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## METHOD FOR THE PRODUCTION OF A FIRE LIGHTING MEANS AND FIRE LIGHTING MATERIAL MADE ACCORDING TO THIS METHOD

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At the slow burning of brown coal, a slowly burning coke, so-called Grude-coke is obtained. The normal Grude-coke shows a comparatively slow lighting speed, so that for the lighting of a Grude fire more easily combustible materials, for instance firewood, are necessary as lighting means. This low lighting speed of the normal coke obtained by slow burning is based chiefly on the high density of its surface, which in turn is due to a coking of the not evaporised bitumen constituent which is sweated out at the slow burning, whereby the surface of the coke is coated with a more or less thick layer of graphite. The percentage of ashes and the composition of the ashes influence in second instance the lighting speed of the slowly burning coke and this in the sense that, when the percentage of ashes decreases and the percentage of the ashes in metal oxides or suboxides increases, the lighting speed is improved.

Surprisingly it has been ascertained, that a slowly burning coke having high lighting speed and which is especially useful for lighting fires and therefore forms an excellent fire lighter is obtained, if brown coal is coked which from the point of view of the proportion of yield in tar to the quantity of heating means for coking is not considered as worthy of coking, that is a brown coal which contains little bitumen and which at the examination as regards slow coking capability according to Fischer yields less than about 10% of slowly burning tar.

Insofar as the brown coal, lumpy by nature, that is cartilagenous brown coal, yields a core of slowly burning coke which is not sufficiently proof against rubbing, the brown coal may be briquetted prior to the smouldering and used in this form.

At the slow burning the temperature can be raised as at the normal smouldering of brown coal up to an extreme temperature of about 570° C. According to the constitution of the initial coal it may be sometimes especially advisable to not completely distil the brown coal but to carry out the distillation only incompletely. For this reason it is advisable to interrupt the coking process already at temperatures below 500° C, preferably at temperatures from 450–470° C. The lighting speed of the slowly burning coke thus obtained is considerably increased as this coke then remains still more strongly porous on the surface.

### *Examples*

1. Brown coal poor in bitumen, which contains ash formers favorable for the obtention of especially rubbing-proof cartilage, such as alumina, in a quantity of about 15% and at the examination to coking capability according to Fischer yields about 5% of tar, is carefully dried preliminarly to approximately 5% water content at temperatures below 100° C for preserving the solidity of the cartilages and then in a slowly burning furnace slowly burnt up to a temperature of 570° C. The slowly burning coke coming from the furnace is cooled in the inert gas current or in a gas current poor in oxygen. The slowly burning coke which is thus obtained is so easily ignitable that it can be brought to glow heat by means of a match. Used as a fire lighter and lighted by means of paper it begins very rapidly to glow and ignites within a few minutes the added fuel, such as pit-coal, mine-coal or the like.

The lighting speed of this slowly burning coke can further be increased thereby that the cartilage coal is not completely coked but the coking interrupted at a temperature of 470° C.

2. Brown coal poor in bitumen, which at the examination as regards coking capability according to Fischer, related to dry coal, shows a figure from 6–7% tar yielding, for instance Rhenish brown coal from the Cologne rounding with a content of ashes of 6% and a sulphur content of 0.5%, is first dried until it is suitable for briquetting and then so finely ground that the brown coal dust can be driven through a sieve of about 81 meshes of $cm^2$. Then the thus prepared brown coal is briquetted, by means of a suitable ring rolling briquetting press arranged for high pressure work, to rods in length of 120 mm, 35 mm high and 25 mm diameter, very solid pieces of such density being produced that the briquettes in this state burn very badly. These briquettes are then slowly burnt in coking furnaces, which are operated by means of superheated flushing gases, up to a temperature of 580° C. The briquettes which have been slowly burnt are then removed from the furnace in avoiding admission of air and cooled. According to the raw material which has been selected, more or less solid slow burning briquettes are produced having a good lighting speed. For lighting ovens and the like in the household and in the industry these briquettes can be lighted quite as well as firewood and lighted with the aid of some paper or the like; the slowly burning coke pieces do not produce flames, but they become red-hot very rapidly and produce a very high degree of heat, and the added fuels, such as pit-coal and the like, are lighted in a very short time. These slowly burning briquettes are therefore suitable for

lighting fires in household and industry and can be substituted for other fire lighting means such as wood.

At the coking of brown coal no attention has been paid up to the present for economical reasons to the so-called fire-coals poor in bitumen, for the reason that these, from the standpoint of the yield of tar, are not to be considered as worthy for coking. The circumstance that such brown coals poor in bitumen of the kind to be employed according to the invention produce at the coking a porous slowly burning coke with an open structure surface free from graphite deposits, the lighting speed of this slowly burning coke being much higher than that of slowly burning coke from brown coal rich in bitumen, is more surprising compared herewith, as at the coking of a brown coal rich in bitumen, owing to the larger quantity of volatile product from coking which has escaped, the volume narrowing of the coked coal grain is greater and thereby also its structure is looser, and from this consideration it might be concluded that the residues from coking of raw materials poorer in bitumen ought to be accordingly less easy to light than the normal lumpy Grude coke.

Although the normal Grude coke seems to be loose in the structure, its structure is less favorable for the combustibility, as on the one hand, as already mentioned, by the decomposed bitumen the surface is more or less packed by graphitic deposits and on the other hand in the interior of the coke grain the capillary vessels larger as such are so jammed by setting of carbon which comes from the decomposition of the more easily boiling constituents of the bitumen, that the oxygen of the combustion air can penetrate only very badly. Compared herewith, the slowly burning coke, from raw materials to be employed according to the invention, is not only open on the structure surface but possesses also continuous open capillary vessels, so that the combustion air can penetrate from all sides through the coke grain into the core of the same. This special property of the coke, which is a condition for the lighting combustibility of the same and renders it capable to be employed as a good fire lighter, is based thereon that the brown coal poor in bitumen has little or no easily boiling bitumen constituents, whereby at the coking in the interior of the coke core no carbon deposits from the dissociated, more easily boiling bitumen occur, and as the coking heat admitted is sufficient to very rapidly remove by evaporation the little bitumen separating out onto the surface, no graphitic deposits are formed on the surface, which deposits render more difficult the admission of air for combustion. In the commonly used coking coals considered to be worthy of coking and rich in bitumen a larger constituent of lighter boiling bitumen exists, at the decomposition of which in the heat carbon is deposited within the the capilliaries of the slowly burning coke, whereas the heat for the slow burning is also not sufficient for rapidly evaporating the bitumen which has been forced to the surface, and as herefor the material for coking must remain for a longer time in the coking zone, the bitumen is decomposed on the surface, whereby the graphitic coating on the slowly burning coke is produced, so that this coke becomes denser on the surface and can be lighted more difficultly. In order to still further prevent the decomposition of the bitumen on the surface at the production of the coke according to the invention, the coking is therefore stopped preferably, as already mentioned above, below a temperature of 500° C, whereby the slowly burning coke which is obtained remains even more porous and is still better suited for fire lighting purposes.

The special qualification of the products obtained according to the invention as fire lighter might therefore be due to the fact that, in opposition to the above mentioned expectations, the lumpy coke contains continuous capillary vessels as well, as it is open on the surface, and therefore on the whole has more fine pores than the normal slowly burning coke which has been produced from brown coal rich in bitumen. The slowly burning coke of the kind according to the invention is therefore much better accessible for the oxygen of the air for combustion than the normal slowly burning coke found on the market.

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