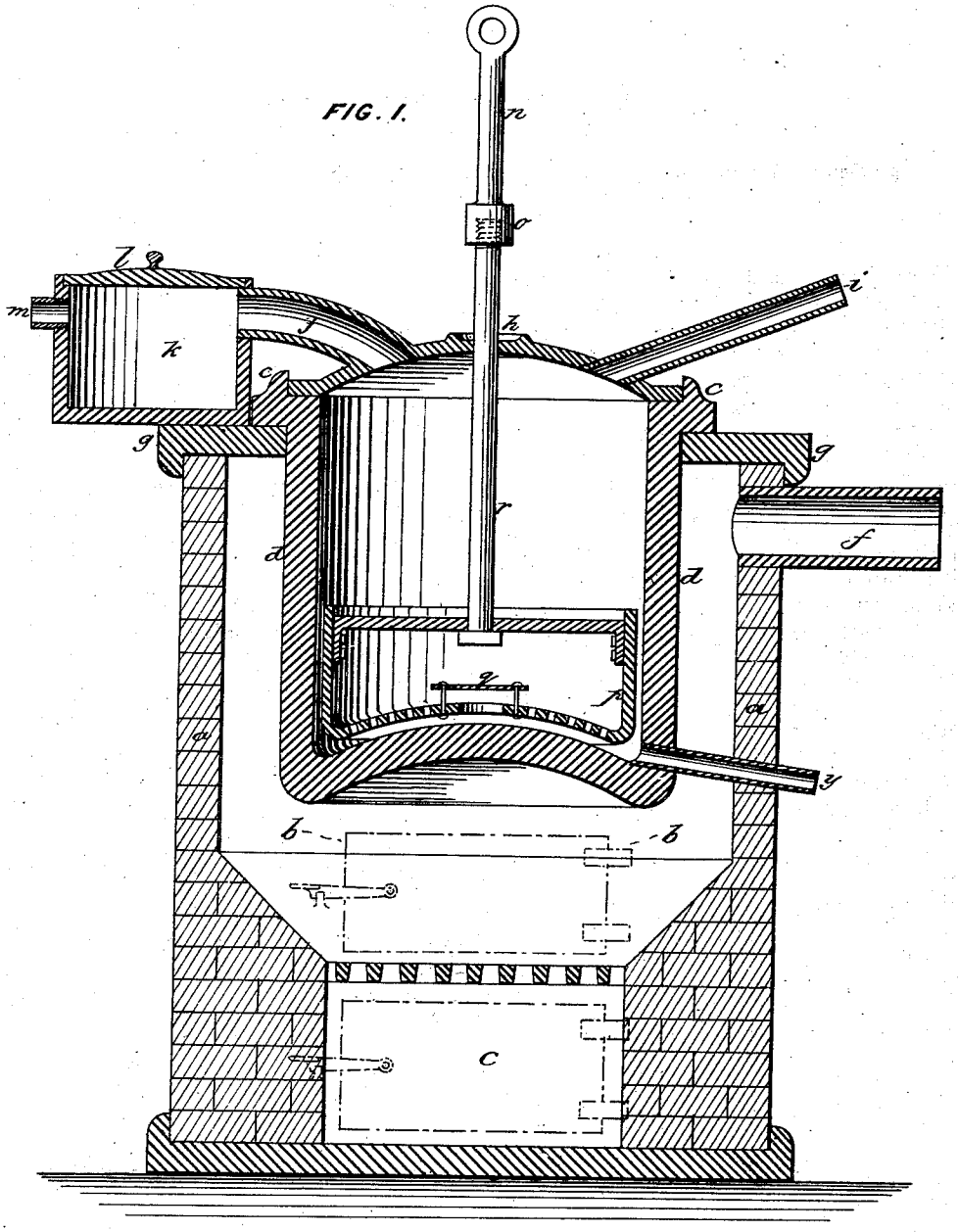
W. A. SHAW.
Refining Lead.

No. 156,180. Patented Oct. 20, 1874.

FIG. 1.



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UNITED STATES PATENT OFFICE.

WILLIAM A. SHAW, OF NEW YORK, N. Y.

IMPROVEMENT IN REFINING LEAD.

Specification forming part of Letters Patent No. **156,180**, dated October 20, 1874; application filed September 18, 1874.

To all whom it may concern:

Be it known that I, WILLIAM A. SHAW, of the city, county, and State of New York, have invented certain new and useful Improvements in Refining Lead, of which the following is a specification, reference being had to the accompanying drawing, which is a vertical cross-section on a line through the center of the improved apparatus employed by me.

My invention relates to the refining of metals by means of gases, more especially lead by chlorine gas; and consists in more thoroughly intermingling the metal, when in a molten state, with the gas used, so that every portion of the metal is brought into contact with it to be acted on, and in readily collecting and preserving the products of the chemical action of the gas on the metal, or, more properly, on the impurities in the metal to be refined. Instead of blowing the gas through the melted mass of metal, as heretofore done, I shower the metal or pass it in small streams through an atmosphere of the gas, and thus more cheaply and thoroughly effect the contact of all parts of the metal with the gas employed, preventing the waste of the expensive gas. The volatile products are collected readily in a condenser connected with the kettle in which the metal is melted and showered.

The following description will enable those skilled in the art to make and use my invention.

In the drawing, *a a* is a cylindrical furnace, constructed of iron, lined with fire-brick, having a fire-box at *b* and an ash-pit at *c*. The cap of the furnace is of heavy cast-iron, as shown at *g g*. Into this furnace, resting and suspended on the cap *g g* by means of a projecting flange, shown at *c*, is placed an iron kettle, *d d*. The bottom of the kettle is immediately over the fire-box of the furnace, and the space between it and the walls of the furnace admits the heat all round to ascend to the smoke-pipe *f*. *h* is a lid for the kettle, which rests within a projecting flange, so that it may be luted gas-tight with clay. Through the center of the lid is an aperture through which passes an iron shaft for the purpose of lifting and lowering a strainer, which will be described farther forward. Projecting from the lid, at an angle of about twenty degrees, is an iron pipe, *i*, for conveying gas to the interior of the kettle. Another similar pipe, *j*, projects from the opposite side, to carry off the volatile products resulting from the action of the gas on the melted metals. *k* is a condenser, made also of iron or other suitable material. This has a lid, *l*, which can be displaced in order to remove the condensed products. *m* is an escape-pipe. The strainer *p p* consists of iron, or other suitable material, having a form corresponding to the bottom of the kettle, but of less diameter, in order that there may be space of about an inch between its sides and the kettle. The bottom is perforated with fine holes about one-thirty-second of an inch in diameter each. At the center is a valve, *g*, for admitting the melted metal into the strainer when it is forced downward, but which closes again when the strainer is lifted, and causes the metal to flow through the small apertures and fall below in small streams. *r* is the shaft for lifting the strainer. *n* is a ring and trevice for operating it. O is the connecting-socket, for convenience in disconnecting the two sections, in order to adjust the lid *h*.

In practical operation I construct a kettle or reservoir, as just described, of capacity for holding three tons of lead to be operated upon, and which, when melted, will occupy about one-third the height or capacity of the kettle. The lid, strainer, and condenser having been adjusted, I pass chlorine gas through the pipe *i*, which, being heavier than atmospheric air, falls to the bottom of the reservoir and fills the whole space and overflows through the condenser. The strainer or showering apparatus is then lifted and lowered repeatedly, or as often as it will fill and empty itself. This operation not only agitates the melted metal, but, by showering it in fine streams, causes the greatest amount of surface to come in contact with the chlorine gas, which converts the impurities into chlorides—mostly volatile—which pass over through the pipe *j* and condense in the chamber *k*. When the operation is completed the metal is drawn off through the pipe *y* and cast into pigs. Those chlorides not volatile at the temperature employed are found in the kettle, from which

they may be removed and reduced to a metallic state by means now employed and understood by chemists in such cases.

During the process the completion of the operation may be judged of by testing small quantities from time to time as the process proceeds. It depends upon the kind and quantity of metals to be removed, and will require from five hours to several more. Commercial lead varies greatly in the quantity of impurities, as well as in their kind. A small percentage of antimony, bismuth, tin, or all together, causes a marked difference in the physical qualities and render it unfit for chemical purposes and the manufacture of carbonate of lead, or what is technically termed white lead.

For generating the chlorine gas, any well-known process may be employed. I prefer the use of lead retorts in cast-iron steam-jackets, and the use of chloride of sodium in the proportion of four parts mixed with three parts of black oxide of manganese and seven parts of sulphuric acid diluted with seven parts of water. The gas should be washed and dried before it is allowed to enter the melted-lead receptacle. On a scale of operation which I have described, a steam-engine and any suitable hoisting apparatus are employed to lift the agitator and strainer.

Chlorine gas is of such a nature that it cannot be pumped, as it corrodes all metals. By my invention the vessel is filled with chlorine and the metal to be purified is showered through it, thus dispensing with the use of a pump.

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

1. In the refining of lead by chlorine gas, the showering or agitating of the molten metal in an atmosphere of the gas, so as to present a large surface to be acted on by the gas, substantially as and for the purpose set forth.

2. The combination of a kettle and strainer or showering apparatus, substantially as and for the purpose set forth.

3. The strainer *p p*, provided with valve *g* and shaft *r* for moving it, as described.

4. The kettle *d d*, provided with pipes *i*, *j*, and *y*, and condenser *k*, as described.

5. The combination of a suitable chlorine apparatus, with a closed chamber with an agitator and a condenser, substantially as specified.

In testimony that I claim the foregoing I have hereunto set my hand this 31st day of August, 1874.

WILLIAM A. SHAW.

Witnesses:

D. D. PARMELEE,

ALBERT M. SCHUCK.