E. H. HOPKINS.

APPARATUS FOR USE IN SMELTING ZINC ORE, GALVANIZER'S DROSS, AND THE LIKE.

APPLICATION FILED OCT. 3, 1908.

914,839.

Patented Mar. 9, 1909.

2 SHEETS—SHEET 1.

Fig. 1.

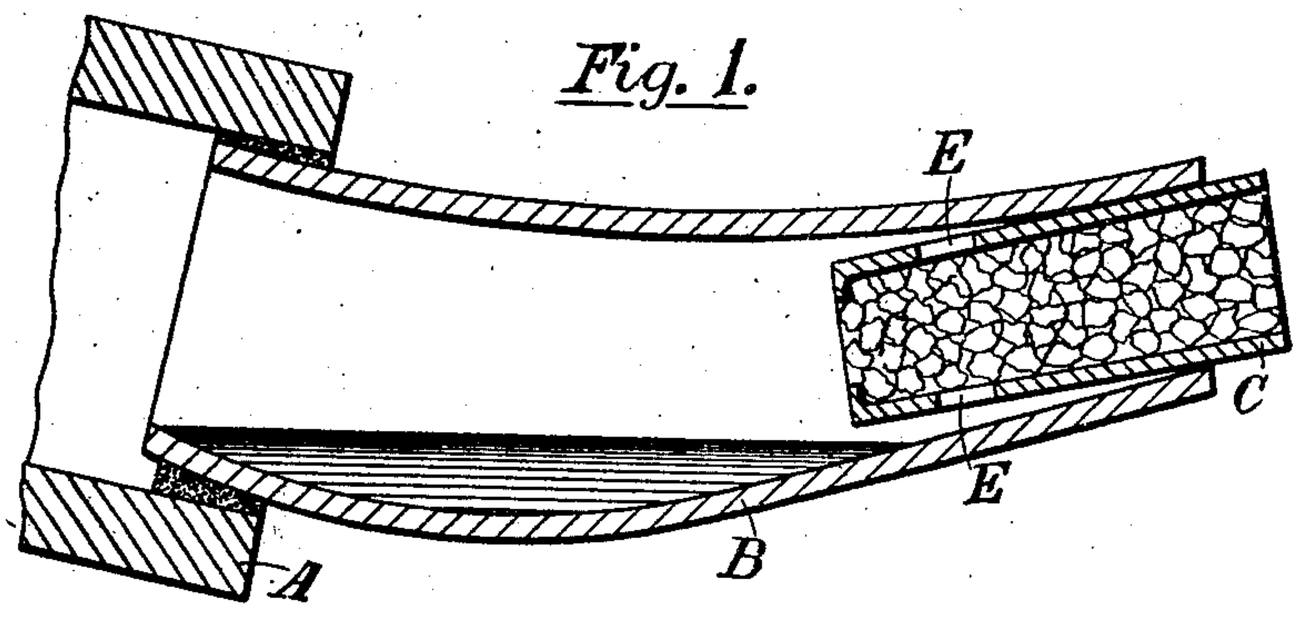


Fig. 3.

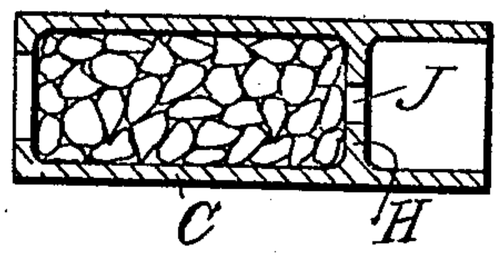
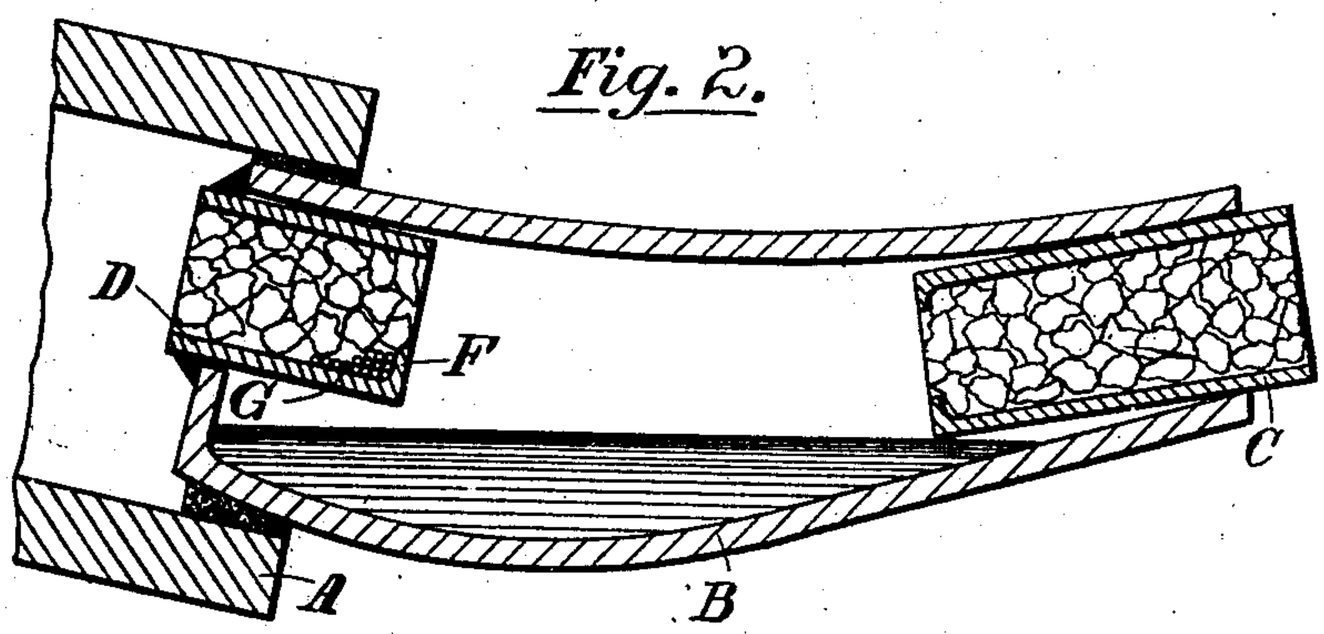


Fig. 2.



Witnesses:
P. F. Nagle.
L. Louville.

Inventor:
Evan Henry Hopkins.
By Wiedersheim & Fairbanks.
Attorneys.

E. H. HOPKINS.

APPARATUS FOR USE IN SMELTING ZINC ORE, GALVANIZER'S DROSS, AND THE LIKE.

APPLICATION FILED OCT. 3, 1908.

914,839.

Patented Mar. 9, 1909.

2 SHEETS—SHEET 2.

Fig. 4.

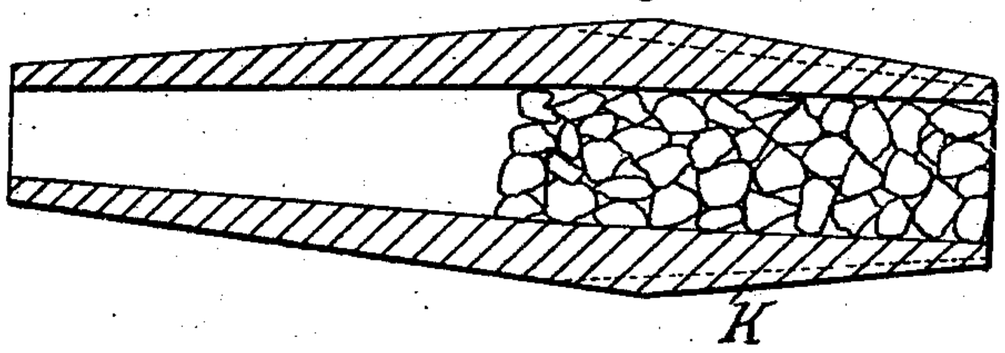


Fig. 5.

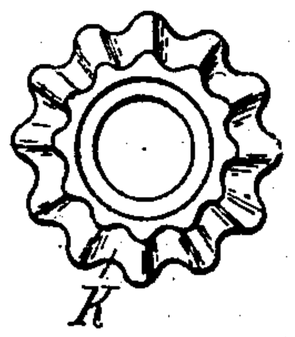


Fig. 6.

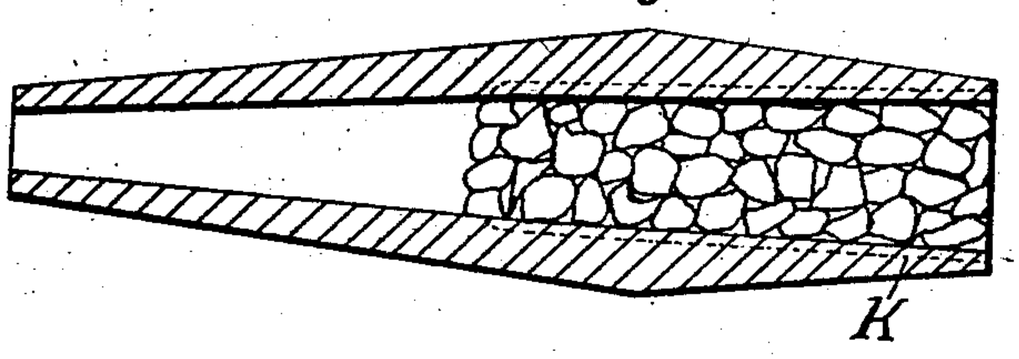


Fig. 7.

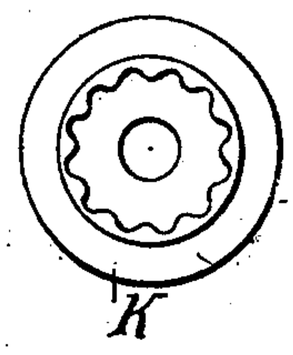


Fig. 8.

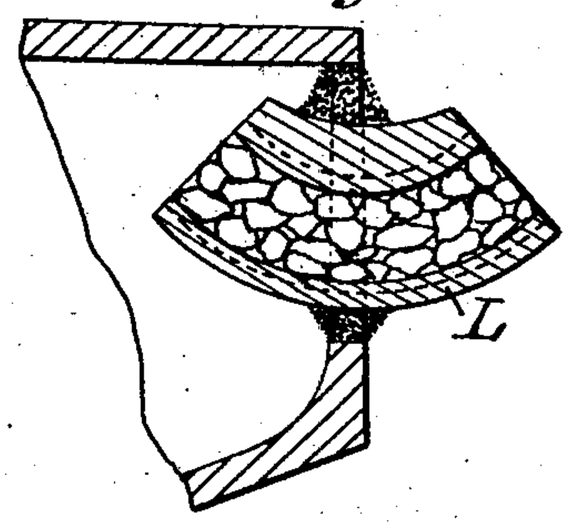
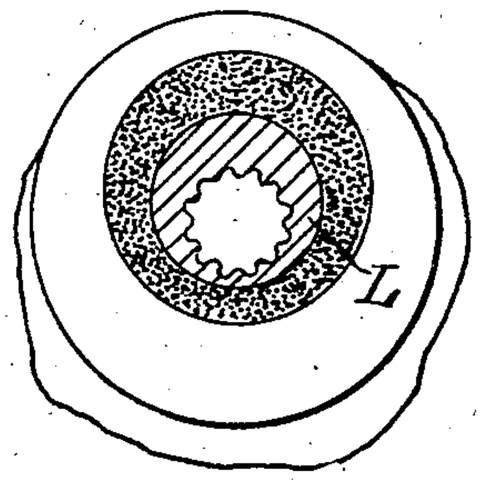


Fig. 9.



Witnesses:
P. F. Nagel.
L. Dourville.

By

Inventor:
Evan Henry Hopkins
Wiederoheim & Fairbanks.
Attorneys.

UNITED STATES PATENT OFFICE.

EVAN HENRY HOPKINS, OF ADDLESTONE, ENGLAND.

APPARATUS FOR USE IN SMELTING ZINC ORE, GALVANIZER'S DROSS, AND THE LIKE.

No. 914,839. Specification of Letters Patent. Patented March 9, 1909.

Application filed October 3, 1908. Serial No. 456,065.

To all whom it may concern:

Be it known that I, EVAN HENRY HOPKINS, a subject of the King of Great Britain, residing at Addlestone, Surrey, England, have invented a certain new and useful Improved Apparatus for Use in Smelting Zinc Ore, Galvanizer's Dross, and the Like, of which the following is a specification.

This invention relates to apparatus for use in smelting complex zinc ores containing lead, galvanizer's dross, or waste and the like.

I have previously proposed a process for obtaining zinc free from lead, from mixtures of the oxids of zinc and lead by heating the oxids mixed with carbonaceous material in a closed retort, and passing the products of distillation through carbon heated to incandescence, the carbon being contained in a chamber of the retort or in a separate perforated vessel fitting into the retort. I have also previously proposed a further improvement in this process consisting in condensing the zinc vapors in a receptacle which is charged with heated carbon in order to exclude the air.

My present invention consists in the provision of improved apparatus or means for carrying out the principles involved in the aforesaid processes in an effective and practical manner.

My said invention also provides improved means for preventing or minimizing the escape of zinc fumes from the condenser and thereby increasing the yield, and for trapping the lead at the entrance to the condenser without risk of choking the apparatus.

If spelter of only ordinary purity is required I apply to the outer end of each fireclay condenser or pipe, into which the zinc vapor passes from the retort, a tube preferably made of fire-clay filled with coke or charcoal broken into suitable lumps. This tube so charged prevents the admission of air to the interior of the condenser and insures that no zinc vapor shall escape. During the early stages of the smelting operation before the zinc vapor begins to come off the end of the condenser is left open, so that the foreign gases may at such times easily escape. But as soon as the zinc vapor begins to come off, the tube aforesaid is inserted into the end of the condenser and the escape of the zinc fumes into the atmosphere is thus effectually prevented, waste is avoided and the maximum yield of spelter in the condenser is insured. The tube may be luted into the condenser but in most cases it is sufficient and preferable to make it an easy fit and to rely upon the gases around the tube for preventing the entrance of air. In such cases the tube may be perforated to allow of the escape of carbon monoxid gas from the interior of the tube to the annular space surrounding the tube and so effectually prevent the entrance of air into the condenser.

The pipe or condenser is usually about 16 inches long, and the tube aforesaid is about 7 or 8 inches long.

When spelter of a high standard of purity is required, in addition to the fireclay tube above described at the outer end of the condenser or pipe, I lute into the inner end of the pipe or condenser a similar tube to that above described but somewhat shorter and filled with coke or charcoal, so that the zinc vapors must pass through the coke to enter the condenser. The lead will be condensed and deposited within the said inner tube and will be thus separated from the zinc vapor which passes into the condenser.

I may use plain tubes for the purpose indicated, but I find that tubes having longitudinal corrugations formed therein either externally or internally or both externally and internally possess the great advantage of preventing choking of the apparatus when at work.

The methods of separation of the zinc and lead, and of preventing the admission of air to the condenser are in accordance with the processes hereinabove referred to.

In the accompanying drawing, Figure 1 is a longitudinal section of a fireclay condenser having a fireclay tube in the outer end thereof as used when spelter of ordinary purity is required. Fig. 2 is a similar section of a fireclay condenser having a fireclay tube at the inner end as well as at the outer end as used when spelter of a high standard of purity is required. Fig. 3 is a section of a modified form of fireclay tube. Fig. 4 is a longitudinal section on a larger scale, and Fig. 5 is an end view of a double cone shaped tube having external corrugations. Figs. 6 and 7 are longitudinal section and end view respectively of a double cone tube having internal corrugations. Fig. 8 is a longitudinal section, and Fig. 9 is a transverse section of still another form of tube and shows a portion of the condenser. The tubes shown in

Figs. 4 to 7 are intended for use in the outer end of the condenser, while the tube shown in Figs. 8 and 9 is specially intended for the inner end of the condenser.

A is the mouth of the retort in which the smelting is effected; B is the condenser of ordinary construction; C is the fireclay tube in the outer end of the condenser, and D, Fig. 2, is a similar fireclay tube in the inner end of the condenser. Said tubes C and D are filled with broken coke or charcoal. The tube C, Fig. 1, is shown perforated with a number of holes E one or two inches from the inner end which allow the carbon monoxid gas to escape from the interior of the tube C to the annular space around the tube and so form a check preventing the atmospheric air from entering the condenser. These holes are however not essential to the construction and may be omitted. The tube D must be luted in place in the condenser, but the tube C as already said may be used without any luting. To prevent the metallic lead from finding its way into the condenser from the tube D, I may construct the latter with a ledge or internal flange F at the end thereof by means of clay or otherwise to catch and retain the lead which collects in the form of pellets G in said tube D. To secure a more complete reduction I sometimes provide the tube C with a diaphragm H, Fig. 3, near its outer end such diaphragm having a hole J in it to allow of the escape of the carbon monoxid and other gases. In lieu of the cylindrical tube C Figs. 1 and 2 I sometimes use double cone shaped tubes K corrugated externally as shown in Figs. 4 and 5, or corrugated internally as shown in Figs. 6 and 7.

I prefer the internal corrugations to the external ones, because any gases or fumes escaping through the grooves formed by the corrugations are thereby caused to pass over the heated pieces of carbon. The opening in the tube may diminish from $1\frac{1}{4}$ ins. in diameter or thereabout at the larger end to $\frac{1}{2}$ in. or thereabout at the smaller end. I prefer to make these tubes of fireclay but they can be made of iron. As they do not require to be luted in place, they can be inserted in the mouth of the condenser and removed without trouble.

The internally corrugated tube L Figs. 8 and 9 is a very advantageous shape of tube for use in the inner end of the condenser. It is corrugated internally to prevent risk of choking and is curved as shown to form a receptacle for the lead which condenses therein.

My invention can be applied to zinc furnaces of the kind in which the pipes or condensers are fixed and through which the retorts are charged, such as Silesian and Rhenish furnaces. In such cases the tubes C, D are made larger in diameter, and the tube D may be made slightly taper so as to facilitate its introduction into and removal from the pipe or condenser through the outer end thereof.

I am aware that it has been proposed to partially close the outer end of the condenser during working by means of clay, and I do not claim such practice.

What I claim is:—

1. The combination with a zinc retort condenser of a tube (C) containing broken coke or charcoal inserted in the mouth of the condenser.

2. The combination with a zinc retort condenser of a tube inserted in the outer end thereof, said tube containing broken coke or charcoal and having a number of holes therein to allow the carbon monoxid gas to escape from the interior of the tube to the annular space around the tube.

3. The combination with a zinc retort condenser of a tube (C) containing coke or charcoal inserted in the outer end of the condenser, and an additional tube (D) containing broken coke or charcoal inserted in the inner end of the pipe or condenser for the purpose of obtaining spelter of a high standard of purity.

4. The combination with a zinc retort condenser of a tube inserted in the outer end of the condenser said tube containing broken coke or charcoal and having a perforated diaphragm extending across the pipe, substantially as described.

5. The combination with a zinc retort condenser of a tube inserted in the outer end of the condenser, said tube containing broken coke or charcoal and being formed with internal longitudinal corrugations.

6. The combination with a zinc retort condenser, of a tube charged with broken coke or charcoal inserted in the outer end of the condenser, another tube also charged with broken coke or charcoal inserted in the inner end of the condenser, the last named tube being longitudinally corrugated internally.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

EVAN HENRY HOPKINS.

Witnesses:
GEORGE HARRISON,
HERBERT A. BEESTON.