

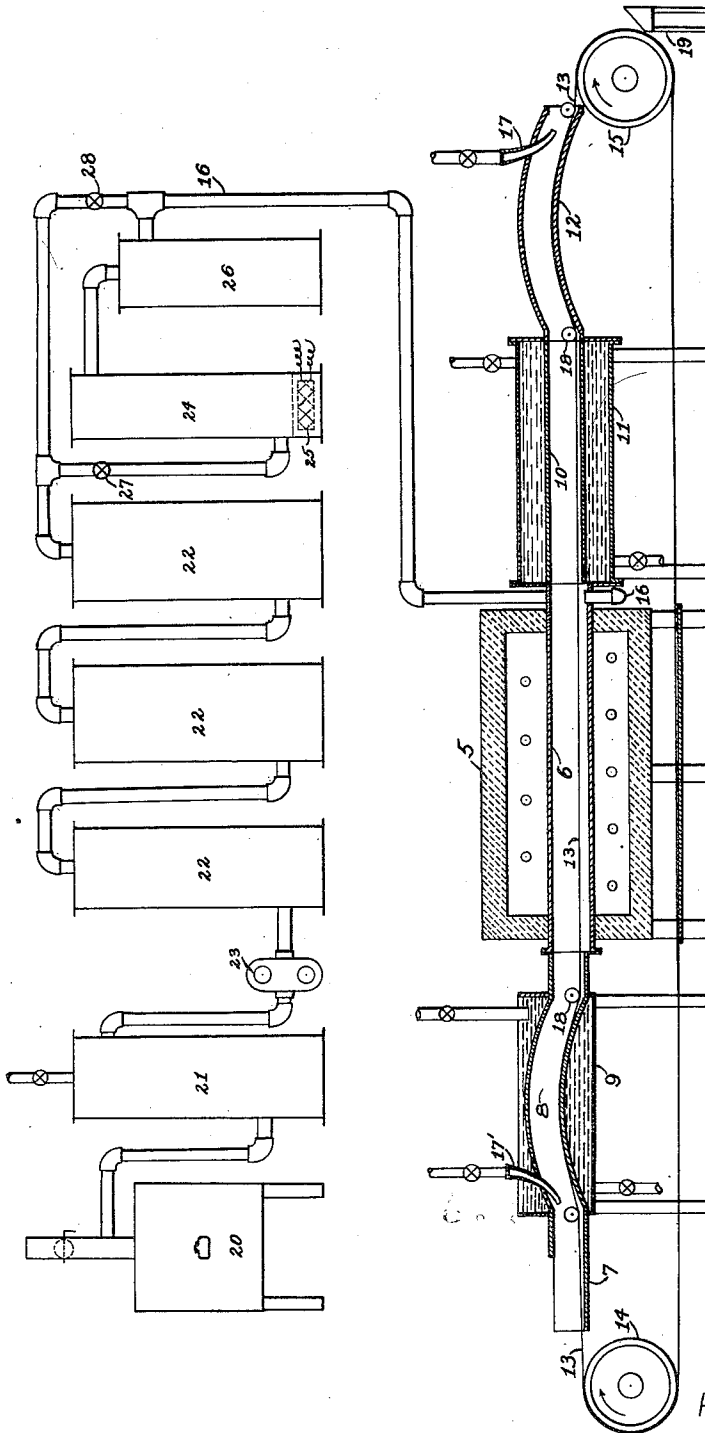
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METHOD OF PREVENTING OXIDATION OF METALS DURING HEAT TREATMENT

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METHOD OF PREVENTING OXIDATION OF METALS DURING HEAT TREATMENT

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This invention relates generally to the art of preventing surface oxidation of brightly finished work during a heat-treating operation such an annealing and more particularly to the art of bright annealing non-ferrous metals.

It is a well known fact that practically all metals will tarnish to a greater or less degree during annealing unless some kind of a protective atmosphere is employed and even then it is practically impossible to obtain a clean untarnished surface. As between ferrous and non-ferrous metals the latter are by far the more difficult to anneal in a manner to prevent surface tarnish. In fact, as regards brass, there has hitherto been no satisfactory bright annealing process. Incidentally, ferrous metals such as steel usually require annealing temperatures in excess of 1250° F. whereas non-ferrous metals generally, and brass in particular, require annealing temperatures below 1250° F. It is a well known fact that hydrogen is an active reducing agent at temperatures in excess of 1250° F. but is not particularly active at temperatures below 1250° F. This explains in a measure why it has hitherto been difficult if not impossible to bright anneal with hydrogen at temperatures below 1250° F.

With the above facts in mind, it is an object of the present invention to provide ways and means for more effectively conducting bright annealing operations and in particular to provide a bright annealing process that shall have special utility at annealing temperatures below 1250° F.

The atmosphere that I have found most suitable for annealing at temperatures below 1250° F. is dehydrated flue gas impregnated with the vapors of an alcohol. The particular alcohol is not important but ordinarily I prefer to use methanol. The preferred way of impregnating the flue gas with the alcohol is to bubble the gas through liquid alcohol maintained at constant temperature. Dehydration of the flue gas is important since even a slight trace of water vapor will cause the work to tarnish.

It will, of course, be understood that by "flue gas" is meant gaseous products of com-

bustion devoid or substantially devoid of free oxygen. As is well known to those skilled in the art, flue gas, as such, has an oxidizing effect on non-ferrous metals generally and brass in particular and hence would not ordinarily be considered as suitable for use as a component part of any protective atmosphere for such metals during annealing thereof. The present invention, therefore, offers a totally new type of protective atmosphere for annealing brass and other non-ferrous metals.

An important feature in connection with the use of an alcohol-impregnated flue gas is that the heat-treating chambers and other parts such as the conveyor must be made of a material which shall have no activating or catalytic effect on the alcohol. A suitable material for this purpose is an iron-chromium alloy devoid or substantially devoid of nickel.

Referring now to the accompanying drawing forming part of this specification, there is shown a longitudinal vertical section through a preferred form of heat-treating apparatus suitable for use in the practice of the invention, certain accessories being shown in elevation.

In the drawing, 5 indicates a furnace of any suitable construction adapted to be fired in any suitable manner as with fuel gas, the heating or annealing chamber, and 10 a cooling chamber surrounded by a water jacket 11. At the opposite ends of the heat-treating chamber formed by the parts 6 and 10 are humps 8 and 12 forming gas traps for preventing the inflow of atmospheric air in accordance with the principle that cold air will not readily flow up hill. Due to the proximity of the hump 8 to the furnace, it may be desirable to externally cool the same as by water in a tank 9. By the use of said humps I am thereby enabled to use an open-ended heat-treating chamber without the necessity of providing additional seals for preventing the inflow of atmospheric air, it being understood that the presence of air in the heat-treating chamber counteracts the effect of the protective atmosphere.

Extending through the heat-treating chamber is the upper run of an endless belt or

conveyer 13, the pulleys, about which the belt is looped, being indicated at 14 and 15. The pulley 15 is driven by any suitable means (not shown) in a clockwise direction as indicated by the arrow. It will therefore be understood that the work to be annealed is first introduced into the annealing chamber 6 and from thence into the cooling chamber 10. A loading platform is indicated at 7 and a receptacle for the heat-treated work at 19. For holding the belt at a proper level, between the humps 6 and 12, there are provided fixed rollers 18, below which the side edges of the belt pass. The belt is preferably of a perforated type such as wire mesh to permit free flow of the protective gas from one side to the other thereof.

The protective gas is introduced into the heat-treating chamber at one or more points adjacent the discharge end of the annealing chamber 6, the supply pipe therefore being indicated at 16. All but a minor portion of the protective gas is caused to flow through the annealing chamber in opposition to the oncoming work, the remainder of the gas being caused to flow through the cooling chamber in the same direction as the work. For insuring that the protective gas shall flow as stated, I prefer to provide ejectors 17 and 17' inside of the respective humps 12 and 8, the ejectors being set to discharge towards the adjacent outlet of the conduit as will be readily understood. By regulating the flow of fluid through the ejectors, the flow of the protective gas may obviously be controlled as desired.

The supply pipe 16 is connected with a source of supply of the protective gas. In the present instance I have shown means for generating flue gas and for mixing the same with the vapors of alcohol. 20 indicates any suitable means such as a stove wherein fuel gas may be burned for the purpose of generating flue gas; 21 a scrubber for the flue gas; 22 a series of drying towers containing calcium chloride and 23 a pump or blower for forcing the flue gas through said towers. 24 indicates a tank containing alcohol; 25 an electric immersion heater for maintaining the alcohol at constant temperature and 26 a condenser for condensing any excess alcohol. 27 and 28 indicate valves. By closing the valve 27 and opening the valve 28, dehydrated flue gas may be passed through the heat-treating chamber for purging the same of air and moisture preparatory to conducting the annealing operation as will be readily understood. By regulating the valve 27, the amount of flue gas and alcohol vapors admitted to the heat-treating chamber can be readily controlled.

The present application is a continuation in part of my application Serial No. 440,616, filed March 31, 1930.

What I claim as new and desire to secure by Letters Patent is:

1. In a method of bright annealing metals, the steps comprising continuously passing through a heating chamber a gaseous mixture comprising dehydrated flue gas and the vapors of an alcohol, and passing the metal through said chamber in a direction opposite to the flow of said mixture.

2. In a method of bright annealing metals, the step comprising surrounding the metal during heating with an atmosphere formed by passing dehydrated flue gas through alcohol.

3. A method of preventing the formation of surface tarnish on brass during annealing, comprising continuously passing an atmosphere comprising dehydrated flue gas impregnated with the vapors of an alcohol through a heating chamber which will have no appreciable catalytic effect on the alcohol at the prevailing annealing temperature, passing the brass through said chamber in a direction opposite to the flow of said atmosphere therethrough and finally passing the brass through a cooling chamber where-through the same kind of atmosphere as aforesaid is moving in the same direction as the brass.

4. A method of preventing the formation of surface tarnish on brass during annealing, comprising continuously passing an atmosphere comprising dehydrated flue gas impregnated with the vapors of an alcohol through a heating chamber which will have no appreciable catalytic effect on the alcohol at the prevailing annealing temperature, passing the brass through said chamber in a direction opposite to the flow of said atmosphere therethrough and finally passing the brass through a cooling chamber where-through the same kind of atmosphere as aforesaid is moving in the same direction as the brass, said atmosphere being formed by passing said flue gas through liquid alcohol.

5. In a method of bright annealing brass, the steps comprising continuously introducing into a heating chamber for flow there-through a gaseous mixture comprising dehydrated flue gas and the vapors of an alcohol, and passing the brass through said chamber.

6. In a method of bright annealing brass, the steps comprising continuously introducing into a heating chamber for flow there-through a gaseous mixture comprising dehydrated flue gas and the vapors of an alcohol, and passing the brass through said chamber, said mixture being formed by passing the flue gas through liquid methanol.

7. In a method of bright annealing brass, the steps comprising continuously introducing an atmosphere comprising dehydrated flue gas impregnated with the vapors of an

alcohol into a heating chamber which will have no appreciable catalytic effect on the alcohol at the prevailing annealing temperature, and passing the brass through said chamber.

8. In a method of bright annealing non-ferrous metals, the steps comprising continuously introducing into a heating chamber for flow therethrough an atmosphere comprising dehydrated flue gas impregnated with the vapors of an alcohol, and passing said metal through said chamber.

9. In a method of bright annealing non-ferrous metals, the steps comprising utilizing a heating chamber made of a chrome iron alloy, continuously introducing into said chamber an atmosphere comprising flue gas impregnated with the vapors of an alcohol, and passing the metal through said chamber.

In testimony whereof I affix my signature.
ROYSEL J. COWAN.