in the above table are illustrative of the properties of the alloy of the invention which make it suitable for use in applications where resistance to wear is required.

I claim:

1. An alloy containing 5% to 18% silicon; 5% to 30% cobalt; 10% to 30% copper; up to 15% chromium; up to 15% iron; remainder nickel, the nickel content being not less than 35% and not exceeding 65%, the sum of chromium and iron not exceeding 20% and the sum of nickel and iron not exceeding 65% of the alloy.

2. An alloy containing 10% to 14% silicon; 15% to 25% cobalt; 15% to 25% copper; 3% to 10% chromium; remainder nickel and incidental impurities, the nickel content being not less than 35% and not more than 65% of the alloy.

3. A welding rod composed of the alloy defined by claim 1.

4. A welding rod composed of the alloy defined by claim 2.

5. An article required to withstand wear and abrasion, at least the portions of such article subjected to wear being composed of the alloy defined by claim 1.

6. An article required to withstand wear and abrasion, at least the portions of such article subjected to wear being composed of the alloy defined by claim 2.

7. An alloy containing 10% to 14% silicon; 15% to 25% cobalt; 15% to 25% copper; 3% to 10% chromium; 3% to 10% iron; remainder nickel and incidental impurities, the nickel con-

tent being not less than 35% and the sum of the nickel and iron contents being not more than 65% of the alloy.

8. A welding rod composed of the alloy defined by claim 7.

9. An article required to withstand wear and abrasion, at least the portions of said article subjected to wear being composed of the alloy defined by claim 7.

WILLIAM A. WISSLER.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,163,813	Douglass	Dec. 14, 1915
1,203,555	Brix	Oct. 31, 1916
1,762,871	Lytle	June 10, 1930
2,222,472	Bishop	Nov. 19, 1940
2,245,566	Bolton	June 17, 1941
2,309,136	Nieman	Jan. 26, 1943
2,355,581	Wise	Aug. 8, 1944

FOREIGN PATENTS

Number	Country	Date
155,829	Switzerland	Oct. 1, 1932