

Dec. 7, 1926.

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APPARATUS FOR THE HEAT TREATMENT OF MATERIALS

Filed Jan. 17, 1924

2 Sheets-Sheet 1

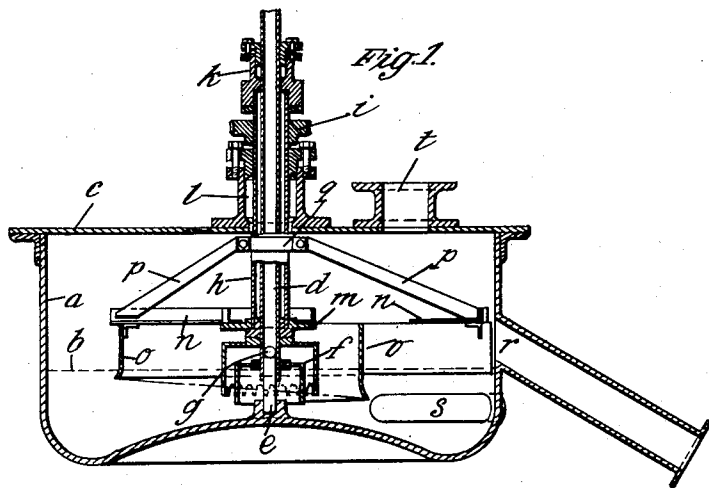
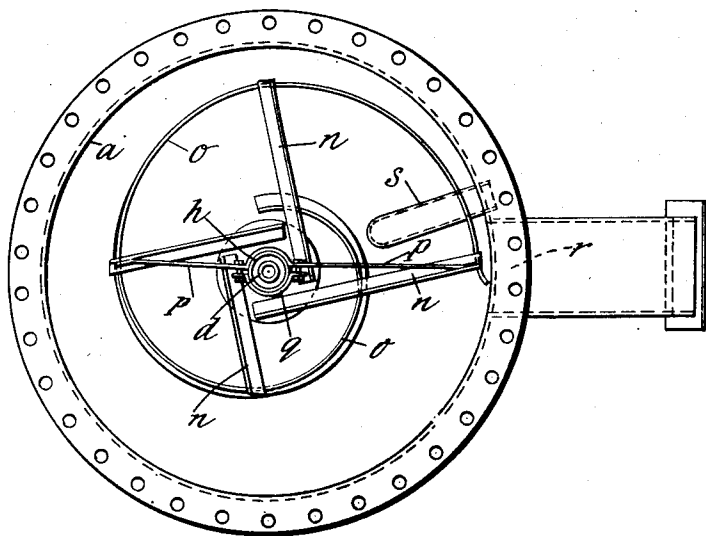


Fig. 2.



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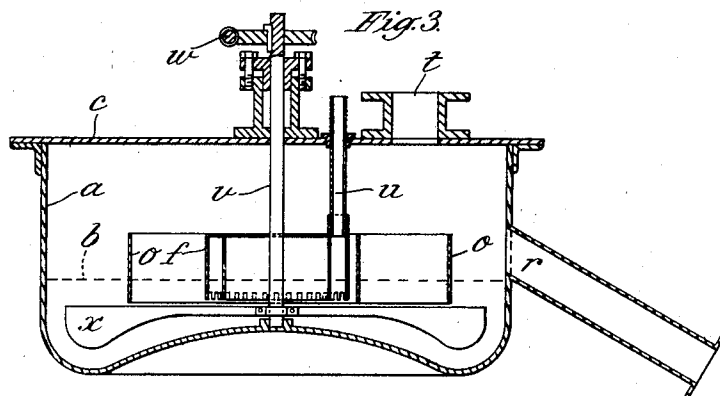
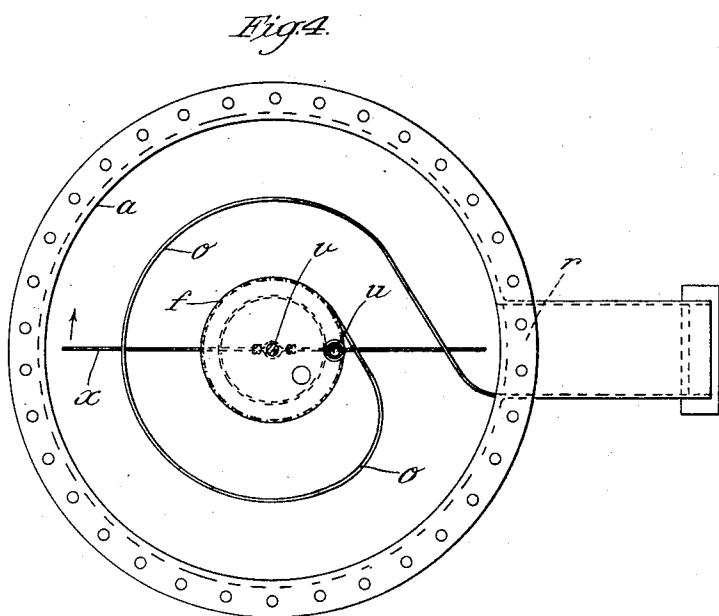
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UNITED STATES PATENT OFFICE.

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APPARATUS FOR THE HEAT TREATMENT OF MATERIALS.

Application filed January 17, 1924, Serial No. 686,876, and in Great Britain February 2, 1923.

In the heat treatment of materials by means of molten metal it is often necessary to remove more or less continuously a layer of solid or liquid material from the surface of the molten metal. This invention provides for this purpose a blade which is spiral in plan and is supported with its lower edge immersed in molten metal, and a device for causing relative rotary movement between the spiral blade and the molten metal.

The invention is particularly applicable to molten metal baths for distillation of tar, oil or the like, such as are described in United States Patent No. 1,527,847.

It has been found that in working apparatus of this class, when the liquid residues of distillation or heat treatment travel over the surface of the molten metal, difficulties are encountered owing to the fact that free carbon, ash, or other finely-divided solid material has a tendency to settle on the surface of the metal, over which the liquid products travel, forming a solid layer and thereby reducing the efficiency of heat transmission between the metal and the liquid products.

It is an object of the present invention to obviate these difficulties by the removal of the free carbon, ash or other finely divided material. For this purpose a spiral blade of the kind referred to is slowly revolved on a vertical axis within a cylindrical still during the distillation of the tar, oil or the like which preferably enters the still axially; or the blade may be stationary and the lead may be caused to revolve by a paddle revolving beneath its surface.

In one arrangement the lower edge of the blade dips below the surface of the metal and cleanses the surface of any deposit of carbonaceous or other solid material from the centre to the periphery of the still and at the same time causes a positive travel of the liquid products over the surface of the metal. An outlet is provided on the periphery of the still from which the carbonaceous or other solid material is ejected by the spiral rotating blade. One effect of the submersion of the lower edge of the blade in the molten metal is to produce a certain degree of agitation of the metal. In addition to removing matter from the surface of the liquid, and producing a positive travel of material over the surface from the inlet towards the outlet, the partly submerged blade acts as a

baffle, and causes the material to traverse an extended path, and so to remain in contact with the molten metal for such time as may be necessary for the completion of the heat treatment.

The accompanying drawing shows in vertical section in Fig. 1 and in plan in Fig. 2, a still for distilling tar with aid of molten lead, provided with a spiral blade in accordance with the invention.

Fig. 3 is a vertical section of a modification and Fig. 4 is a plan of Fig. 3, the cover having been removed.

The still *a* contains molten lead *b* and has a cover *c*.

Referring to Figs. 1 and 2, through the centre of the cover extends a tube *d* having a solid end *e* supported on the bottom of the still. The tube carries a hood *f* of the kind described in United States Patent No. 1,527,847; communication between the hood and the tube is through perforations *g* in the latter. The tar to be distilled is forced through the tube into the hood and passes through the serrations of the lower edge of the latter to rise on to the surface of the molten lead. The upper part of the hood forms a bearing surface for a hollow shaft *h* co-axial with the tube *d* and driven by a worm wheel *i* and a worm not shown; a tight joint between the tube *d* and the shaft is afforded by a stuffing box *k*, and between the shaft and the cover *c* by a stuffing box *l*.

The lower part of the shaft carries a hub *m* to which are bolted arms *n* carrying the spiral blade *o*, this construction being strengthened by ties *p* between the far end of two of the arms *n* and a collar *q* on the shaft.

The rotation of the blade *o* forces matter that floats on the molten lead to a discharge opening *r* in the side of the still.

s is a tube for receiving a thermometer and *t* is the connection of the still with a condenser.

Referring to Figs. 3 and 4, the spiral blade *o* is fixed at one end to the annular hood *f*. The tar is fed into the annulus of the hood through pipe *u*. Thus the blade remains stationary and in order to produce the movement necessary for causing the material on the surface of the molten lead to travel to the discharge opening *r*, there is provided an axial shaft *v* driven by worm *w* and car-

rying at its lower end the paddle α . The revolution of the paddle in the metal causes the latter to revolve.

Having thus described the nature of the said invention and the best means I know for carrying the same into practical effect, I claim:—

1. Apparatus for the heat treatment of materials by travel over the surface of molten metal, comprising a chamber containing molten metal and having in close proximity to and above the surface of the molten metal an outlet for treated material, means for feeding material to the surface of the molten metal, a baffle which is spiral in plan, means supporting the baffle in a position adapted for guiding to the outlet material fed to the surface of the molten metal, and with its lower edge immersed in the molten metal,

and means for causing relative rotary movement between the baffle and the molten metal.

2. Apparatus for the heat treatment of materials by travel over the surface of molten metal, comprising a chamber containing molten metal and having in close proximity to and above the surface of the molten metal an outlet for treated material, means for feeding material to the surface of the molten metal, a baffle which is spiral in plan, means supporting the baffle in a position adapted for guiding to the outlet material fed to the surface of the molten metal, and with its lower edge immersed in the molten metal, and means for causing the baffle to rotate about a vertical axis.

In testimony whereof I have signed my name to this specification.

ARTHUR McDOUGALL DUCKHAM.