

(No Model.)

2 Sheets—Sheet 1.

E. O. BARTLETT.

METHOD OF AND APPARATUS FOR MAKING SUBLIMED METALLIC
PIGMENTS.

No. 592,860.

Patented Nov. 2, 1897.

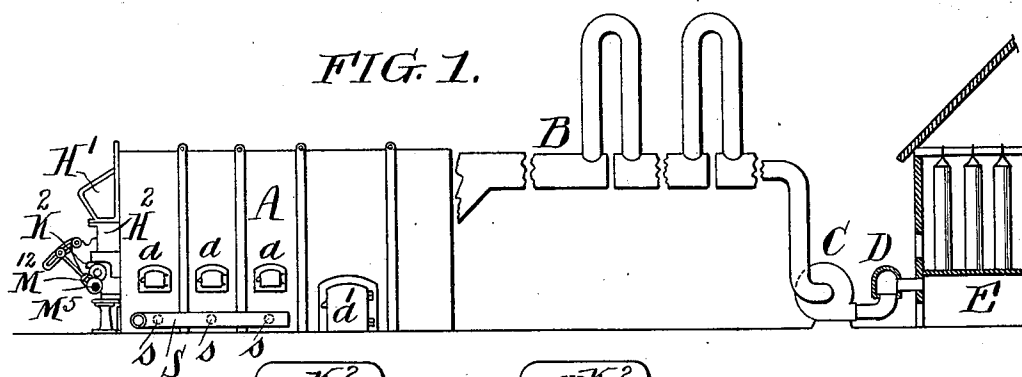
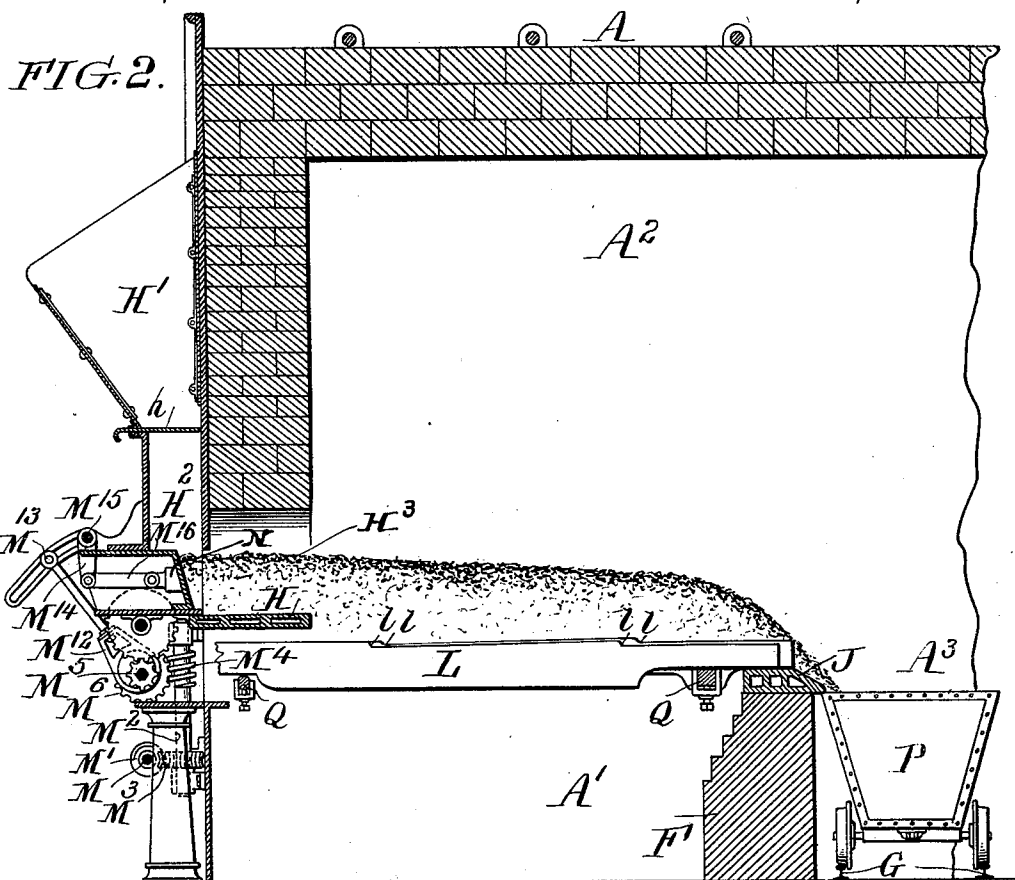


FIG. 8.

WITNESSES:

Wm. Drury
J. Stewart

FIG. 9.

INVENTOR:
Eugene O. Bartlett
by his atty.
Frederic J. Chambers

(No Model.)

2 Sheets—Sheet 2.

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FIG. 3.

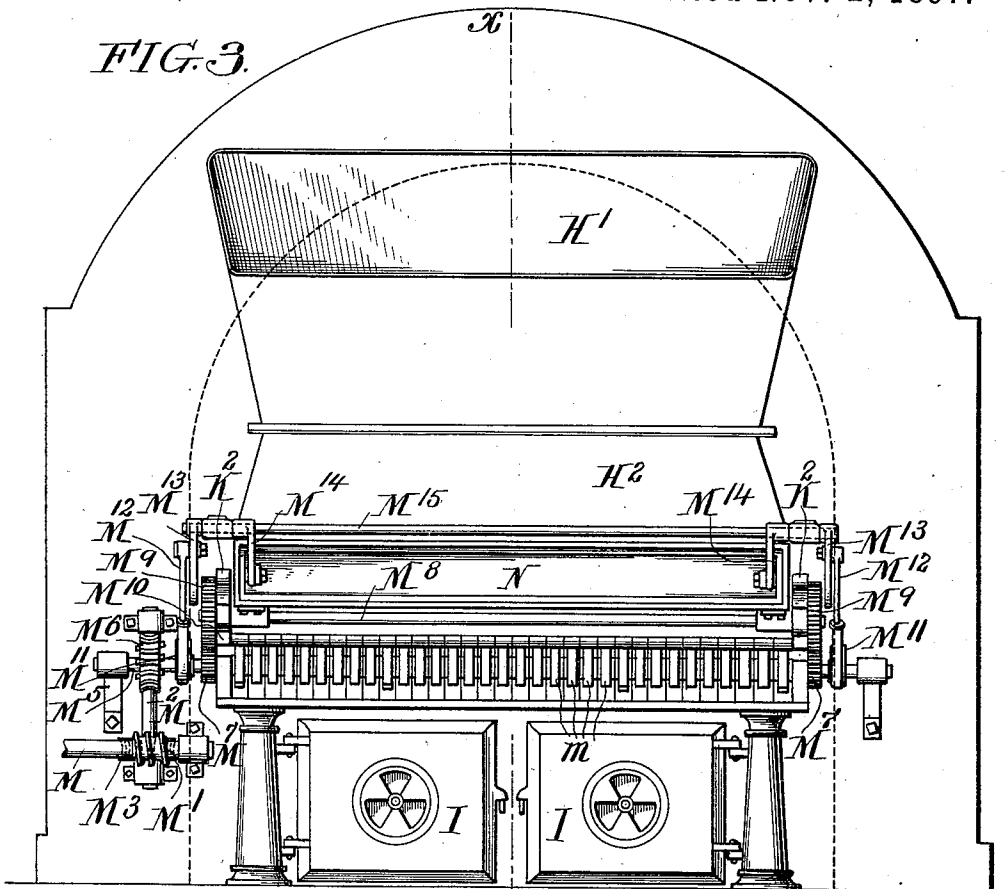


FIG. 5.

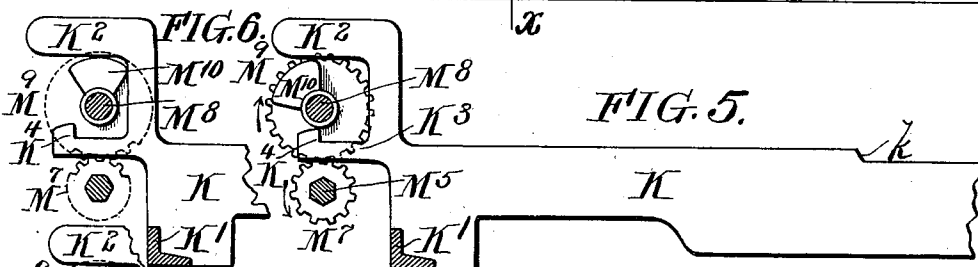


FIG. 4.

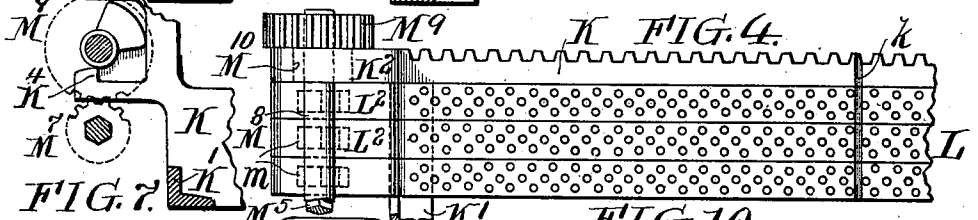
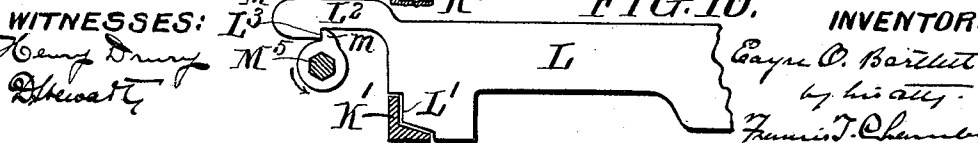


FIG. 10.



WITNESSES:
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UNITED STATES PATENT OFFICE.

EAYRE O. BARTLETT, OF JOPLIN, MISSOURI.

METHOD OF AND APPARATUS FOR MAKING SUBLIMED METALLIC PIGMENTS.

SPECIFICATION forming part of Letters Patent No. 592,860, dated November 2, 1897.

Application filed December 20, 1893. Serial No. 494,189. (No model.)

To all whom it may concern:

Be it known that I, EAYRE O. BARTLETT, a citizen of the United States, residing at Joplin, in the county of Jasper and State of Missouri, have invented a certain new and useful Improvement in Methods of and Apparatus for Making Sublimed Metallic Pigments, of which the following is a true and exact description, reference being had to the accompanying drawings, which form a part thereof.

My invention relates to the manufacture of pigment from sublimed metallic fumes, and particularly to the manufacture of white oxid of zinc pigment, though it is also applicable to the manufacture of sublimed lead pigment, consisting, essentially, of sulfate of lead and more particularly to the manufacture of a mixed pigment of zinc oxid and lead sulfate.

Hitherto it has been the general practice to treat zinc ores or other compounds containing zinc in a Wetherill furnace for the purpose of oxidizing and driving off the zinc as zinc oxid, which oxid is afterward caught and saved by a screening system. Compound ores of zinc and lead have been treated in a similar way, and ores essentially of lead have also been so treated though not so generally. In the treatment, the ore or other metal-bearing substance is mixed with fuel and the mixture charged onto the perforated floor of the Wetherill furnace, where it is ignited, the treatment continuing until the metal is substantially driven off, when the scoria is removed and a fresh charge thrown into the furnace, the process being intermittent and involving, of course, much loss of time and of heat. As heretofore practiced, particularly in the treatment of zinc ores, anthracite coal has been found to be the only fuel adapted for use in this treatment, coke giving too hot a fire and causing the formation of a liquid slag with great loss of metal, while bituminous coal is not adapted for use, because in the first place carbonaceous gases are driven off at a heat too low to act as reducing agents, while in the later stages it has the same drawbacks as noted with regard to coke.

The object of my invention is, in the first place, to render the treatment continuous, thus saving time and heat and maintaining substantial uniformity in furnace temperature and character of product, and, in the sec-

ond place, to provide a method of treatment which will enable me to use bituminous coal as well as anthracite; and my invention, generally speaking, consists in gradually feeding a mixture of fuel and oil to a grate in a shallow layer, igniting it thereon and subjecting the ignited charge to a progressive stoking action to remove the ash and scoria and make room for the fresh portions of the charge. Preferably I give the ignited fuel a backward movement over the grate or furnace-bottom, so that the fresh material of the charge is injected at one end of the grate and the scoria dumped at the back end thereof, and particularly when using bituminous coal I prefer to first inject the charge upon a shelf situated in the furnace and in front of the grate, so that the carbonaceous gases will be driven off to some extent and then passing through and over the fuel, and in the hottest portion of the furnace these gases will serve to assist in reducing the metal in the charge. The charge, it will be understood, is in this last-mentioned case fed to the grate from the shelf.

I may mention here that the reactions in the furnace, as in the old style of furnace, is as follows: The coal is first burned to carbon monoxid, which gas serves to reduce the metal in the ore to a metallic state, the zinc being volatilized and mixing with carbon dioxid in the upper part of the fire, where it is burned to zinc oxid, the carbon dioxid losing oxygen and again becoming monoxid. The regulation of temperature is of course important, but its requirements are well understood by all skilled in the art. Naturally the carbonaceous gases driven off at the head or front of the furnace when bituminous coal is used will ignite there and thus promote the desired high temperature of the charge which it would be difficult to attain at that point by the fresh ignition of the comparatively thin charge of fuel and ore fed upon the grate.

In the ordinary or intermittent operation as heretofore carried on in the Wetherill furnace the character of the furnace charge as a whole varied from the beginning of the process or first ignition of the charge, when it was still rich in ore, to the completion of the operation, during which period the ore became leaner and leaner until finally exhausted. As a result, while the fumes given off at

the beginning of the operation were rich in character they gradually became poorer and poorer toward the end of the process. As distinguished from the varying character of the charge composition in the intermittent process, the varying furnace temperature existing therein, and the varying fume product, my invention presents an operation wherein by supplying the mixture of ore and fuel constantly to the front end of the grate and moving progressively toward the rear end thereof the charge composition upon the grate at any time during the process remains a constant factor, the temperature of the furnace also remaining constant and the resultant fume product being always of substantially the same uniform character.

My invention both as a process and with respect to the apparatus I have devised to carry it into effect will be better understood as described in connection with the drawings, in which the apparatus is illustrated, and in which—

Figure 1 is a side elevation of a pigment-furnace with cooling-flues and screen system shown on a smaller scale. Fig. 2 is a longitudinal sectional elevation through the furnace on line $x x$ of Fig. 3. Fig. 3 is a front view of the furnace. Fig. 4 is a plan view of a portion of the grate; Figs. 5 to 9, detailed views of a portion of the mechanism for actuating the grate-bars, showing its operation; and Fig. 10 is a view of another part of the grate-bar-actuating mechanism.

A indicates the furnace; B, the cooling-flues, leading therefrom to a fan C.

D is the flue system, leading from the fan to the screen system, (indicated at E.)

The interior of the furnace A is indicated at A², F being a wall built up in the furnace to support the side ends of the grate-bars and divide the furnace at its bottom into the scoria-chamber A³ and the ash-pit A'.

G indicates tracks in chamber A³ upon which a slag-car, as P, can be run back of the grate.

II is a feeding-shelf, preferably made hollow, so that it can be kept cool by water, and situated inside the furnace at the front end thereof and immediately above the front end of the grate.

II' indicates a charging-hopper for the mixed ore and fuel; II², the conduit, leading therefrom to the shelf II, b being a slide for regulating the discharge from the hopper, and II³ the passage for charge, situated above the shelf II.

I indicates the doors of the ash-pit.

J is a hollow casting situated on top of wall F and upon which the rear ends of the grate-bars rest. It is made hollow, so that water can be passed through it to keep it cool and prevent warping.

K K are the side bars of the grate, one extending along each side of the furnace. Their rear ends rest upon the casting J and they are united in front by a cross-bar K'. From

the front ends of bars K extends the arms K³ K³, the arm K³ having at its end an upward projection K⁴. At the front of the furnace and extending between the arms K² K³ is a shaft M⁸, having upon it cams M¹⁰, which, rotating with the shaft, first act upon the arms K², lifting bars K and pushing them backward, as shown in Figs. 5, 6, and 7, then permit the bars K to fall, (see Fig. 8,) and then engage projection K⁴, as shown in Fig. 9, and draw the bars forward to their original position.

L L, &c., indicate a series of grate-bars situated between bars K K and preferably formed, as shown, of perforated plates, the rear ends of which rest on casting J. The top face of these bars and, as shown, of the bars K also are formed of several upwardly-inclined planes connected by abrupt shoulders l or k , the function of which is to engage the charge and assist in moving it backward over the grate. At the front of bars L and, as shown, in a downward projection from the bar are recesses L', formed to engage the cross-bar K', as illustrated in Fig. 10.

L² is an arm projecting forward from the end of each bar L and having a downward projection L³. These arms rest on cams secured to a shaft M⁵ and rotating, as shown by the arrow, Fig. 10, a projection m on each cam serving at each revolution of the shaft to raise each bar and move it toward the front of the furnace.

Q Q, Fig. 2, indicate rods extending across the furnace below the grate-bars and which serve to support them in their normal position or to assist in supporting them.

N, Figs. 2 and 3, is a stoking-plunger the function of which is to push the charge into and through the passage II³.

M, Fig. 3, indicates a driving-shaft provided with a worm M', which engages a worm-wheel M³ on vertical shaft M². (See Figs. 2 and 3.) Secured to this shaft is the worm M⁴, which engages the worm-wheel M⁶ and drives the shaft M, to which it is secured. This shaft extends across the front of the furnace and has secured to it the cams m , upon which rest the arms L² of the grate-bars L. The projecting fingers of the cams M are arranged so as to act on the bars L in series, lifting them one by one or in a definite order. Spur-wheels M⁷ on shaft M⁵ engage spur-wheels M⁹ and through them drive the shaft M⁸, upon which are secured cams M¹⁰.

M¹¹ indicates an eccentric on shaft M⁵; M¹², a rod secured to the eccentric and to a lever M¹³, preferably slotted, as shown, so that the point of attachment can be adjusted. Lever M¹³ is attached to a rock-shaft M¹⁵, to which are also attached lever-arms M¹⁴, which by means of rods M¹⁶ are connected to and actuate the plunger N.

S is an air-blast pipe leading through nozzles $s s$, &c., to the ash-pit A'.

$a a a$ indicate doors in one side of the furnace by which the charge can be gotten at for

adjustment or stirring when necessary, and a' is a door in chamber A^3 for the extracting of scoria.

The operation of my furnace can be readily followed. The mixed ore and fuel are charged into the hopper H' and pass from it into conduit H^2 and down to shelf H . The plunger N , making one stroke for each revolution of shaft M^5 , pushes the fuel forward on shelf H for a determined distance and of course thrusts a portion off of the shelf onto the grate-bars L , but before reaching this point all portions of the charge remain for some time upon the shelf exposed to the heat of the furnace, and the gases driven off are ignited in the front of the furnace in and over the charge, which is heated by the burning gas as well as by its own ignition. Owing to the revolution of the cams m on shaft M^5 the grate-bars L are constantly in motion, each in due order being raised and allowed to fall again to normal level and each being drawn forward when out of place by the action of the cam-finger on projection L^3 . The up-and-down motions of the grate-bars serve to break up the charge and can be utilized to work ash down into the ash-pit. When the cams M^{10} on shaft M^8 come into operation, they lift the bars $K K$, and by means of the cross-bar K' , which engages each grate-bar when in its normal position, they lift the front ends of the grate-bars also and then they move the side bars and grate-bars back together to the extent of the throw of the cam, the preliminary lifting of the grate-bars elevating their front ends out of reach of cams m . All of the bars then fall to normal level, and by the operation the whole body of fuel and ore has been moved back. Then the cams m resume their action upon the grate-bars, drawing them back to normal position, but the charge does not move back because of the fresh fuel coming in at the front end and because of the resistance of the shoulders ll , &c., so that as the bars move from beneath it it falls over the wall F into the scoria-chamber A^3 or into a car, as P , situated in said chamber, but before reaching the end of the grate the metal has been driven off and only the scoria is discharged, as described.

The furnace above described is particularly well adapted for carrying my process into effect, but it will be understood that I do not confine my claims to its use save where it or parts of it are specifically referred to it in the claims.

Having now described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In the method of making a sublimed metal pigment by treating shallow charges of mixed ore and fuel in a furnace and securing the resultant fume, the improvement which consists in constantly charging fresh ore or fuel onto the front end of the grate of such furnace, moving the ignited charge progressively from the front to the rear of the grate, supplying a substantially uniform air-blast

to the charge, maintaining thereby a substantially uniform furnace temperature, maintaining the charge composition within the furnace as a substantially constant factor, and obtaining a resultant fume product of substantial uniformity, substantially as and for the purpose set forth.

2. The method of making a sublimed metallic pigment which consists in mixing ore or other metal-bearing substance with bituminous coal, subjecting said mixture to the heat of a furnace to drive off coal-gas, then feeding said mixture to one end of a grate-surface and igniting it thereon, causing the ignited fuel to move with regulated speed over the face of the grate, dumping the scoria over the end of the grate and catching the sublimed metallic compound driven off in screens, substantially as and for the purposes described.

3. The method of making a sublimed metallic pigment which consists in mixing ore or other zinc-bearing substance with bituminous coal, subjecting said mixture to the heat of a furnace to drive off coal-gas, then feeding said mixture to one end of a grate-surface, and igniting it thereon, causing the ignited fuel to move with regulated speed over the face of the grate, dumping the scoria over the end of the grate and catching the zinc oxid driven off in screens, substantially as and for the purposes described.

4. The method of making a sublimed metallic pigment which consists in mixing the ore or other metal-bearing substance with bituminous coal, gradually feeding said mixture to a shelf situated within the furnace to drive off carbonaceous gases, then feeding the mixture to a grate igniting it thereon and causing the ignited charge to move with regulated speed over the surface of the grate to remove ash and scoria and screening the gaseous products of the furnace to save the metallic fume, substantially as and for the purposes described.

5. A pigment-furnace having in combination a bottom made up of a series of perforated plates or bars, means for supplying air to the under side of the perforated plates or bars, means for feeding ore and fuel to one end of said bottom, means for giving said bars an up-and-down motion and means for giving said bars a back-and-forward motion substantially as and for the purpose specified.

6. A pigment-furnace having in combination a bottom made up of a series of perforated plates or bars, means for supplying air to the under side of the perforated plates or bars, a chamber for dumping scoria situated back of and below the furnace-bottom, means for feeding ore and fuel to one end of said bottom, means for giving said bars an up-and-down motion, and means for giving said bars a back-and-forward motion, substantially as and for the purpose specified.

7. A pigment-furnace having in combination a bottom made up of a series of perfo-

rated plates or bars, means for supplying air
to the under side of the perforated plates or
bars, a charging-shelf situated in front of the
furnace-bottom, means for feeding ore and
5 fuel to the charging-shelf and thence to one
end of said bottom, means for giving said
bars an up-and-down motion and means for
giving said bars a back-and-forward motion
substantially as and for the purposes specified.
10 8. A pigment-furnace having a perforated
floor, means for charging it with ore and
fuel and means for moving its charge over
the furnace-bottom in combination with a
screen system for catching the metallic fume
driven off from the furnace, substantially as 15
and for the purposes described.

EAYRE O. BARTLETT.

Witnesses:

GALEN SPENCER,
C. V. PETRAMS.