No. 614,361. Patented Nov. 15, 1898.

E. O. BARTLETT & C. V. PETRAEUS.

METHOD OF AND APPARATUS FOR PURIFYING AND SAVING THE FUMES OF LEAD.

(Application filed June 21, 1893.)

(No Model.)

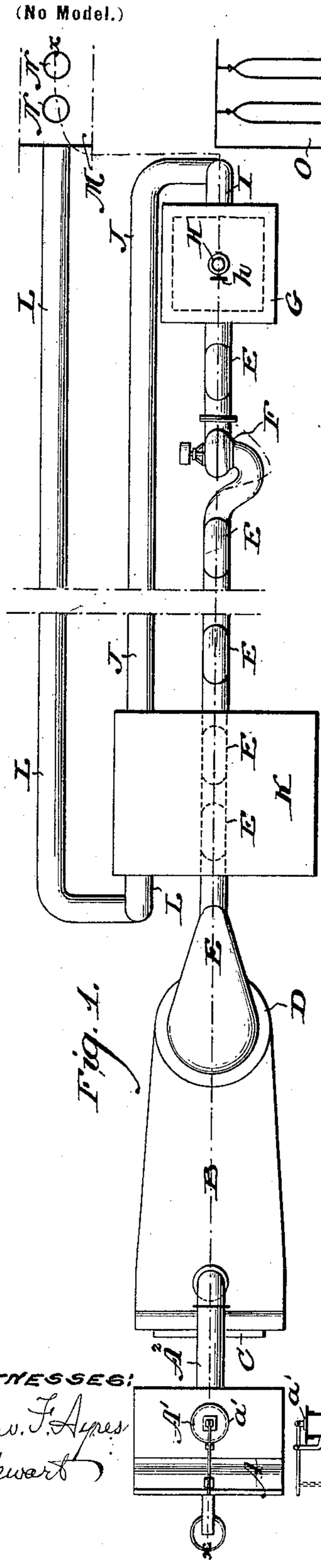

Fig. 1.

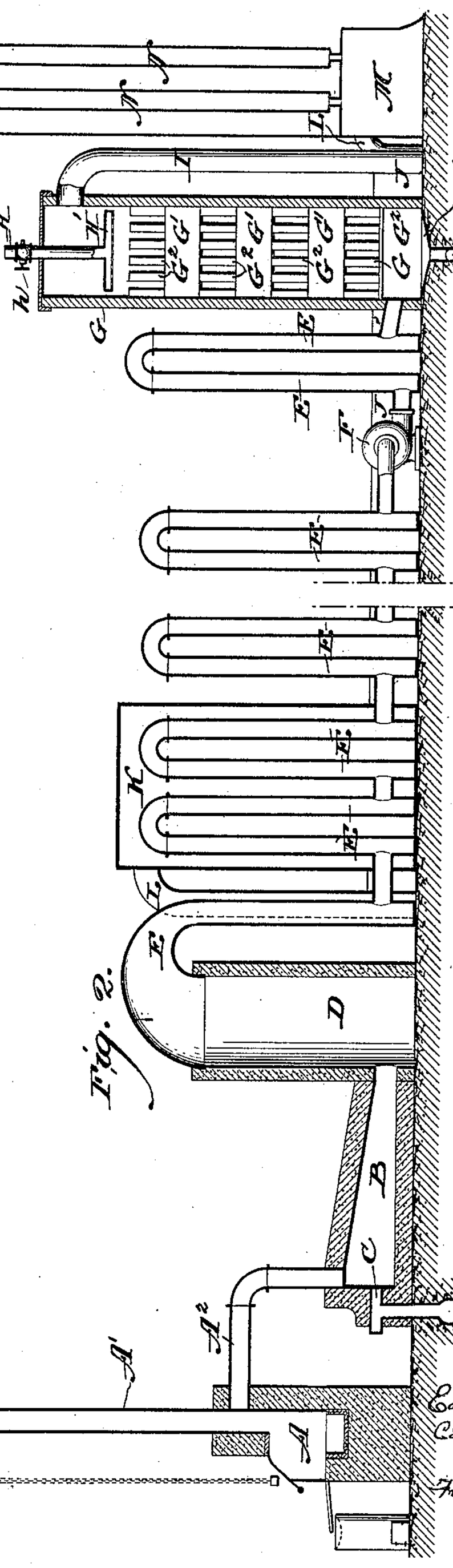

Fig. 2.

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METHOD OF AND APPARATUS FOR PURIFYING AND SAVING FUMES OF LEAD.

SPECIFICATION forming part of Letters Patent No. 614,361, dated November 15, 1898.

Application filed June 21, 1893. Serial No. 478,324. (No model.)

To all whom it may concern:

Be it known that we, EAYRE O. BARTLETT and CARL V. PETRAEUS, citizens of the United States, residing at Joplin, in the county of Jasper, in the State of Missouri, have invented a certain new and Improved Method of and Apparatus for Purifying and Saving the Fumes of Lead Driven Off from Metallurgical Furnaces, of which the following is a true and exact description, reference being had to the accompanying drawings, which form a part thereof.

Our invention relates to the purification of lead fume driven off from metallurgical furnaces of various kinds and the separation and saving of the same for use as a pigment.

Heretofore lead fume driven off from metallurgical furnaces has been separated from the gaseous constituents of the furnace-smoke in various ways, the most successful being by first causing the furnace-smoke to pass through a system of cooling-flues and then separating it from the gases by means of fabric screens. The fume, however, as first formed is unfitted for use as a pigment, because it is largely mixed with unconsumed carbon and also because the fume arising from the generality of metallurgical furnaces is largely in the form of lead sulfid and of a dark color, and it has therefore been found necessary to subject the fume to some process of reburning for the purpose of eliminating the carbon mixed with it and also of oxidizing the lead sulfid to a lead sulfate. Many devices have been tried with varying degrees of success for so purifying the fume, and, among other methods, the fume has been subjected to the action of another fire as it passes from its point of generation to the screen system; but while this plan is reasonably successful in whitening and purifying the fume it has been found objectionable, owing to the fact that the smoke ordinarily contains a large quantity of sulfur dioxid, which, under the high temperature and other conditions of treatment in the second furnace, unites with the oxygen and moisture present to form sulfuric acid, which rapidly destroys the fabric of the screens. Owing to this drawback the approved practice has been to first separate the dark-colored fume, permitting the escape of the sulfurous acid, and then effect its purification by subsequent treatment.

The object of our invention is to enable us to use the old method of reburning in transit and to eliminate the sulfuric acid formed before the purified smoke reaches the fabric screens; and our process, broadly speaking, consists in generating the fume-containing smoke, passing it through or over a second furnace to purify and whiten the lead fume, then passing it through a cooling system to reduce the temperature of the smoke to, say, from 200° to 300° Fahrenheit, then bringing it into contact with water to absorb and eliminate the sulfuric acid, and then screening the purified residue, preferably reheating the smoke after subjecting it to the action of the water, so as to prevent the presence of moisture in sensible form in the screen.

Reference is now had to the drawings which illustrate our invention, and in which—

Figure 1 is a plan view of an apparatus adapted for use with our improved process and embodying the novel features which we desire to protect; and Fig. 2 is a side elevation of the same, taken on the line *x x* of Fig. 1.

A indicates the fume-generating furnace, which may be of various constructions, that illustrated being that familiarly known as a "Scotch eye" furnace, A′ indicating the stack of the furnace, which is provided with a damper *a*′, and A² a flue leading therefrom to a second furnace, (indicated at B.) This furnace is preferably of the reverberatory form shown and is heated by a gas-flame issuing from the opening C. The smoke of the furnace A, passing into the said reverberatory furnace B, is subjected to the action of a high heat and in the presence of sufficient oxygen to secure the combustion of the unconsumed carbon and the oxidation of the sulfid of lead to lead sulfate. From the furnace B the smoke passes first to a dust-chamber D, in which ponderable particles settle in the form of flue dust, the lighter fume passing with the gases into the cooling-flue E, which said flue is preferably made up largely of what are familiarly known as "goosenecks" or U-shaped tubes, as shown in the drawings. The smoke is drawn through the cooling-flue and

forced into the flues and chambers following it by means of an exhaust-fan, as indicated at F, and having been cooled to a sufficient degree it passes through the water-tower G, which may be a device of any kind adapted to bring the smoke into intimate contact with water, but not to force it through a body of water. In the construction shown the tower G, which forms a part of the flue, is filled up with boards set on edge and at a little distance from each other, each layer of boards being set in the opposite direction to those above and below it, or the filling of the tower could be of any material which will provide a series of intercommunicating interstices through which the water can flow down and the smoke pass up. Water is introduced by the top of the tower through a pipe H, preferably provided with a regulating-cock *h* and a sprinkling-head H'. As the smoke passes up through the tower it is brought into very intimate contact with the spray and thin films of water passing down through the same, and the mineral acid contained in the smoke is wholly or to a large extent absorbed by the water and eliminated from the smoke. Some particles of the lead fume will also be carried down by the water which flows out from the bottom G^3 of the tower to a conduit G^4, and can be carried thence to a settling-place, (not shown,) from which the particles can be recovered. From the top of the tower the smoke passes through the screen system. Preferably, however, we provide means for reheating the smoke before screening it, which extend along the flue E and communicate with the chamber K, which is built around a portion of the cooling-flue, preferably the hottest portion thereof. From the chamber K we carry the smoke through the flue L to the screen system. The flue L is shown communicating with a hopper M, which in turn connects with a series of fabric bags N N, &c., contained in a bag-house O.

In another application filed by us on the 21st day of June, 1893, and bearing the Serial No. 478,323, we have shown and described a combination of a furnace with the cooling system, water-tower, reheating apparatus, and screen system substantially the same as hereinabove described, and in said application we have claimed, broadly, both the process and apparatus, our present invention relating solely to the construction and method in which a second furnace is provided for the purpose of reburning or purifying the fume as the smoke passes from the furnace in which it is generated to the screen system.

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

1. The method of purifying fumes of lead driven off from metallurgical furnaces and separating the same from furnace-gases which consists in generating the fume, then causing the smoke from the generating-furnace to pass through or over a second furnace to eliminate combustible ingredients and whiten the lead fume, then cooling down the purified smoke, then causing it to pass in intimate contact with but not through water to eliminate mineral acid and then screening the residue.

2. The method of purifying fumes of lead driven off from metallurgical furnaces and separating the same from furnace-gases which consists in generating the fume, then causing the smoke from the generating-furnace to pass through or over a second furnace to eliminate combustible ingredients and whiten the lead fume, then cooling down the purified smoke, then causing it to pass in intimate contact with but not through water to eliminate mineral acid, then reheating the smoke and then screening the residue.

3. The combination of a fume-generating furnace A with a second smoke-purifying furnace B, a cooling-flue leading therefrom, means for bringing the smoke into intimate contact with water, said means situated in or forming a part of said flue, a flue J, K, L, leading therefrom and inclosing a part of the cooling-flue aforesaid, a screen system and means for conducting the smoke thereto.

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