

TABLE IV

Ex.	Rupt. Life (h)	% El.	% R.A.
1	273.3	4.1	3.6
2	624.0	2.6	0.8 (1)
3	247.9	11.8	16.0
4	525.1	6.6	3.5 (2)
5	273.9	10.4	16.7
6	626.1	3.3	0.0 (2)
7	642.7	4.9	3.5 (3)
8	401.9	4.7	4.7 (2)
9	609.2	8.1	10.9 (2)
10	343.7	36.3	43.7 (4)
11	520.2	23.6	34.7
12	471.7	25.3	56.2
13	327.6	33.7	66.9
14	271.6	36.8	51.8
15	408.7	31.9	51.2
23-8N	151.0	6.7	7.6

(1) One specimen broke at end; one specimen broke at punch mark.

(2) Both specimens broke at end.

(3) Both specimens broke at punch mark.

(4) One specimen broke at end.

Table IV illustrates the good stress rupture life of the present alloy which is significantly better than the 23-8N alloy.

Hot hardness testing was performed on samples of heats 2-4, 6, 7, 9, 12, 14, 15 and a sample of the 23-8N heat all of which were solution treated and aged in accordance with Table II above. The hot hardness specimens each measured about 0.39 in rd. x 0.195 in high and the surface of each specimen was polished to a 6 micron finish.

Hot hardness testing was performed using an Akashi Model AVK-HF hot hardness tester. Indentations were made using a 5 kg load, measured, and then converted to DPH hardness in accordance with the standard test procedures for the apparatus. For each specimen, up to six hardness measurements were made and recorded at room temperature, 1000° F., 1200° F., 1400° F., and 1500° F. Elevated temperature specimens were stabilized for five minutes before hardnesses were measured.

The results of the hot hardness tests shown in Table V as Vickers hardness numbers (HV) are the lowest and the highest (low/high) for each specimen at each test temperature.

TABLE V

Ex.	HV				
	R.T.	1000° F.	1200° F.	1400° F.	1500° F.
2	412/435	313/325	280/329	268/280	241/249
3	396/423	274/293	251/268	221/244	208/225
4	412/429	303/329	293/306	260/271	232/241
6	407/423	303/317	293/313	268/280	232/246
7	423/435	306/353	296/345	271/289	241/251
9	412/435	321/336	303/321	274/313	241/251
12	362/391	227/262	223/244	210/216	203/227
14	345/362	216/227	195/216	193/206	165/180
15	362*	249/268	229/241	208/223	201/221
23-8N	332/362	199/212	190/197	168/183	156/175

*One R.T. reading taken for Ex. 15.

Table V illustrates the high hardness and good heat resistance of the present alloy. It is noted that the room temperature and elevated temperature hardness of present alloy is as good to significantly better than the 23-8N alloy. The data of Table V is also indicative of the improved wear resistance of the alloy as described more fully hereinbelow.

Wear testing was performed at 800° F. on specimens of Examples 3, 12, 15 and a specimen of the 23-8N alloy. Ring specimens were machined from blanks cut from the solution treated bars and aged in accordance with

the heat treatments specified in Table II. The wear test was carried out by mating a ring specimen for a given example against AISI type M2 high speed steel with a load of 100 lbs and rotating the ring specimen at 100 rpm for one hour at 800° F. The results of the wear tests are shown in Table VI as the mass of material lost (Mass Loss) in milligrams (mg). The mass loss of each specimen was determined by taking the difference between weighings made before and after testing. A smaller mass loss indicates better wear resistance.

TABLE VI

Ex.	Mass Loss (mg)
3	4.3, 13.2
12	3.6, 4.3
15	0.4, 0.8
23-8N	9.7, 12.6

Table VI illustrates the significantly better wear resistance of the present alloy overall in comparison with 23-8N although one of the weight loss values for Example 3 is higher.

It can be seen from the foregoing description and the accompanying examples, that the alloy according to the present invention provides a unique combination of room temperature and elevated temperature strength and excellent heat resistance well suited to a wide variety of uses. The alloy, because of its excellent elevated temperature wear resistance is especially advantageous for the fabrication of engine valves. The improved wear resistance of the alloy also makes it more economical to use than those alloys which must be hard faced to achieve comparable wear resistance.

The terms and expressions which have been employed are used as terms of description and not of limitation. There is no intention in the use of such terms and expressions of excluding any equivalents of the features shown and described, or portions thereof. It is recognized, however, that various modifications are possible within the scope of the invention claimed.

What is claimed is:

1. A precipitation strengthenable, austenitic steel alloy that provides a good combination of high temperature strength, corrosion resistance, and wear resistance, said alloy, in weight percent, consisting essentially of about

	w/o
Carbon	1.50 max.
Manganese	3.0-10.0
Silicon	2.0 max.
Phosphorous	0.10 max.
Sulfur	0.05 max.
Chromium	18-28
Nickel	4.5-10.0
Molybdenum	0.5 max.
Vanadium	0.75-4.0
Boron	Up to 0.03
Nitrogen	1.0 max.
Tungsten	0.5 max.
Niobium	0.5 max.

and the balance essentially Iron, wherein

$$\%C + \%N \geq 0.65 + 0.15(\%V) + 0.04[(\%Mo) + 0.5(\%W)],$$

and