

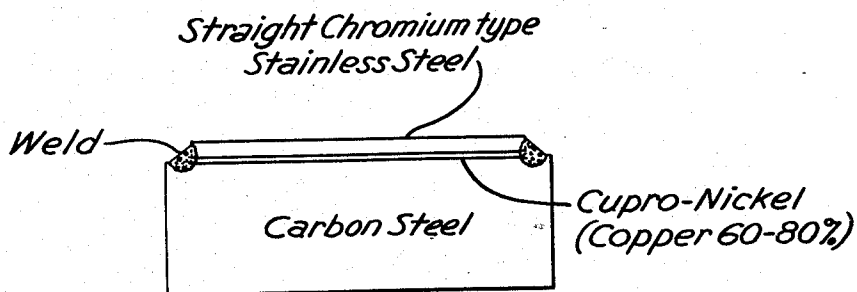
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W. L. KEENE ET AL

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BIMETALLIC BILLET

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INVENTORS

*Walter L. Keene and
William A. Carlson*

*By Thorpe, Leonard & Glenn,
their attorneys.*

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BIMETALLIC BILLET

Walter L. Keene, Dormont, and William A. Carlson, Pittsburgh, Pa., assignors to Superior Steel Corporation, Pittsburgh, Pa., a corporation of Virginia

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3 Claims. (Cl. 29—196.3)

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This invention relates to bimetallic billets. It relates particularly to the prevention of carbon migration in bimetallic billets comprising components of carbon steel and stainless steel and especially to the employment of a so-called buffer layer between adjacent carbon steel and stainless steel components of such a bimetallic billet to prevent migration of carbon from the carbon steel to the stainless steel.

The problem of preventing carbon migration in a bimetallic billet comprising components of carbon steel and stainless steel is an old one. Stainless steels, particularly stainless steels of the 17% chromium (straight chromium) type, when clad to carbon steel possess a powerful affinity for carbon, tending to attract and combine with carbon from the carbon steel to form high carbon-chromium alloys. These alloys possess marked air-hardening characteristics, becoming hard and brittle when cooled from elevated temperatures. Migration of carbon is a time-temperature reaction which takes place during annealing cycles.

Stainless clad steels intended for deep drawing must be soft and ductile throughout, that is, the stainless steel must be thoroughly annealed, the carbon steel must be in the best condition for deep drawing and, highly important, the bond between the two must be soft and ductile. This condition is not met if carbon migrates from the carbon steel to the stainless steel because the carbon tends to concentrate at the bond line, forming a brittle film which does not withstand cold deformation. On increase of time at elevated temperature the carbon diffuses further into the stainless steel and reduces its corrosion resistance.

While it seems a strange phenomenon it is nevertheless true that stainless steel containing .10% carbon attracts carbon from a rimmed steel billet containing only .04% carbon at the surface and .07% carbon in the interior. Tests show that after hot rolling and annealing the carbon content of the stainless steel increases from .10% to in the neighborhood of .40%. This apparently occurs because a given amount of carbon in the carbon steel when migrating to the stainless steel concentrates in a thickness of stainless steel which is only a fraction of the thickness of the carbon steel from which it came. Ordinarily, of course, the stainless steel component is very thin in comparison with the carbon steel component.

It is known to those skilled in the art that carbon migration in a carbon steel-stainless steel

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billet can be inhibited by the interposition of a so-called buffer layer between the carbon steel and stainless steel components. The buffer layer is very thin as compared with the billet components and is of metal. Its function is to prevent carbon migration but it must possess suitable physical characteristics, including a high enough melting point to enable proper hot rolling, ability to bond readily to either component without forming a brittle alloy with either and ability to react to the annealing cycle in the same manner as the carbon steel and stainless steel components.

Those skilled in the art have been trying for years to find or develop an ideal buffer metal. Some metals are satisfactory from the standpoint of preventing carbon migration but are unsatisfactory because of low melting point, failure to properly bond and/or failure to properly react to the annealing cycle. For example, pure copper is an excellent buffer material from the standpoint of preventing carbon migration but its melting point is so low as to make its use impracticable because the rolling has to be carried out at such low temperatures that undue strain is imposed on the rolling equipment and the efficiency of rolling is greatly reduced. Other metals are satisfactory from the standpoint of melting point or other physical characteristics but are not satisfactory from the standpoint of inhibiting carbon migration.

We have discovered that a buffer layer of cupro-nickel containing copper from about 60% to about 80%, the remainder being substantially all nickel, is highly satisfactory from all standpoints and successfully solves the problem. It satisfactorily inhibits carbon migration. Its melting point is high enough so that the bimetallic billet can be rolled at practicable and convenient temperatures. It bonds readily with both carbon steel and stainless steel. It reacts to the annealing cycle in the same manner as the two major components.

Specifically we prefer to employ in a bimetallic billet comprising a component of carbon steel and a component of stainless steel a layer disposed between said components, said layer being of cupro-nickel in which the copper ranges from about 60% to about 80%, the remainder being substantially all nickel. Desirably the cupro-nickel may consist of about 70% copper and about 30% nickel.

The carbon steel and stainless steel components of the bimetallic billet are preferably welded together peripherally. The buffer layer is pref-

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erably confined by said components and the weld therebetween. The weld between the carbon steel and stainless steel components is preferably disposed outside the periphery of the buffer layer as the cupro-nickel might interfere with proper welding if it extended into the weld metal.

The buffer layer may have a thickness of in the neighborhood of .02 inch. It is preferably fastened to one of the billet components before the components are assembled and welded together. Desirably the buffer layer is spot welded to the stainless steel layer.

It is desirable when employing a buffer layer as above disclosed to hot-roll the bimetallic billet at temperatures not substantially exceeding 2000° F. to produce bimetallic strip. If the rolling temperature is maintained below about 2000° F. the cupro-nickel buffer layer will maintain its integrity and properly perform its function, yet this gives a sufficient range of temperature for proper and efficient hot-rolling of the bimetallic billet.

A billet which may be made in accordance with our invention is shown diagrammatically in end view in the accompanying drawing, the legends therein describing the billet components

Certain method features herein disclosed are claimed in our copending divisional application Serial No. 690,612, now abandoned.

While we have described certain present preferred embodiments of the invention it is to be distinctly understood that the invention is not limited thereto but may be otherwise variously embodied within the scope of the following claims.

We claim:

1. A bimetallic billet comprising a component of carbon steel and a component of straight chromium type stainless steel welded together peripherally and a layer confined by said components and the weld therebetween, said layer being of cupro-nickel in which the copper ranges

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from about 60% to about 80%, the remainder being substantially all nickel.

2. A bimetallic billet comprising a component of carbon steel and a component of straight chromium type stainless steel welded together peripherally and a layer confined by said components and the weld therebetween, said layer being of cupro-nickel consisting of about 70% copper and about 30% nickel.

3. A bimetallic billet comprising a component of carbon steel, a component of straight chromium type stainless steel and a layer disposed between said components, said layer being of cupro-nickel in which the copper ranges from about 60% to about 80%, the remainder being substantially all nickel, said components being connected together outside the periphery of said layer.

WALTER L. KEENE.
WILLIAM A. CARLSON.

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