Oct. 30, 1956 H. D. DE VRIES 2,768,943

FURNACE FOR CONTINUOUSLY DISTILLING BITUMINOUS COAL

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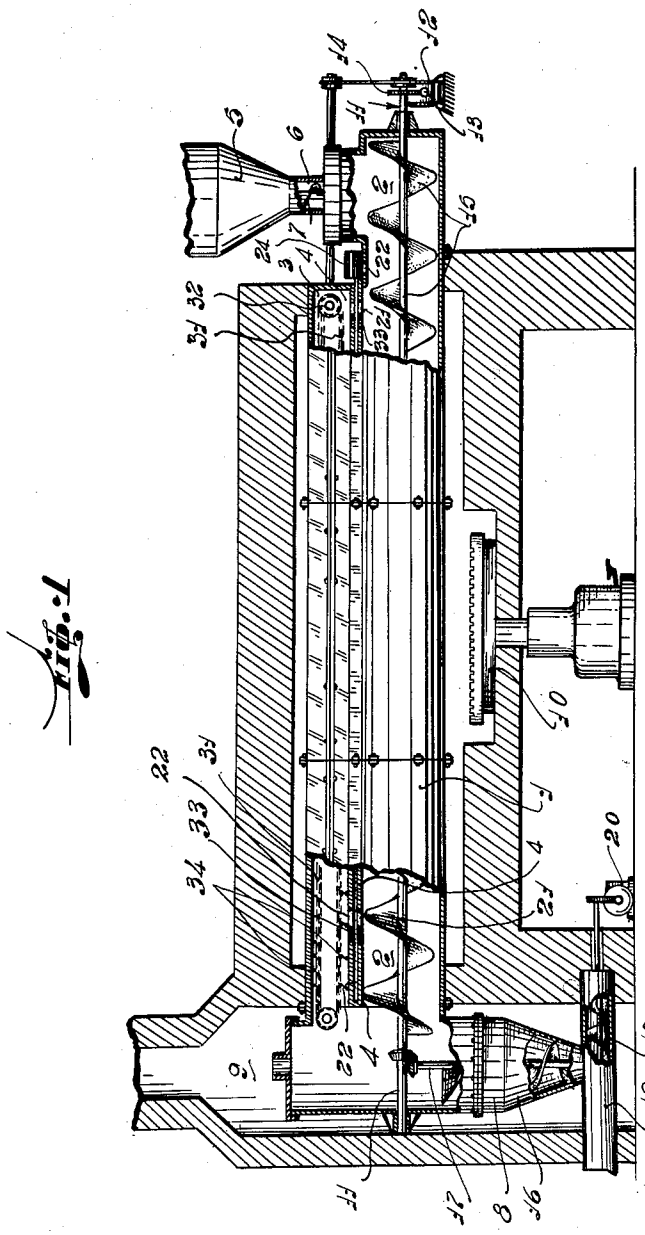


Fig. 1

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Fig. 2

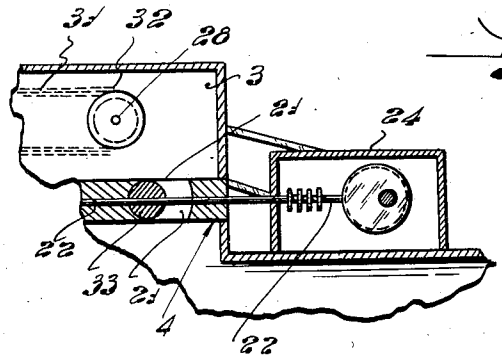
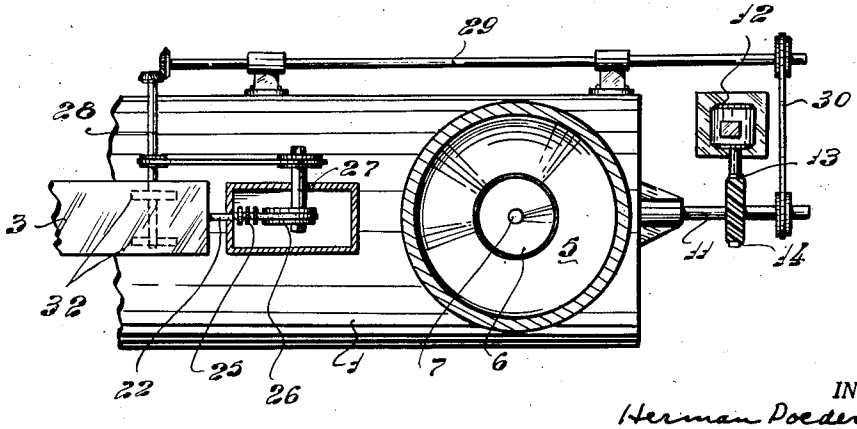


Fig. 3



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FURNACE FOR CONTINUOUSLY DISTILLING BITUMINOUS COAL

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7 Claims. (Cl. 202—118)

The use of soft mineral coal of the bituminous type, such as asphaltite, raphaelite, etc. has always involved problems of a technical nature, derived from either the low melting point or the expansion during the heating thereof.

Therefore, the use of these products as generators of combustible and distillable gases and of different cokes, which are two of the most important applications of mineral coal was only made in case of necessity and never with bituminous coal alone but in mixtures wherein the bituminous amounted to not more than 20%.

From an economical standpoint it would be most advantageous to use a coal which is not even acceptable as such, since due to its low softening point it will clog the grids.

Many attempts have been made to coke these products, and obtain the benefit of their distillable tars and the excess of gas produced, but the equipment usually employed for coal and also different static equipments, were not found useful.

This invention relates to a dynamic furnace for distilling asphaltites and soft bituminous coal in general, which comprises a pair of superposed tubular chambers the lower one of which acts as a furnace proper, whereas the upper chamber acts both as a gas collector tube and asphaltite expansion chamber, in case the asphaltite should swell excessively.

In the furnace of this invention the material to be distilled, i. e. the bituminous coal, does not fill the entire volume of the furnace nor is it static. The volume occupied by the material is only a very small fraction of the total volume. The material is moved slowly to the heated zone and finally proceeds at the same speed to the discharge end, after having been subjected to the effects of the heat.

The bitumen is thus converted into a fairly friable porous solid mass, into vapors which are condensed thereby constituting a tar from which various aliphatic hydrocarbon fractions are recovered, and into combustible gases of high heating power, about 7,000 to 8,000 calories per $m.^3$, a portion of which can be used for running the system, the rest remaining available for use as fuel.

In order that the invention may be more clearly understood and readily carried out, a preferred embodiment thereof has been illustrated by way of example in the accompanying drawings, wherein:

Fig. 1 is an elevation, partly in section, of a furnace embodying the invention.

Fig. 2 is an elevation and Fig. 3 a plan view showing details of the furnace illustrated in Fig. 1.

The same reference characters are used to indicate like or corresponding parts throughout the drawings.

The furnace comprises a body 1 enclosing a lower chamber 2 and an upper chamber 3 separated by an intermediate wall 4. The lower chamber 2 is longer than the upper chamber 3. At one end, the chamber 2 communicates with a hopper 5 through a relatively narrow tube 6 housing therein a screw conveyor.

The other end of the furnace is provided with a tubular zone 8 for the discharge of the solid materials and a large chamber from which a tube 9 extends for collecting the gases and condensable vapors produced.

The furnace is heated externally and the heating system is not dependent thereon, and consequently forms no part of this invention, although it has been schematically shown in Fig. 1 and indicated with the reference numeral 10.

The axis of chamber 2 is occupied by a drive shaft 11 actuated from one of the ends thereof and from the outside of the furnace by means of a motor 12 and an endless screw 13 meshing with a pinion 14. This shaft supports a screw conveyor 15 throughout the length of the furnace.

At the opposite end of the furnace and axially within the tubular zone 8 which extends into a frusto-conical zone 16, there is provided a shaft 17 actuated by said shaft 11 and supporting a screw conveyor. Finally, the smaller end of the frusto-conical portion 16 is connected with a cylinder 18 housing a screw conveyor 19 actuated through a motor 20.

The chamber 3, which is smaller than the chamber 2 and superposed thereto, is separated therefrom by the wall 4. This wall 4 is not continuous but leaves rectangular spaces 21 with the major axes longitudinally of the chamber. In the center of the wall 4 and throughout the length thereof, there is provided a tubular orifice housing a rod 22 traversing the spaces 21. In such spaces the rod 22 has pieces 33 of various shapes, such as spherical, parallelepipedal, etc., fixed thereto and occupying all of the cross-sectional area of said spaces 21.

One end of the rod 22 projects outside of the furnace and enters a box 24 housing the actuating mechanism.

The mechanism for actuating the rod 22 may be of a type capable of causing the reciprocating motion thereof. As shown, the mechanism comprises a spring 25 and an eccentric 26 the spindle 27 of which is actuated from a further spindle 28 driven in turn by the drive shaft 11 through a transmission 29—30.

The upper chamber 3 houses therein a pair of chains 31 driven by respective sprocket wheels 32, the latter being in turn driven by the spindle 28.

Said chains 31 support scraper members 34 having any suitable shape and being pressed against the chamber walls so as to perform the function assigned thereto.

The chambers 2 and 3 open into the chamber from which the gas and vapor collecting tube 9 extends.

In operation, the suitably ground bituminous material is charged into the hopper 5 while at the same time the entire moving system of the equipment is started. The screw conveyor 7 will move the material towards the chamber 2, performing two functions, viz; that of continuously charging the furnace, and, due to the presence of the bituminous material to a slight compressing action, that of closing said opening with respect to the air or, in other words, the screw conveyor 7 will act as a selector valve allowing the passage of solid material but preventing the passage of gases, whether air into the furnace or distillates outwardly therefrom.

As soon as the bitumen enters the chamber 2 it will be driven smoothly by the screw conveyor 15 towards the other end of the furnace, passing same through the central zone coinciding with the hottest zone. The material will swell a short time after it starts to become heated and at about one half of its travel will have its maximum volume, which may be up to 25 times larger than the original volume. The evolved gases will occupy a considerable volume and might recede and exert pressure on the material inlet or even escape through the hopper

tube 6, since in the central zone the swollen material will have become softish, sticky and bubbling. The gases will not recede due to the fact that they will at all times find their way clear to the gas chamber 3. In effect, the gas will pass to the chamber 3 through the rectangular openings 21 communicating both chambers, and from said chamber 3 the gas will flow to the large chamber preceding the collector tube 9 through which it will pass to the condensers and finally the non-condensable gases will pass to a gasholder. Neither the condensers or the gasholder form part of this invention and therefore are not shown in the drawings.

In passing to the chamber 3, the gases will carry solids materials which will soon adhere to all the surfaces, and also in some cases the treated bitumen could swell enough to reach past a portion of the gas tube. This would help to dirty the equipment and hinder the free movement of the gases, which is avoided by the means described above. In effect, the bodies 33 inserted and moved by the rod 22 will keep the spaces 21 clean. In turn, the walls of the chamber 3 are kept clean by the scraper members 34 which on being moved will carry the material to the gas-tube end, from where it will fall into the tubular discharge zone 8.

The solid materials will continue to move slowly and will leave the central zone towards the other end, always moved by the screw conveyor 15, until they also fall into the discharge tubular zone 8. In said zone, the cooperating action of the frusto-conical portion 16 and the screw conveyor mounted on the shaft 17 will compress the carbonous residue, a semi-coke, which will be taken by a further screw conveyor 19 in tube 18. The frusto-conical shape of the portion 16, the shape and screw conveyor effect of the shaft 17 and the screw conveyor 19 will cause the semi-coke to close the way to the gases, whereby the furnace, while being a continuous charging and discharging furnace, will at all times be closed to the air.

It is evident that in carrying out the invention, many changes will occur to those skilled in the art without departing from the scope of the invention as clearly set forth in the appended claims.

I claim:

1. A furnace for the continuous distillation of bituminous coal which tends to swell greatly when heated comprising two horizontally disposed parallel superposed tubes having a common wall therebetween, said common wall being formed with a plurality of apertures spaced along the length thereof, means movable within said apertures for maintaining said apertures in unobstructed condition, means to supply bituminous coal to one end of the lower of said superposed tubes, means to convey said bituminous coal through said lower tube, means to heat said tubes, gas discharge means in communication with the upper of said superposed tubes and discharge means for solids communicating with the discharge end of said lower tube.

2. A furnace as recited in claim 1 in which a screw conveyor is employed to convey said bituminous coal through said lower tube.

3. A furnace as recited in claim 2 in which means are provided to continuously scrape the walls of said upper tube and transport the scrapings to said discharge means for solids.

4. A furnace as recited in claim 3 in which said scraping means comprises sprocket wheels mounted at each end of said upper tube and chains journaled about said wheels and carrying scraper members.

5. A furnace as recited in claim 1 in which a rod extends through a tube disposed lengthwise within said common wall, said rod traversing said apertures and a plurality of members mounted on said rod within said apertures.

6. A furnace as recited in claim 5 in which means are provided to axially reciprocate said rod.

7. A furnace as recited in claim 1 in which the discharge ends of said superposed tubes open into a common chamber, said chamber being provided with means at the lower portion thereof for discharging the semi-coke formed and being provided at its upper portion with at least one outlet tube for gas and vapor.

References Cited in the file of this patent

UNITED STATES PATENTS

556,065	Pierce	Mar. 10, 1896
1,461,614	Harrison	July 10, 1923
1,490,213	Jenson	Apr. 15, 1924
1,510,045	Day	Sept. 30, 1924
1,547,027	Cantieny	July 21, 1925
1,730,570	Greene et al.	Oct. 8, 1929
1,884,379	Tenney	Oct. 25, 1932
2,265,857	Reynoldson	Dec. 9, 1941