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METHOD OF FREEING LITHARGE FROM METALLIC LEAD MIXED WITH IT.

APPLICATION FILED JULY 27, 1910.

975,955.

Patented Nov. 15, 1910.

Fig. 1.

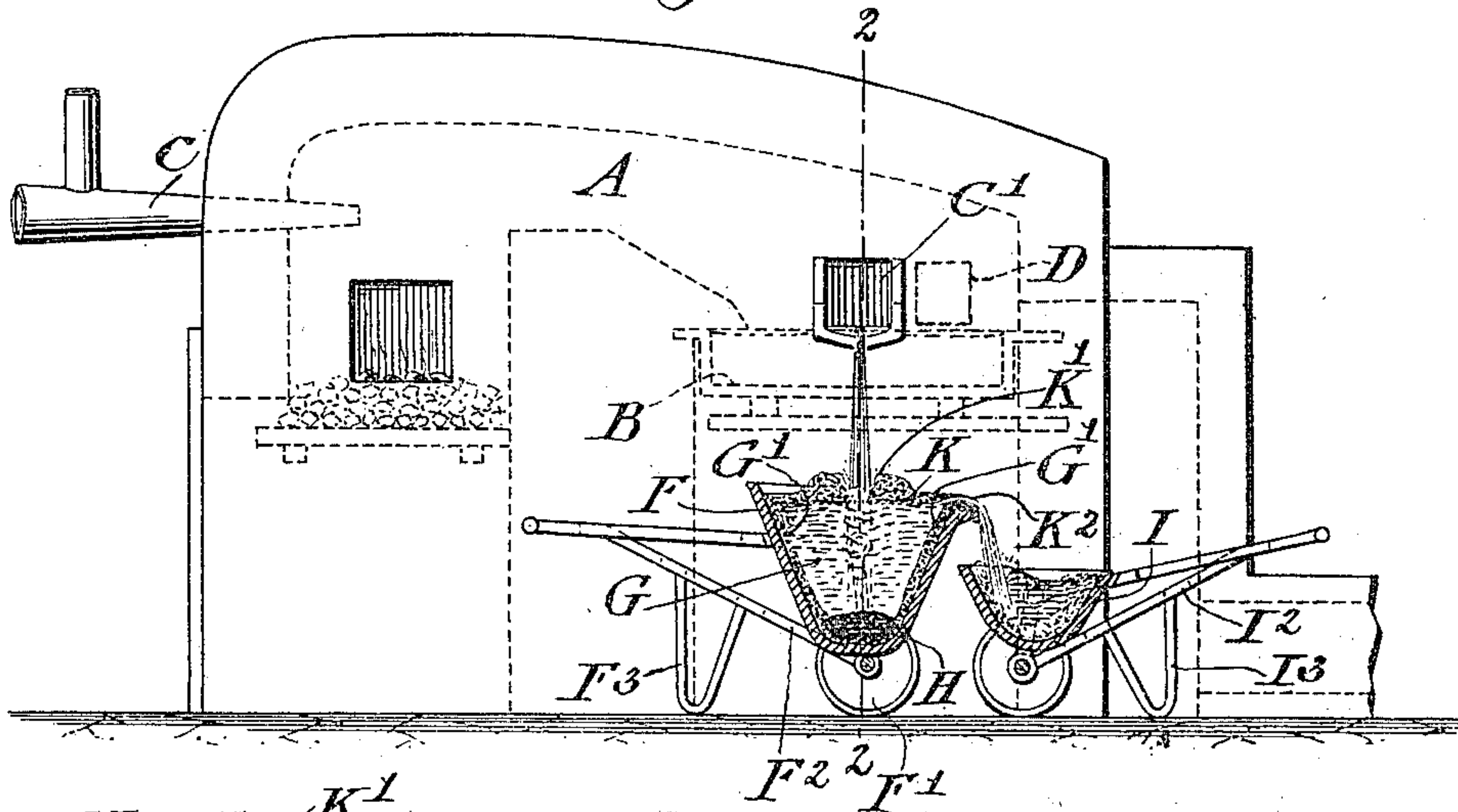


Fig. 2.

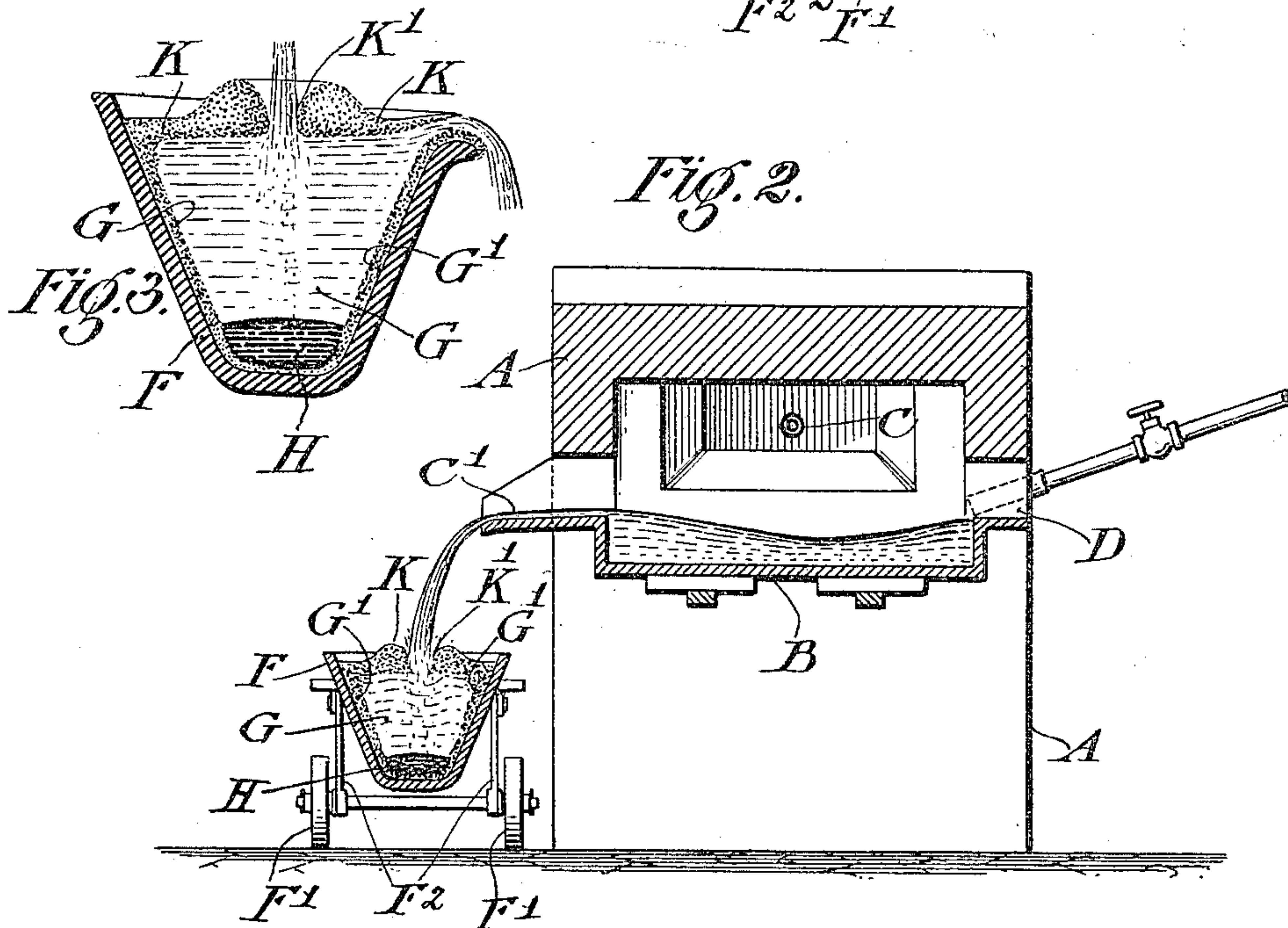
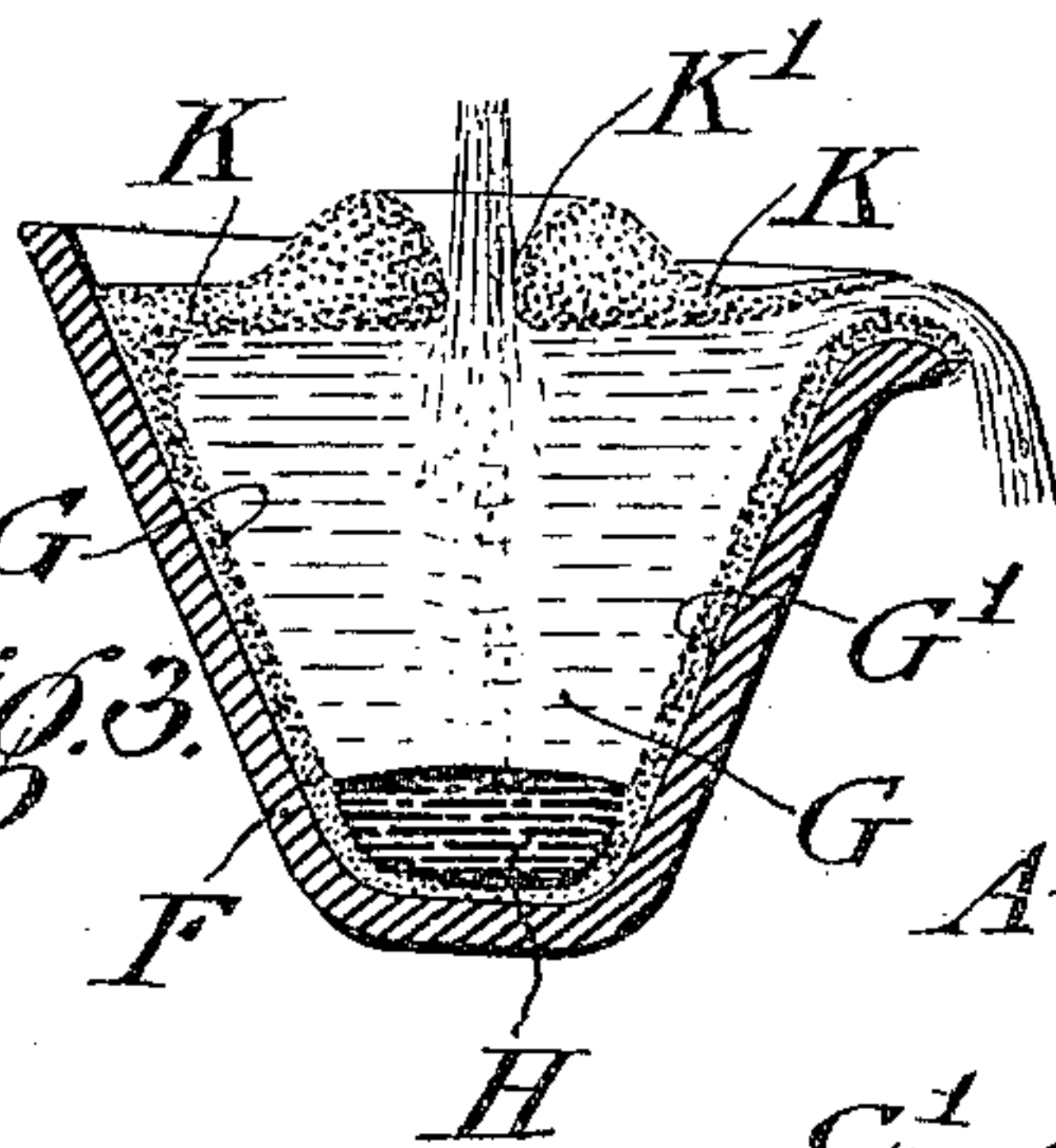


Fig. 3.



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METHOD OF FREEING LITHARGE FROM METALLIC LEAD MIXED WITH IT.

975,955.

Specification of Letters Patent.

Patented Nov. 15, 1910.

Application filed July 27, 1910. Serial No. 574,027.

To all whom it may concern:

Be it known that I, LOUIS S. HUGHES, a citizen of the United States of America, residing in Joplin, in the county of Jasper, in the State of Missouri, have invented a certain new and Improved Method of Freeing Litharge from Metallic Lead Mixed with It, of which the following is a true and exact description, reference being had to the accompanying drawings, which form a part thereof.

Litharge is ordinarily manufactured by oxidizing molten lead, and the litharge thus formed is always, or practically always, admixed with metallic lead when discharged from the oxidizing furnace. The presence of metallic lead in the litharge is usually objectionable, and for many purposes for which litharge is used it is absolutely essential that the litharge should be practically free from metallic lead.

The object of my invention is a simple and effective method for freeing litharge from lead mixed with it, which will give quantitative results, and can be carried out in an inexpensive manner.

In carrying out my invention, I pass the litharge, with its lead mixture, in a molten stream from the cupeling furnace in which the litharge is formed, into a suitable purifying receptacle from which the litharge over-flows, and in which the metallic lead, on account of the greater specific gravity, is separated from the litharge by a gravital action and collects. While the litharge is thus being passed through the purifying receptacle, I preferably maintain the wall of the receptacle at a temperature below that at which litharge melts. By proceeding in this manner, the initial litharge discharge into the receptacle results in coating it internally with a thin shell of solidified litharge, which chills and solidifies immediately on contact with the relatively cool receptacle wall. This shell or coating serves to effectually protect the receptacle wall from the corrosive action of the molten litharge contained within the shell or coating. Moreover the litharge composing the portion of the shell in immediate contact with the receptacle is chilled and cooled so quickly that it does not act chemically on the receptacle wall, although, as is well known, there are few substances other than litharge, which are not vigorously attacked by molten litharge.

As the litharge and lead continue to flow into the receptacle, and the purified litharge over-flows therefrom, the lead collects in the bottom of the receptacle, because of its greater density, in gradually increasing amounts. At the same time the solid lining of the wall of the receptacle gradually increases in thickness through the solidification of litharge consequent upon the heat radiation from the outer wall of the receptacle. Eventually the receptacle fills up with lead and solidified litharge until the molten litharge receiving cavity or space in the receptacle becomes too small for the further effective separation of litharge and lead. When this occurs the furnace discharge of litharge is diverted to another purifying receptacle. After the contents of a purifying receptacle thus filled with litharge and lead, have all cooled and solidified, the contents may be readily dumped out of the receptacle and the exfoliation of the litharge following solidification and cooling, makes it easy to separate from the litharge, the accumulated metallic lead which solidifies in the form of a button or "niggerhead." The litharge which solidified in the purifying receptacle is, on the average, appreciably freer from lead than the litharge passing into the purifying receptacle, since all of the litharge solidified in the receptacle, except that forming the chill or outer skin of the wall coating, is purified to some extent by the settling out of the lead.

In practice, I prefer to have the litharge fall from a height of a couple of feet or so, into the purifying receptacle rather than to have it flow gently into the receptacle. When the litharge falls into the purifying receptacle the entering material is carried well below the upper surface of the molten material in the receptacle, which is an obvious advantage. Moreover, when the stream of litharge and lead plunges into the molten mass within the receptacle with a considerable downward velocity, the difference between the specific gravities of lead and litharge results in a differential rate of reduction in the downward velocities of the heavier lead and lighter litharge constituents, which adds to the efficiency of the gravital separation.

While it is theoretically possible to free molten litharge from lead admixed with it in the manner previously described, regard-

less of the source of supply of melted litharge and lead, I consider it practically feasible to purify litharge in this manner only when the litharge is passed directly to the purifying receptacle from the outlet of the furnace in which the litharge is produced. The labor and fuel cost of remelting litharge as well as the contamination of the litharge resulting from the chemical action of molten litharge on any receptacle in which the litharge may be remelted, makes it impossible from a commercial and practical standpoint, I believe, to effectually purify remelted litharge in this manner.

The method of purification described can obviously be carried out with apparatus differing greatly in form and mode of construction, but for a better understanding of the invention, reference should be had to the accompanying drawings and descriptive matter in which I have shown and described a form of apparatus well adapted, and which has been practically employed with success, for carrying out my invention.

Of the drawings, Figure 1 is an elevation partly in section, of a cupeling furnace and purifying apparatus. Fig. 2 is a sectional elevation on the line 2—2 of Fig. 1, and Fig. 3 is a sectional elevation taken similarly to Fig. 2 but on a larger scale and showing a portion only of the apparatus shown in Fig. 2.

In the drawings, A represents the cupeling furnace proper, and B the hearth thereof, on which the metallic lead to be oxidized is melted.

C is the nozzle for the air-blast directed against the surface of the molten metal to oxidize it, and assisting also in causing the molten litharge thus formed, with its lead admixture, to flow out of the furnace through the discharge spout C'.

D represents a door through which metallic lead can be inserted into the furnace from time to time as necessary.

The cupeling furnace structure described is essentially the same as that shown in the Petraeus Patents 592,594 and 637,028.

The purifying receptacle shown is in the form of a conical pot F, mounted on and forming a part of a truck comprising wheels F¹ and the framework F², the latter including a support F³ arranged to hold the pot with its upper end inclined so that the over-flow from the pot will occur at one point, and will pass into a pot I, which preferably is smaller than the pot F, and may well have associated parts I¹, I² and I³ corresponding to parts F¹, F² and F³ respectively.

In the pot F, H represents the body of pool of the accumulated metallic lead; G, the molten litharge with a more or less large percentage of lead admixture with it, and G¹, the shell or coating of solidified

litharge on the inner wall of the receptacle proper.

K represents the scum or layer of solidified litharge forming at the top of the pot.

K¹ represents the hole in this layer of solidified litharge kept open by the stream of molten litharge passing to the pot from the discharge spout C of the furnace, and K² represents the opening in the scum layer through which the purified litharge overflows into the pot I. In practice it is necessary to clear out the opening K², as with a poker, from time to time.

It will, of course, be apparent to those skilled in the art, that not only the form but the size of the apparatus disclosed may vary greatly. For the sake of illustration, however, I may say that a cupeling furnace of the character disclosed and of convenient capacity will yield between 750 and 1,000 lbs. of unpurified litharge per hour. The furnace should be operated to deliver litharge at a temperature somewhat above the melting point, say, at 1800 degrees Fahrenheit. The pot F may conveniently be of capacity sufficient to hold between 600 and 700 lbs. of litharge, and with such apparatus and the rate of litharge production mentioned, approximately three-fourths of the furnace yield will be obtained from the purifying receptacle or receptacles in the form of litharge practically free from contamination with lead, and the remaining one-quarter of the litharge will be rather freer from lead than the product of the litharge furnaces as heretofore operated, and can be used to advantage for many purposes where the presence of the relatively small percentage of lead admixed with it is little or no detriment.

The litharge from the purifying receptacle F may be allowed to pass into the pot or receptacle I, and to cool and solidify gradually with a resultant production of flake litharge quantitatively free from metallic lead, or the purified litharge may be cooled energetically, as described in the Petraeus Patent 637,028, to produce litharge in a fine granular crystalline form, or the litharge may be otherwise treated as desired.

It will be apparent that the purification process described can be carried out in a very inexpensive manner. Practically all the labor and attention required, aside from the substitution of empty pots for filled pots, from time to time, and the dumping of the latter, is to occasionally clear out the discharge of the hole K² in the scum layer at the top of the purifying pot F, and to see that the stream discharged from the cupeling furnace is uninterrupted. The fact that it is necessary to have this stream continuous in order to keep the top of the purifying pot free from "freezing over" or becoming covered by an unbroken layer of solidified lith-

arge, adds, in practice, to the efficiency of operation of the cupeling furnace, since it required the furnace to be properly attended to, and the best results from the furnace proper, are obtained when the discharge from it is continuous.

Various methods of purifying litharge have been suggested and employed, but all the methods of purification practically employed heretofore, as far as I am aware, have involved a subdivision of the litharge with its lead admixture after its solidification, into fine particles or powder, and the separation of the particles of litharge and the particles of lead by flotation in air or water. These methods are inherently expensive and are not entirely efficient. Moreover, such methods of purification, from the very nature of things, do not yield litharge in the form of flake litharge, a substance for which there is a substantial demand, and so far as I am aware, pure, lead-free, flake litharge was never commercially available prior to its purification in accordance with the present invention.

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

1. The method of purifying litharge from metallic lead which consists in passing a molten mixture of litharge and metallic lead into a receptacle of such volume and depth that the metallic lead separates therein by gravital action and the purified litharge overflows.

2. The method of purifying litharge from metallic lead intermixed with it which consists in passing the litharge and metallic lead in a molten state into a purifying receptacle from which the purified litharge overflows while the volume and depth of the receptacle are such that the lead is separated from the litharge by gravital action and collects in said receptacle, and maintaining the wall of said receptacle at a temperature below the melting point of litharge, whereby the receptacle becomes coated with a shell of solid litharge which protects the wall against the corrosive action of the melted litharge.

3. The method of purifying litharge from metallic lead which consists in passing a molten mixture of litharge and metallic lead into a receptacle of such volume and depth that the metallic lead separates therein by gravital action and the purified litharge overflows therefrom by causing said molten mixture to plunge downward into said receptacle from an elevation above its top whereby the entering mixture of litharge and metallic lead passes below the surface of the pool in the receptacle and the separation effect due to the difference between the specific gravities of the lead and litharge, is increased.

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Witnesses:

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J. EDWARD WEBB.