SINCLAIR REFINING COMPANY

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Method of carbonizing oil shale and equipment for it.

This invention refers to the underground carbonization of oil shale, in heaps as well as in the natural rock.

There are several well-known methods of the underground carbonization of shale. All of these methods, however, are beset with various drawbacks, in particular, because they conduct gases and air in horizontal networks. The underground carbonization of oil with horizontal gas and air conduit lines is sometimes impossible; it is always economically impractical.

Pursuant to this invention, the oil shale is carbonized in underground carbonization chambers charged with shale in heaps. The carbonization advances from top to bottom. Gas and air are introduced into the upper part of the chamber, the volatile carbonisation products are drawn off from the lower part.

The air inlet-channels and the gas discharge-channels may open vertically into the upper and into the lower part of the chambers respectively. They may also open into a connecting drift of two carbonisation chambers, placed at the lower part, or else horizontal pipelines may have been provided for, e.g. subsidiary pipelines, which are in connection with the upper part of the carbonisation chambers for air injection and with the lower part for gas discharge.

Which kind of pipeline network ought to be chosen will depend upon local conditions. But the air-gas stream within the chamber will always flow vertically from top to bottom and not horizontally.

We are familiar with the method of vertical airgas injection in above-ground kiln processes; but obviously it has hitherto been deemed inapplicable to the underground carbonization processes.

However, it has been found to be very suitable.

. . . Fig. (Ia) and (Ib) illustrates a process where vertical air and gas channels reach from above ground into the carbonization chambers.

Between two shafts (1) and (2) sunk with the strike of the bed, connecting galleries (v_1 - v_4, etc.) 15 m apart have been constructed; starting from these, the carbonization chambers (s_1-s_4) have been prepared by blasting shale. In between two carbonisation chambers at the footwall of the bed, the connecting galleries (u_1-u_4) are constructed between shaft (2) to shaft (1).

From above ground drill holes are sunk into the carbonization chambers, at a distance of e.g. 10 m. They reach into the upper part of the carbonization chambers. The air required for the carbonization process is introduced through these drill holes; the shale heaps in the upper part of the carbonization chambers is kindled through them.

Likewise from above ground, drill holes are sunk between the carbonization chambers, opening in the connecting galleries (u_1) and (u_2); they serve for discharging or sucking off the carbonization gases. For the discharge of the carbonisation water and the carbonisation gas, the galleries (u_1-u_4) are connected with the two adjacent carbonization chambers by galleries ten meter apart. It is suitable to drain the carbonization water from galleries (u_1, u_2, etc.) through special pipe lines and a collector into shaft 2.

Safety pillars are left standing at the breasts of shafts (1) and (2) and at the carbonization chamber(s) as well as at the faces of the galleries facing the carbonization chambers.

It is suitable to install the condenser unit above ground, if possible, above the seam.

All the inlets to the carbonization chambers are sealed gas tight during the carbonisation process by means of sealing dams.

Whenever vertical drill holes are impractical, for one reason or another, horizontal subsidiary galleries may be used, pursuant to another mode of applying this invention (fig. IIa, IIb, IIc, IId((*).

Between two shafts (1) and (2) sunk with the strike of the bed, connecting galleries (v_1-v_4) 15 m apart, are worked. They serve as starting points for the preparation of the carbonisation chambers (s_1-s_4, etc.) which are charged with heaps of shale obtained by blasting. At the bottom of the bed, in the midst between two carbonization chambers, connecting galleries (u_1-u_4) are constructed leading from shaft 2 to shaft 1; ignition gal lers (z_1-z_4, etc.) with a diameter as small as possible are constructed, leading from the auxiliary shaft (2) to the auxiliary shaft (1), in the roof part of the shale oil bed. Moreover, horizontal drill holes or galleries are constructed, for igniting the heaped-up shale in the upper part of the chambers. They start from the ignition galleries, e.g. at a distance of a few meters, and reach at both sides to the far ends of the carbonization chambers penetrating the leftover intermediary posts. Carbonization gas and carbonisation water are discharged through drill holes or galleries which connect the galleries (u_1-u_2, etc.) with the carbonisation chambers at a distance of 10 m from one another. Both the carbonization gas and carbonization water may be collected and discharged through shaft (2). In this case the condenser unit may be erected near the opening of shaft 2 or even underground.

* These diagrams have not been included in the reel. (M.B.)

Between the openings of the four shafts - however, it is by no means necessary for the subsidiary shafts to have above ground openings - and the carbonisation chamber (s) and at the breasts of the gallers which face the carbonisation chamber, solid safety pillars are left standing.

All the inlets to the carbonisation chambers are sealed gas-tight during the carbonization process.

When the carbonisation process which always proceed from the top to the bottom, the intermediary solid pillars which have been left standing can also be carbonized.

When the intermediary pillars are to be carbonized, too, the rocks of these intermediary posts are loosened by a concussion of the rocks by means of blowing fuses starting from the drill holes or galleries. Moreover, the solid pillar between two carbonisation chambers can be attenuated to such an extent that at some places only a residual pillar of about 1 m or less is left. The shape of the carbonisation chambers may be varied; they may be square instead of rectangular.

Patent Claims

1.) A method of underground carbonisation of oil shale, distinguished by the feature that the carbonisation of the charge arranged in heaps in the carbonisation chambers takes place by introducing gas and air into the upper part of the chamber and sucking off the volatile carbonisation products from the bottom.

2.) Equipment for operating with method (1) distinguished by the feature that vertical drill holes opening in the upper part of the carbonisation chamber serve as air inlet and vertical drill holes opening at the lower part of the drill holes serve as air outlet.

3.) Equipment for operating method (1) distinguished by the feature that vertical auxiliary shafts serving as air inlets are connected with the upper parts of the chamber and others serving as gas outlets are connected with the lower part.

4.) Method pursuant to (1-3) distinguished by the feature that the intermediary posts or the solid faces can be carbonised by shaking them by means of fuses blown from the galleries or drill holes.

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