

June 24, 1924.

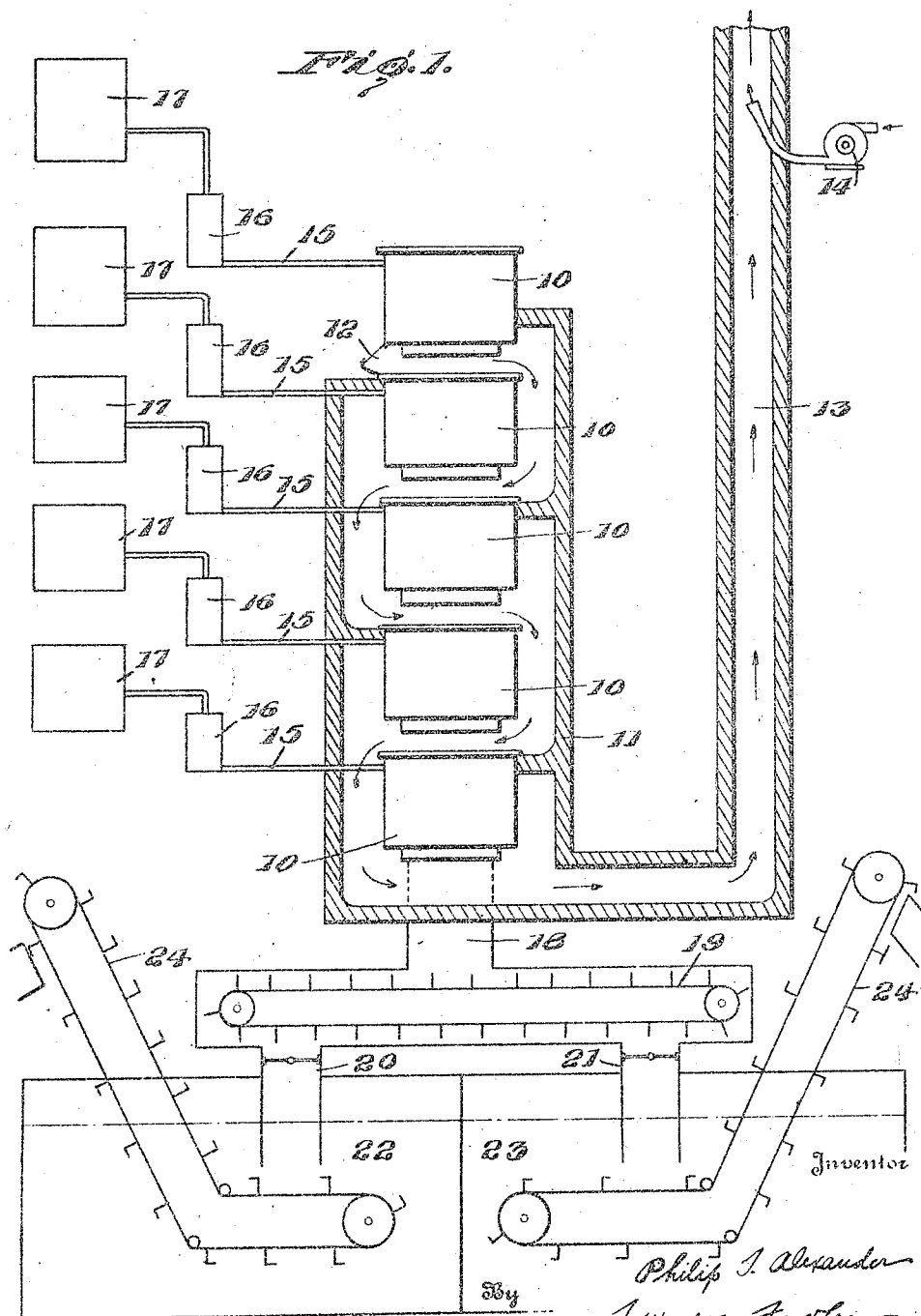
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P. T. ALEXANDER

APPARATUS FOR THE DESTRUCTIVE DISTILLATION OF OIL BEARING MATERIALS

Filed May 29, 1922

3 Sheets-Sheet 1



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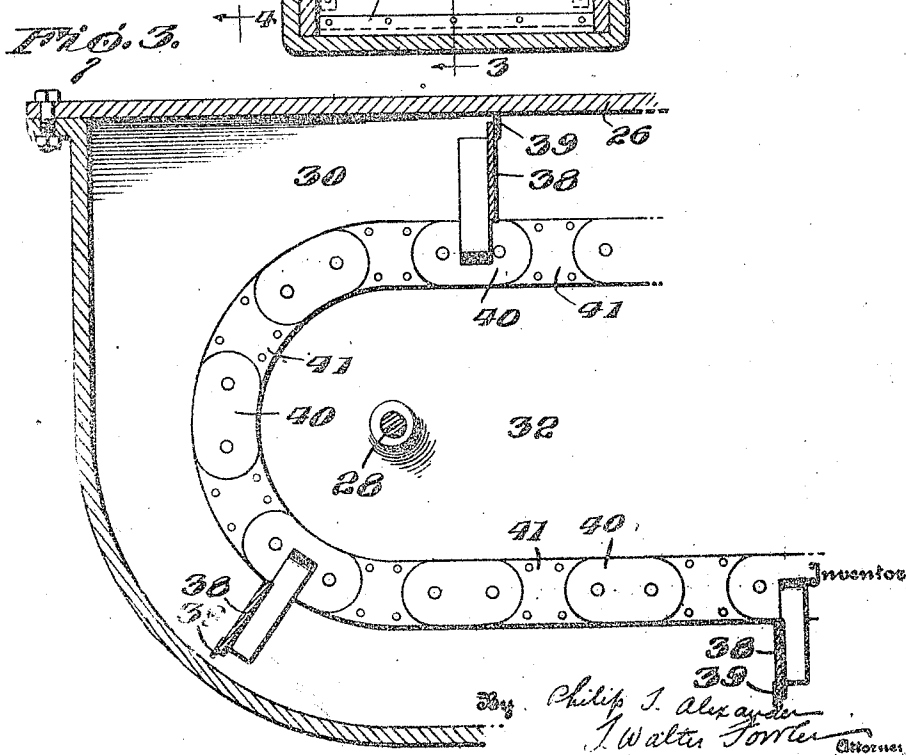
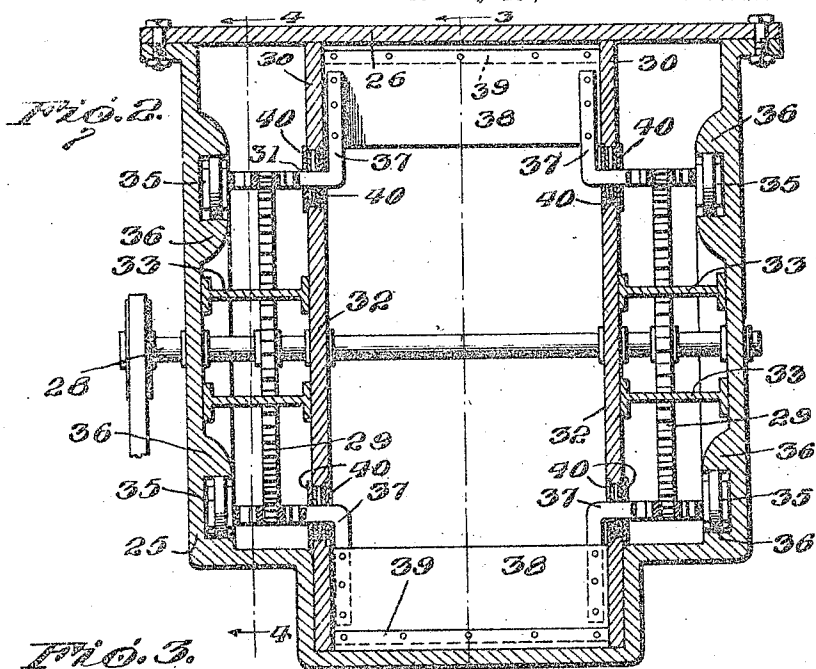
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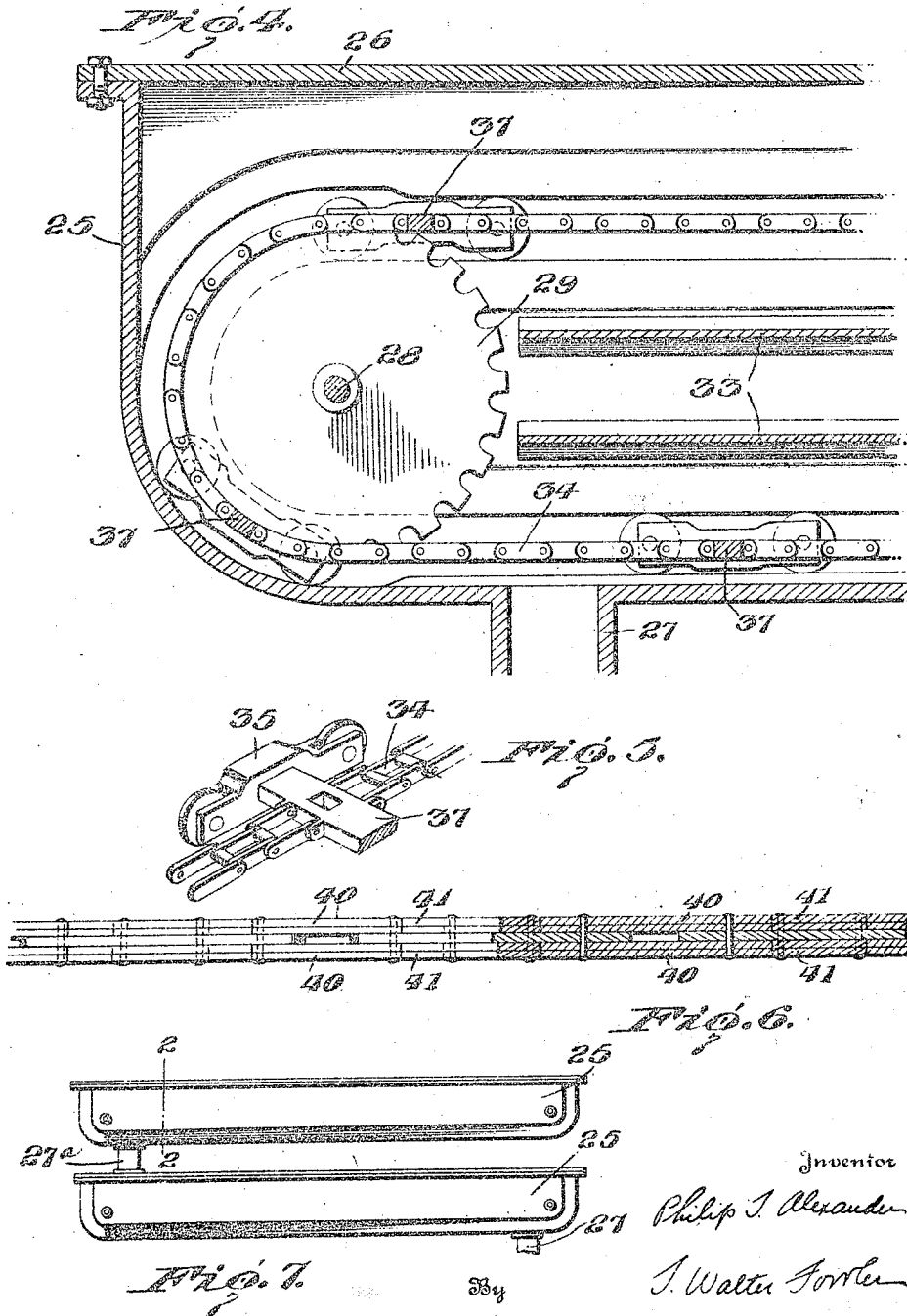
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APPARATUS FOR THE DESTRUCTIVE DISTILLATION OF OIL BEARING MATERIALS

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UNITED STATES PATENT OFFICE.

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TO ARTHUR E. MILLER, OF SACRAMENTO, CALIFORNIA.

APPARATUS FOR THE DESTRUCTIVE DISTILLATION OF OIL-BEARING MATERIALS.

Application filed May 29, 1922. Serial No. 564,498.

To all whom it may concern:

Be it known that I, PHILIP T. ALEXANDER, a citizen of the United States, residing at Sacramento, in the county of Sacramento and State of California, have invented certain new and useful Improvements in Apparatus for the Destructive Distillation of Oil-Bearing Materials, of which the following is a specification.

10 This invention relates to apparatus for the destructive distillation of oil bearing materials such as shale, peat, sand, lignite, coal, coal tar, gums, asphalt, natural and fractional oils of vegetable or mineral origin, carbon bearing residues, and the like, and has particular reference to an improved reduction furnace, comprising a plurality of independent units connected in series and so arranged that the oil bearing material is caused to continuously pass through the different units, thereby effecting an eduction of the volatile products from the oil-bearing material.

25 An object of this invention is to provide a device of this general character in which the several independent retort units are each provided with suitable scrapers for causing the oil-bearing material to travel over the lower heated surface of the unit and to provide means for effectively driving the scrapers during the distillation process.

35 In the destructive distillation of oil-bearing substances particularly organic shale, it is common in the art to use a series of retort units superposed one on the other, connected at alternate ends to the underlying unit, and to use within each of such units a conveyor or scraper which causes the oil-bearing material to traverse the unit and discharge into the next lower compartment or unit, and so on through the several units in alternate directions until the bottom or discharge end of the apparatus is reached. In such apparatus difficulties have been heretofore experienced in the operation of the conveyors or scrapers because of the fact that the coke or other residuum of distillation tends to clog or gum the working parts of the conveyors and thus materially effect the efficient operation of the apparatus. The present invention is particularly designed for, and has as its principal object, the construction of the unit and driving mechanism for the conveyors or scrapers, wherein the

working parts of the drive mechanism are so placed that they cannot become clogged or gummed by the accumulation of coke or other residuum.

In the accompanying drawings forming a part of this specification and in which like numerals are employed to designate like parts throughout the several views,

Fig. 1 is a sectional view in elevation of a distilling apparatus of the general character;

Fig. 2 is an enlarged sectional view through one of the retort units, on the line 2—2 of Fig. 7;

Fig. 3 is a fragmental sectional view on the line 3—3 of Fig. 2;

Fig. 4 is a fragmental sectional view on the line 4—4 of Fig. 2;

Fig. 5 is an enlarged detailed perspective view of the drive chain, showing the method of mounting the chain and scrapers on the roller carriage;

Fig. 6 is an enlarged plan view of the packing washer assembly, a portion of which is shown in section; and

Fig. 7 is a reduced side elevation of two of the individual retort units.

Referring to the drawings, wherein for the purpose of illustration is shown a preferred example of my invention, I have shown in Fig. 1, a complete apparatus for the destructive distillation of oil-bearing materials, comprising a plurality of superposed retort units 10 arranged within a suitable furnace structure 11, said furnace structure comprising an upper fire box 12 and a vertical stack 13. Arranged at a suitable plane in the vertical stack 13 is a fan blower 14 for drawing the heat and products of combustion from the fire box 12 in a circuitous path downwardly past the several retort units within the furnace structure to heat the contents of the units and thus effect the eduction of the various volatile hydrocarbons contained in the material being treated. Each of the separate retort units is provided with an outlet pipe 15 leading to an air-cooled condenser 16 and then to a water cooled condenser 17 of the usual type, in which the volatile vapors are reduced to the liquid state and then withdrawn to suitable storage receptacles.

Each of the separate retort units is connected at alternate ends to the underlying unit so that the oil-bearing substance is

caused to travel lengthwise of the unit and then discharged into the next lower unit and so on through the several units in alternate directions until the bottom and discharge end of the apparatus is reached.

The lowermost retort of the unit leads to a discharge or unloading device arranged at the bottom of the furnace structure. This discharge mechanism comprises an elongated compartment provided with a central inlet opening 18 and with an endless conveyor mechanism 19, driven by suitable mechanical means, not shown, and so controlled that the direction of its movement through the chamber may be varied at will. At the lower part of this compartment near the ends thereof I provide two valve-controlled outlet pipes 20 and 21, the lower ends of which extend into water tanks 22 and 23 respectively below the level of the water contained therein. Arranged in proximity to the lower open ends of the outlet pipes 20 and 21 I further provided a pair of endless conveyors 24 for removing the residuum of distillation from the tanks.

In the operation of this apparatus, the oil bearing material such as shale, peat, sand or the like is introduced into the uppermost retort unit at one end thereof and is caused to travel the length of the unit by suitable means to be hereinafter described. This first unit discharges its contents into the next lower unit where the same traversing movements of the oil-bearing material takes place. This movement continues throughout the entire apparatus, the material traveling lengthwise of each unit in alternate directions during the heating or cracking operation until the lowermost or discharge end of the apparatus is reached. The coke or other residuum of distillation is then deposited on the endless conveyor 19 and carried by said conveyor to either one of the discharge pipes 20 or 21. Assume, for the purpose of illustration, that the conveyor 19 is moving in a counter-clockwise direction and the valve in pipe 20 in open position, the residuum will then discharge into the tank 22. The immersion of the discharge pipes in the water provides an efficient water seal which will prevent any discharge of the gases of distillation at this point, or the entrance of air. The residuum then falls on the conveyor 24 which removes the same from the tank. In practice it is preferable to discharge first into one tank until the same is filled and then into the other while the first tank is being emptied. This is readily accomplished by reversing the direction of movement of the conveyor 19 and properly manipulating the valves in the discharge pipes 20 and 21.

Referring specifically to the individual retort units employed in the assembling of the apparatus above described, it will be noted that each of said units comprises elongated,

relatively narrow chambers 25, each provided with a cover plate 26, detachably secured to the body of the chamber by suitable fastening means. Each unit is provided with an inlet pipe 27^a and outlet pipe 27 arranged near the opposite ends thereof. Journaled at each end of the unit is a transverse drive shaft 28, one end of one of said shafts projecting through the side of the unit and being connected by means of suitable gearing or the like with a suitable source of power. Sprocket wheels 29 are keyed to the shafts near the ends thereof and the pairs of sprocket wheels at opposite ends of the unit are connected by sprocket chains the construction of which is to be hereinafter described. The interior of each unit contains two longitudinally vertical partitions 30 each slightly spaced from the side walls of the unit, so that separate compartments are provided at each side of the unit for completely housing the drive mechanism. Each of the partitions 30 are cut through to form a continuous slot or passage 31 thus making the middle portion 32 of the partition slightly spaced from the remainder of the partition. This central portion of the partition 32 is supported through the medium of suitable I-beams 33 secured to the outer walls of the unit as clearly shown in Fig. 2.

Connecting the two sprocket wheels 29 arranged within each compartment, is a suitable link drive chain 34 the detailed construction of which is clearly shown in Fig. 5. In order to provide free and easy movement of the sprocket chains the same are connected at spaced intervals to a two wheeled carriage 35 adapted to travel within the runway formed by the bosses 36 integral with the inner sides of the retort unit. Each carriage 35 has projecting inwardly therefrom a flight arm 37 which extends through the opening 31 in the partition and has secured thereto a scraper blade 38. This blade 38 is substantially rectangular and carries at its outer edge a strip 39 of manganese steel or other wear resisting material. It is thus obvious that upon the rotation of the sprocket 29, the chain will cause the scrapers 38 to traverse the entire length of the retort unit and thus convey the oil bearing material from the inlet end of the unit to the discharge end of the same.

As a means for preventing the oil-bearing material from entering the compartments containing the above-described drive mechanism, where its presence would tend to clog or gum the mechanism and thus render the apparatus inoperative, I provide an endless flexible guard member adapted to completely close the slot 31. The detailed construction of this guard device is clearly shown in Figures 3 and 6 of the drawings, from which it will be seen that the same comprises a laminated structure consisting

of a plurality of connected links. In the assembly of this guard device the outer links 40 and filler links 41 are slightly higher than the centrally disposed links thus forming substantially upper and lower grooves, the outer edges of which straddle the upper and lower edges of the slot 31 as clearly shown in Fig. 2, thus forming a complete seal for the slot 31. The flight arms 37 extend entirely through the guard members at spaced intervals and into the working chamber of the unit and movement of the scrapers causes the guard member to move with the same and thus continuously traverse the slot 31 during the operation of the unit as above described.

It is to be understood that the form of my invention herewith shown and described is to be taken as a preferred example of the same and that various changes in the shape, size and arrangement of parts may be resorted to without departing from the spirit of the invention or the scope of the subjoined claims.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:—

1. A retort unit for multi-chambered reduction furnaces, comprising an elongated relatively narrow chamber, vertically arranged partitions within said chamber, a series of scrapers arranged centrally of the unit between said partitions, drive mecha-

nism arranged between the partitions and outer side walls of the unit, arms extending through endless slots in said partitions for connecting the drive mechanism with the scrapers, and a guard member adapted to be moved with the scrapers along said endless slots to completely close the same.

2. A retort unit for multi-chambered reduction furnaces, comprising an elongated, relatively narrow chamber, scrapers adapted to traverse said unit, drive means for said scrapers, arms connecting said scrapers and drive means, a partition between the scrapers and drive means having an endless slot, therein, and an endless guard member comprising a plurality of connected links adapted to be moved along the slot to completely close the same.

3. A retort unit for multi-chambered reduction furnaces, comprising an elongated, relatively narrow chamber; scrapers adapted to traverse said chamber; drive means for said scrapers; arms connecting said scrapers and drive means; a partition between the scrapers and drive means having an endless slot therein; and a flexible guard member comprising a plurality of connected links slightly spaced from each other and filler links arranged between the said links, to completely seal the slot in the said partition.

In testimony whereof I hereunto affix my signature.

PHILIP T. ALEXANDER.