

UNITED STATES PATENT OFFICE

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HIGH-TEMPERATURE ALLOY

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1 Claim. (Cl. 75—171)

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The present invention is an alloy particularly adapted for use under high temperature conditions and stresses such as encountered in the operation of supercharger turbines and the like. Since the buckets in supercharger turbines rotate at a speed of about 20,000 revolutions per minute while subjected to temperatures in the neighborhood of 1500° F., the bucket material should have high physical properties at the operating temperature of the turbine.

In carrying out the present invention I employ an alloy which contains about 69% cobalt, about 24% chromium, about 5% tungsten carbide, about 1% ferro silicon with the remainder about .8 to 5% of metal from the group consisting of titanium and columbium. While ferro silicon is desirable, its presence is not absolutely essential and it may be omitted. Although iron usually will be present in the alloy, it is considered an impurity. It is not harmful, however, in quantities up to about 3%. The quantity of carbon present in the alloy is in the range of 0.1% to about 1.0% and preferably should be about 0.64% of the content of the alloy.

An alloy containing about 69% cobalt, about 24% chromium, about 5% tungsten carbide, about .8% titanium and about 1% ferro silicon at room temperature and in the as-cast condition has a tensile strength of about 109,000 to 111,000 pounds per square inch and an elongation in two inches of about 8 to 6%. At 1500° F. the alloy as cast has a tensile strength of 72,100 to 77,400 pounds per square inch and an elongation in two inches of 25 to 22%. After the alloy has been aged for 100 hours at 1500° F. it has a room temperature tensile strength of about 127,300 pounds to 132,500 pounds per square inch and an elongation of 3 to 4%. At 1500° F. the aged alloy has a tensile strength of 78,400 to 79,000 pounds per square inch and an elongation of 10%.

When a stress of 39,200 pounds per square inch was applied to the alloy at a temperature of

about 1500° F. it failed in 10 hours, the elongation at the time of failure was 20%. When a stress of 32,000 pounds per square inch was applied to the alloy at a temperature of 1500° F. the time of failure was 100 hours and the elongation at failure was 13%. When a stress of 26,700 pounds per square inch was applied to the alloy at a temperature of 1500° F. the time for failure was 1000 hours.

If the composition is changed by substituting columbium for titanium similar improvement in the properties of the aged alloy may be obtained. For example an alloy consisting of about 69% cobalt, about 24% chromium, about 5% tungsten carbide, about 1.2% columbium and about 1% ferro silicon has at room temperature and in the as-cast condition a tensile strength of 113,200 to 117,300 pounds per square inch and an elongation of 7% in two inches. At 1500° F. the alloy in the as-cast condition has a tensile strength of about 65,200 to about 70,000 pounds per square inch and an elongation of about 25 to 26%. After the alloy was aged 100 hours at 1500° F. it had a tensile strength of about 131,500 to 134,500 pounds per square inch and an elongation of 3%. At 1500° F. the aged alloy had a tensile strength of 67,800 to 71,900 pounds per square inch and an elongation of 11 to 12%. Under a stress of 39,000 pounds per square inch the aged alloy failed in 10 hours at a temperature of 1500° F. The elongation at time of failure was 20%. Under stress of 29,800 pounds per square inch the aged alloy failed in 100 hours the elongation at failure being 3%.

What I claim as new and desire to secure by Letters Patent of the United States is:

An alloy containing about 69% cobalt, about 24% chromium, approximately 5% tungsten carbide, about 1.2% columbium and about .80% silicon.

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