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DISTILLATION RETORT

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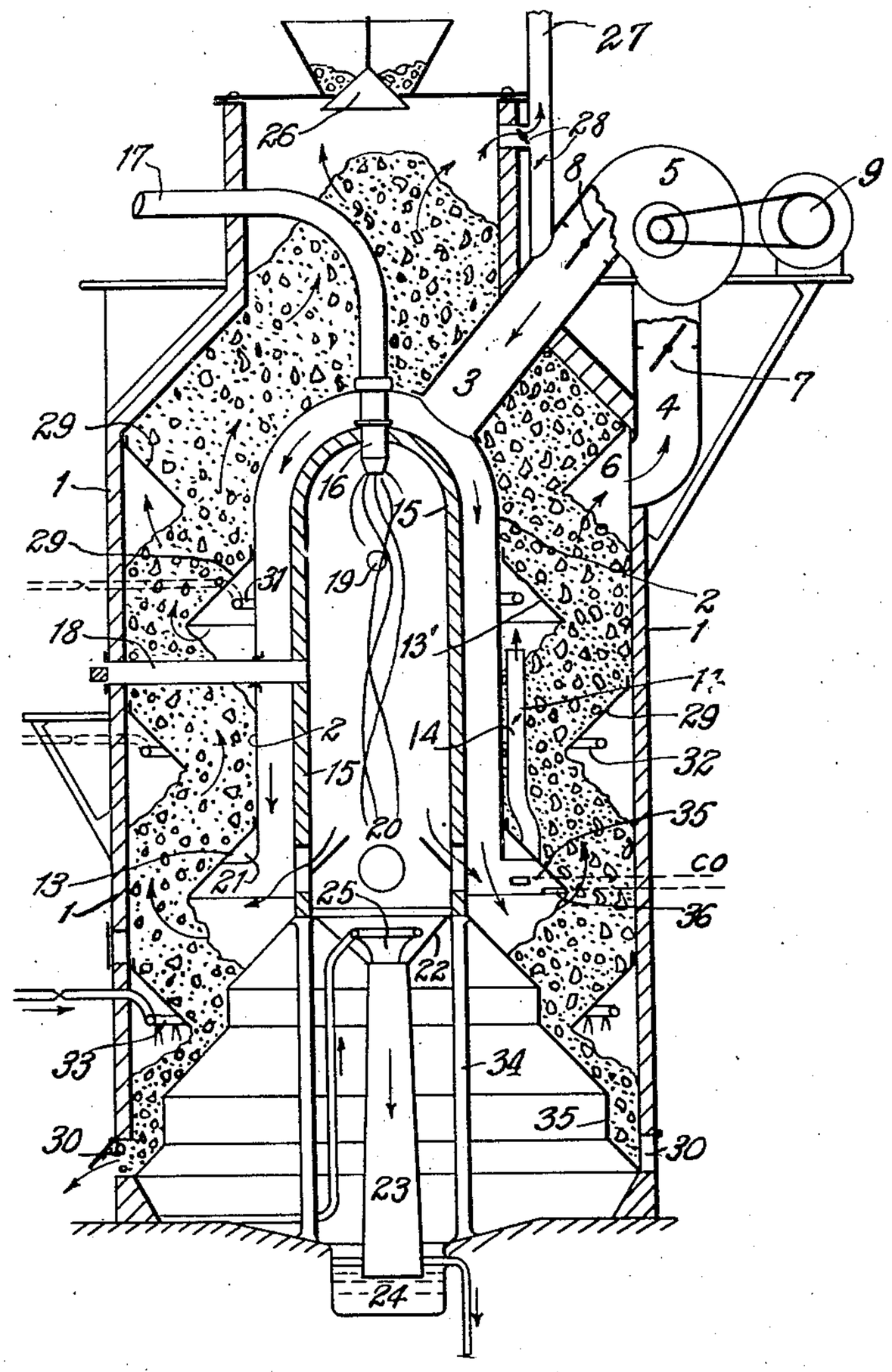

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DISTILLATION RETORT

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This invention relates to a retort for destructively distilling solid carbonaceous fuel without the formation of gaseous or liquid distillation products and consists essentially in exposing the fuel, in the absence of air and at a temperature which is higher than that required for the drying of the fuel, to the action of reducing gases obtained by the incomplete combustion of fuel dust.

Experiments have shown that on being exposed in this manner to the action of reducing gases at a temperature which depends on the particular nature of the fuel under treatment and which may amount to about 500° C., the natural fuel will, in addition to being dried, undergo a substantial change in respect of its carbon contents. This applies particularly to ligneous fuel which, owing to its contents of moisture and oxygen, is thermically and technologically of low value. A similar change in the carbon constituents takes place when the fuel is merely heated, but in this case losses are incurred owing to self-oxidation. The process according to the present invention can be carried out without substantial loss of carbon constituents. Tar and oil products will in some instances be produced but can be limited to very small quantities by careful timing of the carbonizing process in accordance with the nature of the fuel. The timing is experimentally determined. Self-oxidation cannot take place so long as the process is carried out in the absence of air.

Fuel treated according to the invention will be free from volatile non-combustible substances but will, on the contrary, contain a considerable amount of volatile combustible constituents, the heating value of the fuel being thus greatly enhanced.

In order to carry out the process in an economic and industrially practical manner, it is advisable to produce the reducing gas by the incomplete combustion of fuel dust obtained as waste from previously treated fuel. Thus a useful employment will be found for the waste which is produced in considerable quantities in mining operations and which has hitherto been looked upon as useless owing to its large admixture of ashes.

It is advisable to pass the reducing gas in counter-current through the stream of materials so as to give traces of oil carried away with the gas an opportunity to precipitate in the colder regions of the wet fuel.

For the successful carrying out of the process, plants may be used which comprise one or more fuel shafts and one or more combustion chambers wherein the incomplete combustion of the fuel dust takes place, automatic temperature regulation being provided for.

An effective plant capable of meeting all requirements is illustrated in the accompanying drawing which represents a diagrammatic view in elevation with parts in section of the plant.

The fuel such as lignite to be treated is fed continuously downwards through a shaft 1 fitted with staggered, downwardly-inclined baffles 29. An elevator, not shown, feeds the fuel into the upper part of the shaft through a hopper fitted with a valve 26. A vertically elongated combustion chamber 15, which in the construction shown in Fig. 1, is situated centrally within the shaft 1, is surrounded by a bell 2 which is spaced from the chamber. A pipe 3 connects the upper part of the bell 2 with the pressure side of a blower 5 operated by a motor 9. The suction side of the blower is connected through a pipe 4 with the upper part of the shaft 1. A pipe 17 supplies air and fuel dust to a burner 16 situated inside the combustion chamber wherein the dust is subjected to an incomplete combustion, the object being to produce as much CO gas as possible. The combustion chamber is accessible from outside the shaft 1 through pipes 18 and 19. The ignition of the dust is effected through the latter pipes. Discharge apertures 20 for the combustion gases are provided at the lower end of the combustion chamber opposite a conical fuel baffle 13 supported on a flange 21 at the lower end of the bell 2. There are adjustable outlets 30 at the lower part of the shaft through which the treated fuel, in the form of coke, is automatically discharged more or less rapidly according to the required prolongation of the process.

While the fuel passes downwards through

the shaft 1 it will be swept by gases which are kept in circulation by means of the blower 5. The gases pass upwards through the fuel towards the inlet 6 of the pipe 4 and are fed by the blower through the pipe 3 into the bell 2 wherein they sweep downwards along the outside of the combustion chamber. At the lower end of the latter the gases are mixed with fresh gases, including carbon monoxide, issuing from the discharge apertures 20 in the combustion chamber whereupon they will be fed from under the baffle 13 into the fuel for renewed circulation. The baffle 13 effects a uniform distribution of the gases all round the shaft.

The circulation may be regulated either by varying the speed of the motor 9 or by the adjustment of throttle valves 7 and 8 situated in the pipes 4 and 3 respectively. Since the velocity of the gases affects the working temperature, the latter may be regulated automatically by a thermostatic device 36 which controls the speed of the motor 9. The air and fuel supply through the pipe 17 may also be automatically regulated by means of a device 35 arranged so as to be affected by the gases. By this arrangement the supply of gases will remain constant.

One or more pipes 14, fitted with regulating valves, may be arranged so as to feed gas mixture beneath a baffle 13′ direct into the upper, colder regions of the shaft 1.

The gases are maintained at such a pressure that no air can enter the shaft through the discharge apertures 30. In order to prevent the ignition of the fuel in case of accidental admission of air, pipes 31, 32, and 33, through which water sprays can be produced, are arranged at different elevations inside the shaft 1. The spray 33 may be used for cooling the fuel before it is discharged from the shaft.

The ashes from the combustion chamber 15 are discharged through a funnel 22 and through a pipe 23 which opens into a water seal 24. The funnel may contain a water spray 25 for washing down the ashes. The pipe 23 and funnel 22 form a tight joint with the combustion chamber, and the water seal will therefore tend to maintain a uniform pressure within the combustion chamber.

A gas outlet pipe 27 is provided which communicates with the pipe 3 as well as with the upper part of the shaft 1, the discharge being regulated by means of throttle valves 28.

In the case of large plants several blowers 5 may be provided.

The fuel is sifted after the treatment, and the ash-containing dust obtained in the sifting process may be used for feeding the burner 16.

The combustion chamber 15 is supported on legs 34 situated in a space which is divided off from the fuel shaft by means of a bell-shaped casing 35.

I claim:

1. An apparatus for destructively distilling solid carbonizable fuel by treatment with CO gas, comprising a vertical shaft, means for feeding the fuel downwards through said shaft, a vertically elongated combustion chamber, means for feeding fuel dust and air into said combustion chamber through the top thereof, a bell surrounding said combustion chamber and spaced therefrom, said shaft, said bell and said combustion chamber being in communication with one another at the lower parts thereof, a gas offtake for said shaft communicating therewith at the upper part thereof, a blower communicating at the suction side thereof with the upper part of the shaft and at the pressure side thereof with the upper part of the bell, and means for regulating the flow of gas through said blower.

2. An apparatus as claimed in claim 1, wherein the combustion chamber and the surrounding bell are situated in the centre of the fuel shaft.

3. The structure claimed in claim 1, in combination with means for water sealing the combustion chamber below its communication with the bell.

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