Patented Nov. 19, 1940 2,222,474

UNITED STATES PATENT OFFICE

2,222,474

NICKEL BASE ALLOY

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No Drawing. Original application August 24, 1939, Serial No. 291,671. Divided and this application April 12, 1940, Serial No. 329,307

4 Claims. (Cl. 75—170)

The invention relates to corrosion resistant alloys and particularly to nickel-base alloys having improved corrosion resistance. This application is a division of application Serial No. 291,671, filed August 24, 1939.

Nickel-base alloys containing silicon, with or without additions of aluminum or copper or mixtures thereof are particularly resistant to many corrosive media, notably including hot aqueous solutions of hydrochloric acid. Alloys of the foregoing type are disclosed in Patents 1,514,064 and 1,753,904, issued to A. J. Mandell and C. E. Plummer, respectively. While extensive use has been made of the excellent resistance of such alloys to corrosion by hydrochloric acid, there is a demand for alloys having even greater resistance to this acid.

The principal object of this invention is to provide a nickel-base alloy having improved corrosion resistance, particularly to hydrochloric acid, and good physical properties. This and other objects are attained in the present invention by the application of my discovery that the addition of antimony, within certain definite composition limits greatly improves the corrosion resistance and other properties of the nickel-base alloys.

Alloys included in the invention contain silicon in a proportion between 3% and 14%, preferably between 6% and 11%; antimony in a proportion between 0.02% and 10%, preferably between 0.3% and 5%; with or without aluminum in a proportion between 0.02% and 5%, preferably between 0.5% and 3%; remainder nickel which may be replaced in part by cobalt or iron or both. In addition to the foregoing elements, a small proportion of manganese may be present to improve the hot working characteristics of the alloy.

The following table indicates the composition of several representative alloys of the invention and also indicates the results of corrosion tests made on samples of those alloys and on samples of alloys containing no antimony but otherwise similar to those of the invention.

	Composition				Corrosion rate in milligrams per square centimeter per hour in aerated 10% aqueous HCl at a temperture of 70° C.	
Alloy No.	Si	Al	Sb	Ni	First 48 hours	Second 48 hours
	Percent	*Percent*	*Percent*	*Percent*		
1	8.7	None	None	Remainder	3.8	2.7
2	8	None	2.9	do	1.3	1
3	8.6	3.7	None	do	0.91	0.71
4	8.6	3.7	2.9	do	0.19	0.12

The corrosion rates shown in the above table were determined by completely immersing the specimen in the acid solution indicated therein and maintaining that solution at constant temperature for the periods of time indicated. The loss in weight was determined and reported as the number of milligrams dissolved per square centimeter of surface per hour of time.

The addition of 0.3% to 5% antimony to the alloys described herein, in accordance with the preferred procedure of the invention, does not materially affect their mechanical properties, but greater proportions of antimony, that is, between 5% and 10%, usually lower the strength of the alloy somewhat. However, in both instances the alloys possess excellent corrosion resistance, and in apparatus constructed from alloys containing the greater proportions of antimony a proper allowance in the design of such apparatus may be made to compensate for the decrease in strength of the alloy.

I claim:

1. An alloy comprising silicon in a proportion between 3% and 14%; antimony in a proportion, between 0.02% and 10%, serving to impart improved corrosion resistance to the alloy; the remainder substantially all nickel.

2. An alloy as defined in claim 1 in which the silicon is in a proportion between 6% and 11%.

3. An alloy as defined in claim 1 in which the antimony is in a proportion between 0.3% and 5%.

4. An alloy comprising silicon in a proportion between 6% and 11%; antimony in a proportion, between 0.3% and 5%, serving to impart improved corrosion resistance to the alloy; the remainder nickel.

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