

UNITED STATES PATENT OFFICE

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OXIDATION-CARBURIZATION RESISTANT
ALLOY

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This invention relates to an oxidation and carburization resistant alloy which may be used for boxes employed for thermally treating metal parts.

Heretofore, carburization resistant alloys have been available for the case hardening of metal parts in a furnace atmosphere. Such boxes have had poor oxidation resistance and as a result, outside portions thereof were subjected to excessive deterioration.

It has been an object of our invention to provide a new and improved alloy which in addition to carburization resistance will also have a high oxidation resistance, particularly under high temperatures, such as employed in case hardening parts in a carburizing compound;

Another object has been to provide an alloy having an improved strength at elevated temperatures.

In carrying out our invention, we employ an alloy in which silicon and nickel are critical in the range stated and with respect to zirconium within its stated range amounts to provide both oxidation and carburization resistance. The following tabulation sets forth the contents of the alloy of our invention:

	General Range	Optimum Range
C.....	up to .20% max.....	Per Cent .05 to .15.
Si.....	1 to 5%.....	3 to 4.5.
Ni.....	22 to 40%.....	26 to 30.
Mn.....	up to 5%.....	.20 to 1.
P.....	residual amounts, up to .02% each.....	2.
S.....		
Zr.....	.5 to 4%.....	

Remainder substantially iron with incidental impurities.

Additions of the carbide-forming elements molybdenum, tungsten and vanadium may be made up to a maximum of about 2%, each to improve the strength of the alloy at elevated temperatures.

What we claim is:

1. An improved ferrous alloy which contains up to about .20% maximum carbon, about 22 to 40% nickel, about 1 to 5% silicon, about .5 to 4% zirconium, the remainder iron with incidental impurities; the silicon, nickel and zirconium being essential elements and critical within the ranges stated, and the alloy being characterized by its high resistance to oxidation and carburization at high temperatures.

2. An improved ferrous alloy which contains up to about .20% maximum carbon, about 22

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to 40% nickel, about 1 to 5% silicon, about .5 to 4% zirconium, up to about 5% manganese, up to about 2% each of the carbide-forming elements molybdenum, tungsten, and vanadium, up to about .02% each of sulfur and phosphorus, and the remainder substantially iron with incidental impurities; the silicon, nickel and zirconium being essential elements and critical within the ranges stated and the alloy being characterized by its high resistance to oxidation and carburization at high temperatures.

3. An improved ferrous alloy which contains up to about .20% maximum carbon, about 22 to 40% nickel, about 1 to 5% silicon, about .5 to 4% zirconium, up to about 5% manganese, up to about 2% each of the carbide-forming elements molybdenum, tungsten and vanadium, the remainder iron with incidental impurities; the silicon, nickel and zirconium being essential elements and critical within the ranges stated, and the alloy being characterized by its high resistance to oxidation and carburization at high temperatures.

4. An improved ferrous alloy which contains about .20% maximum carbon, about 22 to 40% nickel, about 1 to 5% silicon, about .5 to 4% zirconium, up to about 5% manganese, the remainder iron with incidental impurities; the silicon, nickel and zirconium being essential elements and critical within the ranges stated, and the alloy being characterized by its high resistance to oxidation and carburization at high temperatures.

5. An improved ferrous alloy which contains about .05 to .15% carbon, about 26 to 30% nickel, about 3 to 4.5% silicon, about .20 to 1% manganese, about 2% zirconium, up to about 2% each of the elements molybdenum, tungsten and vanadium, the remainder iron with incidental impurities; the silicon, nickel and zirconium being essential elements, and the alloy being characterized by its high resistance to oxidation and carburization at high temperatures.

6. An improved ferrous alloy which contains about .05 to .15% carbon, about 26 to 30% nickel, about 3 to 4.5% silicon, about 2% zirconium, about .20 to 1% manganese, the remainder iron with incidental impurities; the silicon, nickel and zirconium being essential elements and the alloy being characterized by its high resistance to oxidation and carburization at high temperatures.

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