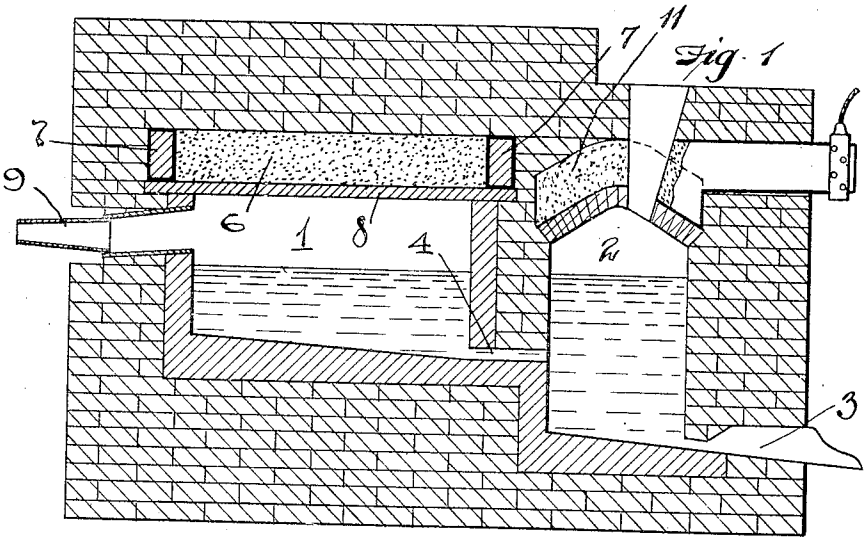
R. ZIESING.

FURNACE.

APPLICATION FILED MAY 4, 1916.

1,237,141. Patented Aug. 14, 1917.



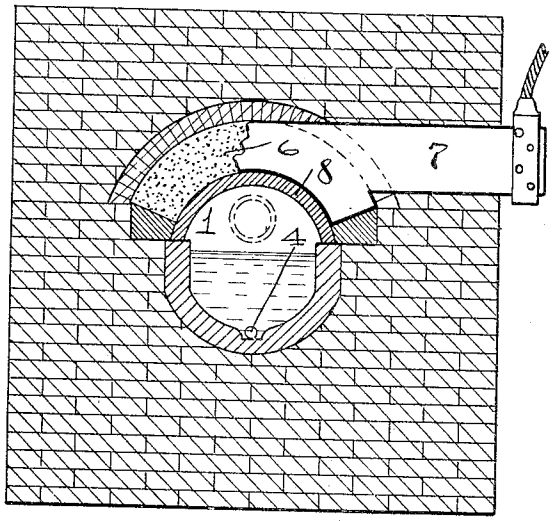


Fig. 2

WITNESSES=
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UNITED STATES PATENT OFFICE.

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FURNACE.

1,237,141. Specification of Letters Patent. Patented Aug. 14, 1917.

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To all whom it may concern:

Be it known that I, RICHARD ZIESING, a citizen of the United States, and a resident of Cleveland, county of Cuyahoga, and State of Ohio, have invented a new and useful Improvement in Furnaces, of which the following is a specification, the principle of the invention being herein explained and the best mode in which I have contemplated applying that principle, so as to distinguish it from other inventions.

The present invention relates to a method of, and apparatus for, purifying metals of other and heavier metals mixed therewith and relates more particularly to a method of separating pure zinc from lead and iron contained therein. In the purification of zinc, it is necessary to remove from the solid metal, iron and lead, and the process must be carried out in the absence of air, the zinc being volatilized and driven off from the furnace chamber into a compensation tower. To the accomplishment of the foregoing and related ends, said invention, then, consists of the means hereinafter fully described and particularly pointed out in the claims.

The annexed drawing and the following description sets forth in detail one approved method of carrying out the invention, such disclosed mode, however, constituting but one of the various ways in which the principle of the invention may be used.

In said annexed drawing:—

Figure 1, is a longitudinal vertical section through my improved furnace, and Fig. 2, is a transverse vertical section on the line 2—2, Fig. 1.

In Fig. 1, there is shown essential parts of the furnace, and it will be seen that I have provided two chambers, 1 and 2, of which the chamber 1, may be termed the distillation chamber and 2, the preliminary melting and purification chamber. The chamber 2, is inclosed, except for an opening at one end through which solid material may be introduced, and except for a drainage conduit 3, which leads from the inclined bottom of chamber 1. It will be noticed that the chamber 2, extends to a lower level than the chamber 1 and has an inclined bottom directed toward the outlet 3. About midway in one vertical side of chamber 2 is a passage 4 leading to the inclined bottom of the chamber 1 and serving to connect these two furnace chambers. An outlet pipe 9 extends from the upper part of the chamber 1 through the furnace wall to any suitable means for collecting the condensing zinc. The chamber 1 is closed against the admission of air, any suitable means being provided in the passage 9 for this purpose, it is effectively sealed against admission of air from the chamber 2 by the metal in the connecting passage 4.

It will be understood that the present furnace may be heated in any suitable manner, although preferably this will be done electrically, the current being supplied to resistance elements placed in the roof of the furnace, and here shown in the form of granular carbon 6. This resistance material is positioned in the form of an arch over the top of the furnace and at either end contacts carbon blocks or electrodes 7 which extend exteriorly of the furnace where they may be connected to any suitable source of current. The granular carbon is supported upon a lining 8 of fireclay, or a similar non-conducting material, and the heat from this carbon is thus diffused slowly and uniformly over the roof of the furnace. In this way a very even heat effect can be obtained on the material in the furnace, and it will be understood that any suitable means for regulating the current may be supplied by this means, preferably taking the form of an external rheostat, although if desired the electrodes 7 can be made adjustable and can be moved toward or away from each other to force the granular carbon into varying degrees of contact, to secure in this way a variation of the resistance of this material, and consequently a variable temperature in the furnace.

The preliminary heating chamber or furnace may be heated in any one of a number of ways, but will preferably be heated by means of a granular carbon electrode 11 extending across the roof of the furnace and connected to a suitable source of current supply. This furnace may be charged through an opening 12 in the roof, which may be closed by means of a cover 13 during the operation of the furnace, and it will be understood that this charging may be accomplished without interrupting the continuous operation of the furnace and without affecting the action in the furnace, so long as no great amount of new metal is charged at any one time.

In order to start up the furnace, crude metal is supplied to the chamber 2, and is there heated until the level of metal in this chamber is raised sufficiently to fill the chamber 1 to about the point indicated in Fig. 1. The heat is then applied in full force and the metal in the chamber 1 is continuously boiled or distilled, the distilled zinc then passing into outlet pipe 9 when it can be condensed and collected in suitable receptacles. As fast as the metal is withdrawn from chamber 1, additional metal will be supplied to chamber 2 to maintain a level in these two chambers at the desired height.

The crude metal, which is supplied to chamber 2, contains more or less iron and lead. As both the lead and iron are heavier than the zinc, they sink to the bottom of the chamber 2, and until a considerable quantity of metal has been melted, the level of the zinc and iron in this chamber, except a small percentage, will not rise to the level of passage 4 leading to chamber 1, but when the lead and iron have risen to the level of passage 4, larger quantities of these metals will enter chamber 1, and as the action continues the zinc will be contaminated with lead and iron. Whenever this contamination reaches the point where the resulting refined zinc is appreciably affected, it is necessary to cool the furnaces down somewhat, and then draw off the lead and iron in the bottom of chamber 2, in this way lowering the level in chamber 1 and causing the lead and the iron that may be in the zinc in that chamber to flow back into chamber 2, where they will not contaminate the zinc which has been purified and has been removed. To secure this action, the temperature is dropped to about 450 degrees or only a few degrees above the melting point of zinc.

The advantages of my improved furnace are its ability to automatically retard the passage of lead and iron into the distilling chamber, and the convenience of drainage of this chamber in case any appreciable amount of these metals does find its way in.

Other modes of applying the principle of my invention may be employed instead of the one explained, change being made as regards the process herein disclosed, provided the step or steps stated by any one of the following claims or the equivalent of such stated step or steps be employed.

I therefore particularly point out and distinctly claim as my invention:—

1. In a two-stage method of purifying zinc of heavier metals associated therewith, the steps which consist in melting the impure zinc in a chamber to allow the heavier metals to settle, drawing off the relatively pure zinc above the level of the heavier metal, distilling such drawn off metal and allowing the heavier part thereof to drain back into such melting chamber.

2. In a two-stage method of purifying zinc of heavier metals associated therewith, the steps which consist in heating impure zinc in a chamber to a temperature but slightly above the melting point of zinc to allow the heavier metals to settle, drawing off the relatively pure zinc above the level of the heavier metal, distilling such drawn off drawn metal and allowing the heavier part thereof to drain back into such melting chamber.

3. In a distillation furnace, the combination of a melting chamber adapted to receive zinc contaminated with heavier metals, a distillation chamber adjacent thereto and connected to drain into the former at a point spaced from the bottom of the same and means for heating said chambers.

4. In a distillation furnace, the combination of a melting chamber adapted to receive zinc contaminated with heavier metals, a distillation chamber adjacent thereto and connected to drain into the former at a point spaced from the bottom of the same, means for heating said chambers, and means for drawing off the heavier metals collecting at the bottom of said melting chamber.

5. In a distillation furnace, the combination of a melting chamber adapted to receive zinc contaminated with heavier metals, a distillation chamber adjacent thereto and connected to drain into the former at a point spaced from the bottom of the same, means for heating said chambers, means for drawing off the heavier metals collecting at the bottom of said melting chamber, and means for collecting the zinc distilled away from said distilling chamber.

Signed by me, this 2nd day of May, 1916.

RICHARD ZIESING.

Attested by:
E. W. Furst,
C. H. Klaustermeyer.