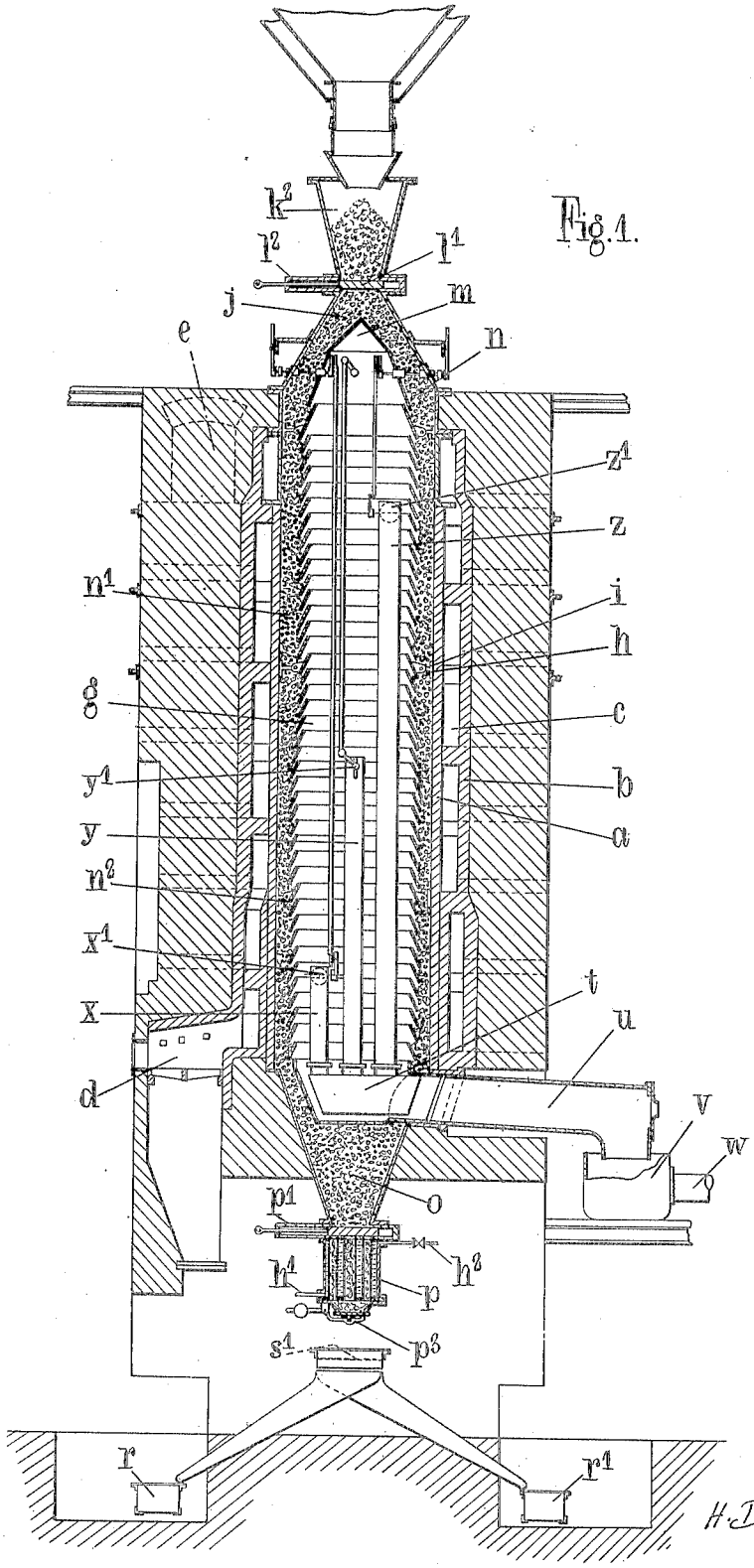
May 14, 1929. H. DEBAUCHE 1,713,032

APPARATUS FOR USE IN DRYING AND DISTILLING LIGNITE, PEAT, NONCOKING COALS, AND OTHER SIMILAR CARBONACEOUS MATTER

Filed July 6, 1927 2 Sheets-Sheet 1

Fig. 1.



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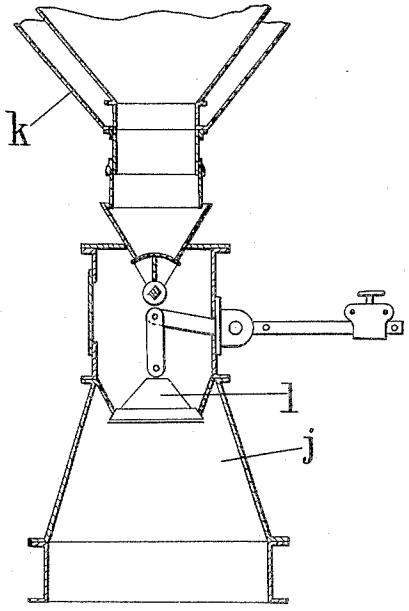


Fig. 2.

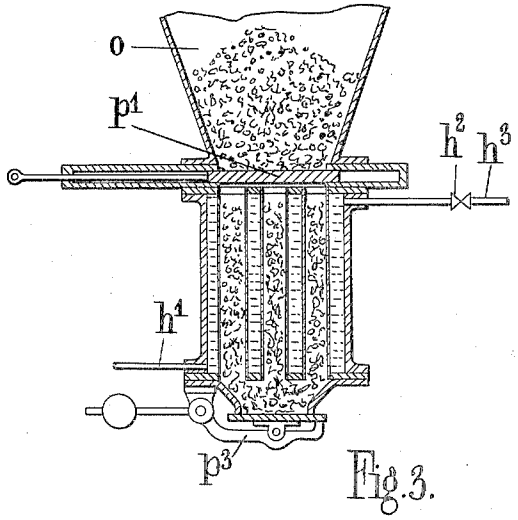


Fig. 3.

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UNITED STATES PATENT OFFICE.

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APPARATUS FOR USE IN DRYING AND DISTILLING LIGNITE, PEAT, NONCOKING COALS, AND OTHER SIMILAR CARBONACEOUS MATTER.

Application filed July 6, 1927, Serial No. 203,861, and in Great Britain July 20, 1926.

This invention relates to apparatus for drying and distilling lignite, peat, noncoking coals or similar other carbonaceous matter.

The object of the invention is to provide an apparatus for continuous operation without applying any mechanically driven devices, to obtain a good heat economy, and a high output in relation to the area of the heated retort surface, and to prevent at the same time a decomposition of the tar vapours formed, and their contamination by dust.

Cylindrical retorts made of cast iron or of refractory material to be charged at the top, and discharged from the lower end, have been known for many years.

To spread the charge evenly in a comparatively thin layer around the internal cylinder surface, collars or rings made of cast iron, steel plate, or refractory material, are placed in the centre of the retort cylinder in such a manner that the space between the collars and the cylinder wall is occupied by the lignite, and the gases and vapours issuing from the charge pass between the collars into the central space within the collars and collect there; they are withdrawn, either from the bottom or from the top or from both ends together.

The apparatus as outlined above has many disadvantages and it is for the purpose of obviating them that the present invention has been designed according to the following specifications and illustrated by the drawings annexed.

It is well known that lignite and other fuels of recent geological ages having a high content of oxygen, require a great amount of heat to evaporate the combined water and carbon dioxide and to reach the distillation temperature required. Once such temperature is reached, at which the decomposition of the bituminous matter begins, the tars are formed through the exothermic action, that is to say, at that point the charge does not absorb further heat, but heat is liberated.

To reach this temperature evenly all over the section of the lignite charge, the thickness of the charge must not exceed 2 inches. On the other hand it has been proved by practice that it is difficult to dry a charge of only 2 inches of thickness, in the relatively cooler upper part of the retort cylinder, owing to the particles, when only partially dried, not sliding down evenly between the collars and the cylinder wall with the result that the charge sticks in the oven, and disturbs its regular working.

The conclusion is therefore reached that the charge in the upper part of the retort or drying zone, must have a greater thickness, compared with the lower part or distilling zone.

Should the retort be made in cast iron, this could be obtained by giving the walls of the retort a certain taper, but the retort is built of specially shaped, grooved and tongued fire bricks, and such retort must be vertical and cylindrical to ensure the necessary strength of the cylinder, and taper walls could not secure this.

Consequently the charge has hitherto been of the same thickness in retort cylinders of brickwork.

By the present invention a varied thickness of the fuel charge, depending upon the nature of the lignite or other material to be treated, can be provided in the retorts which are built of fire bricks and perfectly cylindrical.

The variation in the thickness of the charge is obtained by varying the diameter of the collars or rings forming the internal chamber.

The invention will now be described with reference to the accompanying drawing, in which:—

Figure 1 is a vertical section through an oven constructed according to the invention.

Figure 2 is a sectional elevation of a modified form of admission valve at the top of the oven, and

Figure 3 is a sectional elevation of the outlet at the bottom of the oven.

The brick retort cylinder *a* is surrounded by a second cylinder *b*, the space *c* between both cylinders forming the flues through which pass the hot combustion gases for heating the oven, coming from the ordinary furnace *d* or from gas burners, using the irreducible gas from the distillation.

The gases leave the upper flue of the oven passing through the chimney flues *e*.

Inside the inner brick cylinder *a* is a third cylinder formed by a series of iron collars or rings placed above each other.

These collars are tapered so as to allow the passage of the vapour or gas from the charge, between the annular collars.

The vapours and gases collect in the inner chamber or space g within the series of collars from which space they are withdrawn by a system of appropriate pipes set at different levels.

To impart a certain rigidity to the collars arranged in columns as described, one on top of the other, several collars h are provided in three or four places with projections i which are arranged on the circle and touch the surface of the cylinder and are thus prevented from falling or leaning to either side.

With a view to avoiding the entrance of air, inside the oven which would burn a part of tar gas and vapours, the oven is closed at the top as hermetically as possible.

The drawing shows two different forms of closing; that which is represented in Figure 1 includes a register l' which is opened every time the semi-coke is discharged at the bottom. This register being opened, the lignite or other material contained in the hopper k^2, falls into the hopper j where it makes up the void caused by the discharge of the semi-coke.

The register l' is afterwards closed to prevent the admission of air.

Inside the hopper j is situated a lid m of a conical form which closes the upper end of the hollow interior of the column and divides the lignite or other material within the annular space n.

As indicated on the drawing, the register l' works in the closed box l^2 and is absolutely air-tight, from which passes out only the actuating rod.

The mode of closing shown in Figure 2 is similar to those used in gas producers, and the lignite or similar matter is fed from the over head storage hopper k into the oven top j by means of the bell valve l.

One important point of this invention is the provision of collars with a larger diameter in the lower half of the retort cylinder or the like and with a smaller diameter in the upper half. In the accompanying drawing for instance the charging space n' in the upper half of the retort may be 4 inches wide, while the space n^2 in the lower half may be only 2 inches wide; the exact width of the annular charging spaces n', n^2 depends on the physical conditions and nature of the fuel treated.

The respective height of the zones n' and n^2 to each other, depends upon the chemical behaviour of the lignite or similar fuel treated, and if for representation on the drawing, the spaces n' and n^2 of different width, each form one half the height of the retort cylinder, in reality these proportions must vary and have to be ascertained by preliminary tests.

The lignite or similar material once freed of tar passes down to the tapered bottom piece o, and is withdrawn through the cooling box p or any other device and falls through the door or flap-valve p^3 into a convenient screen s' for the grading of the material and finally the two classes of material obtained are transported by conveyors r and r' one to an agglomeration plant, the other to storage and sale.

The cooling box p consists in a box provided with a set of pipes of very thin metal, into which the hot semi-coke falls when the slide p' is drawn. The slide itself is contained in a closed box fixed between the tapered bottom part of the retort and the cooling box and no air can be drawn into the oven through its operating movements.

The cooling is done by a circulating stream of water and semi-coke is brought from 400–450° C. temperature to about 50°–200° C. as may be required for the subsequent operations.

The cold water is admitted to the cooling box by means of a pipe h' and the hot water passes out by pipe h^2 on which is fitted a regulating valve h^3, allowing of the increase or reduction, as desired, of the volume of water passing through the cooling apparatus and consequently allowing a regulation of the temperature of the semi-coke.

The discharge of the cooling box takes place by means of a bottom outlet closed by a well fitting balanced flap-valve p^3, kept in position by a proper balance weight. The cooling box is characterised by the arrangement of enclosed slide or gate valve for introducing the semi-coke, and the flap-valve at the bottom discharge, by which arrangement it is impossible to introduce air into the oven when operating.

The cooling effected by circulating water through the very thin piping is very effective.

The semi-coke withdrawn from the cooling box, and being at the required temperature passes over a screen s' giving two classes 0 to 5 m/m, and 5 m/m and over.

The 5 and over grade constitutes a ready commercial fuel which is carried at once to storage and sale. The aggregate which is below 5 m/m in size, say 0–5, is carried away for further treatment and finally transformed into briquettes and ovoids.

The multi-ring cylinder within the retort rests on a tapered bottom member o open at both ends and in this is placed a pipe t having a number of brakes rising up therefrom. The pipe t extends at one end into the suction pipe u connected to the gas collecting main v and suction main w leading to the cooling and condensing plant and the exhauster fan.

As shown in the drawing, the circular gas collecting space inside the collars or rings,

is divided into three zones, and in the lowest zone the gas developed is withdrawn by the vertical pipe x, from the middle zone by the pipe y, and from the upper zone by the largest pipe z.

The number of stand pipes in the casting t and consequently the number of zones thus provided may be varied to meet the requirements of the particular fuel treated.

One particular feature of this invention is that for the purpose of well regulating the extraction of the gases, and to prevent them travelling uselessly about the retort and to improve the efficiency of the above-mentioned standing extraction pipes, the latter are provided respectively with a butterfly valve x', y' or z' so as to regulate at will, from the outside, the amount of gas extracted from each respective pipe at each respective zone.

In this way, the gases are withdrawn almost as soon as they are formed and removed without any possible contamination by dust.

The oven is operated continuously, that is to say, when an amount of coke is being withdrawn at the bottom a corresponding amount of raw lignite or similar material is charged in at the top.

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

1. Apparatus for drying and distilling lignite, peat, non-coking coals and other similar carbonaceous matter, comprising a cylindrical retort chamber built vertically from fire brick, an external heating chamber surrounding the retort, a concentric multi-conical ring element within and spaced from the retort wall, said element being of two diameters so as to provide between the retort wall and the said element an upper annular space of greater width for drying the carbonaceous matter, a lower annular space of smaller width for carbonizing the fuel, and means for drawing off the distilled vapors from the retort.

2. Apparatus for drying and distilling lignite, peat, non-coking coals and other similar carbonaceous matter, comprising a cylindrical retort chamber built vertically from fire brick, an external heating chamber surrounding the retort, a register closure at the top of said retort chamber to prevent admission of air while charging; a concentric multi-conical ring element within and spaced from the retort wall, said element being of two diameters so as to provide between the retort wall and the said element an upper annular space of greater width for drying the carbonaceous matter, a lower annular space of smaller width for carbonizing the fuel, and means for drawing off the distilled vapors from the retort.

3. Apparatus for drying and distilling lignite, peat, non-coking coals and other similar carbonaceous matter, comprising a cylindrical retort chamber built vertially from fire brick, an external heating chamber surrounding the retort, a concentric multi-conical ring element within and spaced from the retort wall, said element being of two diameters so as to provide between the retort wall and the said element an upper annular space of greater width for drying the carbonaceous matter, and a lower annular space of smaller width for carbonizing the fuel, and a plurality of pipes arranged within the multi-conical ring element at different heights for drawing off the gaseous products; said pipes being provided with valved tops and connected at their lower extremities with a main collecting pipe.

4. Apparatus for drying and distilling lignite, peat, non-coking coals and other similar carbonaceous matter, comprising a cylindrical retort chamber built vertially from fire brick, an external heating chamber surrounding the retort, a concentric multi-conical ring element within and spaced from the retort wall, said element being of two diameters so as to provide between the retort wall and the said element an upper annular space of greater width for drying the carbonaceous matter, and a lower annular space of smaller width for carbonizing the fuel, means for drawing off the distilled vapors from the retort, a register closure at the bottom of the retort and a balanced flap valve co-operating therewith to prevent admission of air during discharge and cooling of the coke.

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

HUBERT DEBAUCHE.