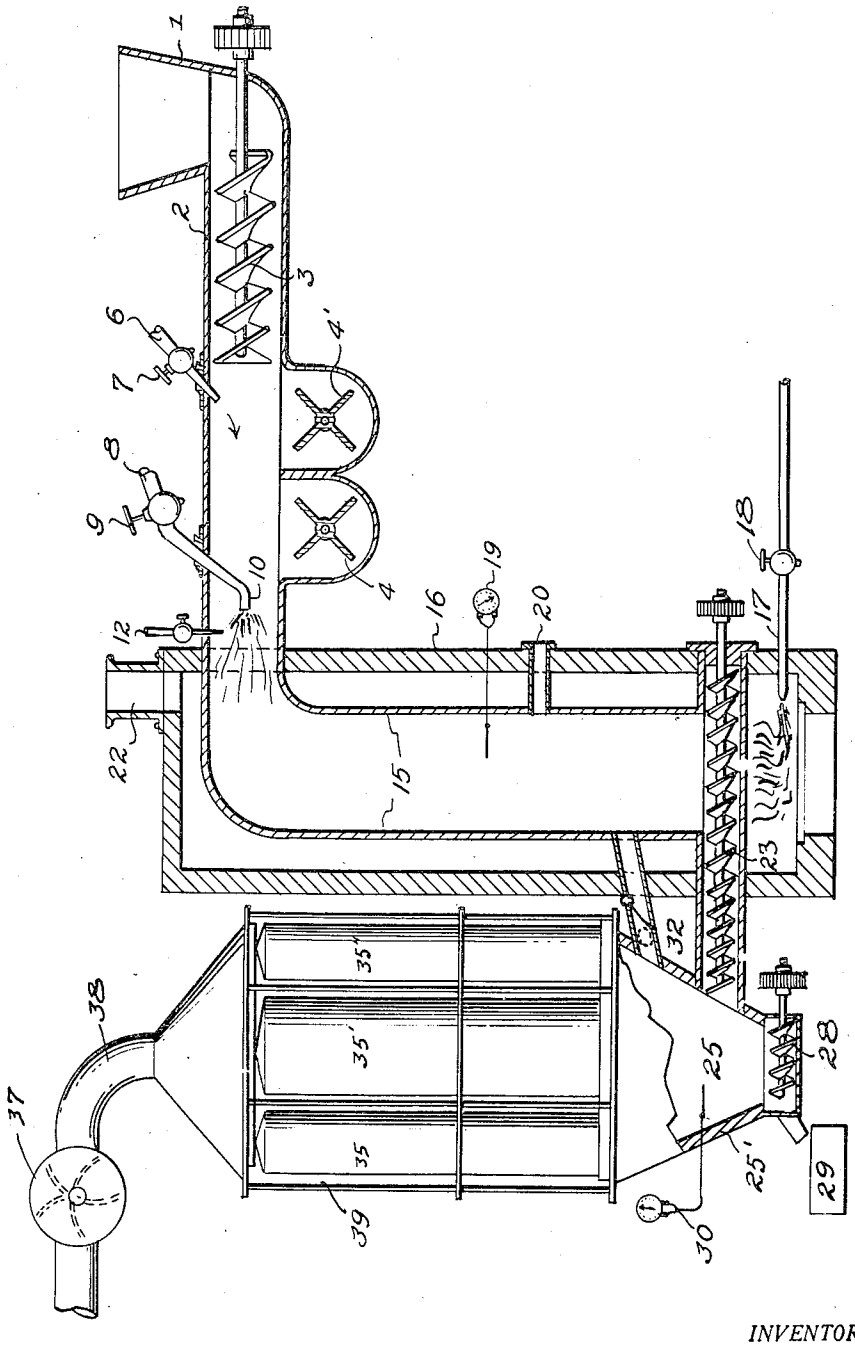
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APPARATUS FOR CONVERTING LEAD SUBOXIDE TO LITHARGE

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APPARATUS FOR CONVERTING LEAD SUBOXIDE TO LITHARGE

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4 Claims. (Cl. 23—146)

This invention relates to the production of an oxide powder from a powder having a lower oxygen content and particularly to the production of PbO from Pb_2O.

Lead suboxide, Pb_2O, is not usually the best form for use of leaden powders since it is unstable and hence it is frequently desirable to change the lead suboxide, Pb_2O, to litharge, PbO, which is stable.

In making lead suboxide as described in my application Ser. No. 470,652, filed July 25, 1930, now Patent No. 1,961,296 I may deliver the dry lead suboxide produced in the tumbling mill shown therein, directly to the apparatus shown in the present application before the suboxide is cooled, or I may introduce into my machine, Pb_2O obtained from any other source of supply. The lead suboxide powder produced by my aforesaid process is sometimes in an amorphous state or condition, only such indefinite particles adhering together due to the surface tension, and a simple beating arrangement can separate them into indefinitely finer particles.

The object of this invention is to oxidize such particles individually to form ideally fine higher oxides which may be used to many industries such as storage batteries, etc.

Lead suboxide, Pb_2O, heretofore has been oxidized to produce PbO by piling it up and exposing it to air, but I have found that the fine particles of powder have a tendency to stick together to form a coarser product. It is desirable, therefore to stir or beat up the powder into a very fine condition so that sometimes all, and at other times a considerable portion may be suspended in the surrounding air, and then pass the powder suspended partially in air over a heater, preferably an oxidizing flame, to heat it sufficiently in the presence of oxygen and maintain it in the heated condition long enough to convert the Pb_2O to PbO.

A convenient apparatus for carrying out my invention may be arranged as disclosed in the accompanying sheet of drawing in which the lead suboxide Pb_2O may conveniently be introduced in a dry state into a hopper-like receiving vessel 1 directly from the tumbling mill shown in my said application. I find it convenient to feed the powder that is supplied to the vessel 1 through a tube 2 by means of a screw conveyor 3 and is better that the conveyor practically fill the tube 2 so as to prevent any backward movement of the powder since it is ordinarily dry and quite finely divided when it enters the tube 2 and is liable to impregnate the surrounding air unless it is pushed along through the tube 2 by the conveyor which nearly fills it.

After the powder is well within the tube 2, I find it advantageous to beat it up into a finer condition than it was when entering the tube 2. I therefore provide a beater, shown as a double beater 4, 4', which may be run by any source of power, that also operates the screw conveyor 3. The beaters 4, 4', break up the leaden powder into a very fine condition.

During the beating up operation, I find it advantageous to supply an oxygenized gas, such as air, put through a pipe 6 having a valve 7 therein to regulate this supply of air or gas, such oxygen containing gas may be heated before the application.

Since the lead suboxide may be introduced directly from the tumbling mill, shown in my said application, it may be in a warm condition and the air passing through the pipe 6 begins the conversion of the Pb_2O into PbO while the powder is being beaten up by the beaters 4, 4', but to increase the rapidity of the chemical action, I may supply through a pipe 8 controlled by a valve 9, an oxygenized gas which may be burned at the nozzle 10 inside the tube 2. Instead of burning the oxygenized gas, such as air, at this point, it is apparent that I may heat the gas at this point by any well known form of electric heater. In order that there may be a sufficient supply of oxygen, I may provide a pipe 12 for conducting the oxygenized gas into the tube 2 in front of the burner 10.

The gas now in a heated condition may be passed along to a vessel 15 and to keep the gas and powder hot I may surround the vessel 15 with a furnace 16 having a burner 17 in its lower portion, the burner being controlled by a valve 18.

I preferably provide a pyrometer 19 with a part extending into the vessel 15 to indicate the heat of the contents in the vessel and I find it convenient to provide a peep-hole 20 so as to be able to see inside the vessel 15 when desired.

The vessel 15 is made with sufficient capacity to maintain the hot gases and powder long enough to convert the Pb_2O to PbO. The vessel 15 being kept at an elevated temperature in the furnace 16, the heat from the burner 17 and the waste products of combustion finally pass out of a chimney 22 in the furnace.

At the bottom of the furnace 15 I may provide a screw conveyor 23 to convey the powder from the vessel 15. This conveyor delivers the powder into a cooler 25 which may be water

jacketed in an exterior vessel 25' so as to cool down the powder as quickly as possible after it has been converted to PbO.

From the vessel 25 the powder may be conveyed by a screw conveyor 28 into any convenient receptacle as 29. The conveyors may all be conveniently operated from the same source of power. I preferably provide a pyrometer 30 extending into the vessel 25 to indicate the heat of the interior of the vessel and I find it convenient to connect the vessel 25 by means of a passage-way 32 to the vessel 15. I may also provide a gate valve (not lettered) and sampling opening in the passage-way 32.

After the powder has been converted from Pb_2O to PbO as described, it may be drawn through a series of dust collectors 35, 35', 35'', attached to the top of the vessel 25 in such a way that as the gases and powder are introduced into the vessel 25, the gases would be drawn through the dust collectors 35, 35', 35'' by a fan 37, suitably arranged in an outlet 38, of a vessel 29 enclosing the dust collectors 35, 35', 35'' and these dust collectors may be made of any suitable coarse cloth material which collect the powder and allow it to fall back into the vessel 25 and the gases passing out through the outlet 38 will be comparatively free of powder.

To recapitulate the operation of the apparatus, which may be varied without departing from my invention, the lead suboxide Pb_2O may be delivered directly from the tumbling mill of my aforesaid application or it may be passed entirely through the apparatus of my said application and then delivered in any convenient way to the vessel 1 from which it is conveyed by the conveyor 3 to the beaters 4, 4' which beat up the lead suboxide into an exceedingly fine powder and allows the oxygenized gas coming through the pipe 6 to partially oxidize the Pb_2O to PbO while in the very fine condition produced by the beaters 4, 4'. The mixed powders and gas are passed on through the tube 2 to the burner 10 where more oxygen is supplied through the tube 12 and the gas and powder preliminarily heated before they enter the vessel 15. This vessel 15 is kept sufficiently hot by the burner 17 in the bottom of the furnace 16 to completely convert the finely divided Pb_2O into PbO which is then conveyed by the conveyor 23 into the water cooled vessel 25 where the powders are cooled down sufficiently before a portion is drawn up by the fan 37 into the dust collectors 35, 35', 35''. Of course, much of the powder will settle in the bottom of the vessel 25 without passing up into the dust collectors. The dust collectors being only necessary to take out the remaining powder before the gases pass beyond the fan 37.

By adjusting the oxidizing period within the furnace or chamber the converted lead oxide PbO may further be changed into red lead oxide Pb_3O_4 by regulating the temperature of the oxidizing chamber at the same time, thus the present process can be applied to produce an ideally fine powder of litharge or red lead by using lead suboxide powder as the initial material.

What I claim is:

1. An apparatus for converting Pb_2O in powder form to a higher oxide of lead, comprising, a conduit, a conveyor in the conduit, an agitator or beater in communication with the interior of the conduit located to receive the powder from the conveyor and operative to subdivide the Pb_2O and make it very fine as it passes through the conduit and means extending into the conduit for heating the contents.

2. An apparatus for converting powdered suboxide to a higher oxide of lead, comprising, a conduit, a conveyor in the conduit to cause the powder to move through the conduit, an agitator in communication with the interior of the conduit located to receive the powder from the conveyor and operative to mix the air and powder as they pass through the conduit, a heater extending into the conduit for heating the air and powder and a vessel in communication with the conduit with means to heat the vessel.

3. An apparatus for converting powdered Pb_2O to a higher oxide of lead which comprises a conduit, an agitator in communication with the interior of the conduit to subdivide the powder and make it finer and mix it with the air in the conduit, means for applying heat to the contents of the conduit, a vessel in communication with the conduit, means at the bottom of the vessel to remove the powder therefrom, a second vessel into which the powder may be conveyed from the first-mentioned vessel, a filter and a suction fan for withdrawing the air from both vessels through the filter.

4. An apparatus for converting Pb_2O to a higher oxide of lead comprising a conduit, an agitator or beater in communication with the interior of the conduit, means for forcing a gas into the conduit and mixing the same with the agitated powder, a heating means extending into the conduit for heating the mixed gas and powder, a vessel in communication with the conduit, a furnace surrounding the vessel and having means therein to heat the vessel, a filter and a suction fan communicating with the vessel to draw the mixed gas and powder through the filter and filter the gas from the powder.

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