SINCLAIR REFINING COMPANY

May 28, 1948

1851

S-117

Translation Book #145
Reel 224
Frame 10323-6
20128-31

Process which is suitable for underground carbonisation.

The volumes, the physical and chemical properties of the gases are not uniform during the course of the carbonization if normal underground chambers are employed. The pipelines, condensers, exhaust fans and all other apparatus must be designed in such a manner that they are able to handle the maximum volume of the gases that causes comparatively high installation costs. The volumes of the liberated gases and vapors are small at the beginning of the carbonisation process. Due to the temperature drop in the long lines which connect the carbonization chamber with the condensing system, condensation takes place if the lines are not heated to adequate temperatures. Moreover, when the last part of the carbonisation stock has to be carbonised, the hydrocarbons are re-condensed. Another disadvantage is caused by the fact that valuable carbonization gases and even oil vapors must be burned in order to dry and preheat the shale.

The proposed process intends to overcome the described difficulties. The volume of the gases and their physical and chemical properties shall be kept nearly uniform by operating two or more chambers simultaneously. One chamber after the other is put in operation and the progress of the carbonization is controlled in such a manner that nearly uniform gas volumes are produced. The sizes of the pipes, condensers, etc. must accommodate only the average gas production. It is claimed that the gasoline extraction process is also improved by the application of this process.

Hot flue gases which are obtained by the combustion of the carbonisation gases, which cannot be utilized for other purposes, shall be admixed to the air which is introduced into the carbonization chamber in order to secure a uniform progress of the carbonisation and to utilise the heat energy which is available in the otherwise unused flue gases. A corresponding volume of valuable carbonisation products, which hitherto were consumed in order to furnish the required carbonisation heat is now available for other purposes. It is also possible to preheat the introduced air by the hot flue gases by the application of heat exchangers.

The hitherto unused heat energy which is present in the flue gases shall be used for the drying and preheating of the shale before the carbonization takes place. The quantity of the produced carbonization water decreases and the recondensation of oils near the outlet of the chamber is also prevented to a large extent. In this case it is necessary to introduce the flue gases at the outlet of the chamber in order to preheat the section of the chamber which is responsible for the condensation of oils.

It is well known that the simultaneous operation of numerous chambers secures a uniform gas production (operation of coke over batteries, gas works.) A nearly uniform gas production is obtained by the operation of large chambers as shown by the following calculations:

Length of the chamber 60 m (197 ft.)
Progress of the carbonisation zone 2 cm per hour (0.79")
Carbonisation time of the chamber $\frac{6000}{2 \times 24}$ = 120 days.

The number of days which are necessary to start and to finish the carbonisation are negligible compared with the number of the days which are necessary to carbonise the shale which is present in the chamber. A combustion of gases and oils occurs only at the beginning of the carbonization process when the introduced air comes in contact with raw shale. As soon as flue gases are formed by the combustion of the fixed carbon the oxygen of the introduced air is consumed in the combustion zone and has no opportunity to react with noncarbonised shale. The admixture of flue gases to the introduced air lowers the oxygen content of the mixture but does not consume the oxygen, which still burns the organic substance if it comes in contact with non-carbonised shale. It is not necessary to burn gases and oil vapors in order to furnish additional heat energy for the carbonisation because in most cases sufficient fixed carbon is available to furnish the carbonisation heat. The burning of gases and oil vapors is not a result of a lack in thermal units but of a non-uniform progress of the carbonization and the combustion zone which must be kept separated. The admixture of flue gases to the introduced air increases the velocity of the gases during their passage through the chamber and lowers the oil content of a unit of volume of the gas thus preventing a condensation of oil vapors at comparatively high temperatures.

It has been observed that the universal substance of the shale melts due to the heat units which are furnished by the combustion of the fixed carbon. The introduction of preheated air increases the fusion of the shale. The utilisation of hot flue gases for drying and preheating purposes before the carbonization takes place is recommendable if the condensation of oils can be effectively prevented by this method.

The best method to secure a full separation of the combustion from the carbonization zone is to combine two chambers. One of both which is already carbonised furnishes the heat for the carbonization by the combustion of the fixed carbon. The hot flue gases are introduced into the other chamber where the carbonization takes place. The chambers must be connected by channels or pipes through which the flue gases pass from one chamber to the other. As soon as this carbonization has been finished, the combustion of the fixed carbon begins and the flue gases are passed through the following chamber. It is possible to control the inlet temperatures of the flue gases by admixing cooled lean gases.

(The "Commentary" contained in Frames 20130-31 is not based on the German text. M.B.)

M. Beth

M. Beth
May 15, 1948

MB/ed