May 5, 1925. 1,536,176

C. H. ALDRICH

METHOD OF PREVENTING THE CRUSTY FORMATION OF SOLIDIFIED OXIDES

Filed Dec. 5, 1921

Fig. 1.

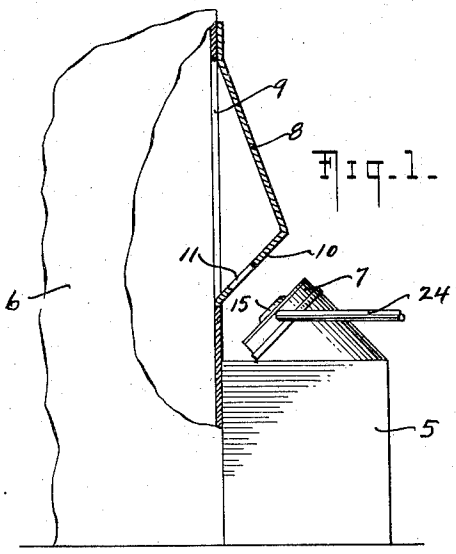


Fig. 4.

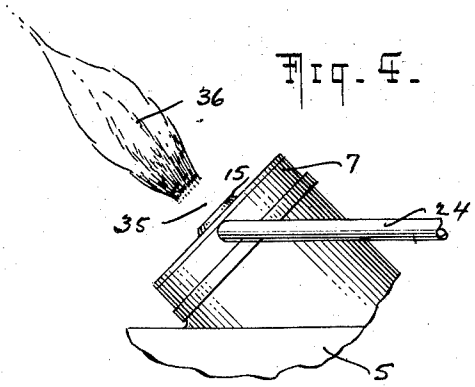


Fig. 2.

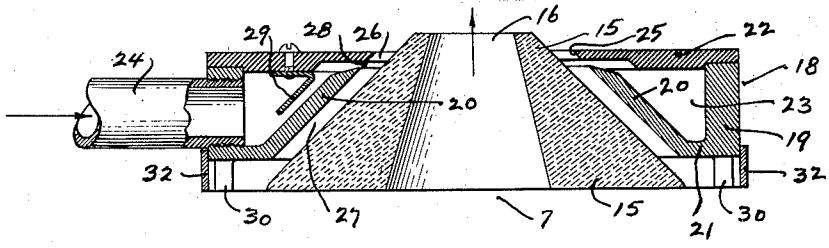
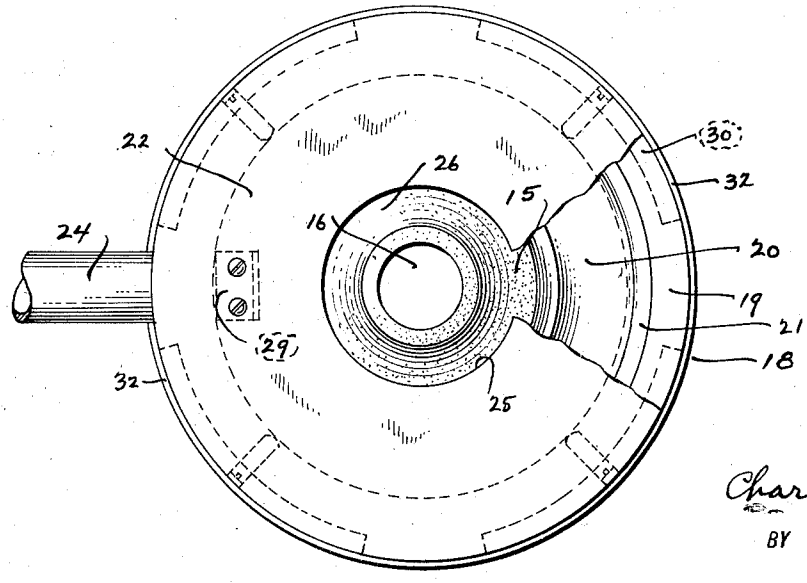


Fig. 3.



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METHOD OF PREVENTING THE CRUSTY FORMATION OF SOLIDIFIED OXIDES.

Application filed December 5, 1921. Serial No. 520,000.

To all whom it may concern:

Be it known that I, CHARLES H. ALDRICH, a citizen of the United States of America, and a resident of the city of Keene, county of Cheshire, and State of New Hampshire, have invented certain new and useful Improvements in Methods of Preventing the Crusty Formation of Solidified Oxides, of which the following is a full, clear, and exact description.

My invention relates in general to methods of forming solid oxides and in particular to such methods in which volatile metals, such as, zinc, cadmium, or the like are volatilized and then burned.

For convenience in this specification, I will describe the formation of zinc oxides from the burning of zinc vapor, it being obvious that the method of producing solid oxides from other metals will be substantially the same.

It is well known to those skilled in the art that in the manufacture of zinc oxide, the metallic zinc or spelter is charged into retorts, after which the metal is heated by any suitable means to the boiling point, and the zinc vapor issuing from the mouth of the retort is burned under a suitable hood, the fumes of zinc oxide, together with a large excess of air, being drawn through cooling flues and caught in a suitable collecting system, usually settling or precipitating chambers, or a bag house, or both. In present day practice, it is customary to partially close the mouth of the retort to diminish the admission of air, thereby correspondingly increasing the formation of oxide within the retort.

Under these conditions there is a rapid formation or building up of a hard deposit of crusty zinc oxide surrounding the issuing stream of zinc vapor, at the point where the zinc vapor comes in contact with the air. This deposit builds up very rapidly; and, if left alone, it would soon become large enough to block the hood, surrounding the mouth of the retort, and even close the retort itself. As this deposit of zinc usually assumes a tubular form, it acts as a condenser, with the result that condensed zinc forms on the inner surface of the tube and runs back into the retort or leaks out in the metallic state.

Since this crusty material is of no commercial value as zinc oxide but must be disposed of on the basis of its zinc contents or redistilled with a reducing agent, it will be seen that the losses due to its formation as well as the leakage of metallic zinc, are considerable.

From numerous experiments, I have discovered that this crusty oxide is formed wherever the metallic vapor is burned in contact with any solid body; and, that if the vapor burns freely as it issues from the nozzle, a crust of hard oxide builds up around the edge of the nozzle orifice, at the point where air comes in contact with the stream of issuing vapor. Moreover, I have discovered by means of these experiments, that if, by any means, the combustion of the vapor can be retarded so that the zone of combustion is some distance away from the edge of the nozzle, there will be no formation of crust, and all of the vapor will be converted into marketable oxide.

In carrying out my invention, I have discovered that this may be accomplished by any suitable apparatus by means of which a sufficient amount of a reducing or inert gas may be introduced into and around the vapor as it is issuing from the mouth of the retort or furnace. Combustion is thereby retarded so that it does not start at once, but usually at a point a number of inches away from the edge of the orifice through which the vapors emerge. The point of initial combustion is regulated by the amount of reducing gas used. Under these conditions, no crusty material is formed and there is a complete conversion of the volatile metal into a uniformly good oxide.

In the accompanying drawings, I have shown one form of apparatus for carrying out my invention, it being obvious that other forms of devices may be used in accomplishing the desired results. In the drawings:

Fig. 1 is a side elevation of the complete device, partly in section.

Fig. 2 is an enlarged, sectional elevation of the gas burner.

Fig. 3 is a plan view of the same.

Fig. 4 is a view of the burner, slightly enlarged, and shows the point at which combustion of the metal vapors takes place.

In the drawings, 5 represents a retort or furnace of any type suitable for bringing the volatile metals to their boiling points. At 6, I have shown in a fragmentary manner

a settling or precipitating chamber in which the oxides may settle.

Arranged on top of the retort 5, and preferably at an angle of 45°, is a burner 7. A hood 8 is provided over the burner and incloses an opening 9 formed through the wall of the settling chamber. The hood 8 is provided with a bottom 10 which is arranged at a suitable distance away from the top surface of the burner 7 and in which an opening 11 is formed. The opening 11 is in registering position with the mouth of the burner.

Referring now more particularly to Figs. 2 and 3, it will be seen that the burner 7 comprises a cone 15, which is formed of refractory material and provided with a central opening 16, which is arranged to register with the opening (not shown) of the retort. In Fig. 2 the line 17 represents the upper surface of the retort. Surrounding the cone 15 is a metallic casing 18, which is formed by an outer wall 19, an inner wall 20, a bottom wall 21, and a top wall 22. An annular gas space 23, is provided by these walls, and a pipe 24 is connected to the ring 18 whereby some suitable reducing or inert gas may be conducted to the space in the ring. The top wall 22 is provided with a central opening 25, which is slightly larger in diameter than the portion of the cone 16 which it surrounds, whereby an opening 26 is provided. The inner wall 20 is inclined inwardly at substantially the same angle as the outer surface of the cone 15, and a space 27 is provided between this wall and the outer surface of the cone. The upper edge of the inner wall 20 is arranged some distance from the inner surface of the top wall 22, whereby an annular space 28 is provided. The gas coming from the pipe 24 will pass through this space 28, and will be projected outwardly through the space 26. So as to equally distribute the flow of gas from the pipe 24 a baffle plate 29 is arranged in front of the pipe.

The ring 18 is provided with a plurality of legs 30, with spaces 31 arranged between them. This provides a space below the ring in which sediment and dirt may accumulate. A band 32 is arranged about the ring 18, for closing the spaces 31, except when the burner is being cleaned.

When the apparatus is in operation the inert or reducing gas coming from the pipe 24 will be forced out through the openings 28 and 26 and will not immediately mix with a stream of metallic vapor as it is issuing from the central opening 16 in the cone 15 until the stream of vapor is some distance from the mouth of the cone. The angle of the outer periphery of the cone 15 is such that the gas will be projected inwardly toward the vapor and will cause combustion to occur at some distance away from the mouth of the burner. This is clearly shown in Fig. 4, where it will be seen that there is a space 35 between the mouth of the burner and the flame of metal vapor which is represented at 36. As shown in this figure, the flame does not touch any part of the burner and therefore there will be no formation of oxide at the mouth of the burner. Neither will there be any condensation of the vapors due to the formation of oxide around the mouth of the burner. The bottom 10 of the hood 8 is so arranged in relation to the top of the burner that the flame 36 occurs within or slightly beyond the opening 11 in the bottom.

The vapors, issuing from the burner and the inert gas which protects the same, are not mixed or commingled since the volume of inert gas necessary to prevent oxidization is preferably very much less than the volume of vapor jet, and since the velocity of the gases are relatively high.

Having thus described my invention, what I claim is:

1. A method of preventing the crusty formation of solidified oxides at or in the delivery mouth of a volatilizing retort, which consists in surrounding the issuing jet of metallic vapor with a relatively thin envelop of flowing inert gas.

2. A method of preventing the crusty formation of solidified oxides, which comprises the volatilization of metal in a suitable furnace and then surrounding the metallic vapor, at its place of issue from the furnace, with a tubular envelop of flowing inert gas.

3. A method of preventing the crusty formation of solidified oxides at the mouth of a volatilizing furnace, which consists in surrounding the flowing metallic vapor with a flowing tubular envelop of inert gas, the gas being such and so disposed that the desired oxidizing reaction does not take place except at some distance from the mouth of the furnace.

4. A method of preventing the crusty formation of solidified oxides at the mouth of a volatilizing furnace which consists in causing the vapor to pass through a tubular envelop of impelled inert gas, whereby oxidization at the mouth of the furnace is prevented.

5. A method of temporarily preventing the contact of oxygen with a flowing jet of volatilized metal in its traverse of a gap between the mouth of a volatilizing furnace and an oxidizing chamber, which consists in interposing a barrier of flowing inert oxygen-excluding gas between the atmospheric air and the gas.

6. A method of preventing the crusty formation of solidified oxides comprising the volatilization of the metal in a suitable furnace, and then enveloping the vapors, as they issue from the furnace, with a gas, whereby

combustion occurs at some distance from the mouth of the furnace.

7. A method of preventing the crusty formation of solidified oxides at the mouth of a volatilizing furnace comprising the volatilization of the metal in a suitable furnace, then enveloping the vapors as they issue from the mouth of the furnace with an inert or reducing gas for preventing combustion of such vapors and gases until the vapors have reached a point some distance from the mouth of the furnace.

In testimony whereof, I have hereunto signed my name.

CHARLES H. ALDRICH.