

A. B. PESCATORE.
 PRODUCTION OF ZINC AND THE LIKE.
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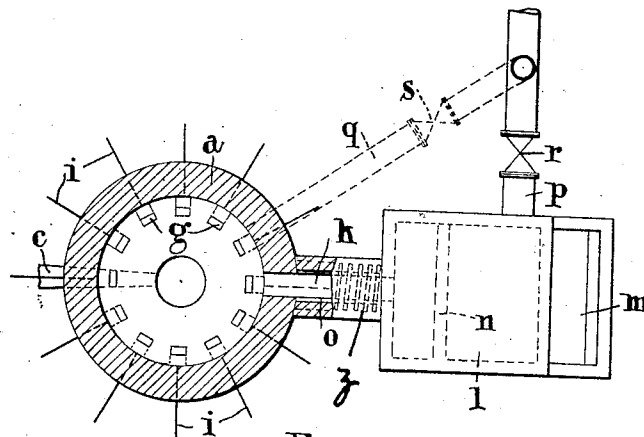
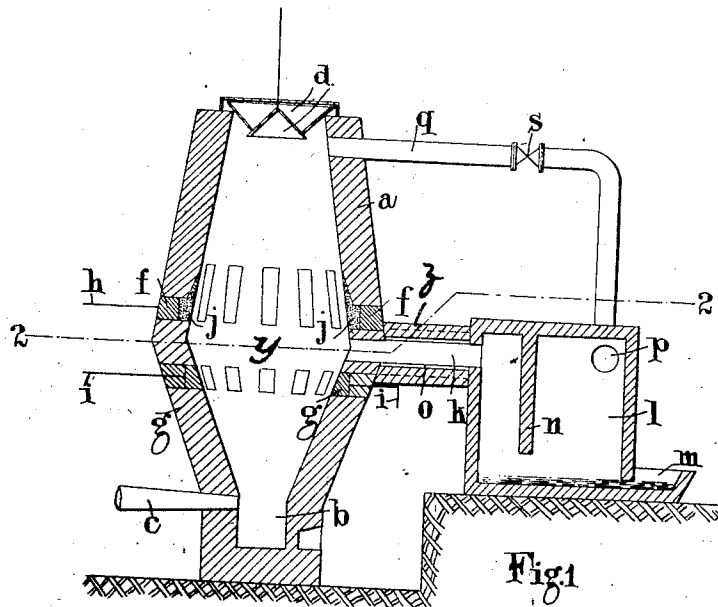


Fig. 2.

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PRODUCTION OF ZINC AND THE LIKE.

1,057,878.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, ANTOINE BONAVENTURE PESCATORE, a subject of the Grand Duke of Luxemburg, and residing at 24 Upper Hamiltan Terrace, London, England, have invented certain new and useful Improvements in and Relating to the Production of Zinc and the Like, of which the following is a specification.

10 This invention refers to the production of zinc and the like in high or like blast furnaces which method of production undoubtedly offers essentially economical advantages as compared with the methods most generally employed hitherto, according to which 15 the zinc oxid mixed with carbon is reduced in closed receptacles by heating from outside or by means of electric heating. The numerous attempts already made to obtain zinc in 20 blast furnaces have not, however, up to the present given the desired results, inasmuch as on the one hand the consumption of carbon was excessively high and furthermore some portions of the furnace and of the exhaust pipes got choked by deposits of zinc 25 oxid, thereby occasioning constant interruptions in the work and necessitating frequent repairs. Now the applicant has discovered that the cause of these disadvantages consists in the partial oxidation of the zinc in 30 gaseous condition by the carbonic acid gas contained in the hot gases. In order to obtain the necessary high temperature for the reduction of the zinc ores, the charge consisting of a mixture of ore and carbon must be supplied with a strong current of air, so 35 that it is impossible to prevent the formation of a certain quantity of carbonic acid besides the main portion of carbon monoxid which is absolutely passive with respect to the zinc vapors, whereas the carbonic acid acts on the zinc vapor to form carbon monoxid and zinc oxid. The latter must again 40 be reduced to zinc and consequently a further supply of carbon must be consumed thus considerably increasing the consumption of carbon for the production of a definite quantity of zinc. Furthermore the newly 45 formed zinc oxid is not deposited in the reduction zone of the furnace but at other spots of the same and thus occasions the choking-up referred to.

50 The present invention is for the purpose of avoiding both these disadvantages and consists in that in a blast furnace or other 55 like apparatus the air is only supplied in

such slow current to the charge consisting of oxid zinc ores and carbon, that the oxygen of the air on reaching the reduction zone has been completely converted into carbon monoxid. Now inasmuch as owing to the slow 30 combustion of the carbon, the necessary high temperature for the reduction of the zinc cannot be attained so means are provided in the blast furnace to bring the temperature 35 of the reduction zone up to the necessary degree by electric heating. The zinc vapor thus produced has no opportunity of being re-oxidized and consequently there is no stopping up of the pipes by deposits of zinc. 40 Furthermore only relatively small quantities of electric energy are necessary for supplying the additional heating and on the other hand carbon is economized, because any re-oxidation of the zinc vapor formed 45 is avoided and thus regarded as a whole the present process is more economical than those hitherto employed.

In the accompanying drawings a blast furnace suitable for carrying out the present 50 process is shown as example, in which:—

Figure 1 is a vertical section through the furnace and the condensing chamber. Fig. 2 is a section along the line 2—2 of Fig. 1.

The furnace differs from those generally 55 employed essentially by the arrangement of the electrodes *f* and *g* (the electrodes illustrated being provided with facing material *j*) in the reduction zone as well as by the 60 pipe *k* passing from the reduction zone to the condensing chamber and by the pipe *q* passing from the top of the furnace and provided with an adjustable valve *s* passing 65 out into the gas exhaust pipe from the condensing chamber. Between both these inlet spots and the condensing chamber an adjustable valve *r* is arranged. The charge is 70 introduced at *d*. The blast air is introduced in cold or warm condition by the nozzles *c* and as above mentioned is supplied in such 75 quantities that the oxygen of the reduction zone *y* is completely converted into carbon monoxid. By supplying suitable strength and voltage of current between the electrodes 80 *f* and *g*, there results a further increase of temperature in the reduction zone owing to resistance-heating and thus the zinc oxid 85 of the charge is converted into zinc vapors which latter are conducted away at the hottest portion of the furnace or near the same 90 through the pipe *k* which can be heated by resistance coils *z* into the condensing cham- 95 100 105 110

ber *z*. The zinc-free gases escape from the latter into the open air through the pipe *p*. A portion of the combustion gases, which as above mentioned are completely free from oxygen and carbonic acid, pass also through the upper portion of the furnace, where it serves for heating the charge. Any zinc vapor contained in it, is condensed, and subsequently when the corresponding portion of the charge has descended into the reduction zone, is conducted to the condensing chamber together with the zinc freshly formed from zinc oxid, so that there is no loss of zinc. The valves *s* and *r* serve for suitably regulating the distribution of both the currents of gas referred to. The other metals besides zinc contained in the ores such as lead, which are reduced by carbon and are not volatilized under the existing conditions of temperature, collect in the lower portion of the furnace at *b* from where they can be drawn off in the usual manner by tapping.

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

1. A process for the production of zinc and the like in shaft or like blast furnaces which consists in providing a limited supply of air for the furnace such that the combustion gases in the reduction zone are kept free of oxygen and carbonic acid gas and at the same time increasing the temperature in this zone by electric heating, as set forth.

2. A process for the production of zinc or the like in shaft or like blast furnaces which consists in feeding the zinkiferous ore with a reducing body into the furnace supplying a slow current of air sufficient to reduce the ore but to prevent oxygen reaching the reduction zone and heating the reduction zone by an auxiliary regulable means, as set forth.

3. A furnace for the reduction of zinc comprising a shaft, means permitting the introduction of a charge to said shaft, means permitting the introduction of a supply of air, electric means situate at about the middle of said shaft disposed for heating the charge and means for permitting zinc vapors to be released from said shaft at about the middle thereof; as set forth.

4. A zinc furnace comprising a shaft, means for permitting introduction of the

charge at the top of said shaft, electric heating means substantially at the middle of said shaft and means for permitting the introduction of an oxidizing gas at the bottom of said shaft together with an aperture substantially at the middle of said shaft for enabling zinc vapors to be released therefrom; as set forth.

5. In combination a shaft, a vapor exit disposed about half way up the shaft, a series of electrodes in proximity to said exit and twyers situate near the hearth together with a hopper arranged at the top of the shaft; as set forth.

6. In combination a shaft furnace, a condensing chamber, a conduit leading from the middle of said furnace to said condensing chamber and a further conduit leading from the condensing chamber to the top of the furnace and to the atmosphere; as set forth.

7. In combination a shaft furnace, a condensing chamber, a conduit leading from the middle of said furnace to said condensing chamber with means for heating the same and a further conduit leading from the condensing chamber to the top of the furnace and to the atmosphere; as set forth.

8. In combination a shaft, a vapor exit disposed about half way up the shaft, a series of independently adjustable electrodes in proximity to said exit and twyers situate near the hearth together with a hopper arranged at the top of the shaft; as set forth.

9. In combination a shaft, a series of electrodes disposed about the boshes thereof, with auxiliary electrodes of combustible material, twyers situate near the hearth and a hopper arranged at the top, as set forth.

10. In combination a shaft furnace, a condensing chamber, a conduit leading from the middle of the said furnace to the said condensing chamber and a further conduit leading from the top of the furnace and adjustable valves in said conduit for regulating the proportion of gases leaving the furnace at the middle and at the top; as set forth.

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

ANTOINE BONAVENTURE PESCATORE.

Witnesses:

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