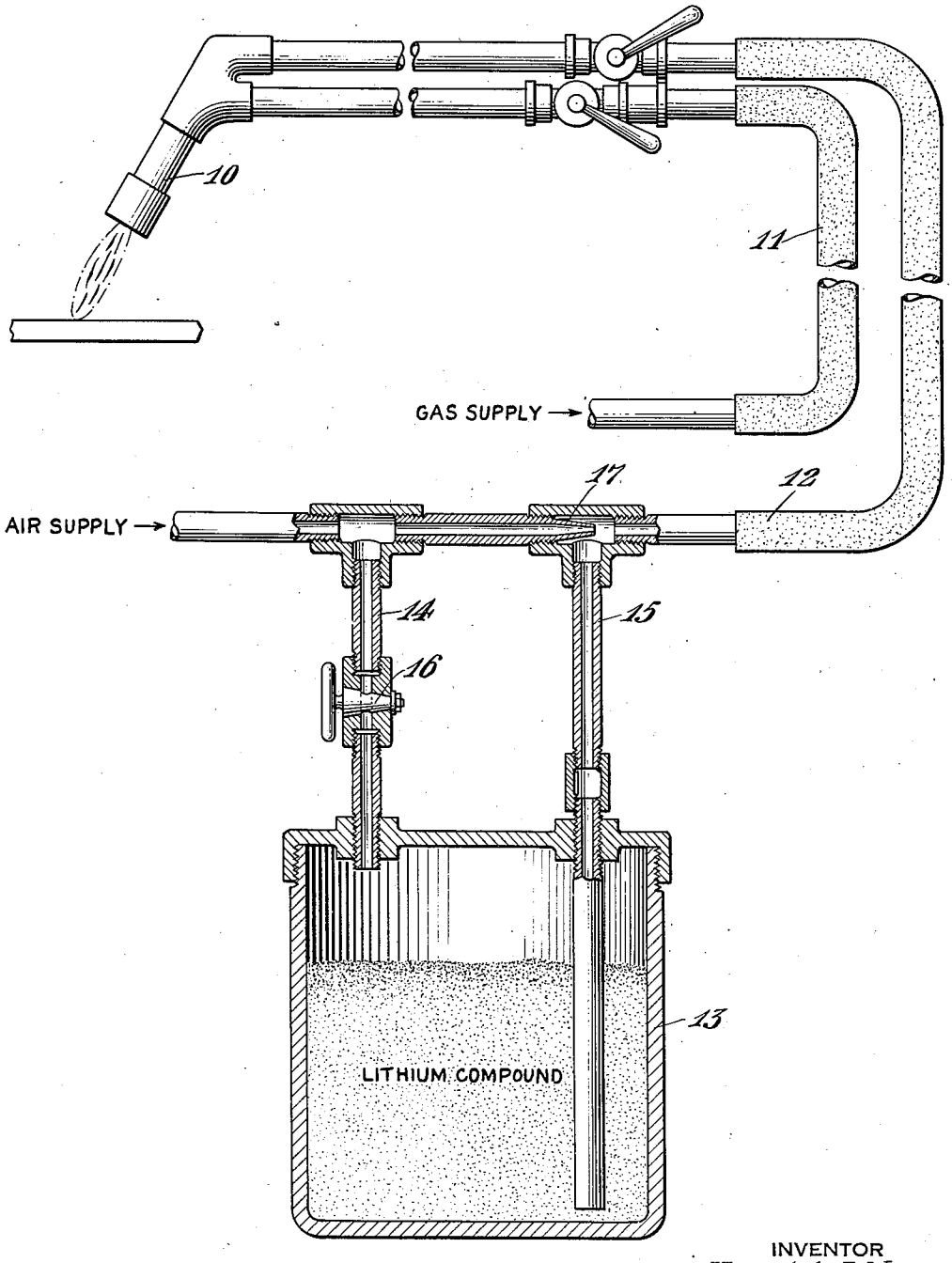
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HEATING TORCH

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HEATING TORCH

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This invention relates to blow pipes, welding torches and similar heating torches and burners, and more particularly to the production of non-oxidizing or reducing conditions in the vicinity of the heating flame.

In such heating operations as the heating and subsequent cooling of metal for local hardening, brazing, welding, spot annealing, soldering and in similar operations, it is desired to produce such heating in the absence of oxidizing conditions. Where the metal is to be heated until it is molten, the maintenance of a non-oxidizing condition adjacent the metal is vital to the success of the process. The oxy-acetylene flame, which is largely used for high temperature heating, requires approximately two and one-half parts of oxygen for each part of acetylene, less than half of the oxygen ordinarily being supplied through the torch and the remainder being taken from the atmosphere. The absorption of oxygen from the atmosphere surrounding the flame partially deoxidizes the air which comes in direct contact with the metal being heated, thus reducing the oxidizing effect of atmosphere on the metal in the immediate vicinity of the flame. Other fuel gases, such as natural or manufactured gas, coke oven gas, or any of the liquified petroleum group of gases, while capable of developing extremely high temperatures, lack the power of absorbing sufficient oxygen from the air to afford any susbtantial protection against oxidation of the work. While as stated, the oxy-acetylene flame is much superior to other fuel gases, from the standpoint of providing a partially deoxidized atmosphere adjacent the flame, it does not entirely prevent oxidation of the work and moreover it requires the provision of cumbersome and expensive acetylene generators.

One of the objects of the present invention is to provide a substantially completely non-oxidizing atmosphere adjacent the flame of a blow pipe, torch or other form of burner.

Another object is to provide a heating flame which has the property of eliminating free oxygen from the immediate surrounding atmosphere.

Another object is to produce a reducing condition surrounding the heating flame.

A still further object is to increase the degree of deoxidation of the air surrounding a flame and to enlarge the deoxidized zone in contact with the work.

Another object is to enable any common form of fuel gas to be employed in a heating torch, in the carrying-out of heating processes without producing substantial oxidation of the heated parts.

A still further object is to produce a cleansing action on the work by the flame applied thereto.

Other objects and advantages will hereinafter appear.

In accordance with the present invention I introduce into the flame of the torch or burner a sufficient amount of lithium metal or a compound of lithium to produce a pronounced lithium line in the spectrum of the flame. The lithium or lithium compound may be introduced directly into the air or oxygen line or into the fuel line.

The lithium so introduced or produced by reduction of the lithium compound is vaporized by the heat of the flame and due to its active reducing nature prevents oxidation of the metal being heated. In addition to eliminating free oxygen from the air surrounding the flame and thereby producing a non-oxidizing atmosphere adjacent the heated work, the lithium acts directly on the heated metal to effect a reducing action on any oxides which may have previously formed thereon.

The invention will be more fully understood by reference to the accompanying drawing in which:

The single figure illustrates a conventional blow torch to which the present invention is applied.

Referring to the drawing, I have shown a torch 10, which may be used for welding, heat treating for hardening, annealing, brazing or for any other desired purpose. The torch is supplied with a fuel gas, such as acetylene, natural gas, manufactured gas, vaporized gasoline or a liquefied petroleum gas, through a conduit 11. It is also supplied with either air or oxygen under suitable pressure through a conduit 12. In the particular embodiment shown a lithium compound, such as lithium chloride, lithium fluoride or lithium carbonate, is introduced into the conduit 12 and is carried by the air or oxygen stream directly into the flame, where it becomes decomposed, liberating lithium metal which serves to protect the heated metal, adjacent the flame, from oxidation.

The lithium compound is contained within a receptacle 13 connected to the conduit 12 by tubes 14 and 15. The tube 14 terminates adjacent the top of the container 13 and is provided with a valve 16 whereby the pressure in the container may be regulated. The tube 15 extends to adjacent the bottom of the container 13 and serves to conduct the comminuted lithium compound into the air line. The air line is provided with

an injector nozzle 17 adjacent the outlet of the tube 15, to assist in drawing the lithium compound out of the container 12. The rate of introduction of the lithium compound into the air stream may be regulated by the pressure valve 16, and preferably is sufficient to produce a strong lithium line in the spectrum of the flame.

The lithium compounds added, for instance, to the air stream are converted, under the conditions prevailing in the flame of the burner, or in the conduit leading thereto, to the oxide of lithium, with a liberation of carbon dioxide in the case of lithium carbonate, or a liberation of hydrochloric acid or hydrogen fluoride in the case of the other compounds mentioned. The lithium oxide is reducible by the carbon monoxide of the flame in accordance with the following reaction:

$$2Li_2O+CO=Li_2CO_3+2Li$$

The lithium carbonate produced in this reaction is again reducible by heat to form lithium oxide, the latter being then further reducible by the carbon monoxide, as per the above equation. The lithium in addition to its reducing action on the parts being heated promotes combustion by causing a conversion of carbon monoxide into carbon dioxide, as a result of which the carbon dioxide content of the flame increases and the carbon monoxide content decreases, thereby resulting in a hotter flame. The lithium liberated acts as a reducing agent on the heated work and any lithium oxide formed is again reduced by the carbon monoxide of the flame, the lithium thus being used over and over so that only a small amount of lithium compound is required.

It will be understood that the lithium compound may be withdrawn from the container entirely by suction if desired and may be introduced into the gas line in place of or in addition to the air line. It is also possible to place metallic lithium directly in the air or gas line and the air or gas in flowing past the same will carry a sufficient amount of lithium into the flame to materially assist in providing a non-oxidizing condition about the flame. For instance, the metallic lithium may be placed in the intake of the blower which serves to supply air to the burner, as shown in my copending application Serial No. 56,567, filed December 28, 1935.

The lithium or its compound may be employed either in high or low pressure torches and obviously may be introduced into the flame in other ways than that illustrated.

What I claim is:

1. The method of preventing oxidation in the heating of metals by a torch which comprises introducing lithium or a compound of lithium into the flame of the torch.

2. The method of producing a non-oxidizing atmosphere surrounding a gas flame which comprises introducing lithium or a compound of lithium into the flame.

3. The method of increasing the oxygen absorption of an oxy-acetylene flame which comprises introducing lithium or a lithium compound into the flame.

4. The method of increasing the oxygen absorption of an open gas flame which comprises introducing lithium or a compound of lithium into the air or gas supplied to the flame.

5. The method of reducing the oxidizing effect of gas flames on metals which comprises producing an active vapor of lithium or a lithium compound in the flame.

6. The method of protecting metals against oxidation during heating by a torch which comprises introducing lithium carbonate into the flame of the torch.

7. The method of protecting metals against oxidation during heating by a torch which comprises introducing lithium carbonate into the flame of the torch mixed with one of the combustibles.

8. The method of protecting metals during heating by a torch flame which comprises inducing a compound of lithium continuously into the flame during heating.

9. The method of protecting metals during heating by a torch flame which comprises passing a gaseous medium through a mass of powdered compound of lithium to laden the same with said compound and directing said lithium compound laden medium into the flame.

10. The method of reducing oxide formation on metals comprising heating the metal in an open flame and introducing a compound of lithium into the flame during such heating, in such quantity as to produce a strong lithium color in the flame.

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