April 28, 1925. 1,535,467

E. E. HEDGES

PROCESS OF EXTRACTING MERCURY FROM CINNABAR

Filed Nov. 29, 1922

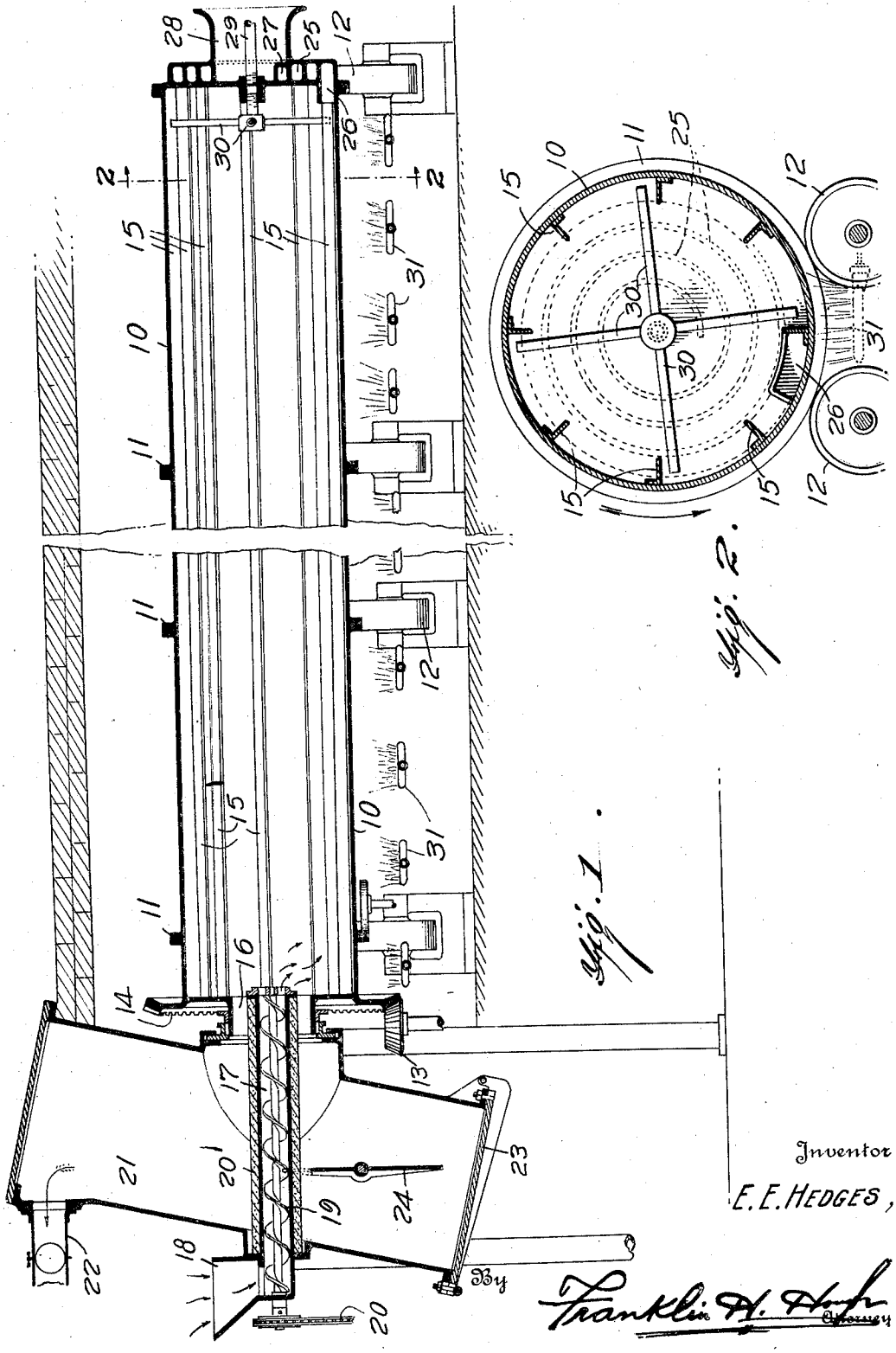


Fig. 2.

Fig. 1.

Inventor
E. E. HEDGES,

By Franklin H. Hough
Attorney

Patented Apr. 28, 1925. 1,535,467

UNITED STATES PATENT OFFICE.

EDWARD E. HEDGES, OF NEW YORK, N. Y., ASSIGNOR TO THE HEDGES NEW EDUCTION PROCESS CORPORATION, OF NEWARK, NEW JERSEY.

PROCESS OF EXTRACTING MERCURY FROM CINNABAR.

Application filed November 29, 1922. Serial No. 604,041.

To all whom it may concern:

Be it known that I, EDWARD E. HEDGES, a citizen of the United States, residing at New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Processes of Extracting Mercury from Cinnabar; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains, to make and use the same, reference being had to the accompanying drawings, and to the letters and figures of reference marked thereon, which form a part of this specification.

This invention relates to the process of extracting mercury from cinnabar and has for an object to confine the cinnabar in a wholly closed retort during the entire process of extraction and condensing the mercury which passes over as vapor in a substantially chemically pure form.

A further object of the invention is to introduce the cinnabar into a rotating and closed retort in finely divided form and introducing into the retort superheated steam and maintaining the contents of the retort at a temperature and for a sufficient length of time to drive off the mercury from the cinnabar, providing means for accommodating the mercury vapors to be condensed into metallic mercury and taking off the residuum or spent ore.

With these and other objects in view the invention comprises certain novel steps in the process, as will be hereinafter more fully described and claimed.

As an apparatus for carrying out the present invention but without limiting the same to said apparatus, the drawings show at:

Figure 1 a longitudinally sectional view taken through a retort and condenser;

Figure 2 a transverse sectional view through the retort showing the means for introducing the superheated steam, maintaining the retort in heated condition and discharging the spent residuum.

Like characters of reference indicate corresponding parts throughout the several views.

The present process is carried out in a closed retort which is heated to a sufficient temperature to drive off the volatilizable constituents. In the drawing such a retort is shown as a cylinder 10 having ribs 11 serving to support the retort upon rollers 12, whereby the said retort may be conveniently rotated in any approved manner and from any approved source, as conventionally indicated by a pinion 13 engaging a beveled gear 14 rigidly secured to the retort.

Preferably the retort will be provided with ribs 15 in its interior by the use of which when the retort is rotated the contained material will be cascaded. The showing of the retort in the drawing as setting substantially upon a horizontal axis is no limitation and the retort may be inclined as may be found necessary to advance the material therethrough, or other means ordinarily known in the art may be employed for the purpose. At the inlet end the retort is provided with a central opening 16 into which is introduced a cylindrical feed conduit 17 having some means therein for advancing the material therethrough from the hopper 18, such means being shown conventionally as the worm 19 driven by the sprocket chain 20. Preferably this conduit 17 will be surrounded and insulated by some refractory material, indicated conventionally at 20'.

This feed conduit 17 extends through the condenser 21. The condenser 21 may assume any form which convenience may make desirable or experience may dictate. It is here shown as a chamber inclined somewhat to the axis of the retort having a flue 22 so that the non-condensable gases passing from the retort through the opening 16 into the condenser may escape through this flue. Means for discharging the material from the condenser will naturally be provided and is here shown as a hinged cover 23 and means for cutting off the lower part of the condenser chamber for the purpose of discharging the condensates without interrupting the action. The retort is provided with means for automatically and continuously discharging the spent material forming meanwhile a seal against the escape of gases, such discharge being in the form of a volute passage 25 having one end opening at 26

into the interior of the retort and its opposite end opening at 27 into the discharge bell 28.

Extended axially through this end of the retort is a steam pipe 29 preferably branched within the retort, as indicated at 30 to form a means for introducing and distributing superheated steam.

Means is provided for heating the retort to the temperature required for the volatilization of such volatiles as may be contained in the material processed and here shown as gas burners 31, which, when used externally are preferably spaced along the under side of the retort, each individually controllable so that the heat may be varied from one end of the retort to the other as the processing of the material may indicate as desirable.

In the processing of cinnabar for the extraction of mercury the cinnabar is first ground in any convenient and approved apparatus to a finely divided condition and is introduced manually or mechanically into the hopper 18, the worm meanwhile being driven by the sprocket chain 20 and the retort rotated by the pinion 13. This causes the finely divided cinnabar contained in the hopper to be passed through the conduit 17 under the action of the worm and introduced into the retort. It is well known that cinnabar decomposes and mercury vaporizes at approximately 680° F. and the maintenance of the retort at such a temperature would discharge the greater part of such contained mercury, but it is found desirable to maintain a higher degree of temperature for the purpose of thoroughly discharging and volatilizing the mercury. In practice it has been found desirable to maintain the temperature in the neighborhood of 950° F. and to so adjust the retort that the passage of the cinnabar from the charging to the discharging end will occupy approximately 45 minutes. Superheated steam at approximately the temperature of the retort, 950° F. is introduced coincidentally therewith through the pipe 29 and spreader 30, so that the cinnabar contained within the retort is subjected to not only the temperature referred to but to the action of the superheated steam thereon at such temperature.

It has been found that the cinnabar yields its mercury more readily and completely and the mercury passes over in more nearly pure condition when subjected to the action of the superheated steam than when subjected only to dry heat, although it has been found possible to get fairly good results in the retort of the kind mentioned when subjected to the temperatures and times described without the use of the superheated steam. The invention, therefore, includes not only the processing of the cinnabar in a closed, heated retort in the presence of superheated steam, but also without the use of the superheated steam but contained in the closed retort and subjected to the temperature approximating those mentioned.

The mercury volatilized by the heat and the superheated steam in such vaporized form passes through the opening 16 at the end of the retort into the condenser 21. Mercury condenses at substantially the same temperature at which it is volatilized, 680° F., and it is necessary, therefore, to maintain the condenser at such temperature as will produce such condensation. Unvolatilizable gases or gases to be further processed or further condensed will pass outwardly from the condenser in the type of apparatus shown in the drawing through the conduit 22 and the mercury will be discharged from the condenser in the type shown in the drawing by closing the damper 24 and opening the cover 23.

What I claim is:

1. The process of extracting mercury from cinnabar consisting in subjecting cinnabar to steam superheated above the vaporization point of mercury and excluding the air.

2. The process of extracting mercury from cinnabar consisting in subjecting cinnabar to steam superheated above the vaporization point of mercury excluding the air, conducting off and condensing the vapor.

3. The process of extracting mercury from cinnabar consisting in introducing the cinnabar into a closed retort, introducing into the retort superheated steam, maintaining the contents of the retort at a temperature sufficient to drive off the mercury and conducting the mercury to a condenser, the while maintaining the retort against the introduction of air.

4. The process of extracting mercury from cinnabar consisting in introducing the cinnabar into a retort, introducing into the retort superheated steam, maintaining the temperature of the contents sufficiently high to drive off the mercury, agitating the contents of the retort, and conducting the mercury to a condenser, the while maintaining the retort and the condenser against the introduction of air.

5. The process of extracting mercury from cinnabar consisting in introducing the cinnabar into one end of an elongated retort, introducing superheated steam at the opposite end of the retort, cascading the cinnabar in the retort through the superheated steam, maintaining the temperature of the retort sufficiently high to drive off the mercury and conducting the mercury in vapor form into a condenser, the while maintaining the retort and the condenser against the introduction of air.

6. The process of extracting mercury

from cinnabar consisting in introducing the cinnabar into one end of an elongated rotating retort, introducing superheated steam into the opposite end of the retort, cascading the cinnabar through the superheated steam, adjusting the retort to pass the material therethrough to discharge in approximately 45 minutes, maintaining the internal temperature of the retort above 680° F., and conducting the liberated mercury to a condenser, the while maintaining the retort and the condenser against the introduction of air.

In testimony whereof I hereunto affix my signature.

EDWARD E. HEDGES.