March 17, 1925. 1,530,154

F. CASPARI

APPARATUS FOR THE CONDENSATION OF VOLATILE METALS SUCH AS ZINC AND THE LIKE

Filed Feb. 27, 1924

Fig. 1

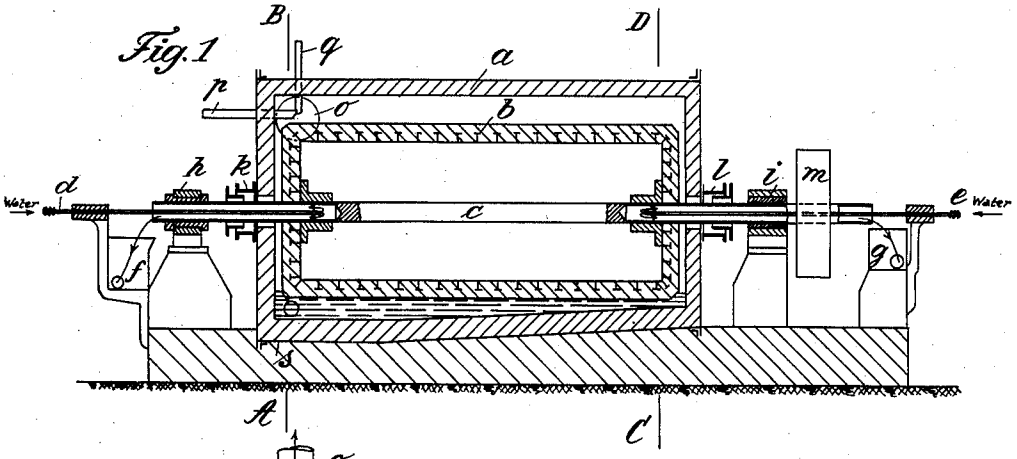


Fig. 2

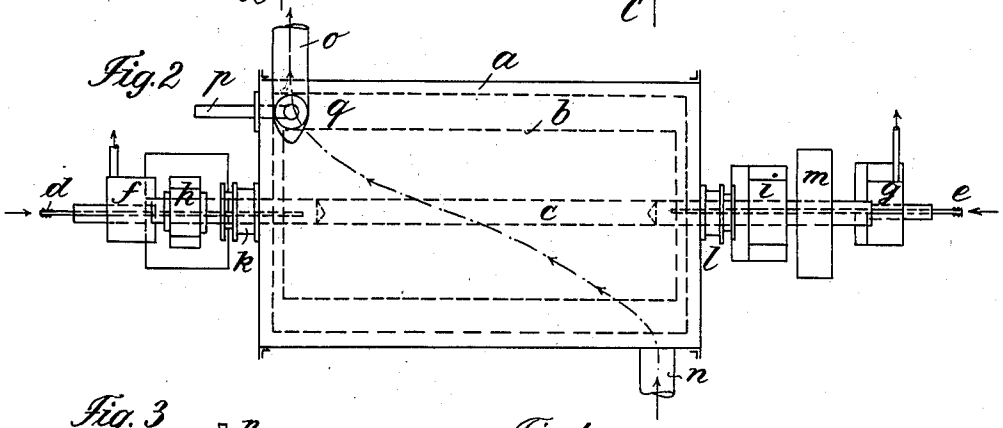


Fig. 3

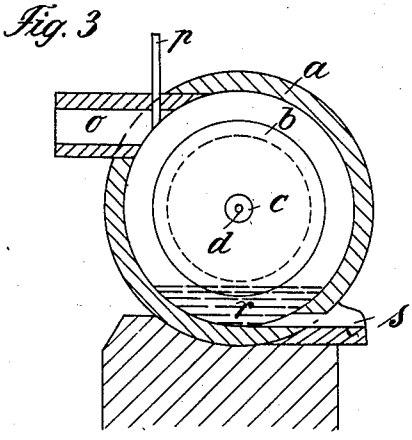
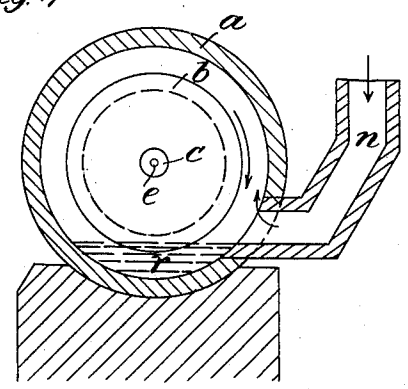


Fig. 4



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UNITED STATES PATENT OFFICE.

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APPARATUS FOR THE CONDENSATION OF VOLATILE METALS SUCH AS ZINC AND THE LIKE.

Application filed February 27, 1924. Serial No. 695,535.

To all whom it may concern:

Be it known that I, FRITZ CASPARI, a citizen of the Republic of Germany, and a resident of Gelsenkirchen, Germany, have invented Improvements in an Apparatus for the Condensation of Volatile Metals such as Zinc and the like, of which the following is a specification.

It is known that in the production of volatile metals such as zinc and the like great difficulties are encountered in converting the metallic vapours into the molten or liquid state.

It has been found, however, that the output in liquid metal is greatly enhanced by keeping the vapours and gases to be condensed in motion during the condensing operation.

To this end several suggestions have been made. Thus it has been suggested to carry out the whole operation of producing zinc electrothermically in a rolling furnace. Further it has been suggested to convey the zinc vapours to be condensed into a rotary furnace or into a rotary drum and to keep them in motion therein together with a metal having no tendency to combine with zinc. Furthermore it has been suggested to subject the zinc-dust in a vessel to the action of an endless screw adapted to revolve within the said vessel.

None of the hitherto proposed suggestions however gave satisfactory results. In cases where the whole of the condensing apparatus is devised and adapted to move bodily great loss, disturbances and difficulties in the management and operation of the apparatus are encountered and mainly due to—

1. The impossibility of properly tightening the rotary apparatus against the atmosphere.

2. The complicated manner of supporting the same in suitable bearings or the like.

3. The difficulty arising from the motion, in accommodating the internal heating device, electric arc and the like required to ensure a satisfactory condensation.

4. The necessity of driving the apparatus by means of a rack which necessarily must be exposed to the heat prevailing in the vicinity thereof.

In other cases the indispensable requirement of mixing the gases and the dust together with the already condensed metal cannot be complied with in a satisfactory manner.

The object of this invention is to remedy all of the aforementioned defects. With this object in view the condensing apparatus which may be located at any appropriate place independently of the furnace, is, according to my invention, constructed to comprise a stationary casing or chamber and a movable body therein, preferably a rotary drum or cylinder acting, through its rotation, to simultaneously mix together the gas, the dust and the already condensed metal.

The apparatus is shown, by way of example, in the accompanying drawings wherein—

Figure 1 is a sectional elevation of the entire plant,

Figure 2 is a plan, thereof,

Figure 3 is a section taken on the line A—B of Figure 1 and

Figure 4 is a section taken on the line C—D of Figure 1.

In the stationary chamber or casing *a* having a lining made of refractory material a drum or cylinder *b* is mounted on and keyed to a horizontal shaft *c* duly supported in suitable bearings *h* and *i* located outside of the casing *a*. The shaft *c* may be caused to rotate in the one or the other direction by any suitable driving means with the aid of a pulley *m*. In order to prevent the shaft from bending under the action of the heat and strains imparted thereto, the two end portions of the shaft are bored, so as to be hollow and pipes *d* and *e* are provided to discharge a cooling liquid into the hollow ends of the shaft from any suitable source of supply, receptacles *f* and *g*, respectively being provided to receive the water flowing out from the open ends of the shaft.

The two openings in the end walls of the casing through which the shaft *c* projects in order to be supported by the bearings *h* and *i*, are closed by stuffing boxes *k* and *l*, respectively. The vapours and gases to be treated are introduced into the condensation chamber preferably near the one end thereof, as at *n*, and they are allowed to escape at the other end, as at *o*, after having dropped all of the metal so as to be practically free of metallic particles.

At the one end of the casing two carbons *p* and *q* are mounted in the wall thereof to

produce an electric arc within the casing. Obviously the arc may be provided and located at any other suitable place in the casing, in order to keep the chamber within a range of temperatures that will be the best suitable for the condensing process. In case of treating zinc the temperature range in the chamber may extend from 400° to 600° C. to give satisfactory results.

The liquefied or condensed zinc gathers at the bottom *r* of the chamber or casing and is preferably kept at so high a level that the drum *b* will be in constant contact therewith and, during its revolutions, will cause the upper layer of the liquid zinc to be constantly in motion. As soon as the level of the liquid zinc rises too high a certain amount thereof will be allowed to flow off through the outlets *s*.

The principal advantages of the invention as compared with the hitherto suggested methods, mainly reside in and are identical with the following improvements viz.

1. Tightening means are not employed in connection with movable parts of the condensation apparatus, all tightening means used in connection with the apparatus comprise two simple stuffing boxes only mounted outside.

2. The bearings supporting the shaft are removed from the reach of the required heat and are not subjected to strains owing to excessive pressures; the pressure they undergo being rather moderate or low.

3. The device for heating the chamber or casing internally is mounted in the latter so as to be stationary.

4. The driving means do not include any gears or chain gearing as in the apparatus hitherto suggested, but they comprise a mere belt and pulley which are not detrimentally affected by the heat produced in the chamber, whilst the gearings heretofore employed for the like purpose soon are seriously damaged thereby.

5. Economy on account of less power consumption than in the apparatus hitherto in use, since instead of the whole of the casing with the heavy metal load therein, as heretofore, only the empty drum carrying no load except its own weight is to be revolved by the driving means.

The operation of condensing the zinc vapours supplied to the apparatus is practically carried out in a manner that a temperature of between 400° and 600° C. will obtain in the condensation chamber. The drum may be rotated in the one or the other direction and the rotary speed may be of any suitable value depending mainly on the percentage of the zinc-vapours present in the mixture of vapours and gases supplied to the condensation chamber.

While I have shown my invention embodied in a certain apparatus, it is not to be inferred that such apparatus represents the only form, in which my invention may be embodied, but is illustrated and described only as illustration of a form now preferred by me, and to make clear the principles and methods of application of my invention. I do not of course desire to be limited to the exact details of construction and arrangement shown and described, as modifications are no doubt possible, which still come within the scope of the invention.

What I claim is:

1. In an apparatus for condensing volatile metals or metallic vapours, such as zinc, the combination of a stationary chamber with a movable body therein for mixing the condensed metal, the zinc-dust and the gases, means for supplying the said chamber with volatile metals and for allowing waste gases to be drawn off, substantially as and for the purpose set forth.

2. An apparatus for condensing volatile metals, comprising a stationary chamber, a drum or cylinder mounted in said chamber to rotate at a certain speed, means for driving said drum or cylinder, and means for supplying and discharging said chamber, substantially as and for the purpose set forth.

3. Apparatus for condensing zinc vapours, comprising a stationary chamber or casing, a rotary drum mounted in said chamber, means for imparting motion to said drum and a heating means in said chamber substantially as and for the purpose set forth.

4. Apparatus for condensing zinc vapours comprising a stationary chamber, a drum or cylinder mounted in said chamber, means for imparting rotary motion to said drum and a heating means in said chamber and attached to the wall thereof substantially as and for the purpose set forth.

5. Apparatus for condensing zinc vapours, comprising a stationary chamber, a drum or cylinder mounted in said chamber, means for imparting rotary motion to said drum, a heating means attached to the inner wall of said chamber, means for supplying the chamber or casing with zinc vapours, means for drawing off from the chamber the residue or waste gases, and a means for periodically tapping the chamber or casing for liquefied zinc, substantially as and for the purpose set forth.

In witness whereof, I affix my signature.

DR. FRITZ CASPARI.