

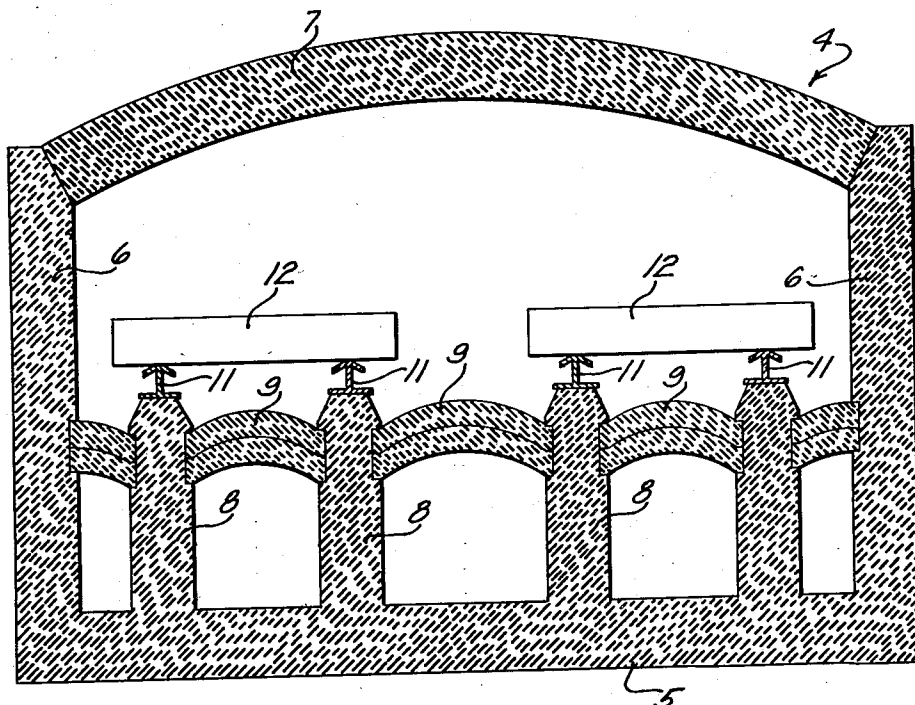
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FURNACE FOR TREATING COPPER

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FURNACE FOR TREATING COPPER

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6 Claims. (Cl. 263—2)

This invention relates to a furnace for treating copper and more particularly to skid rails for copper billet heating furnaces.

Skid rails for copper billet heating furnaces have heretofore, in most instances, been of the water cooled type. The purpose of water cooling the skid rails has been to preserve the life of the rails, which would otherwise rapidly deteriorate. The cooling of the rails has the disadvantage of requiring a large amount of heating fuel because the copper billets to be heated are in direct heat conducting contact with and slide upon the cooled rails. Tests have shown that of the total fuel used in a furnace in which the rails are water cooled about 15 per cent of the fuel is dissipated by the water cooling. The water cooled rail also leaves a cool spot on the billet which is not heated to the proper temperature for the subsequent rolling of the copper.

An object of the invention is to provide effective and efficient contact surfaces for copper heat-treating furnaces.

In accordance with the general features of the invention, a skid rail for a copper billet heating furnace is provided, the composition of which is so related to the copper billet as to counteract the tendency of copper oxide to form upon and to remain adherent to the rail.

The single figure of the drawing is a sectional front view of a copper billet heating furnace having skid rails and embodying the features of the invention.

A furnace, designated generally by the reference numeral 4, is provided with a base 5 and side walls 6—6 spanned by an arched top wall 7. Within the furnace are a plurality of low walls or partitions 8 spanned by arches 9 and each partition supports a skid rail 11. The skid rails are arranged in pairs, one pair along each side of the furnace, and copper billets 12 are placed transversely across each pair of rails. The furnace is of the continuous type and the billets when placed on the rails at one end of the furnace are moved longitudinally through the furnace by a pusher (not shown) to be discharged at the other end when the heat-treatment is completed.

The copper billets are heated in the furnace by oil burners (not shown) to a temperature of approximately 1725° F. This high temperature suggests the use of a nickel, chromium, iron alloy in the skid rails to resist the heat if the water cooling of the rails is to be eliminated. It was found, however, that the use of the nickel, chromium, iron alloy caused large amounts of copper

oxide adhesions on the rails, which had to be scraped at frequent intervals to permit operation of the furnace. The copper seemed to be abraded from the billet and then oxidized upon the surface of the rails. By applying a highly polished surface to the rails to decrease the coefficient of friction and thus decrease abrasion of the copper, the copper oxide adhesions were increased in volume instead of decreased, apparently on account of the greater contact area between the copper billets and the rails.

It has been found that, when the skid rails are made of a heat resisting nickel-free chromium iron alloy, the adhesion of copper oxide on the skid rails becomes negligible. In prior experimenting with nickel chromium iron alloys for skid rails to determine the cause of the copper oxide adhesions, the nickel content of the alloy was regarded as unassociated with the cause of the copper oxide adhesions.

An analysis of the copper oxide adhesions, however, indicated the presence of absorbed nickel therein. The nickel absorbed from the rails seemed to increase the amount of copper oxide adhesions and at the same time render the surface of the rails porous and rough so as to enhance abrasion and further increase the adhesions.

It appears that on account of the affinity of copper and nickel for each other that the copper first adheres to the rail and then oxidizes with an absorption of nickel from the rail to form the copper oxide adhesions on the rails. This discovery led to the nickel content of the alloy of the skid rails being reduced and the amount of copper oxide adhesions decreased accordingly and finally the nickel was completely eliminated with the result that the copper oxide adhesions to the rails became negligible.

In preparing skid rails in accordance with this invention, the rails are made of approximately 68 per cent iron and 32 per cent chromium. The carbon content should be held low, preferably less than one per cent. The proportions of chromium and iron may be varied, although the proportions given above have been found to give the best results. Increasing the chromium content too much from the above renders the alloy mechanically weak and decreasing the chromium content to too great an extent causes the alloy to lose its heat resisting character and deteriorate rapidly in use.

The chromium iron alloy described has excellent heat resisting properties for the temperatures encountered in copper billet heating fur-

naces and the operating difficulty due to copper oxide adhesions on the skid rails is eliminated.

It is, of course, understood that the embodiment of the invention herein described is illustrative only and that many changes and modifications may be made therein without departing from the spirit and scope of the invention.

What is claimed is:

1. In a copper billet heating furnace wherein the billet contacts with a skid rail, a nickel-free chromium iron skid rail comprising solely approximately one-third chromium and two-thirds iron.

2. In a furnace for heat-treating copper wherein the copper contacts with a surface in said furnace, a contact surface of a nickel-free chromium iron alloy consisting solely of a substantially larger amount of iron than chromium.

3. In a copper billet heating furnace wherein

the billet contacts with a skid rail, a skid rail consisting of an alloy of approximately 68 per cent iron and 32 per cent chromium.

4. In a copper billet heating furnace wherein the billet contacts with a skid rail, a skid rail consisting of an alloy of approximately 68 per cent iron, 32 per cent chromium, and less than 1 per cent carbon.

5. In a furnace for heat-treating copper wherein the copper contacts with a surface in said furnace, a contact surface consisting solely of approximately 68 per cent iron and 32 per cent chromium.

6. In a furnace for heat-treating copper wherein the copper contacts with a surface in said furnace, a contact surface consisting solely of approximately 68 per cent iron, 32 per cent chromium and less than 1 per cent carbon.

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