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Method of producing oil-shale carbonization products
by underground carbonization of shale.
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In carbonizing oil shale poor in bitumen . . . the economic profitability of each method will depend on the possibility of utilizing the carbonization residues, e.g. by working them up to hydraulic lime, cement, stone wool, fertilizers, etc.

Suggestions having been proferred for obtaining anthracite gas by carbonizing anthracite beds in their strata, experiments have been made regarding the underground carbonization of oil shale. Attempts at adapting methods used in the shaft-kiln carbonization processes to the underground-carbonization processes, have failed up till now. For, it is very difficult to control the carbonization in the beds in such a manner that it takes place in an orderly-way, the carbonization zone at all times preceding the combustion zone.

For instance, it has been found out that when a drift is worked in a shale bed and the rocks surrounding this drift are loosened by blastings, a combustion process started at the end of such drift will very soon proceed to the upper layers of the loosened shale masses, whilst the rocks lying at the footwall will evolve carbonization gases only later on, if they ever do so, under the action of the combustion heat of the superimposed combustion zone. A large part of the said carbonization gases, however, would then be burnt in the combustion zone, which had got ahead of the lower carbonization zone in the mean time. For this reason, special measures are necessary for achieving the flawless operation of the underground combustion and carbonization processes.

A useful method has been found experimentally: a tunnel is at first laid out in the oil-shale stratum on the strike of the bed. Starting from the said gallery, crosscuts are cut along the bottom level of the oil-shale stratum. In these crosscuts, the backs of the oil shale are loosened by blastings, preferentially within the area of a half cylinder above these drifts. Finally the loosened oil shale is kindled, controlled quantities of combustion air being introduced, starting with the hindmost crosscut. The original gallery is dammed up between each of the said crosscuts. The carbonization products are finally sucked off from the foremost crosscut.

It has been found that a useful control of the combustion and carbonisation processes may be achieved if the blastings carried out for the purpose of loosening up the rocks, are made in such a manner that at the individual crosscuts which start from the main gallery, transversal walls are left standing, directed from the back towards the bottom of the bed, transversely to the progressing carbonisation and combustion zones; these transverse walls will ever again force the carbonization and combustion gases to pass close to the bottom of the bed.

The annexed diagrams show:

Fig. 1.) a vertical cut through the tunnel cut into the oil shale bed along line (I-I) of fig. 2.

Fig. 2.) a horizontal cut along line (II-II) of fig. 1.

Starting from tunnel (1) which had been worked on the strike of the bed, crosscuts (2, 3, 4) of optional length are worked along the bottom of the bed; the last crosscut (2) is arranged as an ignition chamber. The other crosscuts (3) are dimensioned in such a manner that by means of suitably placed blastings the oil-shale bed may be loosened. The method of this invention provides that the loosening zone (7) has the form of a half cylinder lying above this crosscut. The lengths of the intervals between the crosscuts are suitably chosen of a magnitude about like the height of the bed. In this case the not-loosened back parts forms stable, assive transversal walls (5), directed towards the bottom of the stratum. They open a passage for the carbonization and combustion gases close to the bottom of the bed. The gases are thus ever again forced to come close to the bottom of the bed. Furthermore, the crosscuts are dimensioned in such a manner that after the loosening blastings the gases may readily pass in a transversal direction to the crosscut through the oil shale lumps filling the loosening zone.

The loosened rock is ignited in the hindmost crosscut (2), the igniting drift, and the velocity of the advance of the combustion zone is controlled by varying the amounts of air introduced into the igniting drift. The carbonization gas evolved is sucked off from the foremost drift (9) through the duct (8) and condensed. The tunnel had been dammed up with oam packings between each of two crosscuts (3).

The combustion advances, at first, in the shale heaped around one of the crosscuts (3). Through parts of the back (5) which had not been blasted, serving as transversal walls, the combustion zone is ever again deflected towards the bottom of the bed. A part of this loosened shale which had been left standing, will peel off under the action of the burning loosened shale and a considerable part of it will enter into the carbonization processs.

The advancing of the combustion zone can be controlled by adjusting the amounts of combustion air introduced into the igniting drift and of carbonization gases sucked off through crosscut (4) which serves as outlet.

Patent Claims

1. A method for the underground carbonization of shale distinguished by the feature that a tunnel is cut in the oil-shale bed on the strike of the bed. Starting from this tunnel crosscuts are cut along the bottom of the bed. The superimposed rock in these crosscuts, each time in the area of a half cylinder is loosened by blastings. Starting from the hindmost crosscut, the loosened oil shale is ignited while the amounts of combustion air are kept under control. The tunnel is dammed up between each of the crosscuts branching off from it. The carbonization products are sucked off from the foremost crosscut. In front of the combustion zone which proceeds from crosscut to crosscut runs the carbonization zone.

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2.) A process pursuant to Claim 1, distinguished by the feature that the interval between the crosscut is about as large as the height of the bed so that the back which has not been loosened forms transversal walls directed to the bottom of the bed they are forcing down close to the bottom both the carbonization and combustion gases.

M. Beth
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