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E. BLÜMNER

METHOD AND APPARATUS FOR CONTINUOUS DISTILLATION OF TARs AND OILS

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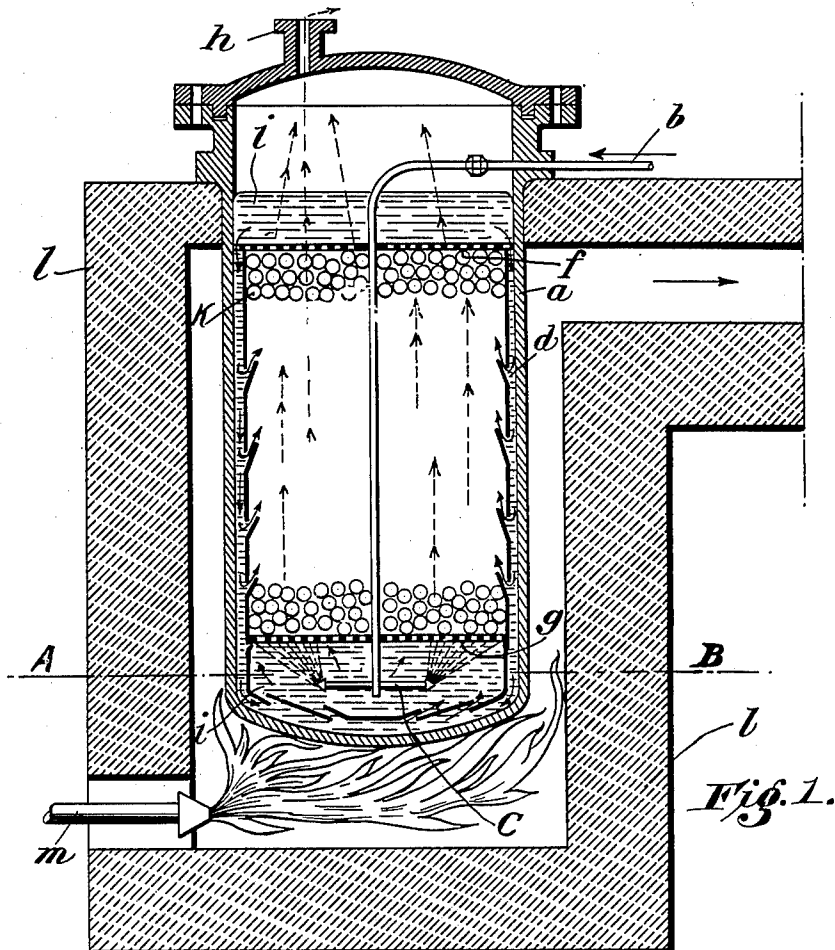


Fig. 1.

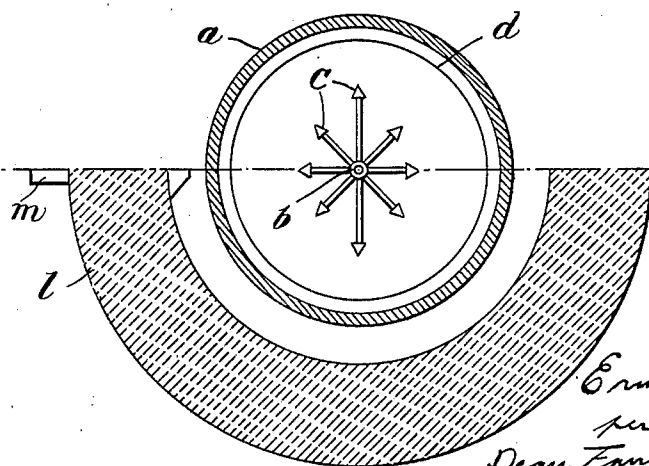


Fig. 2.

Inventor.

Erwin Blümner

per

Dean Frank O'Brien, atty.

Atty.

UNITED STATES PATENT OFFICE.

ERWIN BLÜMNER, OF BERLIN-CHARLOTTENBURG, GERMANY.

METHOD AND APPARATUS FOR CONTINUOUS DISTILLATION OF TARs AND OILS.

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To all whom it may concern:

Be it known that I, ERWIN BLÜMNER, a citizen of Switzerland, and a resident of Berlin-Charlottenburg, Germany, have invented a certain new and useful Method and Apparatus for Continuous Distillation of Tar and Oils, of which the following is a specification.

In the present process, and the apparatus for carrying out the said process, for the continuous distillation of tars and oils an extremely economical disintegrating-pressure distillation is attained with comparatively simple means, without difficult and inefficient heat transmission and moving mechanisms, at pressures above or below atmospheric, by employing molten metal or metallic alloys as heating medium.

According to the invention the process is so conducted, and the apparatus so arranged, that the liquid to be distilled does not come into contact with the walls of the pressure chamber, which are heated by contact with hot-gases, so that all deposition of carbon, and the consequent loss of material and heat, is prevented and all damage to the walls avoided.

In the new distilling process the liquids to be distilled, which may be previously warmed, after passing through nozzles or other appropriate devices which reduce them to a finely divided condition are forced as small particles, or in vaporized form, through a bath of suitable molten metal or appropriate alloy of desired constant distillation temperature, situated above the inlet nozzles or similar devices and partly filling a heated autoclave, and finally collected above the surface of the molten metal. Evaporation is avoided as far as possible within the autoclave preferably by the reduction and regulation of the pressure by means of a suitable valve. The liquids to be distilled are evaporated outside the autoclave and fractionated in suitable chambers. The pressure within the autoclave is kept approximately constant all the time.

In order to obtain the best possible conditions for the circulation and the heat diffusion in the molten metal bath whilst employing comparatively small quantities of metal, filling material or baffles in the form of so called Raschig rings or the like may be put into the molten metal bath.

By the use of an appropriate fitting in the interior of the autoclave the process can be so conducted that, as a result of the circulation of the molten metal the latter is continuously heated at the walls of the autoclave, without allowing the fine particles of the liquid to be distilled, which ascend through the molten metal, to come into immediate contact with the said heating walls. The liquid to be distilled only ascends within the said fitting, in which the above mentioned filling material is advisably exclusively confined, through the molten metal. This arrangement avoids all accumulation of heat at certain points only.

The temperature of the molten metal, which is to be imparted to the tar or oil particles passing through the bath, may, for example, be 400 to 500° centigrade at a pressure of 50 to 60 atmospheres in the autoclave.

Tin or suitable tin or other alloys come into consideration, as examples, for the molten metal bath. If metals which combine with sulphur, such as lead, zinc or calcium are mixed in the bath, the sulphur combinations in the tars distilled are separated in the form of sulphides, thus simultaneously desulphurizing the tar.

A characteristic of the present process is, that the quantity of the tar or oil to be heated passing through the autoclave at any time is very small in proportion to the large heat-accumulator which the molten metal bath represents. This fact, together with the disintegration and the passing of the liquid to be distilled through the molten metal in the form of small particles, presents a considerable divergence from all other known processes. The quantities of oil supplied to the autoclave, the heating temperature of the molten metal bath, the heat capacity as well as the interchange of heat in the molten metal, and the relation of the pressure within and outside the pressure chamber can, when the process is correctly conducted according to the present invention, be easily so adjusted that a continual distillation of tars and oils is secured in all cases, without disturbing temperature drop in the molten metal bath or other troublesome phenomena. This is mainly due to the fact that the apparatus is extremely simple, and that a regular uninter-

rupted circulation is obtained in the molten metal in the autoclave without employing stirrers, pumps, or similar devices.

One application of the apparatus for appropriately carrying out the process according to the invention is illustrated in the drawings of which Fig. 1 is a longitudinal section and Fig. 2 a cross section at the line A—B in Fig. 1.

In the interior of an autoclave *a*, which in practical application on a large scale is suitably mounted in masonry and heated by hot gases, a fitting *d*, consisting for instance of sheet-metal, is mounted at a certain distance from the surrounding walls of the autoclave, and provided with a sieve base *g* at a certain height above the bottom of the autoclave, and closed at the top by a sieve cover *f*. This sieve fitting *d*, which contains the filling material *k*, for instance, so-called Raschig rings between the sieves *f* and *g*, is so firmly supported in any appropriate manner in the interior of the autoclave *a* that it cannot change its position within the molten metal bath *i*, which fills the autoclave *a* to above the level of the sieve *f*, even under the influence of the circulation of the molten metal under practical working conditions.

The liquid to be distilled, which is to be heated in the autoclave *a*, is, in the present case, conducted through the pipe *b*, which, for warming purposes descends through the molten metal bath *i*, and is sprayed in the form of fine particles into the molten metal bath *i* by means of the jet-nozzles *c* situated in the space between the bottom of the fixture *d* and the lower sieve *g*. The fine particles in passing through the molten metal, and between the filling material *k*, are brought to the temperature of the metal bath and pass in a correspondingly heated condition, and without having come into contact with the heated walls of the autoclave *a*, through the upper surface *i* of the molten metal, into the space above. From there the liquid to be distilled passes through the vent *h* and a preferably automatic valve (not shown in the drawing) into the first condensing chamber, evaporating for the greater part outside the autoclave on account of the drop in pressure. The resulting products of distillation are then fractionated in known manner.

A continuous compensation for the heat losses caused by the molten metal imparting its heat to the passing particles of the liquid to be distilled, is attained by the cooled molten metal, in its circulation, coming into immediate contact with the heated walls of the autoclave *a* in the ring-space formed between the fitting *d* and the walls of the autoclave, and subsequently again passing into the interior of the said fitting *d* through the slits in the wall and the bottom

of the latter. The parts of the fitting *d* overlap, similar to the tiles of a roof, so that the oil or tar particles ascending through the molten metal in the interior of the fitting *d* cannot escape through the slits, and consequently cannot come into immediate contact with the heated walls of the autoclave *a*, whilst the circulation of the molten metal is not in any way impaired by the arrangement of the said slits.

I claim:—

1. The method of distilling tars and oils, which include the steps of delivering the tars and oils to the lower portion of a column of hot liquid metal and retarding the upward flow through the metal while maintaining the tars and oils in finely subdivided condition, said upward flow of the tars and oils effecting an upward circulation of the contiguous liquid metal, and permitting a return or down flow of the metal out of the path of the rising tars and oils.

2. The method of distilling liquid hydrocarbons which includes the steps of maintaining a column of metal in a heated liquid condition, delivering the hydrocarbons to the lower portion of the column, maintaining the hydrocarbon in a finely subdivided condition during the upward flow in the metal, and protecting them from the direct heating action by the walls of the column.

3. The method of distilling hydrocarbons, which includes the steps of heating a column of metal to maintain it liquefied, delivering the hydrocarbons to the lower portion of the column at a plurality of points through small orifices, maintaining the hydrocarbons in a finely subdivided condition during the upward flow through the metal, and protecting the hydrocarbons from direct heating action by the walls of the column.

4. A still including a container for liquid metal and adapted to be externally heated, a packing of small inert solid bodies within the container, a reticulated support for said packing, and means for delivering the liquid to be distilled into the liquid metal in said container below said support.

5. A still including a container for liquid metal and adapted to be externally heated, a packing of small inert solid bodies within the container, a reticulated support for said packing, and a liquid delivery pipe having a plurality of nozzles within the liquid metal in said container and below said support.

6. A still including a container for liquid metal and adapted to be externally heated, an inner casing within said container and spaced from the walls thereof, a packing of loosely distributed inert solid bodies within said casing, and means for delivering liquid to be distilled to the container below the bottom of said casing, said casing having openings at the top and bottom whereby the liquid metal may circulate upwardly within

the casing and downwardly between the walls of said casing and said container.

7. A still including a container adapted to be externally heated, a casing within said container and having a peripheral wall spaced from the outer wall of the container and provided with upwardly and inwardly directed passages therethrough, a reticulated support above the bottom of the container, a packing within said casing and upon said support and formed of small, inert, loosely distributed solid bodies, liquefied metal within said container and filling the latter to a level above said packing, and means for delivering liquid to be distilled to said container below said reticulated support.

Dr. ERWIN BLÜMNER.