No. 709,956. Patented Sept. 30, 1902.

J. W. BAILEY.

APPARATUS FOR PRODUCING WHITE LEAD.

(Application filed Mar. 14, 1901.)

(No Model.) 2 Sheets—Sheet 1.

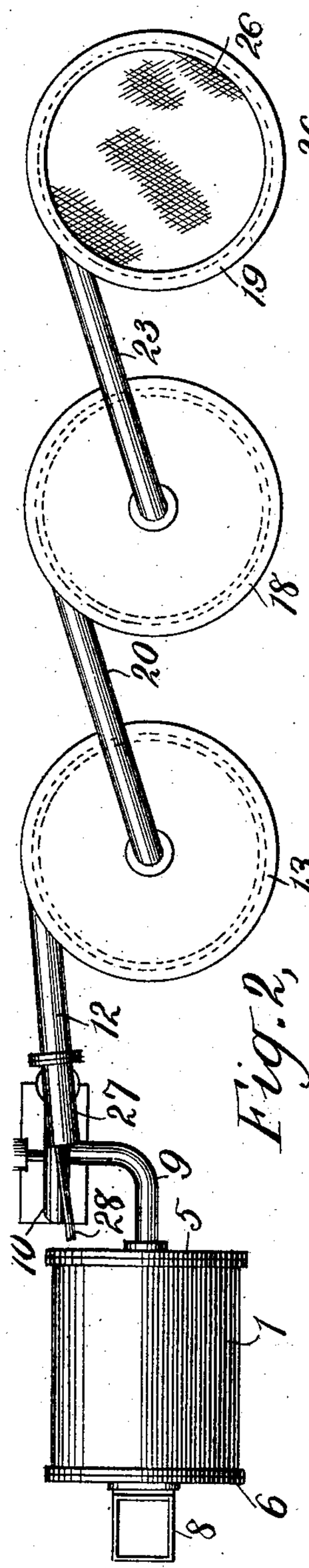

Fig. 2.

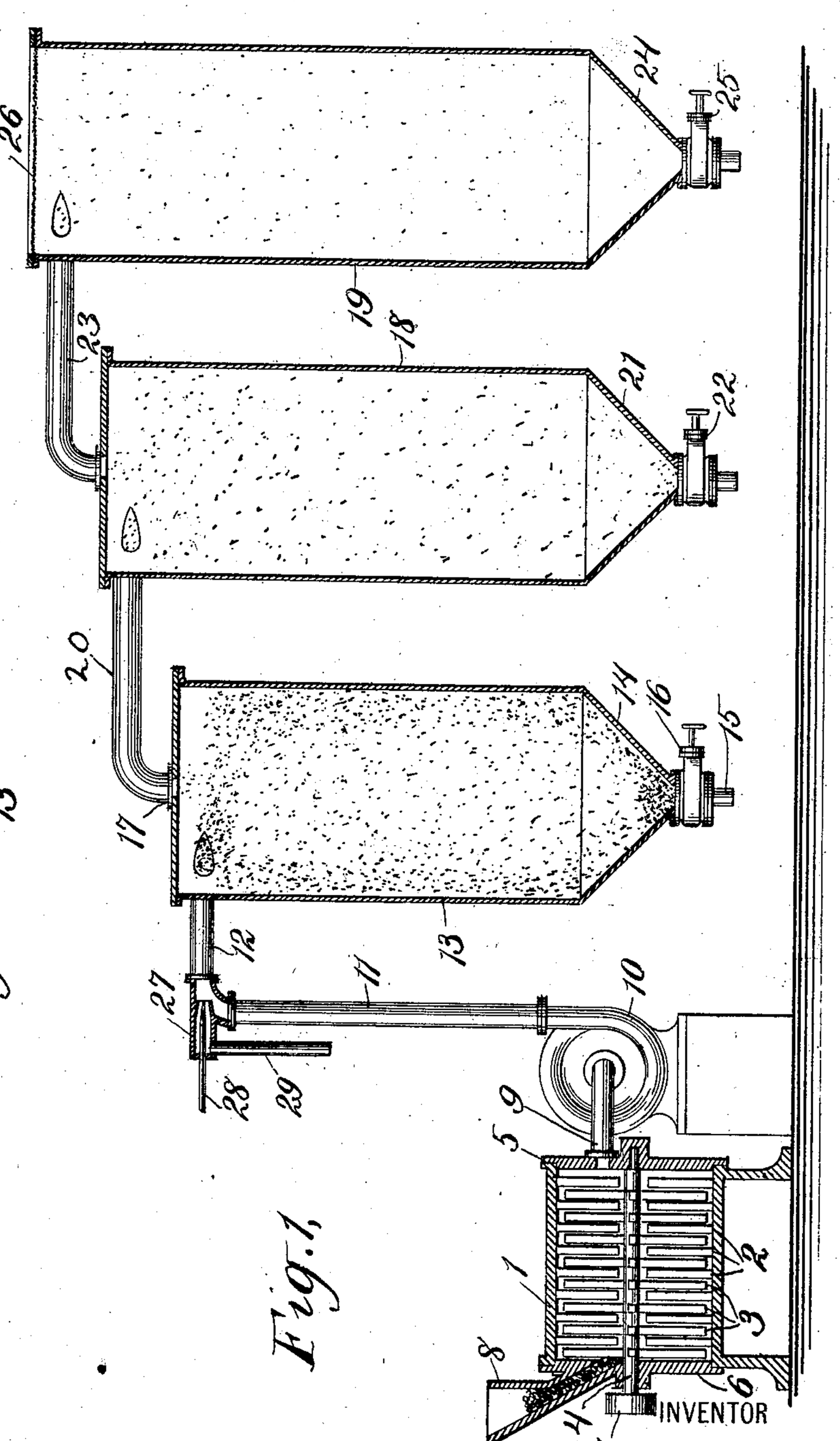

Fig. 1.

WITNESSES:

John O Gempeler

Edwin Segal

INVENTOR

John W. Bailey

BY

Kenyon & Kenyon

ATTORNEYS

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Fig. 4.

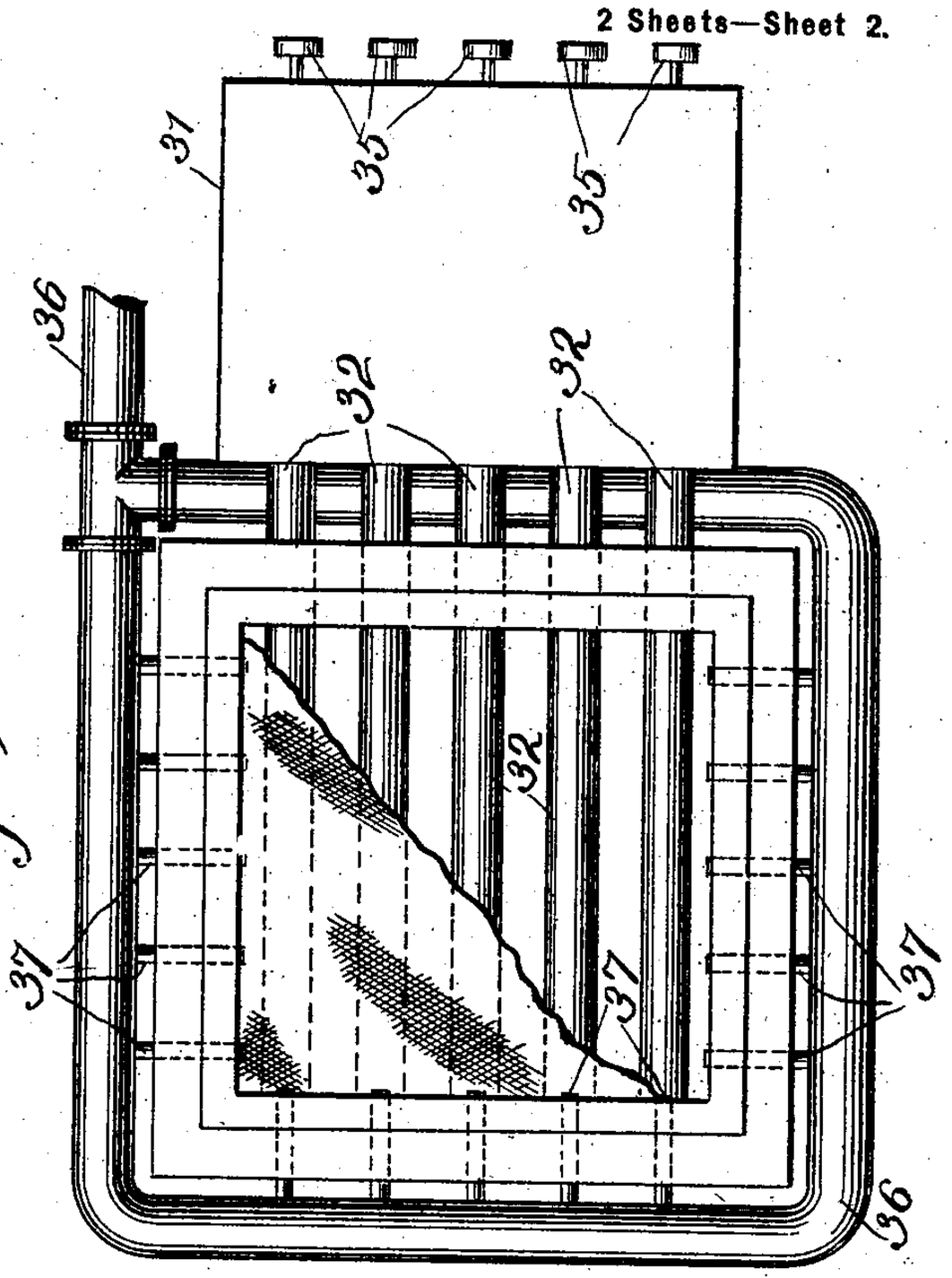
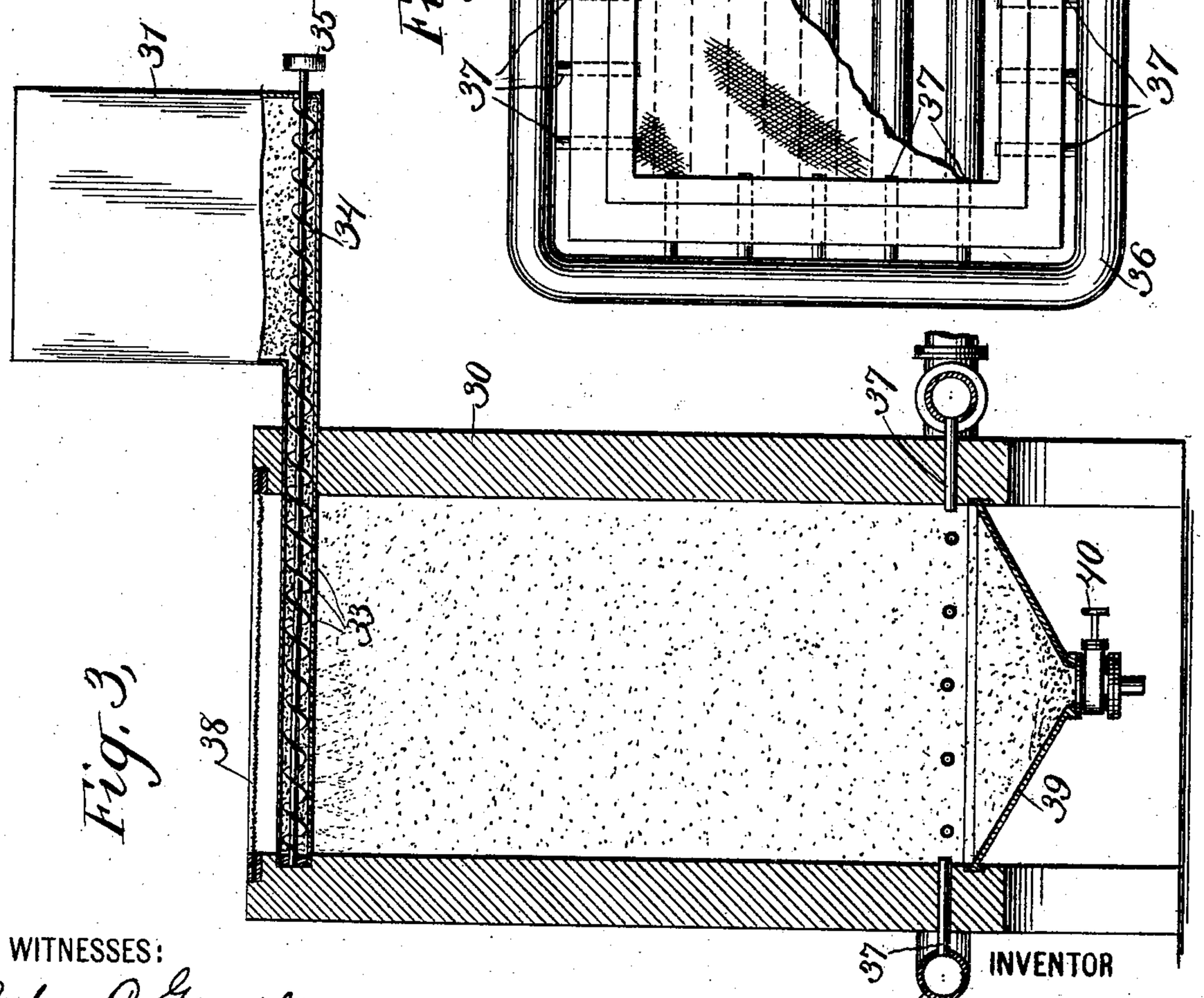


Fig. 3.



WITNESSES:

John O. Gempler

Edwin Segal

INVENTOR

John W. Bailey

BY Kenyon & Kenyon

ATTORNEYS

UNITED STATES PATENT OFFICE.

JOHN W. BAILEY, OF JERSEY CITY, NEW JERSEY, ASSIGNOR TO UNION LEAD AND OIL COMPANY, A CORPORATION OF NEW JERSEY.

APPARATUS FOR PRODUCING WHITE LEAD.

SPECIFICATION forming part of Letters Patent No. 709,956, dated September 30, 1902.

Application filed March 14, 1901. Serial No. 51,149. (No model.)

To all whom it may concern:

Be it known that I, JOHN W. BAILEY, a citizen of the United States, and a resident of Jersey City, in the county of Hudson and State of New Jersey, have invented a new and Improved Apparatus for Producing Lead Carbonate, of which the following is a specification.

My invention relates to an apparatus for manufacturing or producing lead carbonate or the white lead of commerce.

The special object of my present invention is to provide an apparatus which is adapted to carry out the process of corrosion invented by me and made the subject-matter of another application for a patent filed simultaneously herewith, Serial No. 51,150.

More particularly, my invention relates to an apparatus whereby metallic lead is wholly converted without waste into an entirely amorphous product of perfect opacity and great purity and in a very short time as compared with the most approved mode of corrosion hitherto employed.

In the methods heretofore devised for the manufacture of white lead from metallic lead by corrosion or by what is known in the art as the "Dutch" process the metal, although in a comminuted condition, has been introduced into the corroding-chamber in pieces or particles of such size that the time required to completely corrode the same is quite considerable, in some cases days and in other cases weeks being required to completely corrode a single charge of metal. In the old methods, moreover, the charges of metallic lead are necessarily formed of a mass or masses of the comminuted metal. The metal in these masses is inevitably unevenly exposed to the corroding-gases, not only by reason of the fact that the metal forming the inner parts of the masses is more or less protected from the action of the gases by the metal forming the outer parts of the masses, but also because the entangled fibers or filaments forming the masses unavoidably become more or less matted or compacted, and unevenly so, owing to the very soft character of the metal and the lack of any definite structure in the masses. The result is that the lead has to be subjected to the action of the corroding-gases a much longer time than would otherwise be required to completely corrode the metal, and by reason of the lack of uniformity in the masses local aggregations of uncorroded metal are developed, and the product not only lacks homogeneity, but requires special treatment for the separation of the metallic residue.

My invention has for an object to provide an apparatus for the manufacture of white lead whereby the use of the masses of comminuted lead referred to, together with the complicated and troublesome and expensive machinery required to handle the same, is entirely done away with; also, to provide an apparatus which, while involving the use of the same elements employed in corroding by the old Dutch process and producing a similar product, requires much less time to complete the various steps and less expense and less manual labor than are required by any apparatus heretofore devised and which produces, nevertheless, a product which is less contaminated with stains and impurities and has greater covering and spreading qualities than any heretofore produced.

More particularly, my invention has for an object to obtain as nearly as may be those conditions most favorable to the combination or chemical union of the elements required for the production of the desired product and to maintain those conditions for an indefinite time, thus rendering the operation of the apparatus automatic and continuous at all stages of the manufacture from the metallic lead to the completely-corroded product.

In accordance with my invention the metallic lead is first ground or pulverized or otherwise disintegrated and reduced to a fine condition, and then it is uniformly subjected to the action of a suitable corroding-gas until it is completely corroded. Although my invention in its broader aspects is not limited to the particular manner in which the finely-divided lead is uniformly subjected to the action of the corroding-gas, the best mode in which I have contemplated carrying out this feature of the invention consists in diffusing the pulverized lead throughout a body of a suitable corroding-gas and maintaining this diffused condition until the corrosion of the

metal is complete or so nearly so that it will continue and become complete after the diffused condition has ceased.

In carrying my invention into effect I put metallic lead which has previously been granulated or otherwise comminuted to a suitable degree of fineness into a grinding or pulverizing mill adapted to reduce the lead to a fine powder or dust, such as may be floated in a suitable current or blast of air or other gas. This powder, preferably in the form of a stream or current, is then introduced into a corroding-chamber in which a current or circulation of the corroding-gas is maintained, so as to diffuse the powder in the gas and maintain it in the diffused condition for such length of time as is required to corrode the metal. According to the preferred form of apparatus a whirling motion of the corroding-gas is maintained in the corroding-chamber, whereby the powdered lead may be floated and kept afloat or in a state of suspension for an indefinite time.

My invention consists in the novel devices and combinations of devices herein shown and described.

The accompanying drawings, which are referred to herein and form a part hereof, illustrate, by way of example, two forms of apparatus embodying my invention and serving, in connection with the description herein, to explain the principles of my invention and the best mode in which I have contemplated applying those principles.

In the drawings, Figure 1 is a sectional diagrammatic view illustrating an apparatus embodying my invention in its preferred form. Fig. 2 is a plan view of the same; and Figs. 3 and 4 are views similar to those shown in Figs. 1 and 2, respectively, illustrating another embodiment of the invention.

Like reference-numerals refer to like parts wherever they occur throughout the several views.

Referring now to the drawings in detail, and more particularly at first to the form of the device shown in Figs. 1 and 2, 1 represents a pulverizing or disintegrating mill, such as is adapted to reduce the metallic lead to the desired degree of fineness. This mill may be of any ordinary construction. As shown, it comprises a cylindrical chamber, to the inner walls of which are fixed a plurality of inwardly-extending fingers or bars 2, between which the radial fingers or bars 3, carried by a central shaft 4, are adapted to rotate. This shaft 4 is suitably journaled in the heads 5 of the cylinder and is provided with a driving-pulley 7, by means of which it may be given a very rapid rotation. A hopper 8 is provided at one end of the cylinder, through which lead in a suitably-comminuted condition may be introduced into the mill. An outlet-passage 9 is provided at the opposite end of the mill, through which the powder or dust formed in the mill may be withdrawn. In the form of apparatus shown the outlet 9 is connected with the inlet-passage of a suitable fan or blower 10, the outlet-passage of which is connected by pipe 11 to the inlet-passage 12 of a corroding-chamber 13. The corroding-chamber 13 is preferably in the form of a cylinder vertically arranged, with the inlet-passage 12 located at or near the top. The inlet-passage 12 is preferably arranged to communicate with the chamber 13 in a tangential direction, so as to create and maintain a circular or rotary movement of the air and gases in the cylinder, the object being to keep the powdered lead in a state of suspension and to create a zone in the center of the chamber which is comparatively free from the dust particles. The bottom of the chamber 13 is made in the form of a hopper 14, so as to enable the corroded metal which collects in the bottom to be withdrawn from time to time through a suitable outlet-passage 15, a gate-valve 16 being provided to facilitate this operation. The outlet-passage 17 for the corroding-gas is arranged at the center of the top of the chamber, and where a single chamber is used this outlet is covered by a screen of cloth or other material adapted to permit the escape of the gas and not the dust. Preferably, however, I employ in addition to the chamber 13 one or more supplementary chambers to complete the corrosion of the particles not corroded in the first chamber. Two such additional chambers 18 and 19 are shown. Where a third chamber is used, the second chamber may be identical with the first chamber, and its inlet-passage will be connected with the outlet for the gas of the first chamber. As shown, the inlet-passage 20 of the second chamber is tangentially arranged and the chamber is provided at its bottom with a hopper 21, the outlet of which is controlled by a gate-valve 22. The last chamber 19 of the series has a tangential inlet-passage 23, which communicates with the outlet for the air and gases of the preceding chamber, and this chamber is also provided with a hopper-shaped bottom 24 and a valve 25. The top of this chamber is covered with a screen 26, which consists of bolting-cloth or other material adapted to permit the escape of the gases and retain the particles of dust. The gases and vapors necessary to effect the corrosion of the powdered lead may be supplied to the chambers in any suitable way. In the construction shown an injector 27 is provided for this purpose, and it is preferably connected with the inlet-passage 12 of the first corroding-chamber 13. This injector comprises an inlet-pipe 28, which is preferably connected with a steam-generator in order to supply the heat and moisture required in the process of corrosion and to create a suction, by means of which the carbonic-acid gas and vapors of acetic acid, also required for the corroding process, may be drawn in, a pipe 29, connected with any suitable generator, being provided to supply these gases. This form of apparatus

is operated in the following manner: The mill 1 and the blower 10 having been set in motion and the supply of steam and carbonic-acid gas having been established, granulated or other finely-divided lead is fed into the mill 1 through the hopper 8, and as fast as the lead becomes fine enough a stream or current of it is drawn from the mill with the current of air created therein by the blower 10. This current of dust-laden air is brought into contact with and intimately commingled with the steam and corroding-gases in the inlet-pipe 12, and this mixture is forcibly blown into the corroding-chamber 13 by the steam-jet and the blast from the blower 10. A rapid circulation of the air and gases in the chamber 13 is thus created, and the particles of powdered lead are thoroughly diffused throughout these gases and held in a state of suspension or floated therein for a considerable length of time. As the particles become corroded they gradually settle toward the bottom of the chamber, where the process of corrosion, if not already complete, will continue as long as the apparatus is kept in operation or until the metal is entirely corroded. Where a second corroding-chamber is used, a considerable portion of the powdered lead will escape through the outlet 17 of the chamber 13, together with the gases, and will be carried thereby into the second corroding-chamber, where the corroding process will continue, this operation being repeated through the successive chambers until the final separation of the air and gases by means of the screen which covers the outlet of the last chamber. As many chambers of course may be used as circumstances may require. It will be seen that the portion of the metal which passes through two or more of the corroding-chambers will be subjected to a series of successive currents of the corroding-gas and will be kept in a state of suspension for a longer time than if it passed through one chamber only. The corroded product may be removed from the bottom of the corroding-chambers from time to time as it collects therein and then washed and dried in the usual manner to prepare it for the market.

Another form of apparatus by which my invention may be carried into effect is shown in Figs. 3 and 4. According to this construction the finely-divided lead is sifted or diffused in the top of a vertical corroding-chamber in such a manner as to produce a downwardly-moving current of the metal, through which an upwardly-flowing current of the corroding-gas is maintained. In this apparatus the particles of lead are corroded as they fall through the chamber, the final product being removed at the bottom. In the construction shown a vertical corroding-chamber is provided, and it is preferably constructed in the form of a chimney or tower 30, which may be of any desired height, it only being important to note that the finer the metal is divided and the stronger the current of the corroding-gas the shorter the corroding-chamber may be. A suitable receptacle 31 for the powdered lead is arranged at the top of the corroding-chamber, and in the construction shown this receptacle is provided at its bottom with a series of outlet-passages 32, which are carried into and arranged in a parallel relation across the top of the corroding-chamber. Each of the passages 32 is provided within the corroding-chamber with a series of perforations 33, through which the powdered lead is uniformly sifted by a suitable conveyer located within the passage. These conveyers, as shown, consist of suitable worms 34, which are extended across the bottom of the receptacle 31 and are driven by any suitable means, as the pulleys 35. The corroding-gases for the corroding-chamber are supplied through a pipe 36, which is carried around the corroding-chamber at the bottom thereof and is provided with a series of jet-pipes 37, which enter the bottom of the corroding-chamber from all sides. A suitable blast may be created through this pipe by any suitable means, as by a blower and steam-jet, such as illustrated in connection with the form of the apparatus previously described. The corroding-chamber is provided at the top with a screen 38, which will permit the escape of the corroding-gases and prevent the escape of any particles of lead which may be carried along therewith. The corroding-chamber is provided with a hopper-shaped bottom 39, the outlet of which is controlled by a suitable gate or valve 40. This form of apparatus is operated in the following manner: A suitable blast of air and corroding gases or vapors having been established through the pipe 36 and a supply of powdered lead having been placed in the receptacle 31, the worms or propellers 34 are set in motion, and powdered lead is thus conveyed into the top of the corroding-chamber and diffused throughout the corroding-gases therein. As the metal falls downwardly through the current of gas in the chamber it is corroded, and the corroded product is collected in the hopper at the bottom of the chamber, from whence it may be removed from time to time and prepared for market. By reason of the upward current of the corroding-gases in the chamber the fall of the metal is more or less retarded, and in this way it may be floated and maintained in a diffused condition in the gases, so that it can be uniformly acted upon thereby for a length of time sufficient to effect the corrosion. The fineness of the screen 38 and the strength of the blast through the supply-pipe 36 are so regulated as to maintain a suitable pressure of the corroding-gases in the corroding-chamber. Instead of discharging the corroding-gas from the top 38 of the corroding-chamber into the air it obviously may be conveyed to a second or any desired number of successive corrod-

ing-chambers, a suitable means for supplying each of the chambers with powdered lead of course being provided.

It is among the advantages of my invention that the corroding process may be carried out very rapidly and by a simple apparatus which is automatic and continuous in operation and may be easily and accurately controlled. All poisonous gases and other substances are securely confined within the apparatus, and the injurious effects to the workmen which are incident to the forms of apparatus heretofore constructed are thus entirely removed.

My invention in its broader aspects is not limited to the particular forms of the apparatus shown and described nor to the particular form by which it is carried into effect, as many changes obviously may be made therein without departing from the main principles of my invention or sacrificing the chief advantages thereof.

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

1. An apparatus for producing lead carbonate comprising a corroding-chamber, means for introducing suitable corroding-gases into said chamber, and means for diffusing powdered lead in said chamber, substantially as described.

2. An apparatus for producing lead carbonate comprising a corroding-chamber, means for maintaining a current of a suitable corroding-gas in said chamber, and means whereby a quantity of pulverized or powdered lead may be uniformly subjected to the action of said current of corroding-gas, substantially as described.

3. An apparatus for producing lead carbonate comprising a corroding-chamber, means for maintaining a current of a suitable corroding-gas in said chamber, and means for diffusing powdered lead in said chamber, substantially as described.

4. An apparatus for producing lead carbonate comprising a corroding-chamber, means for maintaining a circulation of a suitable corroding-gas in said chamber, and means for diffusing powdered lead in said chamber, substantially as described.

5. An apparatus for producing lead carbonate comprising a corroding-chamber, means for supplying powdered lead to said chamber, an air-blast for diffusing the lead in said chamber, and means for maintaining a supply of a suitable corroding-gas in said chamber, substantially as described.

6. An apparatus for producing lead carbonate comprising a closed corroding-chamber having an inlet and a suitably-screened outlet, of means for creating a blast through the inlet of said chamber, means for introducing powdered lead into said blast, and means for maintaining a supply of said corroding-gas in said corroding-chamber, substantially as described.

7. An apparatus for producing lead carbonate comprising a closed corroding-chamber having an inlet and a suitable screened outlet, means for creating a blast through the inlet of said chamber, and means for introducing powdered lead and a suitable corroding-gas into said blast, substantially as described.

8. An apparatus for producing lead carbonate comprising a substantially cylindrical vertically-arranged corroding-chamber having an inlet-passage tangentially arranged near the top, means for creating a blast through said inlet, means for introducing powdered lead into the blast, and means for maintaining a supply of a suitable corroding-gas in said chamber, substantially as described.

9. An apparatus for producing lead carbonate comprising a substantially cylindrical vertically-arranged corroding-chamber having an inlet-passage tangentially arranged near the top, means for creating a blast through said inlet-passage, and means for introducing powdered lead and a suitable corroding-gas into the blast, substantially as described.

10. An apparatus for producing lead carbonate comprising a substantially cylindrical vertically-arranged corroding-chamber having an inlet-passage tangentially arranged near the top, means for creating a blast through said inlet-passage, means for introducing powdered lead into the blast, and an injector for introducing steam and a suitable corroding-gas into the blast, substantially as described.

11. An apparatus for producing lead carbonate comprising a series of substantially cylindrical vertically-arranged corroding-chambers having tangential inlet-passages, the first of said chambers having substantially central outlet-passages communicating with the inlet-passages of the succeeding chambers and the last chamber having a screened outlet, means for creating a blast through the inlet-passage of the first chamber, means for introducing powdered lead into the blast, and means for maintaining a supply of a suitable corroding-gas in said chamber, substantially as described.

12. An apparatus for producing lead carbonate comprising a series of substantially cylindrical vertically-arranged corroding-chambers having tangential inlet-passages the first of said chambers having substantially central outlet-passages communicating with the inlet-passages of the succeeding chambers and the last chamber having a screened outlet, means for creating a blast through the inlet-passage of the first chamber, and means for introducing powdered lead and a suitable corroding-gas into the blast, substantially as described.

13. An apparatus for producing lead carbonate comprising a series of substantially cylindrical vertically-arranged corroding-chambers having tangential inlet-passages, the first of said chambers having substantially central outlet-passages communicating with the in-

let-passages of the succeeding chambers and the last chamber having a screened outlet, means for creating a blast through the inlet-passage of the first chamber, means for introducing powdered lead into the blast, and an injector for introducing steam and a suitable corroding-gas into said blast, substantially as described.

14. An apparatus for producing lead carbonate comprising a series of substantially cylindrical vertically-arranged corroding-chambers having tangential inlet-passages, the first of said chambers having substantially central outlet-passages communicating with the inlet-passages of the succeeding chambers and the last chamber having a screened outlet, a fan-blower for creating a blast through the inlet-passages of the first chamber, a pulverizing-mill for supplying powdered lead to the blower, and an injector for introducing steam and a corroding-gas into the blast from the blower, substantially as described.

15. An apparatus for producing lead carbonate comprising a corroding-chamber, means for producing a current of finely-divided lead in said chamber, and means for producing a current of a suitable corroding-gas in said chamber, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

JOHN W. BAILEY.

Witnesses:
PENNINGTON HALSTED,
EDWIN SEGER.