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A CONDENSER ROTATING ABOUT A HORIZONTAL AXIS
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Fig. 1

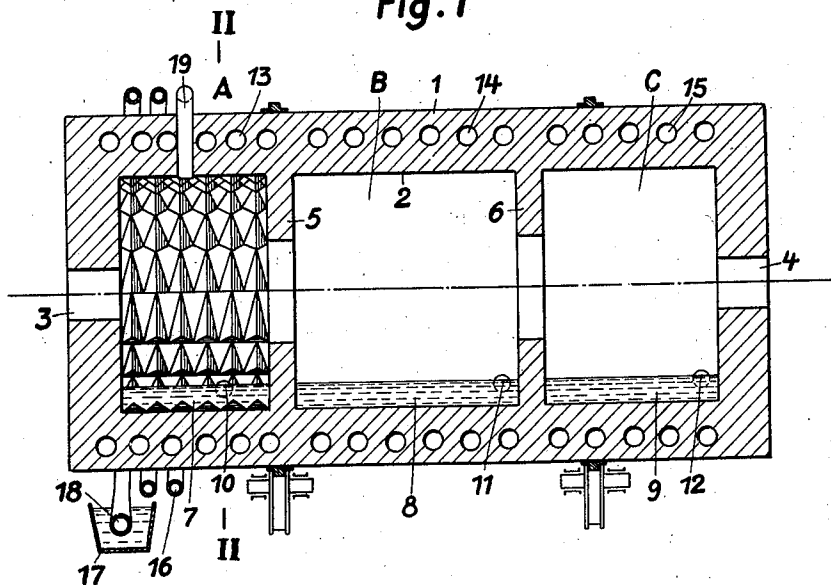
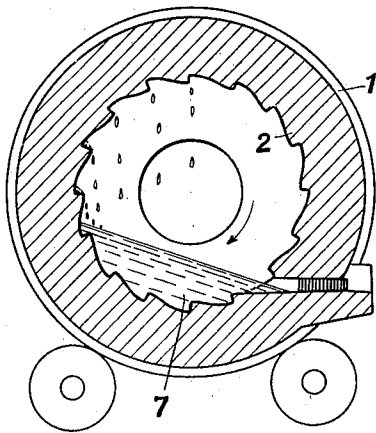


Fig. 2



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APPARATUS FOR THE FRACTIONAL CONDENSATION OF METAL VAPORS IN A CONDENSER ROTATING ABOUT A HORIZONTAL AXIS

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4 Claims. (Cl. 266—18)

It is known to use condensers rotating about a horizontal axis for the condensation of metal vapors. This constructional form of the condenser is mainly applied when the distillation of the metals is carried out in rotating muffles. When carrying out such a distillation process, for example in the distillation of zinc, it is impossible to prevent metals being distilled, in addition to the main metal, whose boiling point lies lower than that of the main metal, for example of cadmium. Moreover, experience has shown that, to a certain extent, those metals are also distilled at the same time whose boiling point is higher than that of the main metal, for example lead. Furthermore, owing to the ready development of the distillation gases, foreign admixtures, such as ore dust, coke dust and the like, are as a rule contained in the distillation gases.

The object of the invention is to produce a form of condenser which renders it possible to obtain a pure metal condensate from these highly impure gases of distillation.

According to the invention in apparatus for the fractional condensation of metal vapours in a condenser rotating about a horizontal axis the condenser is subdivided into several compartments by the building in of one or more damming rings whereby the metal baths condensed in the individual compartments remain separated from one another and the metal vapors to be condensed successively traverse the individual compartments.

A constructional example of a furnace installation suitable for carrying out the process is illustrated in the accompanying drawing, wherein:

Figure 1 is a longitudinal section, and
Figure 2 a cross-section.

In both figures, 1 is the outer condenser jacket internally lined with a heat insulation jacket 2. In Figure 1, the distillation gases enter through the aperture 3. The waste gases of the condenser leave at 4. Two damming rings 5 and 6 are fitted in the condenser, which are so constructed that the metal baths 7, 8 and 9 accumulated in the compartments A, B and C cannot come in contact with one another in any position of the condenser. For the periodical drawing off of the metal baths the apertures, 10, 11 and 12 are provided. In the wall 2 of the condenser, devices 13, 14 and 15 are provided which render possible, by the supply or dissipation of heat, the adjustment of the temperatures required for the individual compartments. Should a supply of heat be necessary, electric heating is preferable, while

for the dissipation of heat, which is mainly necessary, the installation of cooling pipes at 13, 14 and 15 is preferable. Instead of by cooling pipes, cooling can be effected by cooling the outer jacket to different degrees with a corresponding dimensioning of the condenser lining. The metal vapors entering at 3 are, in the chamber A, brought by corresponding cooling to a temperature stage which approximately corresponds to the boiling point of the main metal. In the condensation of zinc vapors, which carry lead and cadmium vapor in addition to flue dust, a temperature of about 900 to 950° is provided in the chamber A. At this temperature, the distilled lead vapor is condensed to correspond to the low vapor pressure of the lead at this temperature. Furthermore, a certain portion of the zinc is condensed, particularly if the temperature is maintained at about 900°. The mist drops composed of lead vapor and zinc vapor forming in the chamber A lead to the depositing of the dust carried along, so that in the bottom of the chamber A a metal bath is formed which consists of lead and a small portion of zinc and practically completely contains the impurities mechanically carried along. The distillation gases purified in this manner enter the chamber B, where the temperature is so far lowered that the main metal, in the present instance zinc, is condensed therein, which practically means a temperature of 600°. At this temperature, the cadmium vapor cannot yet be condensed, but passes with a small quantity of zinc vapor into the chamber C, where a cadmium-zinc alloy is deposited by further temperature reduction. If no value is attached to the recovery of this cadmium-zinc alloy, the arrangement of a second damming ring 6 is not necessary and the temperature of the chamber enlarged by C is made such that at 4 the cadmium vapors leave the condenser with a small portion of the zinc. The recovery of these metal vapors can then take place in the known manner in prolongation of the apparatus.

In order to effect as good as possible a temperature compensation between the gases to be condensed and the fluid metal, and consequently as complete as possible a separation of the metals difficult to condense as well as of the flue dust, it is advisable to so construct the inner wall of the condenser in all compartments or only in the compartment A that upon rotation, a portion of the fluid metal bath in this compartment is carried up by the wall and then, when freely falling, is repassed through the gases. For this purpose, the inner wall of the condenser is provided with

blades or projections constructed in the manner of blades, as illustrated in Figure 2, which shows a section through the chamber A according to the line I—I. The projections in the inner wall of the condenser are not only able to carry a portion of the fluid metal upwards with them in their rotational motion, but the condensation of the metals from the gases takes place for the greater part thereon, whereby the drops forming then also fall through the gaseous current. The contact surface between the gaseous current and the metal bath of the individual chambers serving as washing liquid, in particular of the chamber A, may be substantially increased by placing in the chamber or chambers filling bodies of any desired nature which are such that they are very permeable to gas, the portions of metal carried along then more or less coating the surface of these filling bodies and returning substantially slower into the bath. From the standpoint of the recovery of the principal metal in the main condensing chamber B, the chamber A is a fore chamber in which all impurities are removed from the mixture of vapors which would otherwise condense or deposit in the chamber B. The portion of the main metal, for example of zinc, condensed in the individual chambers may be accurately regulated by adjustment of the temperature in the different chambers. For example, if the temperature of the chamber is temporarily so low that a disproportionately great part of the zinc is condensed therein, a renewed vaporization of this zinc may be brought about by periodically superheating the chamber. If the cooling in the individual chambers through the wall of the condenser is not sufficient in order to effect the temperature reduction required in them, this cooling can be effected by supplying solid or fluid metal to the chambers from the outside. If, for example, the distillation gases, which enter the condenser at 3, have such a high temperature that a sufficient separation of the lead still does not take place in the chamber A, for example solid or fluid lead containing zinc may be introduced into this chamber. A distillation of this added metal then takes place in the chamber, which causes a corresponding reduction of the temperature to the boiling point of the zinc. The supply of this metal in fluid form may, for example, take place through the spiral 16, which in Figure 1 is placed about the condenser at compartment A. The fluid metal situated in the trough 17 is taken up by a conveying device 18 during the rotational motion of the condenser and passes through the pipe 19 into the interior of the compartment A. In each position of the condenser exclusion of air is effected by the fluid metal situated in the individual windings of the spiral. If necessary, valves may be provided in the spiral, which may be periodically opened or closed for the regulation of the supply of metal.

The hereinbefore described condenser for the condensation of zinc vapor may, in a similar manner, also be used for the fractional condensation of other metal vapors, for example for fractional distillation of arsenic and antimony vapors, magnesium, aluminium vapors, lead and silver vapors and the like.

I claim:

1. In a metal vapor condenser for separately recovering a principal metal from mixed vapors containing a higher boiling point metal, a rotary drum, a damming ring dividing said drum into a main condensing chamber and a fore chamber, means for tumbling a bath of the higher boiling point metal through the atmosphere of said fore chamber, and means to regulate the temperature of said bath sufficiently high to keep the principal metal vaporized in said fore chamber but low enough to condense the vapors of the higher boiling point metal in said mixture.

2. In a condenser for recovering a metal from impure and dusty vapors containing the vapor of the metal to be recovered, means forming a plurality of chambers communicating by a gas passage, means for letting the impure vapors into the first of said chambers, temperature regulating means for maintaining said first chamber substantially at the boiling point of the metal to be recovered and a subsequent chamber at a temperature below the boiling point of said metal, said first chamber containing a liquid of boiling point higher than the temperature of said chamber, and means for spreading out said liquid to expose a large surface thereof to said impure vapors to entrain dust and accelerate condensation of vapors of boiling point higher than that of the metal to be recovered.

3. In a condenser for separately recovering from mixed metal vapors a metal of lower boiling point than another metal contained in the mixture, means forming a plurality of communicating chambers, means for admitting the mixture of vapors to the first of said chambers, temperature controlling means adapted to maintain said first chamber substantially at the boiling point of said metal of lower boiling point and a subsequent chamber at a temperature below the boiling point of said metal of lower boiling point, and means for spreading out over a large surface metal condensed in said first chamber to entrain solid impurities carried along with the metal vapors and accelerate condensation of the higher boiling point metal.

4. Apparatus as described in claim 2, wherein said condenser comprises a rotary drum subdivided by centrally apertured damming rings, the walls of said first chamber being provided with projections adapted to raise the liquid in said chamber and pour it through the atmosphere of said chamber.

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