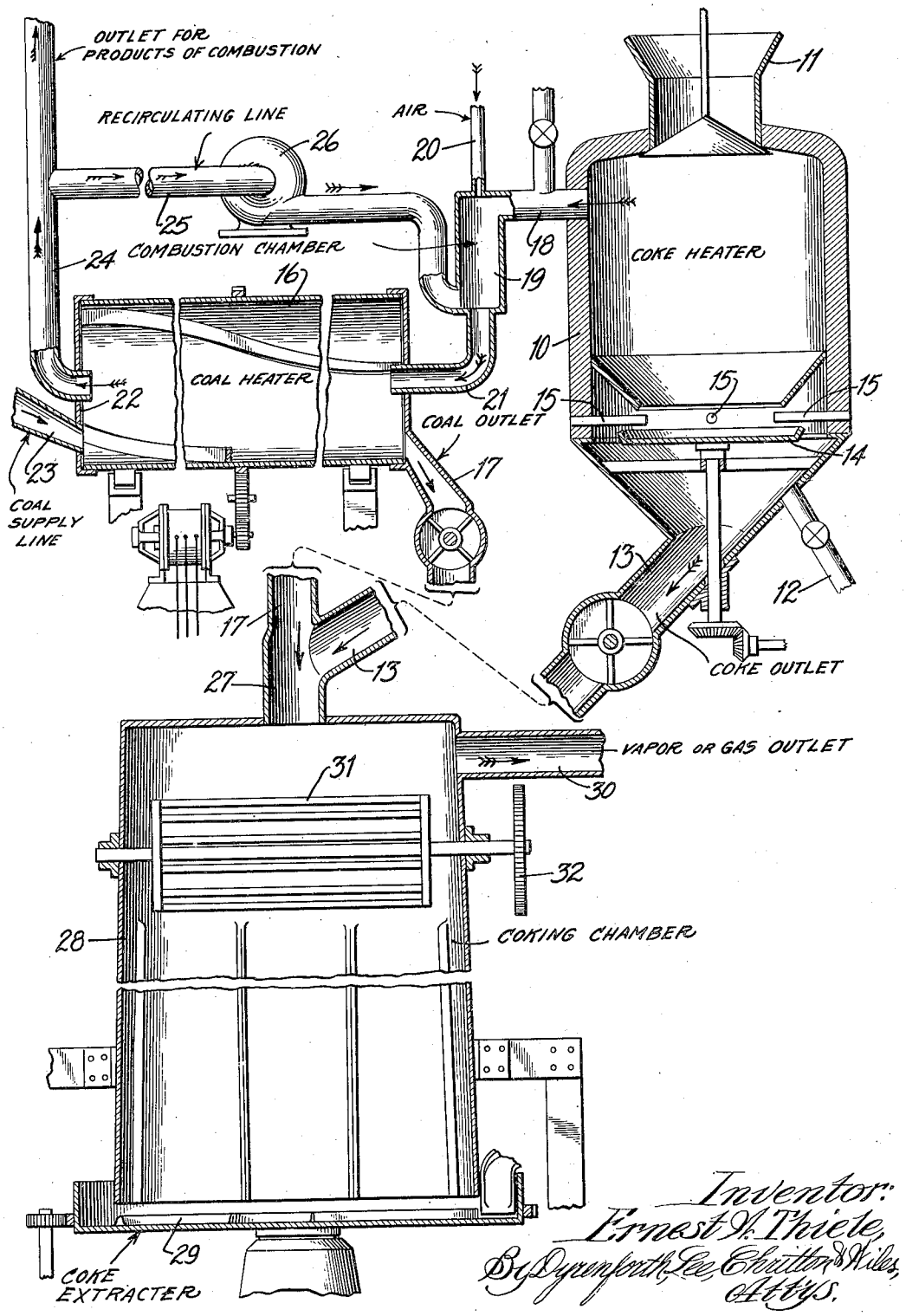
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METHOD OF COKING COAL

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Inventor:
Ernest W. Thiele,
By Dyrenforth, Lee, Chritton & Wiles,
Attys.

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ERNEST W. THIELE, OF CHICAGO, ILLINOIS, ASSIGNOR TO STANDARD OIL COMPANY, OF WHITING, INDIANA, A CORPORATION OF INDIANA

METHOD OF COKING COAL

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This invention relates to the carbonization of coal and particularly to low temperature carbonization thereof.

The invention will be readily understood from the following description in conjunction with the accompanying drawing which shows diagrammatically and in elevation with parts in section a suitable apparatus in which the carbonization may be carried out.

Referring to the drawing, 10 represents a heater for coke which may suitably be constituted by a relatively large chamber provided at its top with a valved loading hopper 11 and at its bottom with suitable air supply means 12. From the base of the heater 10 leads an outlet conduit 13 for the heated coke. The heater 10 is provided near its bottom with suitable mechanical means for causing the coke to move into the conduit 13. This mechanical means may suitably be a rotatable bottom 14 which cooperates with stationary members 15 so as to supply highly heated coke to the conduit 13.

A coal heater 16, which may suitably be constituted by an elongated revolving drum of the revolving kiln type, is located in juxtaposition to the coke discharge conduit 13. The discharge end of said drum leads into a conduit 17.

From an upper point of the heater 10 a conduit 18 leads to a combustion chamber 19, which is provided with a conduit 20 for supplying air to effect the combustion of combustible gases therein. From the combustion chamber 19 a conduit 21 leads into the coal-discharge end of the heater 16 so as to supply the hot gaseous products of combustion thereto for the purpose of preheating coal therein.

The coal-supply end of the coal heater 16 is provided with a stationary end closure 22, into which connects a conduit 23 for supplying coal to the heater 16 and a conduit 24 for conducting the outgoing products of combustion to a suitable stack, not shown. A by-pass 25 provided with a fan 26 may be provided between conduit 24 and combustion chamber 19 so that a certain amount of the flue gases can be recirculated through the coal heater 16, as desired.

The hot coke conduit 13 and the hot coal conduit 17 lead into an enlarged conduit 27 which conducts the mixed coal and coke into a coking chamber 28 which is preferably a downwardly flaring conical retort provided at its base with a rotating spiral coke extractor 29 of a known type. From the upper part of the retort 28 an outlet 30 leads to suitable tar condensing and gas purifying apparatus (not shown). If desired, a suitable distributor 31 may be provided in the upper part of the retort. Such distributor may suitably comprise a cage formed of bars and adapted to be actuated by a pulley 32 located on the outside of the retort.

The method of operation is as follows. Freshly crushed coal is supplied by conduit 23 to the coal heater 16 which is rotated during the operation so as to thoroughly expose the coal to the effect of the hot gases and raise its temperature as high as possible without losing heating value, for example, to a temperature of about 675° F. Similarly crushed coke, which may be part of the coke produced in the process or which may be from any other source is placed in the coke heater 10 and subjected to partial combustion therein, air being admitted by inlet 12, so that it is raised to a high temperature, for example, about 2000° F. Coke at this temperature is fed to the hot coke conduit 13 at the rate of about half the coal supply to the hot coal conduit 17. The hot coal and hot coke pass into the retort 28 and are thoroughly mixed one with the other by the distributor 31 which spreads the mixture uniformly therein. In this way the mixture attains a temperature of about 1100° F. which is sufficient for low temperature carbonization in the course of a few moments. When the retort 28 becomes filled to a suitable degree the coke extractor 29 is operated continuously so as to maintain the level of coke in the retort 28 substantially constant. The gas and other volatile matters produced during the coking pass off by conduit 30 and are treated in the usual manner which need not be described here.

The gases resulting from the partial combustion effected in the heater 10 contain sub-

stantial quantities of carbon monoxide and in this respect are similar to producer gases. The gases pass into the chamber 19 where they undergo combustion with the aid of air introduced by pipe 20. The products of this combustion pass by conduit 21 into coal heater 16 and preheat the coal in the manner already described. By regulating the fan 26 a certain proportion of the combustion products can be recirculated from conduit 21 through the coal heater for the purpose of preventing the coal from attaining a temperature therein which would cause loss of heating value.

It must be understood that the temperature and the relative proportions of coke and coal specified herein are stated by way of example only and the invention is not intended to be limited thereto, since it is obvious that these conditions can be altered within wide limits for the attainment of a mixture of coke and coal in the retort 28, which will insure the coking or carbonization of the coal therein. About 5 or 6% of the coal is consumed in conducting the operation.

It will thus be understood that the coking operation can be conducted in a continuous manner and it is further pointed out that the admixture of coke prevents to a great extent the tendency of the coke which is being produced from adhering to the walls of the retort 28.

Since no exterior heating is employed it is preferred to insulate the whole apparatus to prevent loss of heat.

Although the present invention has been described in connection with the details of a specific apparatus and of a specific example, it is not intended that such details shall be regarded as limitations upon the scope of the invention, except in so far as included in the accompanying claims.

I claim:

1. The method of coking coal which comprises, highly heating coke, by partial combustion thereof, to a temperature sufficient to coke coal, admixing the said heated coke with coal in sufficient quantity to raise the coal to a coking temperature, and causing the coal to coke in the absence of substantial combustion.

2. The method of carbonizing coal which comprises, raising finely divided coke to a temperature sufficient to carbonize coal by partial combustion of said coke, supplying the hot coke and finely divided coal to a closed substantially externally unheated retort, the proportion of the hot coke being sufficient to heat the coal to carbonizing temperature and carbonize the same in said retort, and withdrawing volatile material and coke from said retort.

3. The method of carbonizing coal which comprises, heating particles of coke by partial combustion thereof to a temperature sufficient to carbonize coal, admixing the heated coke with finely divided coal, the proportion of the hot coke being sufficient to heat the coal to carbonizing temperature and carbonize the same, and causing the said coal to carbonize in the absence of substantial combustion.

4. The method of coking coal which comprises, raising finely divided coke by partial combustion thereof to a temperature sufficient to coke coal, supplying continuously said hot coke and finely divided coal to a retort, intimately mixing the coke and coal together therein, the proportion of hot coke being sufficient to raise the coal to coking temperature, coking said coal in said retort substantially entirely by the heat imparted to it by the coke and in the absence of substantial combustion, withdrawing volatile matter therefrom, and continuously withdrawing coke from said retort.

5. The method of coking coal which comprises, raising finely divided coke by partial combustion of the same to a temperature sufficient to coke coal, supplying the hot coke and finely divided coal to a closed externally unheated retort, the proportion of the coke being sufficient to heat the coal to a coking temperature and carbonize it in said retort, causing the coal to coke solely by the heat imparted to it by the coke, and withdrawing volatile material from said retort.

6. The method of coking coal which comprises, raising finely divided coke by partial combustion to a temperature sufficient to coke coal, heating finely divided coal by contact with hot combustion gases from said partial combustion to a temperature short of that at which substantial decomposition of the coal occurs, continuously supplying said hot coke and said heated coal to a closed retort, intimately mixing said coal and said coke together in said retort, the proportion of coke so admixed being sufficient to raise the coal to coking temperature, coking said coal, withdrawing volatile matter from said retort, and continuously withdrawing coke from said retort.

7. The method of coking coal which comprises, subjecting finely divided coke to partial combustion and thereby raising its temperature to about 2000° F., supplying air to the gases from said partial combustion and causing complete oxidation thereof, passing the hot completely burned gases in countercurrent to finely divided coal while agitating said coal thereby raising its temperature to about 675° F., continuously passing the hot coke and the preheated coal into a retort and mixing them in said retort, the amounts of the coke and the coal being such that the mixture attains a temperature of about 1100° F., coking said coal in said retort, withdrawing volatile matter from the upper end of said

retort, and continuously withdrawing coke from the bottom of said retort.

8. The method of coking coal which comprises, raising finely divided coke by partial combustion of the same to a temperature sufficient to coke coal, supplying continuously the hot coke and finely divided coal to an externally unheated retort, intimately mixing the coke and coal together therein, the proportion of coke being sufficient to raise the coal to a coking temperature, coking the coal in said retort solely by the heat imparted to it by the coke, and withdrawing coke and volatile matter from said retort.

9. The method of coking coal which comprises, raising finely divided coke by partial combustion to a temperature sufficient to coke coal, heating finely divided coal by contact with hot combustion gases from the resulting partial combustion of the coke to a temperature short of that at which substantial decomposition of the coal occurs, continuously supplying the hot coke and the heated coal to a closed unheated retort, intimately mixing the coal and said coke together in the retort, the proportion of coke so admixed being sufficient to raise the coal to a coking temperature, coking said coal, and withdrawing volatile matter and coke from said retort.

In testimony whereof I have hereunto set my hand and seal this 28th day of April, 1928.

ERNEST W. THIELE.