

(No Model.)

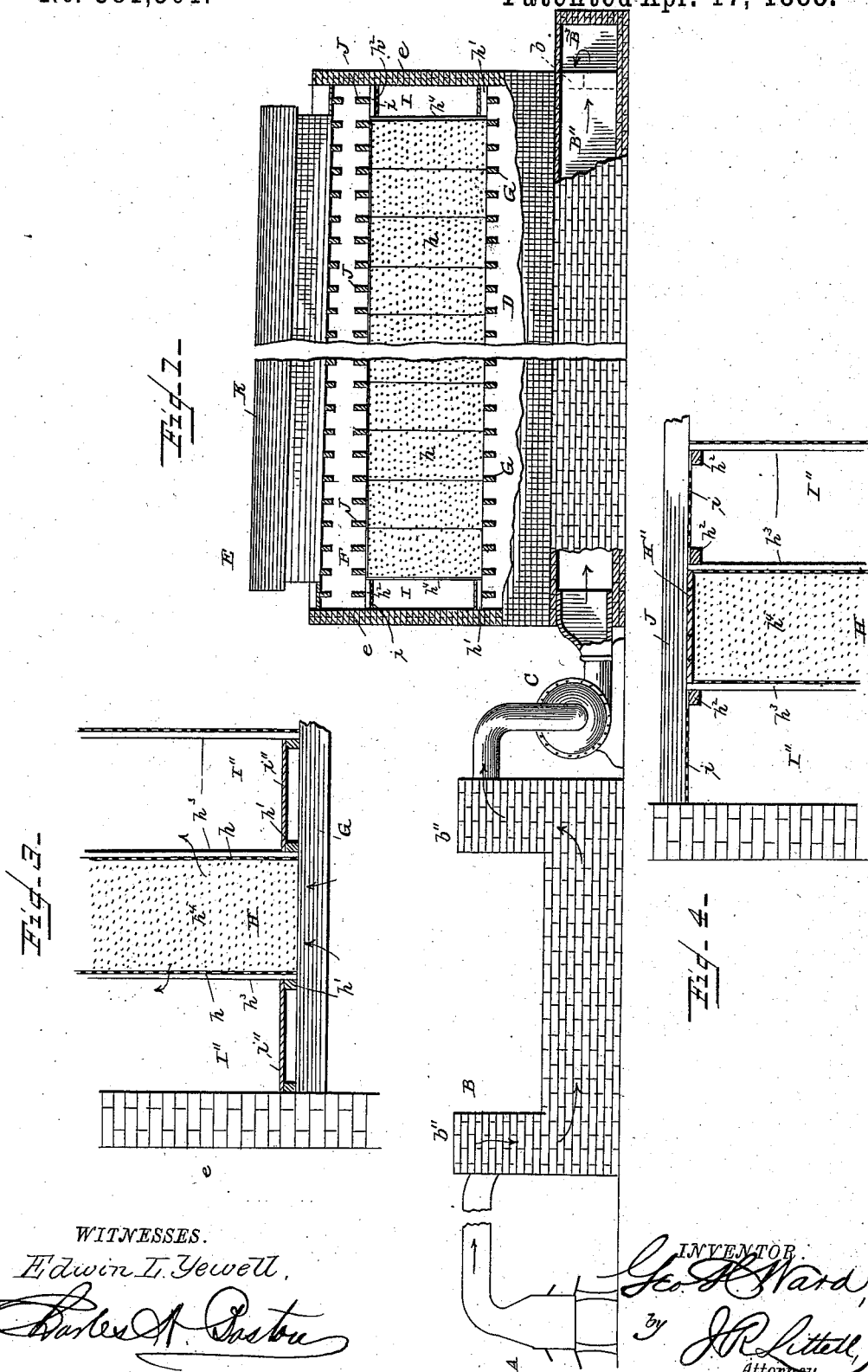
2 Sheets—Sheet 1.

G. H. WARD.

# APPARATUS FOR COLLECTING AND UTILIZING WASTE LEAD FUMES.

No. 381,301.

Patented Apr. 17, 1888.



WITNESSES.

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INVENTOR

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(No Model.)

2 Sheets—Sheet 2.

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Fig. 2.

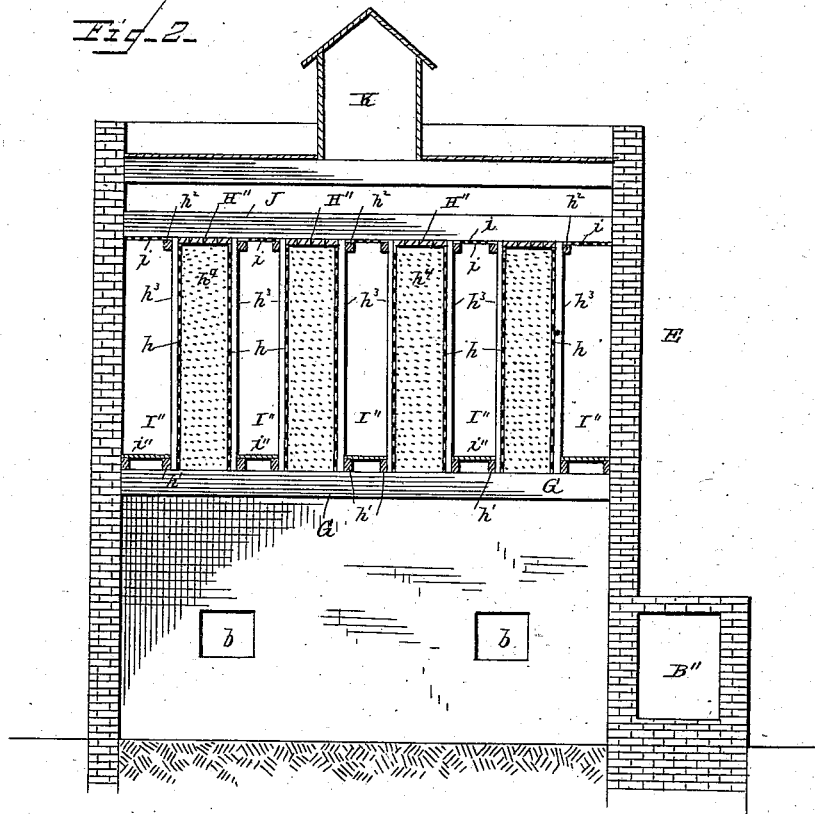
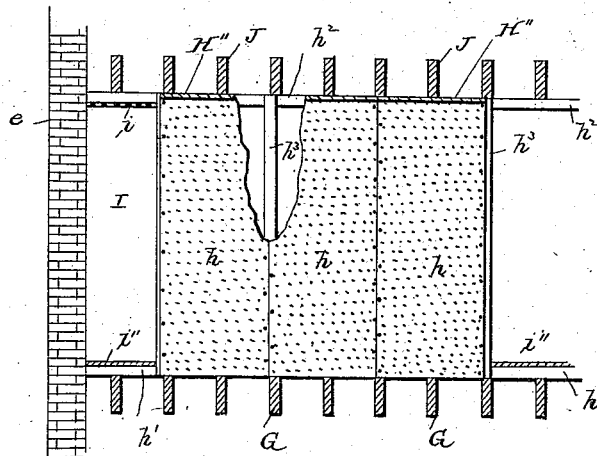


Fig. 5.



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# UNITED STATES PATENT OFFICE.

GEORGE H. WARD, OF JOPLIN, MISSOURI.

APPARATUS FOR COLLECTING AND UTILIZING WASTE LEAD-FUMES.

SPECIFICATION forming part of Letters Patent No. 381,301, dated April 17, 1888.

Application filed July 7, 1887. Serial No. 243,652. (No model.)

*To all whom it may concern:*

Be it known that I, GEORGE H. WARD, a citizen of the United States, residing at Joplin, in the county of Jasper and State of Missouri, have invented certain new and useful Improvements in Apparatus for Collecting and Utilizing Waste Lead-Fumes, of which the following is a specification.

This invention relates to improvements in apparatus and means for collecting and utilizing the waste fumes which are entirely lost in the ordinary processes of smelting lead ore; and its object is to provide simple and improved means for more effectually and conveniently collecting and utilizing all the waste lead-fumes from a smelting-furnace.

In the drawings, Figure 1 is a side elevation, partly in section, illustrating my invention. Fig. 2 is an end elevation, partly in section. Fig. 3 is a detail sectional view illustrating the construction at the bottom of the condensing-compartments. Fig. 4 is a corresponding view illustrating the construction at the top of the condensing-compartments. Fig. 5 is a detail sectional view taken on the longitudinal plane of one of the compartments.

Corresponding parts in the figures are denoted by the same letters of reference.

The furnace used in connection with my invention may be a Scotch-eye, slag-eye, patent "Jumbo," or any furnace now in ordinary use for the purpose of smelting lead ore. In the accompanying drawings I have shown in end view an outline of a furnace, the stack of which, A, is connected with a horizontal flue, B, constructed of brick or stone, and preferably four or five feet wide and five feet high. A portion of this flue extends along one side of the condensing-house, as illustrated at B', and across the end of the condensing-house farthest from the furnace, as shown at B'', and in this latter portion of the flue are provided openings or apertures b, through which the fumes enter the lower story or compartment, D, of the condensing-house. These openings may be closed by dampers (not shown) when desired, and in the construction of the flue and condensing-house the side walls of the latter preferably form the inner sides of that portion of the flue extending along the side and end of the condensing-house.

Part way between the furnace and condensing-house is located a suction fan or blower, C, which is adapted to draw the fumes through part of the flue and force them through the remaining portion of the flue and into the condensing-house. The portion B of the horizontal flue may be constructed with vertical end portions, b'' b'', forming the connection with the furnace-stack A and the fan.

E designates the condensing-house, which in the present instance is provided with an upper and lower story or compartment, F D, respectively, by transverse horizontal joists G. In the upper compartment are mounted the condensing-compartments for straining the sulphurous gases and collecting the fumes, while in the lower compartment the fumes are adapted to be charred or burned after they are collected, and the floor of the latter compartment is therefore formed of cement, grout, or packed earth.

The walls of the condensing-house are of course formed of brick, e, and a door is preferably provided in the end toward the furnace, and two or more windows adapted to be tightly closed may also be provided.

The condensing-compartments H are disposed longitudinally in the upper story of the condensing-house, and are formed of perforated sheets of metal, h; or wire-cloth may be employed with equal effect. The perforated metallic walls of these compartments are secured to a wooden frame comprising longitudinal strips h', mounted upon the joists G, corresponding strips, h'', being secured to the transverse ceiling-joists J, and vertical strips h'', connecting the said strips h' and h''. The metallic sides of the condensing-compartments are preferably formed of zinc or brass, for purposes of economy and for the reason that the sulphurous gases will not destroy these metals, and for the same reason copper nails or tacks are preferably employed to secure the metallic sides to the wooden frame. In practice the fumes enter the compartments H from below, ascending between the joists G, there being no floor or bottom to the compartments, but each of the latter is provided with a ceiling, H'', preferably formed of flooring-strips, secured to the joists J, adapted to force the gases through the metallic sides and ends

of the compartments, and thus collect the fumes. The ends  $h'$  of each compartment H are closed by perforated sheets of metal corresponding to the sides  $h$ .

5 Between the ends of the compartments H and the end walls of the condensing-house are formed passage-ways I I, and between the side walls of the building and the longitudinal compartments, and also between each of said compartments, are provided corresponding longitudinal passage-ways, I'', communicating with the end passages, I. The passage-ways I and I'' are provided with perforated sheet-metal ceilings  $i$ , secured to the joists J, to permit the passage of the gases from the compartments H through the ventilator K at the top of the condensing-house. These passages are also provided with a flooring,  $i''$ , mounted upon the longitudinal strips  $h'$  or upon the joists G, by which the fumes are prevented from entering the passages and caused to enter the compartments H through their open bottoms.

The operation and advantages of my invention will be readily understood by those skilled in the art to which it appertains. The smoke and waste lead-fumes are forced into the condensing-house, and will be partially precipitated and form a deposit, and the remainder will be collected by the compartments H in connection with the perforated metallic ceiling, and only the sulphurous gases will be permitted to escape. Most of the fumes thus collected by the compartments H will fall of their own gravity through the open bottom of said compartments to the lower story, D, and when a sufficient amount has been thus collected the fumes will be fired by throwing two or three shovelfuls of burning coals upon them as they lie upon the floor, and the fire will then spread through the mass of collected fumes. The fumes will be thus charred or coagulated and converted from a dusty into a hard substance, which can be readily handled and taken to the furnace and smelted and made into pig-lead or other marketable product. Such of the fumes as cling to the perforated sides and ends of the compartments H can be easily dislodged and caused to fall to the lower story, D, by slightly jarring the sides and ends of the condensing-compartments.

It is manifest that numerous modifications may be made in the construction and arrangement of parts without departing from the spirit and scope of my invention, and I therefore do not limit my invention to the exact construction and arrangement herein shown and specified, but reserve the right to all such changes as properly fall within the terms of my claims. For instance, in some cases a condensing-house comprising but one story or compartment may be employed, under which circumstances the longitudinal condensing-compartments H may be dispensed with, and the perforated sheet-metal ceiling will serve to collect the fumes but permit the passage of the gas. By preference, however, I employ the apparatus herein shown and described,

and it will be desirable to use two or more condensing-houses of the character herein set forth, the houses being properly connected by the horizontal flue. Under this plan, when the fumes are collected in sufficient quantity in the lower story, D, of any one of the condensing-houses E, the dampers provided in the openings leading from the horizontal flue may be closed, and the fumes thus collected charred or burned and afterward removed to the furnace and resmelted, and during this operation the process of collecting the fumes will proceed in the other condensing house or houses.

If desired, the fumes collected as above described may be utilized without charring or burning them on the floor of the lower story, or resmelting them in the furnace.

It will be noted that the perforated sheet metal forming the sides and ends of the condensing-compartments H are secured to the vertical strips  $h'$  on the inside of the compartments, thus forming a smooth and even interior surface from top to bottom, and facilitating the dropping of the fumes from the said compartments to the lower story of the condensing-house. It will be further noted that in the above-described arrangement the ceiling of the upper story of the condensing-house is formed by alternate flooring or tops over the compartments and perforated sheet metal or wire-cloth over the spaces or passage-ways between and around the compartments.

I am aware that waste lead-fumes have been heretofore collected and deposited in textile bags or receptacles which strain off the gases and retain and collect the fumes, such receptacles being connected by a series of cooling-tubes with the stack of the furnace, and a blower being located in the cooling-tube. In this process the fumes, after being cooled, are collected and retained in the textile receptacles, while in my invention the fumes are condensed and collected by the condensing compartments and sheet-metal ceiling and drop to the floor of the condensing-house, where they may be charred or burned, as above described, to reduce and shrink them in bulk. In my invention the fumes pass from a horizontal flue leading directly from the stack of the furnace into the condensing-house and ascend and enter the condensing-compartment through their open bottoms. The fumes are thus cooled in the condensing-house and collected in bulk upon the floor of the same. I therefore do not claim the above method of collecting the fumes in textile bags or straining-receptacles, nor do I broadly claim the method or process of charring or burning the fumes.

The apparatus embodying my invention and constructed as above set forth is adapted to so strain the smoke and fumes from the furnace that when the smoke and fumes enter the condensing-house all the particles of soot and sublimed lead will remain in the building and only the gases or sulphurous vapors will

be permitted to escape. A complete saving of all waste fumes is thus effected.

I claim as my invention—

1. In combination with the stack of a lead-ore-smelting furnace or lead-refining furnace, a cooling and condensing house or chamber, a horizontal connecting and conducting flue, substantially as described, extending direct from the stack of the furnace and entering the lower portion of said cooling and condensing house or chamber, and perforated sheet-metal or wire-cloth partitions mounted upon a framework in the said cooling and condensing house above the entrance of the conducting-flue, said perforated sheet-metal or wire-cloth partitions forming a metallic condensing compartment or strainer, (in lieu of bags or compartments formed of textile fabric,) by which the ascending fumes which enter the cooling and condensing house through the horizontal flue direct from the furnace are strained and collected in the lower portion of said house without liability of damage to the straining fabric, substantially as set forth.

2. As an improvement in collecting and utilizing waste lead-fumes, cooling and condensing rooms fitting with condensing compartments comprising perforated sheet-metal or wire-cloth partitions mounted upon a framework, substantially as described, said cooling and condensing rooms being provided with the corresponding intermediate ceiling formed of perforated sheet metal or wire-cloth, and having a lower room or compartment connected with the stack of an ore-smelting furnace or lead-refining furnace by the horizontal flue, substantially as set forth.

3. In combination with the stack of a lead-ore-smelting furnace, a flue extending from the same, and a cooling and condensing house divided by a flooring, as at *i''*, between the series of condensing and straining compartments into two stories or compartments, the lower one of which connects with said flue, and provided in its upper story with a series of condensing-compartments formed by perforated sheet metal or wire cloth, and having open

bottoms, through which the collected lead-fumes drop to the lower story and are there collected in bulk, a ceiling, as at *i*, of wire-cloth being formed above said flooring and between the condensing and straining compartments, substantially as set forth.

4. As an improvement in collecting and utilizing waste lead-fumes, the combination, with the stack of a lead-ore-smelting furnace or lead-refining furnace, of a horizontal flue extending from the same, a cooling and condensing house divided into an upper and lower story and having said flue entering the latter, a series of collecting-compartments located in the upper story and having an open bottom and a closed top and sides formed of perforated sheet metal or wire-cloth, a flooring, as at *i''*, located between said compartments at their lower ends, and a ceiling, as at *i*, formed of perforated sheet metal or wire-cloth and located between said compartments at their tops, substantially as set forth.

5. As an improvement in collecting and utilizing waste lead-fumes, the herein-described cooling and condensing house comprising a lower story connected by a flue with the stack of a lead-ore-smelting furnace or lead-refining furnace, and an upper story having a framework formed of a series of longitudinal strips and vertical connecting-strips, a series of longitudinal straining-compartments formed with open bottoms and closed tops, and with sides formed of perforated sheet metal or wire-cloth secured to said framework, a series of longitudinal passage-ways between said compartments, a flooring for said passage-ways located at the lower ends of said compartments, and a ceiling or perforated sheet metal or wire-cloth located at the tops of the passage-ways, substantially as set forth.

In testimony whereof I affix my signature in presence of two witnesses.

GEORGE H. WARD.

Witnesses:

JAMES P. BOSS,

L. P. CUNNINGHAM.