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PRODUCTION OF METALLIC ZINC.

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1,233,652.

Patented July 17, 1917.

Fig. 1.

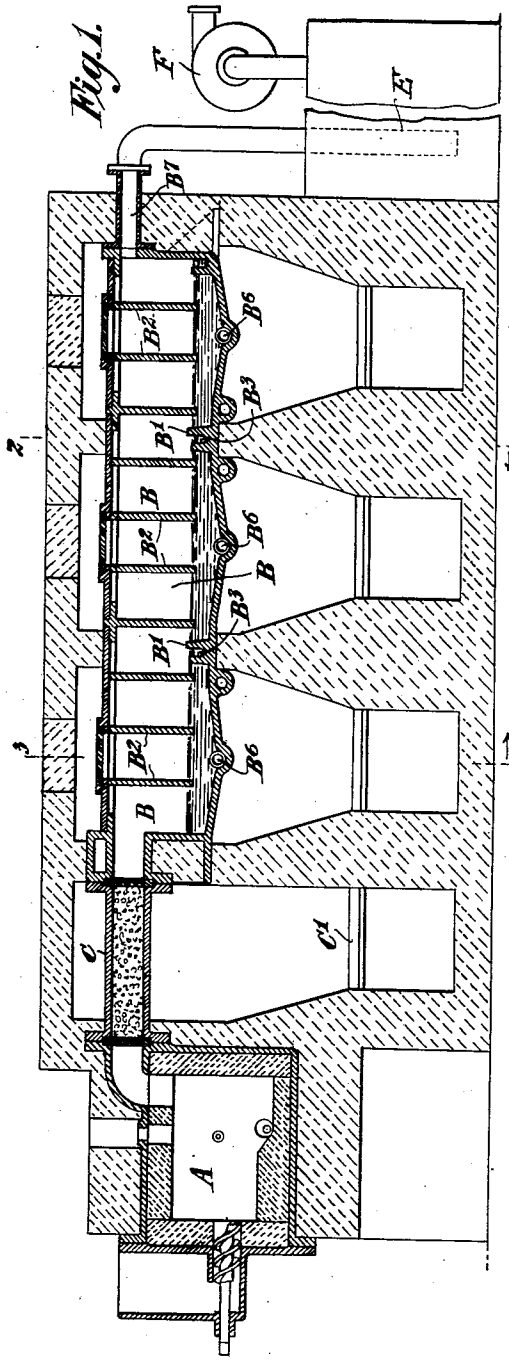
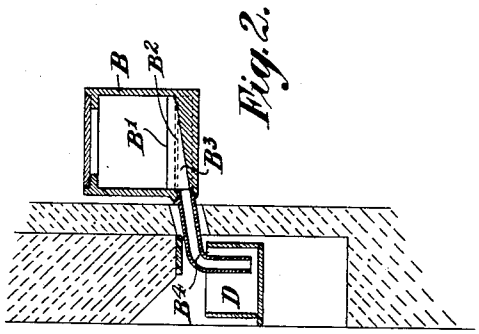


Fig. 2.



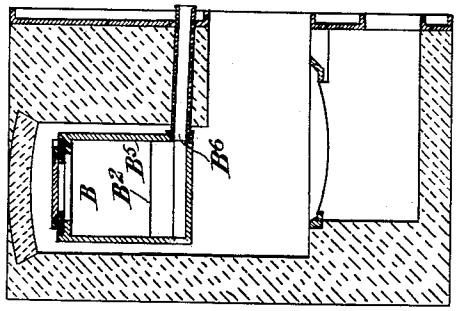


Fig. 3.

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UNITED STATES PATENT OFFICE.

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PRODUCTION OF METALLIC ZINC.

1,233,652. Specification of Letters Patent. Patented July 17, 1917.

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To all whom it may concern:

Be it known that I, AUGUSTE JOSEPH FRANÇOIS DE BAVAY, chemist, a subject of the King of Great Britain, residing at Glencara, Studley Park Road, Kew, in the State of Victoria, Commonwealth of Australia, have invented certain new and useful Improvements in the Production of Metallic Zinc, of which the following is a specification.

This invention relates to certain improvements in the production of metallic zinc by distillation.

In the production of metallic zinc the oxidized ores are heated in retorts with a reducing agent preferably carbon and the metallic zinc is distilled off into suitable condensers.

In carrying out this operation an amount of zinc in powdered form known as "blue powder" is often obtained and further an amount of lead cadmium and other impurities is carried over with the zinc giving an impure product which is commercially known as "spelter". The purification of this spelter involves either re-distillation at very carefully controlled temperatures or electrodeposition.

The invention comprises a method or means whereby relatively pure zinc may be obtained direct by distillation from the zinc ores with a high recovery or whereby the aforesaid impure spelter previously obtained may be refined by re-distillation for the production of relatively pure zinc in metallic form. Thus the method contemplates a process for the separation of metals or the like by passing a complex distillate *seriatim* through a series of differentially heated liquid condensates formed from such distillate.

Thus in one form, in carrying out my invention I provide means whereby the zinc fume is caused to come into direct contact with molten zinc in a condenser which is divided into communicating compartments which are maintained at differentially decreasing temperatures whereby any zinc fumes or vapors are absorbed by the molten zinc and any lead carried over is collected in the first compartment and relatively pure zinc obtained in the succeeding compartments while cadmium zinc may be collected in the last compartment of the condenser or carried over with the residual fume or vapors.

In the embodiment of the invention illustrated I provide an improved construction of condenser which comprises a long chamber divided into a number of compartments by upwardly and downwardly projecting baffles. These compartments therefore have communication from one to the other by means of the passages formed between the aforesaid partitions. The downwardly projecting baffles are adapted to project a short distance below the surface of the molten zinc which is maintained at a constant level within each compartment. A number of these downwardly projecting baffles may be provided as may be found necessary in practice their function being to insure that the fume is forced down on to the metallic zinc and compelled to pass through the same. An inlet is provided at the end of the first compartment and an outlet at the end of the last compartment and if necessary the latter may be provided with an exit vent or the like for maintaining a suction or minus pressure to insure that the fume is drawn through the bath of molten zinc.

In order that this invention may be the better understood reference may be made to the accompanying sheet of drawings in which—

Figure 1 is a longitudinal section of the zinc distillation plant embodying this invention.

Fig. 2 is a cross section taken on the line 2—2 Fig. 1.

Fig. 3 is a cross section taken on the line 3—3 Fig. 1.

The plant illustrated in Fig. 1 comprises a distillation furnace A and a condenser B but it will be understood that the invention relates more especially to the latter and that I do not confine myself to any special means adapted for producing metallic zinc fume or vapor.

In the accompanying drawing the furnace A is shown as an electric furnace designed for reducing ore which has been previously roasted or sintered and mixed with a reducing agent. The furnace A may however comprise a retort or vessel for heating and distilling spelter or other form of metallic zinc incorporated with impurities from which it is desired to obtain metallic zinc in a relatively pure form or in some cases the zinc fume or vapor may be obtained direct from a blast furnace. A suitable temperature and such conditions are maintained

within the furnace A and to insure the distillation therefrom of a fume or vapor of metallic zinc. The furnace A is connected to the condenser B by means of a flue C within which is provided a body of incandescent coke or other reducing matter for the purpose of reducing any zinc oxid powder which may be carried over mechanically. Means are provided for maintaining the requisite temperature within the flue C such as a fire grate C′ or if desired electrical resistances may be provided within the flue C for maintaining the said temperature.

The flue C discharges into a condenser B of improved construction which comprises a long chamber divided into a number of compartments by cross baffles B′ projecting upward from the bottom and subdivided by baffles B^2 projecting downwardly from the top. A bath of molten zinc is maintained within these compartments and the baffles B^2 projecting beneath the surface thereof each division is maintained independent of the other and the fume is thus caused to pass beneath the surface of the molten zinc in its passage from one division to the other. In the acompanying drawing it will be seen that the condenser B is divided into three compartments by the upwardly projecting baffles B′ and each of the said compartments is subdivided by a number of downwardly projecting baffles B^2 but the number of such compartments and subdivisions will depend upon the nature of the operations to be conducted therein and will be ascertained by laboratory or other tests.

The bridges or baffles B′ forming the divisions between the compartments are formed with a groove B^3 and the near side lip is made slightly lower than the far side lip and the said groove or channel B^3 is connected to a downwardly projecting pipe B^4 (as shown in Fig. 2) which dips into a pot or vessel D containing molten zinc of sufficient depth or head according to the minus pressure within the condenser B. In this way a constant level of the bath of molten zinc is maintained within the compartment. The surplus zinc collected accumulating within the pot of vessel D is withdrawn from time to time.

Each compartment is further provided with a well B^5 having a plugged outlet B^6 by which the molten zinc may be tapped therefrom at the completion of the operation.

The last compartment is provided with an outlet flue B^7 which leads to a chamber E to which an exhaust fan F is connected for maintaining a suction or minus pressure within the condenser if such should be necessary to insure that the fume is drawn through the bath of metallic zinc.

In practice the condenser B is first fed or charged with an amount of molten zinc forming the bath in the bottom of the same so that the downwardly projecting baffles project just beneath the surface of the same. The first compartment is connected to the zinc distilling retort or electric furnace A or other source of metallic zinc fume or vapor which is then introduced into the first compartment through the aforesaid inlet. When required hydrocarbon vapor or other reducing gas is introduced so that a reducing atmosphere is maintained in the condenser B.

The temperature in the various compartments or chambers must be sufficient to maintain the zinc in a molten state and is differentially decreasing toward the outlet end. The metallic zinc fume or vapor is directed by the baffles on to the surface of the metallic zinc and by the minus pressure caused by the suction of the fan (if the pressure from the furnace is not sufficient) is caused to pass down through the molten zinc and thereby pass through from one compartment to the other on to the exit, the gas then being practically free from zinc fume. The lead is mostly collected in the first compartment while the molten zinc in the succeeding chambers is differentially free from other impurities. The zinc is maintained at constant level by means of the overflow groove or channel B^3 leading to the vessel D containing molten zinc which seals the same and from which the zinc may be tapped from time to time as it accumulates.

The apparatus may also be adapted for refining spelter previously obtained. In this case the first compartment of the condenser may be adapted for the distillation of the zinc which is fed therein in a molten form from suitable crucible or other receptacle and maintained at a constant level. In such refining operations the first compartment will preferably be maintained at a temperature of 900° C., the second at about 650° C., and the third at about 450° C.

The zinc fume is distilled off from the first compartment and passing through succeeding compartments is brought into contact with the molten zinc therein until the exit gases pass from the last chamber practically free from zinc fume.

I claim.

1. In apparatus for the production of metallic zinc comprising a chamber divided into a number of compartments by upwardly and downwardly projecting baffles with a bath of molten zinc in the bottom thereof the said downwardly projecting baffles dipping beneath the surface of the said molten zinc and means for the maintaining of differentially decreasing temperatures in the said compartments.

2. Apparatus for the production of metallic zinc comprising in combination a furnace for the formation of zinc fume or

vapor, a condenser divided into compartments by baffles and downwardly projecting baffles dipping beneath the surface of the molten zinc within the said condenser channels or grooves within the baffles having discharge tubes leading to a pot or receptacle containing molten zinc, and a suction fan or the like for maintaining the passage of the fume or vapor through the condenser substantially as described.

3. A method of refining metallic distillates or the like comprising the step of differentially heating a plurality of liquid condensates in a descending series of condensing temperatures and the further step of passing such distillates *seriatim* through said liquid condensates.

4. A method of refining metallic distillates or the like, comprising the step of differentially heating a plurality of liquid condensates in a descending series of condensing temperatures and the further step of passing such distillate *seriatim* through said liquid condensates formed from the complex distillate.

5. Apparatus of the kind described, comprising means for producing a distillate, a series of communicating compartments for holding liquid, a duct leading from said means to said communicating compartments, baffle means dividing said compartments and reaching below the normal level of the liquid in said compartments and differential heating means for said compartments.

6. Apparatus of the kind described, comprising means for producing a distillate, a series of communicating compartments for holding liquid, a duct leading from said means to said communicating compartments, baffle means dividing said compartments and reaching below the normal level of the liquid in said compartments and differential heating means for said compartments, and a suction producing means.

7. Apparatus of the kind described, comprising means for producing a distillate, a series of communicating compartments for holding liquid, a duct leading from said means to said communicating compartments, baffle means dividing said compartments and reaching below the normal level of the liquid in said compartments and differential heating means for said compartments and overflow means for said compartments.

8. Apparatus of the kind described, comprising means for producing a distillate, a series of communicating compartments for holding liquid, a duct leading from said means to said communicating compartments, baffle means dividing said compartments and reaching below the normal level of the liquid in said compartments, differential heating means for said compartments, a suction producing means and overflow means for said compartments.

9. A method for fractionally distilling zinc, comprising passing the zinc fumes through a series of liquid zinc bubbling chambers heated respectively at substantially 900° C., 650° C. and 450° C.

In testimony whereof I have affixed my signature in presence of two witnesses.

AUGUSTE JOSEPH FRANÇOIS DE BAVAY.

Witnesses:
ANNA HART,
J. R. CULLEN.