(No Model.) 2 Sheets—Sheet 1.

A. C. J. CHARLIER.

APPARATUS FOR MANUFACTURE OF METALLIC PIGMENTS.

No. 534,197. Patented Feb. 12, 1895.

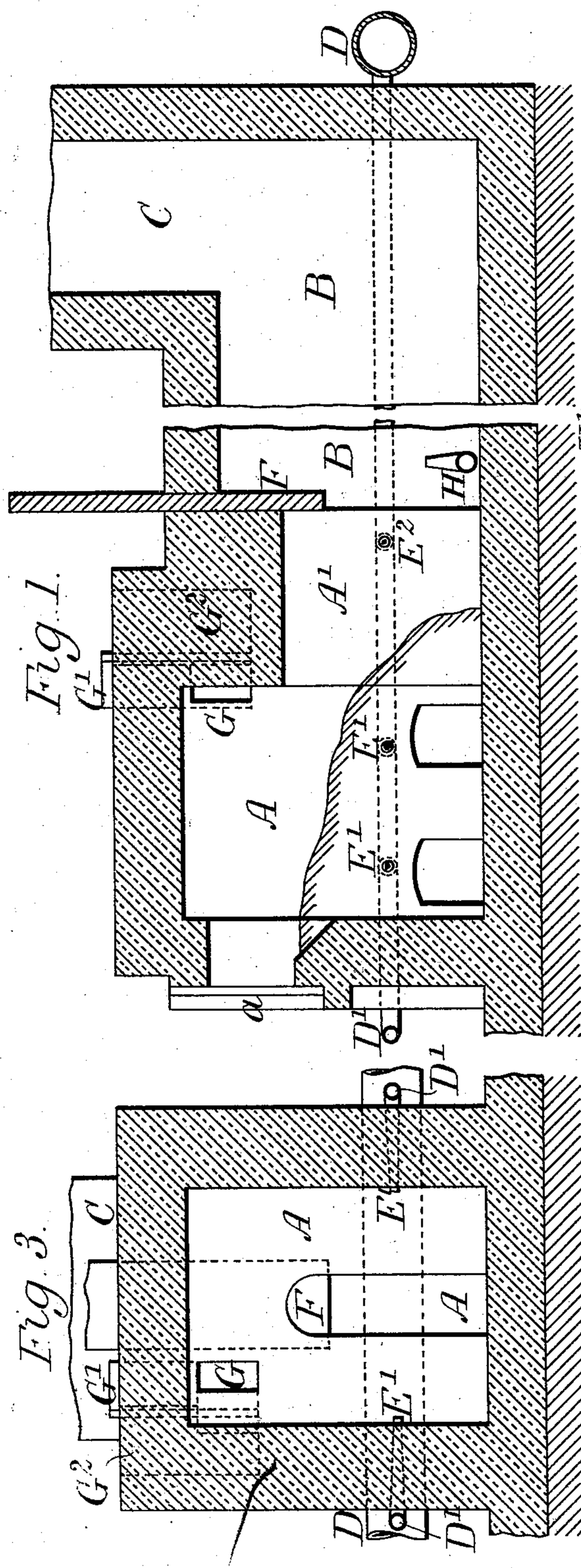

Fig. 1.

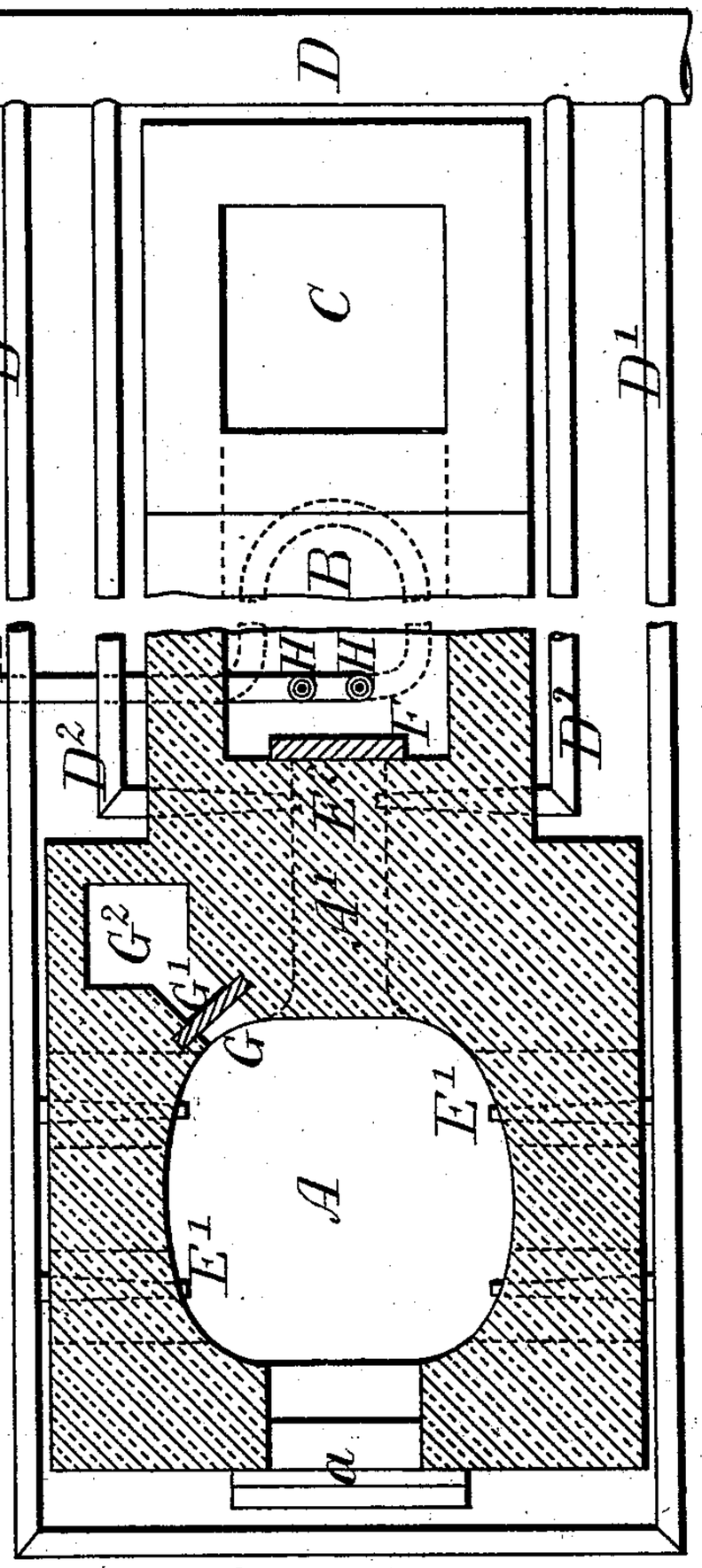

Fig. 2.

Fig. 3.

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(No Model.) 2 Sheets—Sheet 2.

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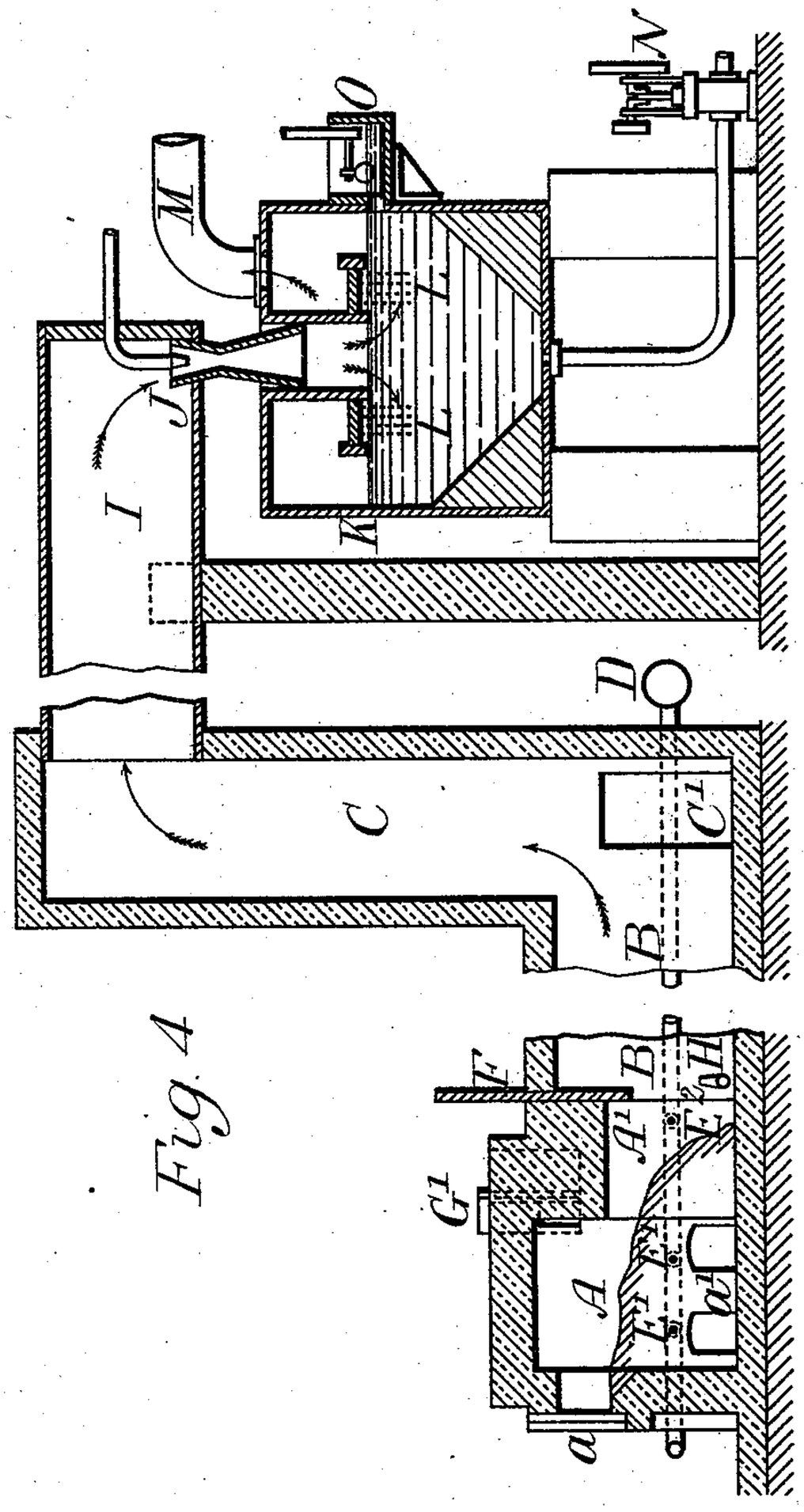

Witnesses;
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UNITED STATES PATENT OFFICE.

ANDREW C. J. CHARLIER, OF GLASGOW, SCOTLAND.

APPARATUS FOR MANUFACTURE OF METALLIC PIGMENTS.

SPECIFICATION forming part of Letters Patent No. 534,197, dated February 12, 1895.

Application filed October 30, 1893. Serial No. 489,518. (No model.) Patented in England April 6, 1893, Nos. 7,117 and 7,119; in France September 27, 1893, No. 233,084; in Belgium September 27, 1893, No. 106,559; in Italy October 21, 1893, LXVIII, 398; in Spain November 13, 1893, No. 15,016, and in Austria-Hungary December 30, 1893, No. 33,370 and No. 59,768.

To all whom it may concern:

Be it known that I, ANDREW CHARLES JOSEPH CHARLIER, a citizen of England, residing at 136 Holm Street, Glasgow, in the county of Lanark, Scotland, have invented certain new and useful Improvements in Apparatus for the Manufacture of Metallic Pigments or Compounds and in the Production of Lead Pigments by Means of such Apparatus, (for which I have obtained Letters Patent in Great Britain, dated April 6, 1893, Nos. 7,117 and 7,119; in Austria-Hungary, dated December 30, 1893, No. 33,370 and No, 59,768; in France, dated September 27, 1893, No. 233,084; in Belgium, dated September 27, 1893, No. 106,559; in Italy, dated October 21, 1893, LXVIII, 398, and in Spain, dated November 13, 1893, No. 15,016,) of which the following is a specification.

This invention relates more particularly to the process and apparatus for the manufacture of sulphate of lead pigment described in the specifications of Hannay's United States Patents Nos. 429,522 and 429,523, dated June 3, 1890, whereby lead ore containing sulphur was volatilized in a chamber in which combustible gas was at the same time produced, the resulting mixture of gases and lead fumes being then burned by the admission of air in an oxidizing chamber. The said volatilizing chamber was in open communication through the oxidizing chamber with the condensers in which the oxidized lead fumes were condensed so that, on first starting the apparatus as well as in adding fresh fuel from time to time, the impurities resulting from the combustion of the gases from the fuel in the volatilizing chamber passed into the oxidizing chamber and thence into the condensers and deteriorated the lead product therein.

According to one of my present improvements I prevent such deterioration by separating the producer furnace or volatilizing chamber from the oxidizing chamber by means of a damper closing the communication between them and also providing such producer furnace as and when required with a separate chimney flue also provided with a damper, so that when the apparatus is first started, or fresh fuel is added, the communication between the producer furnace and the oxidizing chamber is closed by means of the damper, and the damper to the furnace chimney flue is opened, when the combustion gases from the furnace will escape through the latter. After the furnace has been thus fairly started or renewed and made ready for use, the chimney flue damper, when applied, is closed, and the damper of the opening leading to the oxidizing chamber is lifted or opened, and the process of manufacture can then proceed.

According to another improvement, I introduce jets of steam, superheated or otherwise, among the fumes as they pass from the producer furnace into the oxidizing chamber, by means of which I prevent discoloration of the resulting product and the formation of slag in the oxidizing chamber. The steam thus introduced becomes decomposed by the heat resulting from combustion of the fumes, together with the air supply in the combustion chamber, the resulting oxygen combining with that of the air supply for effecting the complete oxidation of the lead, whereby a pure and undiscolored sulphate of lead is obtained. When using air alone for this purpose, as heretofore, it was found that the lead was not completely oxidized, a part thereof separating as PbO from the $PbSO_4$, thus giving an impure and more or less discolored product. The steam also affords the further advantage that it has the effect of lowering the temperature of the lead fumes immediately on their entrance into the combustion chamber, and thus prevents the lead from combining with the silicic acid of the brick walls to form a slag.

Instead of constructing the chamber of the producer furnace of a square or rectangular section on plan, I construct the same more or less in an elliptical form as it has been found in practice that the materials do not get properly fed into the corners of the rectangular section, resulting in a waste of fuel at those points.

Instead of or in addition to supplying the air to the oxidizing chamber from branches on the pipes leading the air supply to the producer furnace, I lead separate branches

from the main air trunk to the oxidizing chamber, whereby the air is made to enter the latter at an increased pressure.

On the accompanying drawings is shown the improved construction of furnace for carrying out the above described processes for the production of lead pigments.

Figure 1 shows a longitudinal section of that part of the apparatus to which the present improvements relate. Fig. 2 shows a sectional plan; and Fig. 3 shows a cross section through the volatilizing producer furnace. Fig. 4 shows a section to a smaller scale of the said apparatus in combination with the condensing apparatus.

A is the volatilizing producer furnace, which is charged with the necessary fuel through the door *a* and into which (also through the door *a*) the mixture of galena, or other lead ore containing sulphur together with fuel is then introduced.

B is the oxidizing chamber and C is the vertical flue leading to the condensing apparatus, which is of the same construction as before.

D is the main air supply pipe, from which branches D′ lead to the tuyeres E′ in the volatilizing furnace, while other branches D^2 lead to the tuyeres E^2 in the entrance to the oxidation chamber.

The volatilizing furnace A, instead of being made rectangular in plan, is made of approximately elliptical section as shown at Fig. 2, for the purpose above stated. It communicates by a narrow part A′ with the oxidizing chamber B, and on the outer side of this passage is provided a damper F by means of which the communication between the volatilizing furnace and the oxidizing chamber can be closed. The furnace A is preferably made to communicate by a flue G provided with a damper G′ with a chimney flue G^2, so that, on starting the furnace or on renewing the supply of fuel, the furnace A can be cut off from the oxidizing chamber B by closing the damper F and be made to communicate with the chimney flue G^2 by opening the damper G′. When the apparatus is working the positions of the dampers F and G′ are reversed.

In front of the opening of the passage A′ leading into the chamber B are arranged steam nozzles H H supplied with steam from any convenient generator by a pipe H′ or otherwise. The steam issuing from these nozzles in coming into intimate contact with the burning mixture of air, combustible gases, and lead fumes, passing from the passage A into the chamber B, becomes decomposed and acts upon the lead compounds so as to prevent the discoloration of the resulting product, and also so as to prevent the formation of slag from the combustion taking place in the chamber B.

If desired the steam supply may be superheated, in which case the pipe H′ may conveniently be formed into a coil in the chamber B, so as to be heated by the combustion taking place therein.

A portion of the resulting lead sulphate is precipitated in the chamber B, while the remainder is carried up the flue C and along the horizontal flue I, Fig. 4, at the end of which is a steam injector J by the action of which the fumes and gases are propelled downward into a condensing chamber K, which is partly filled with water or acidulated water and in which are immersed a number of perforated or permeable screens L so that the gases and fumes forced in between these by the steam jet are made to pass through the screens and are thereby brought into intimate contact with the water which takes up the sulphate of lead contained therein, while the gases issue into the top of the chamber and escape through the pipe M. The lead sulphate subsides toward the funnel shaped bottom of the condensing chamber K from which the mixture of water and sulphate is pumped by a pump N while water is supplied to the condenser K from a cistern O fed by a ball cock. From the pump N the mixture of water and sulphate is delivered to washing tanks where the material is washed in the usual way, and whence, after subsidence and decantation, the washed sulphate is removed to be dried.

At the bottom of the flue C is a door C′ by which access is given to remove the powdery sulphate deposited in the flue and in the chamber B.

When the charge in the chamber A is exhausted, the damper F is closed, the spent charge is removed through the doors *a*, and a fresh charge having been introduced through *a*, the operation is repeated as before.

Having thus described the nature of my invention and the best means I know for carrying the same into practical effect, I claim—

In apparatus for the manufacture of pigments from lead ores containing sulphur, the combination of a volatilizing chamber A into which the metallic compound to be volatilized is charged together with fuel, communicating by a flue G provided with a damper, with a chimney G^2, and by a passage A′ with an oxidizing chamber B in which the combustible gases with the metallic fumes coming from the volatilizing chamber enter into combustion with the air, a damper F for closing communication between the volatilizing chamber A and oxidizing chamber B on first firing the charge of the former, and steam jets H in the chamber B for the introduction of steam among the burning vapors and air, for the purpose specified.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, this 17th day of October, A. D. 1893.

ANDREW C. J. CHARLIER.

Witnesses:
M. SLATER,
CHARLES S. MACDOUGALL.