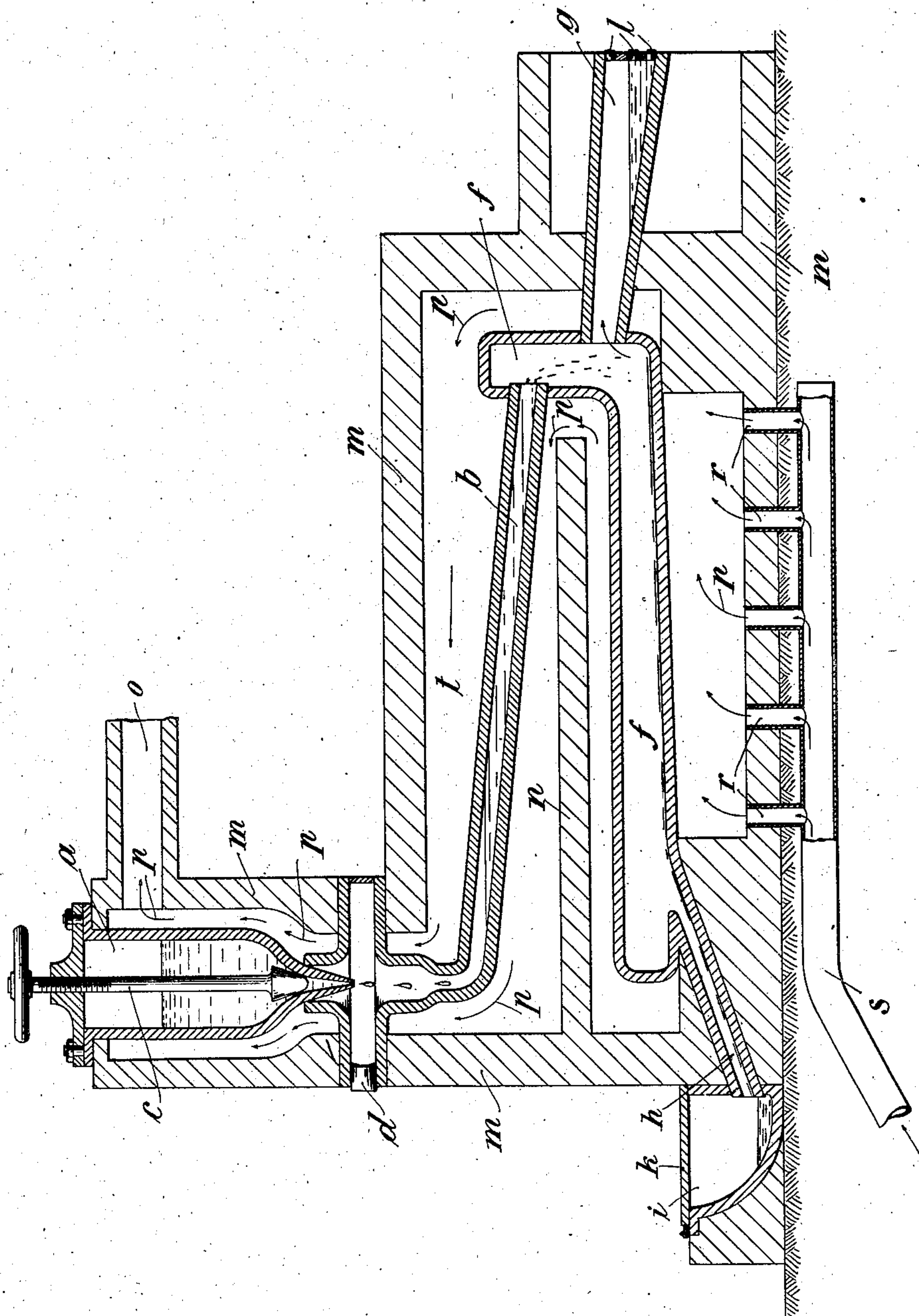


No. 827,418.

PATENTED JULY 31, 1906.

J. CALLMANN & R. BORMANN.
PROCESS OF REFINING ZINC AND OTHER METALS.
APPLICATION FILED FEB. 15, 1906.



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UNITED STATES PATENT OFFICE.

JACOB CALLMANN AND RUDOLF BORMANN, OF BERLIN, GERMANY.

PROCESS OF REFINING ZINC AND OTHER METALS.

No. 827,418.

Specification of Letters Patent.

Patented July 31, 1906.

Application filed February 15, 1906. Serial No. 301,175.

To all whom it may concern:

Be it known that we, JACOB CALLMANN and RUDOLF BORMANN, manufacturers, subjects of the King of Prussia, German Emperor, residing at 15 Gitschinerstrasse, Berlin, Germany, have invented new and useful Improvements in the Process of Refining Zinc and other Metals, of which the following is a specification.

10 It is well known that zinc produced by distillation always contains a greater or smaller proportion of other metals, particularly lead and iron, in consequence of which it has to undergo the so-called process of "refining" 15 in order to make it pure. This is done either by remelting it or by distilling it a second time in retorts or crucibles, (well-like furnaces,) which is an intermittent process, as the retorts and furnaces require attending to 20 and stirring up.

The refining process which is the subject of the present invention is contrary to the foregoing one, a continuous process. It is based on distillation, and its characteristic is 25 that the zinc is distilled while in a liquid condition and flowing in a thin stream through a pipe, which is heated by, say, a regeneration method and fitted with discharge-pipes for the zinc-vapor.

30 The process, which is also adapted for very gross zinc waste and dregs, as well as for other metals, is carried out as follows: A pipe of refractory or fire-resisting material is connected with a vessel containing the zinc 35 to be refined in a molten condition. This pipe is slightly inclined and opens either into a vessel intended for the reception of the impurities melted during the distilling process or into a retort, which is also somewhat inclined and heated. While the outflow of the 40 molten zinc from the above-mentioned vessel into the pipe is regulated by suitable appliances in such a way that the fluid zinc passes on through the pipe in a thin stream or layer and only flows into it as it evaporates, the 45 pipe is best maintained by regenerative heating at such a temperature that at the inflow part it is only slightly hotter than the melting-point of zinc. On the other hand, at the 50 mouth of the pipe the temperature should exceed the boiling-point of zinc. The fluid zinc is accordingly gradually brought to the boiling-point and evaporated as it passes through the pipe. While the vapor is being 55 condensed in condensing-chambers, the foreign metals in a more or less molten condi-

tion pass into the receiving vessel at the end of the said pipe intended for them and from which they can be taken away. A retort or crucible may be fixed between the pipe and 60 the last-mentioned receiving vessel, the heat-supply being regulated in such a way that the boiling-point of zinc will only be reached in the retort, to which also the zinc will flow in only small quantities. While the zinc-vap- 65 pors escape through the neck of the retort, the foreign metals flow off through an aperture close to the bottom of the retort into the receiving vessel. In order to insure as far as possible a perfect distribution in the pipe 70 and retort of the zinc to be distilled, the latter are filled with pieces of fire-resisting or inert materials, such as fire-brick and the like. Instead of fire-resisting or inert materials pieces of coal may advantageously be 75 used, as these combine with the oxygen in the pipe and prevent the zinc from being oxidized. On the other hand, however, if dregs of zinc containing oxygen are treated by this process the coal will abstract the oxygen 80 from these dregs and also from the oxygenous foreign metals, so that the zinc as well as the foreign metals are obtained in a pure metallic condition.

One form of apparatus by which the proc- 85 ess herein described may be carried out is illustrated in the accompanying drawing, in which the apparatus is shown in longitudinal section.

a is a vessel containing the zinc to be re- 90 fined in a molten condition. The receptacle is tapered toward the bottom in a form of a funnel and adjusted to a slightly-inclined pipe *b*. By means of a spindle-valve *c*, ar- 95 ranged inside the receptacle *a*, the inflow of the molten zinc into pipe *b* is thereby regulated. This can be observed by looking through an aperture *d*, closed with mica or other suitable transparent material. The 100 pipe *b* opens into a muffle *f*, which again is fixed to a condensation-chamber *g*, serving to receive the refined zinc, while its other extremity is joined to a receptacle *i* by means of a pipe *h*. The said receptacle *i* serves as 105 collector for the impurities molten during the process of distillation. The impurities are carried off by the lifting of a cover *k*, while the refined zinc is removed across the tapping-holes *l*.

The device is cased in a masonry *m*, and a 110 partition-wall *n* is provided in order to allow the fuel-gases serving for heating the device

to pass outwardly and across the outlet *o* and further across the whole device, as indicated by arrows *p*.

Any suitable gas burning at high temperature is conducted across tube *s* toward the burners *r*, and thus heats the muffle *f*. The molten zinc passing from the tube *b* into the muffle is here rapidly evaporated, and the vapors are condensed in the condensation-chamber *g*. The gases play now around the partition-wall *n* and arrive in the upper compartment *t* of the casing *m* and heat here the tube *b* naturally in such a manner that the one extremity of this tube is heated to the highest degree, while the other one remains at the lowest at its commencement. Before the gases escape across the outlet *o* they play around the receptacle *a* and have still sufficient high temperature that they keep the contents of this receptacle in molten condition. The result of this arrangement is that the molten zinc in tube *b* is assuming a higher condition of heat the more it approaches the end of the tube and evaporates already when arriving at the mouth of the tube, where it opens into the muffle *f*.

What we claim, and desire to secure by Letters Patent of the United States, is—

1. The continuous process of refining zinc and other metals, which consists in melting the metal, passing it in a molten condition and in a thin stream or layer through a suitable conduit, and subjecting it to a gradually-increasing heat in said conduit until the boiling temperature thereof is reached.

2. The continuous process of refining zinc and other metals, which consists in melting the metal, passing it in a molten condition and in a thin stream or layer through a suitable conduit, subjecting it to a temperature of about the melting-point of zinc at the point of its entrance to said conduit, and subjecting it to a gradually-increasing heat while passing through said conduit until the boiling temperature of the zinc is reached or exceeded.

3. The continuous process of refining zinc and other metals, which consists in melting the metal, passing it in a molten condition and in a thin stream or layer through a suitable conduit, subjecting it to a gradually-increasing heat in said conduit until the boiling temperature is reached, condensing the vapors of the zinc and collecting the foreign materials in a molten condition.

4. The continuous process of refining zinc and other metals, which consists in melting the metal, passing it in a molten condition and in a thin stream or layer through a mass of coal in a suitable conduit, and subjecting it to a gradually-increasing heat in said conduit until the boiling temperature thereof is reached.

In witness whereof we have hereunto set our hands in the presence of two witnesses.

JACOB CALLMANN.
RUDOLF BORMANN.

Witnesses:

RACHMIEL KIESLER,
PAUL VOACK.