April 27, 1926. 1,582,297

J. E. NEUMAIER

LIGNITE DISTILLATION APPARATUS

Filed Feb. 1, 1922 3 Sheets-Sheet 1

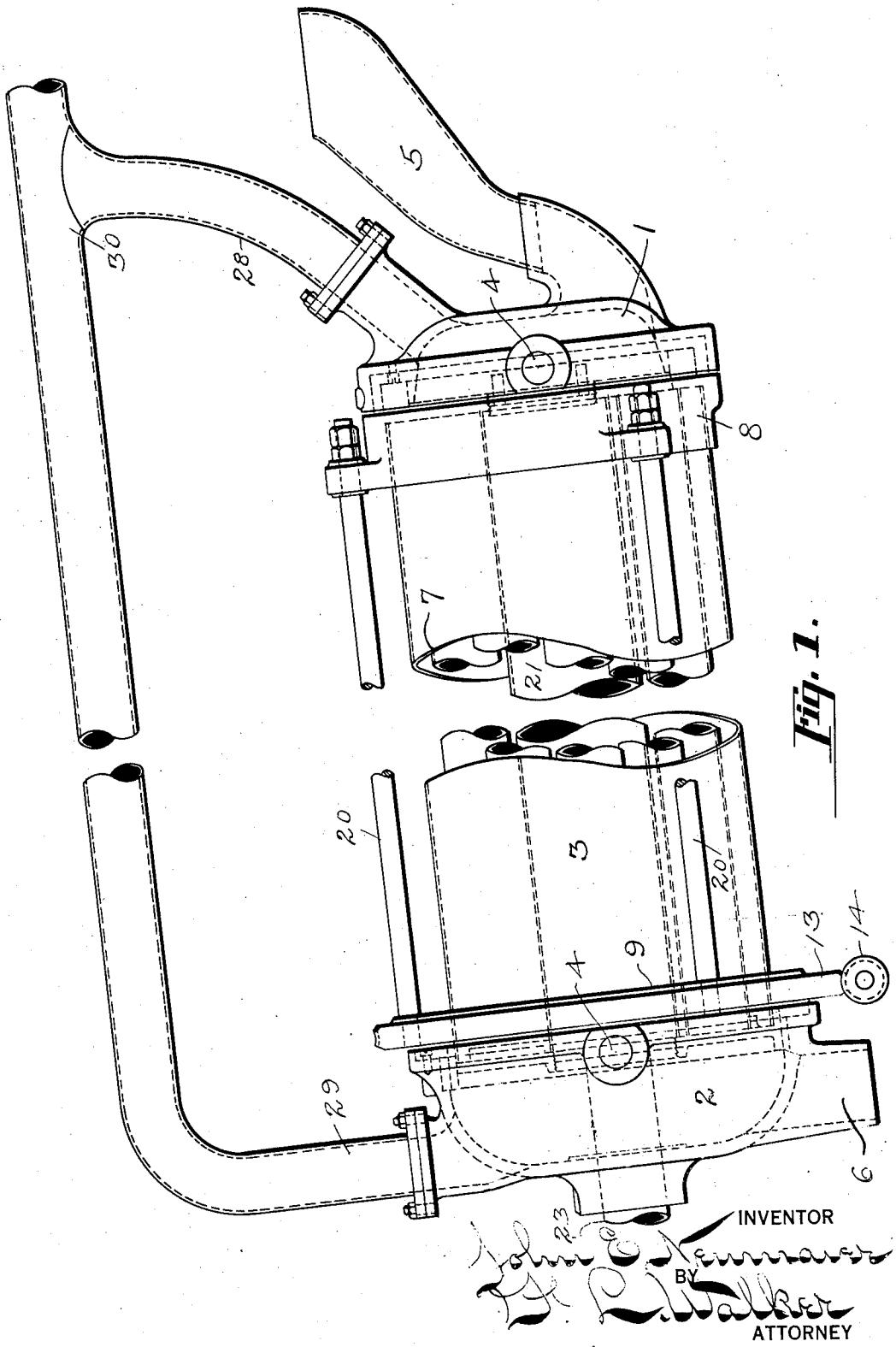


Fig. 1.

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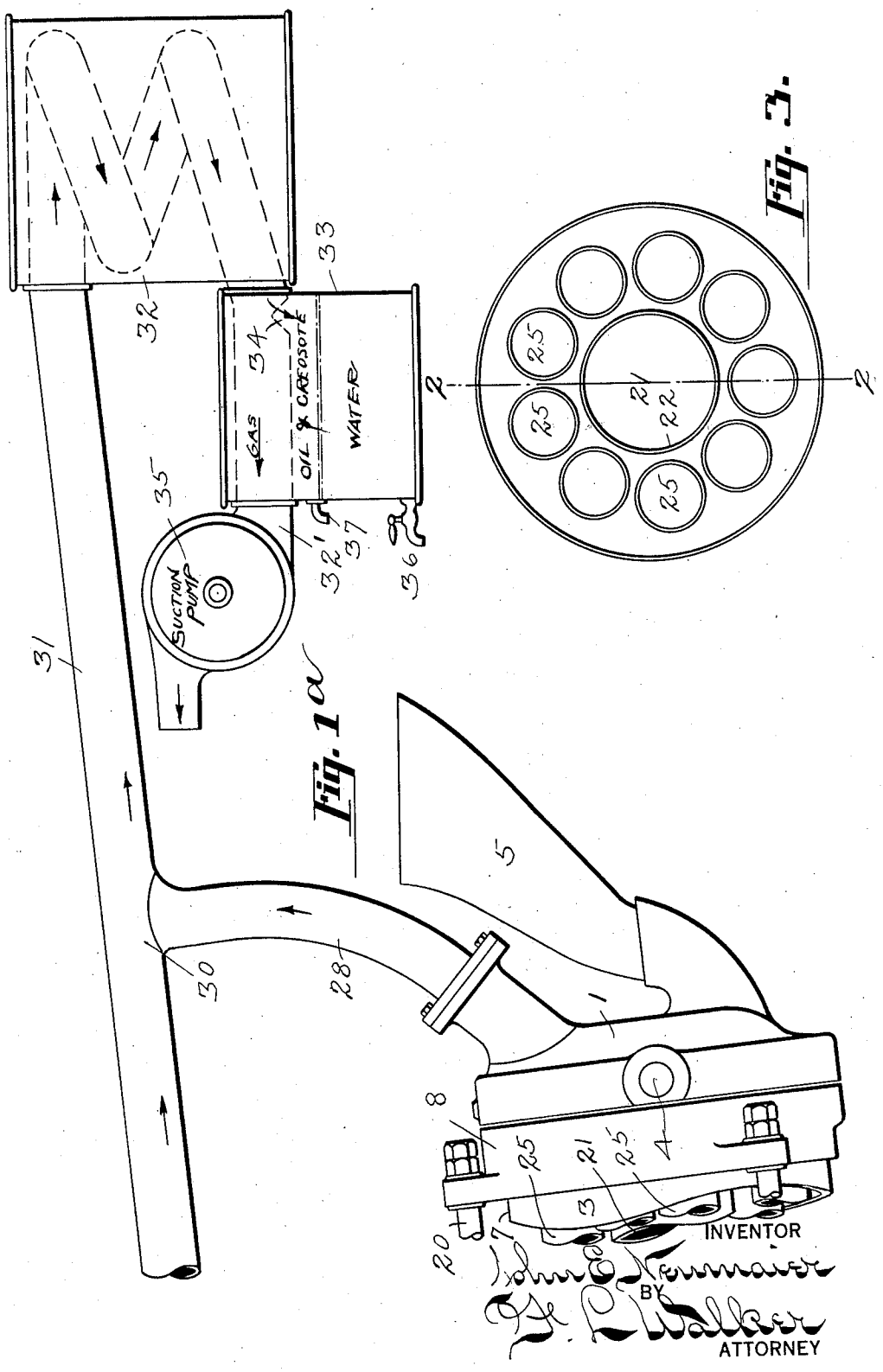


Fig. 3.

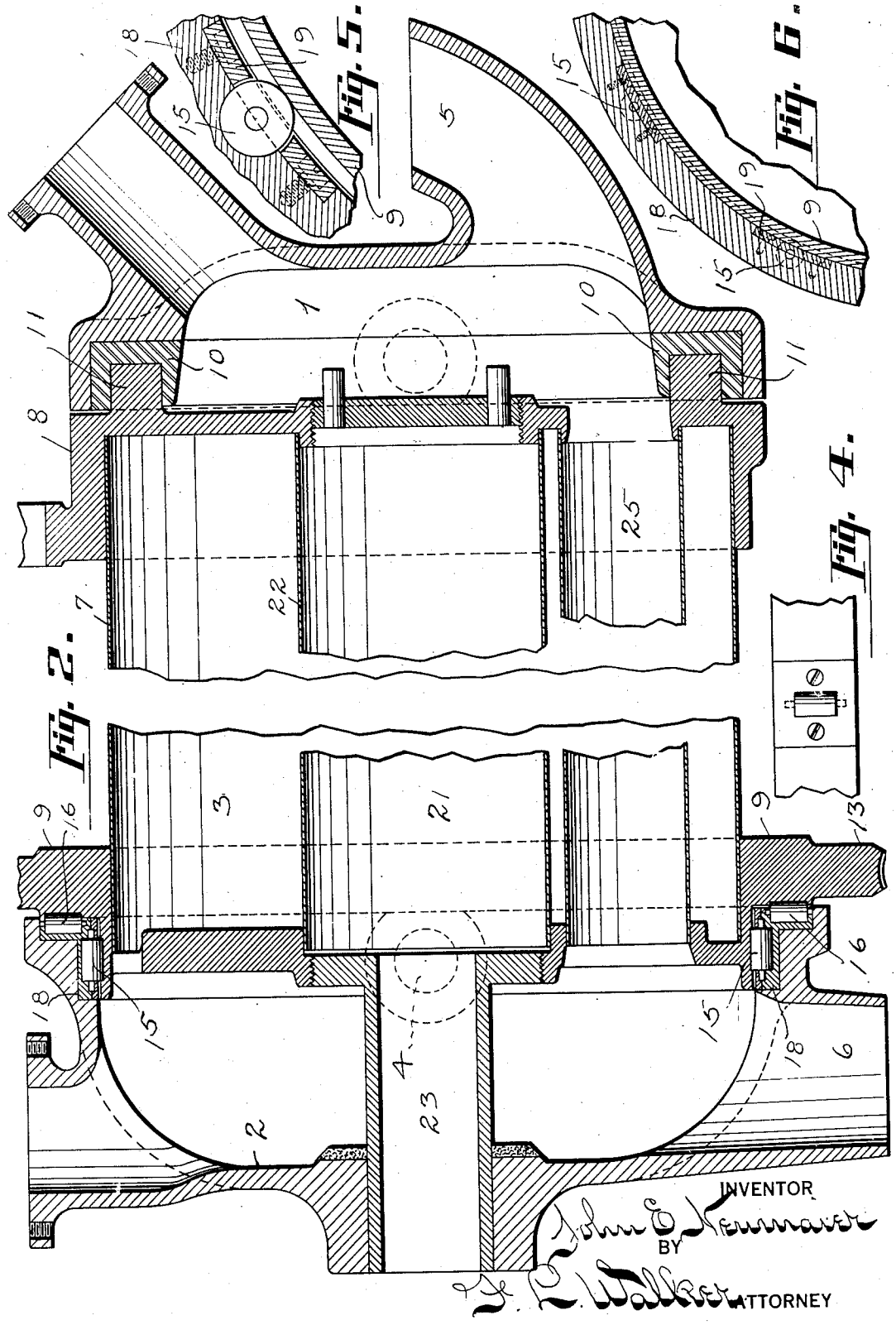
Fig. 1a

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Patented Apr. 27, 1926. 1,582,297

UNITED STATES PATENT OFFICE.

JOHN E. NEUMAIER, OF DAYTON, OHIO, ASSIGNOR TO THE LIGNITE PRESSED COAL COMPANY, OF DAYTON, OHIO, A CORPORATION OF OHIO.

LIGNITE-DISTILLATION APPARATUS.

Application filed February 1, 1922. Serial No. 533,438.

To all whom it may concern:

Be it known that I, JOHN E. NEUMAIER, a citizen of the United States, residing at Dayton, in the county of Montgomery and State of Ohio, have invented certain new and useful Improvements in Lignite-Distillation Apparatus, of which the following is a specification.

My invention relates to an apparatus for treating lignite and like material in order to distil the moisture, oils, creosote and volatile gases, leaving for briquetting purposes only the fixed carbon. As disclosed in the drawing the apparatus comprises a retort of particular form to which is connected a condenser for the vaporized and volatile products from which the liquefied by-products are drawn into a settling chamber while the gaseous products are conducted elsewhere.

Lignite is an imperfectly formed coal or one in which the natural process of transformation has been incomplete. It is found in large deposits widely distributed. In its general chemical composition it occupies a place substantially midway between coal and vegetation. Lignite usually contains a considerable proportion of hygroscopic water, and decidedly more oxygen than true coal. It also contains certain light oils, creosote and a proportion of pitch, as well as other more or less volatile by-products. In its natural state it is much inferior to true coal as fuel and materially less combustible. When briquetted in its natural form it is unstable, possessing a tendency to disintegrate or crumble and is of low combustibility. However, when specially treated to drive off or distil the moisture, light oils, creosote and gases, and formed into compressed blocks or briquettes, it not only affords a highly efficient fuel but one of very convenient form for general purposes, which will retain its shape and high combustibility under all conditions.

The present invention pertains to a simple, economical and convenient form of apparatus by which the lignite may be pretreated to distil the moisture and volatile by-products and reduced to a substantially fixed carbon form preparatory to being briquetted.

The object of the invention is to simplify the structure as well as the means and mode of operation of such distillation or processing apparatus whereby it will not only be cheapened in construction, but will be more efficient in use, positive in operation, uniform in action, rapid and unlikely to get out of repair.

A further object of the invention is to provide improved means for treating the material in small separated portions or masses, whereby the treatment is thorough thruout the entire body of material, and to further provide means for conserving the by-products driven off in the distillation process.

With the above primary and other incidental objects in view as will more fully appear in the specification, the invention consists of the features of construction, the parts and combinations thereof and the mode of operation or their equivalents as hereinafter described and set forth in the claims.

In the accompanying drawings, wherein has been shown the preferred, but obviously not the only form of embodiment of the invention, Fig. 1 is a side elevation of the revoluble drum or retort cylinder and Fig. 1ª is a continuation to the right of Fig. 1, to include the condenser and settling chamber for the by-products. Fig. 2 is a longitudinal sectional view of the retort cylinder or drum on line 2—2 of Fig. 3. Fig. 3 is a detail transverse sectional view of the retort drum or cylinder, showing the relative location of the material passages and the terminal chamber. Figs. 4, 5 and 6 are detail views of the antifriction or roller bearings for the revoluble drum or cylinder.

Like parts are indicated by similar characters of reference throughout the several views.

The retort drum or cylinder shown particularly in Figs. 1 and 2 embodies spaced oppositely disposed heads comprising an intake head 1 and an outlet or discharge head 2, between which there is located the inclined revoluble cylinder or drum 3. Each of the heads 1 and 2 is provided with oppositely extending horizontally disposed trunnions or studs 4 for engagement in a suitable mounting whereby either of the heads may be elevated or lowered relative to the trunnion connection of the other head to vary the inclination of the revoluble drum or cylinder. The intake head 1 is provided with a hopper 5, thru which the materials to be operated upon is supplied. This hopper 5 discharges into the lower portion of the

head 1. The opposite or discharge head 2 is provided at the bottom with an outlet or discharge orifice 6, thru which the material is finally discharged. The intermediate revoluble cylinder or drum comprises an exterior shell 7, carrying at its opposite end heads 8 and 9, having revoluble bearings in the respective heads 1 and 2. The head 1 is provided on its inner face with a grooved bearing ring 10 in which engages a bearing flange 11 projecting from the terminal face of the cylinder head 8. The cylinder or drum head 9 at the opposite end of the shell 7 is provided with an integral worm gear 13 with which engages a driving worm 14 to to rotate the cylinder. The integral gear ring 13 forms with the periphery of the cylinder head 9 two angularly arranged bearing surfaces for engagement with angularly arranged sets of roller bearings 15 and 16, carried by the terminal stationary head 2 of the structure. One set of these bearings 15 engaging the peripheral face of the head 9 carry the load as the cylinder revolves while the second set of roller bearings 16 engaging the lateral face of the gear ring 13 assume the thrust incident to the inclination of the cylinder or drum. These rollers may be mounted in any suitable or convenient manner in the head 2. There have been shown in detail in Figs. 4, 5 and 6 an economical but very efficient construction wherein the stationary structure head 2 is provided with a ring 18 having grooved recesses therein to receive the rollers 15 at spaced intervals. Retaining plates 19 are provided to overlie the trunnions of the roller, such plates having openings therein thru which the face of the roller protrudes into engagement with the cylinder head 9. The ring 18 has been shown of angular or flanged form, the peripheral flange of which is likewise recessed to receive the bearing rollers 16 which are retained by similar retaining plates 19.

The cylinder heads 8 and 9 are interconnected by tie rods 20 to strengthen and stiffen the structure. Within the shell 7 of the cylinder or drum and preferably concentrically disposed in relation therewith is a thermal chamber 21, comprising an enlarged tubular inner shell 22, the ends of which are engaged in the opposite cylinder heads 8 and 9. Extending from the cylinder head 9 thru the stationary discharge head 2 of the structure is a tubular extension or conduit 23, communicating at its inner end with the thermal chamber 21 and open at its outer end to atmosphere. Any suitable form of heating means may be employed within the thermal chamber 21. For instance a succession of coils of hot water or steam pipes may be located therein, the connections thereto being carried thru the extensions or continuation 23. Likewise an electrical heating element may be positioned within the thermal chamber the electrical connections being conveniently made thru the extension or conduit 23 from the exterior of the cylinder. By providing a similar extension or outlet thru the intake head 1, the thermal chamber may be employed as a flue for the passage of heated products of combustion from any suitable burner or fire box. The particular method of applying heat in the present instance is not material.

Surrounding the centrally disposed thermal chamber 21 is a concentric series of longitudinal passages 25 each independent of the other. These passages 25 comprise elongated tubes or pipes having their opposite ends mounted in the respective heads. 8 and 9 of the cylinder and are open at their opposite ends into the intake and discharge heads 1 and 2 of the retort structure. As the material to be operated upon is discharged into the receiving head 1, a portion of such material flows into the lowest passage or retort conduit 25 of the series. As the drum or cylinder rotates each succeeding material passage or conduit 25 receives a portion of the charge. It will be understood that the lignite or other material to be discharged is in a ground or subdivided condition. The material need not be reduced to powder or granular form but is preferably in comparatively small pieces. Of course the smaller these subdivisions are made the more rapidly the material may be distilled. By the use of a plurality of passages or conduits 25, each of which receives a portion of the charge of material, the material is divided into a number of small batches, so that it is brought into more intimate relationship with the central thermal unit. As the cylinder revolves, the material within the passages is agitated and turned so that every portion of it is subjected to the heat emanating from the central chamber 21. This agitation and tumbling of the material in the separate compartments 25 conduces a movement of the material downwardly thru the cylinder toward the discharge end thereof. These material passages or conduits all discharge the contents into the terminal stationary retort head 2 from which the material flows thru the outlet opening 6. In its passage from the intake head 1 to the discharge head 2, while being agitated and tumbled the material under the influence of the heat to which it is subjected gives off its moisture and volatile products. The vapors and gases including the water, the creosote, light oils, oxygen and other gases are released from the mass of material leaving therein substantially only the fixed carbon, and the pitch. The vapors and volatile matter are carried off from the retort thru conduits 28 and 29 com-

municating with the intake and discharge heads 1 and 2 respectively. These vapor conduits 28 and 29 preferably though not necessarily unite at 30 into a common conduit 31 which leads thru a condenser chamber 32 of any suitable or convenient form. In the drawing, the condenser 32 has been shown diagrammatically in a very conventional manner. It will be understood that any type of condenser suitable for this purpose may be employed. From the condenser the continuation of the conduit 31 leads thru a settling chamber 33. The conduit extension 32′ has within the settling chamber 33 a vent or outlet orifice 34, in the lowermost side of the conduit thru which the liquefied products of the distillation are deposited in the settling chamber. The conduit extension or continuation 32′ communicates at its end with a suction pump 35 by which the unliquefied gases are drawn over and beyond the outlet vent 34, and discharged thru any suitable source. The water, creosote and oil will be discharged together into the settling chamber 33, wherein the oil and creosote being of less density will rise to the top of the fluid contents of the chamber, leaving the water in the bottom to be drawn off thru the stop cock 36. The oil and creosote may be drawn from the top of the water thru a similar outlet 37 prior to the discharge of the water.

In many districts where lignite deposits are found, water is quite scarce and the water of condensation or distillation thus extracted from the lignite material may be utilized in the process as for instance in the power plant for supplying water to the boilers of a steam engine for driving the cylinder or drum. Likewise the gases extracted from the lignite fuel may be utilized as fuel for the generation of steam for power purposes.

From the above description it will be apparent that there is thus provided a device of the character described possessing the particular features of advantage before enumerated as desirable, but which obviously is susceptible of modification in its form, proportions, detail construction and arrangement of parts without departing from the principle involved or sacrificing any of its advantages.

While in order to comply with the statute the invention has been described in language more or less specific as to structural features, it is to be understood that the invention is not limited to the specific details shown, but that the means and construction herein disclosed comprise but one of several modes of putting the invention into effect, and the invention is therefore claimed in any of its forms or modifications within the legitimate and valid scope of the appended claims.

Having thus described my invention, I claim:

1. In a distillation retort for lignite or the like, oppositely disposed spaced heads having inlet and outlet orifices, an inclined revoluble cylinder having bearings in said heads, independent passages thru the cylinder and communicating with the heads for the material to be distilled, means for subjecting the material to heat during its passage, and oppositely disposed horizontal trunnions upon the heads about which the opposite ends of the structure is capable of vertical swinging adjustment to vary the inclination of the inclined cylinder.

2. In a lignite distillation apparatus, an inclined revoluble drum, a head enclosing the lower end of the inclined drum in relation with which the drum is revoluble, a thrust collar exteriorly mounted upon the drum, and two series of antifriction rollers carried by the head, the members of one series being arranged at substantially right angles to those of the other series and engaging the thrust collar and the periphery of the drum respectively.

3. In a lignite distillation apparatus, a revoluble drum, a heat compartment concentrically disposed within the drum in spaced relation with the walls thereof and closed at one end, heads enclosing the opposite ends of the drum, material inlet and outlet passages communicating with the heads, and a passage through one of the heads communicating with the heating compartment within the drum.

4. In an apparatus for distilling lignite, an inclined revoluble cylinder having material inlet and outlet orifices located at its opposite ends, means for rotating the cylinder about its longitudinal axis, and pivoted supporting heads at the opposite ends of the cylinder, enabling longitudinal tilting adjustment thereof to vary its inclination to regulate the rapidity of movement of the material from the inlet to the outlet orifice.

In testimony whereof, I have hereunto set my hand this 20th day of October A. D. 1921.

JOHN E. NEUMAIER.