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TESTING OF COAL DUST-MINERAL DUST MIXTURES

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The liability to explosion of coal dust-mineral dust mixtures depends substantially on the chemical properties of the pure coal and of the mixture and of the fineness of the constituents.

From investigations regarding suitability of combustion and fineness of grinding of pure coal dust for coal dust firings, it is known that the combustion operation in the air of suspended fine coal particles is a surface reaction. With an increasing surface development, that is to say with a reduction of the size of the grains of the coal dust, its capacity for ignition increases. This rule, according to the investigations made, also applies to coal dust with which mineral dust is mixed. A mixture of 60% coarse grained coal dust and 40% mineral dust is not capable of being ignited. A mixture of 30% finest coal dust and 70% mineral dust is capable of being ignited.

It, therefore, leads to erroneous results, if, as usual, the capability of ignition of a coal dust-mineral dust mixture is simply determined by the content of combustible or non-combustible constituents. On the other hand considerable difficulties are met with when considering the fineness of the constituents as sizes of grain below 0.06 mm, which are of striking importance for the ignition operation, can no longer be separated by screening.

The brightness measurement of the mixture now affords a possibility of ascertaining the surface ratio of the combustible constituents, that is to say the black coal, and the noncombustible constituents, that is to say the light mineral, by a single measurement. By the brightness measurement there is obtained a simple, and at the same time accurate comparative scale for the capability of ignition of the mixtures, that is to say of the road dust in coal mines.

In a similar manner to the capability of ignition the action of the coal dust, determining the colour tone in mixtures with light constituents, is also dependent on the surface development of the coal dust. The grey stage: 50 white, 50 black, indicates that 50 surface units white and 50 surface units black act optically as a grey mixture on the eye by reason of the smallness of the separate parts. If as admixture there is used a mineral dust of a predetermined brightness and of a predetermined size of grain then one part by weight of the admixture and one part by weight of coarse coal dust give quite another substantially lighter grey stage than one part by weight of the admixture and one part by weight of the finest coal dust. With a constant colour tone and constant grain of light constitutent the grey stage of the mixture is a scale of the content and fineness, that is to say of the superficial development of the coal dust.

If the galleries of a mine are dusted with a mineral dust having a substantially constant colour tone and grain then it is possible according to known methods to determine the lower limit of capability of ignition of the coal dust-mineral dust mixtures of the mine in question. The grey stage of the mixture which corresponds to the lower limit of capability of ignition is the critical grey stage of the mine in question and hereinafter referred to as the normal grey of the mine. In order to ascertain to what extent a given sample is removed from the lower limit of liability to explosion it is sufficient to measure the distance of the grey stage of the sample from the normal grey of the mine. If a given dust sample is a predetermined stage number brighter than the normal grey the sample is not capable of ignition and it is immaterial how much of the bright constitution is due to the small content of coal constituents in the mixture or the coarse construction thereof. If, however, a given dust sample is a predetermined stage number darker than the normal grey, then the sample is liable to explosion and it is not necessary to re-examine as to how much of the dark constitution is due to the high content or the fine granulation of the coal constituents.

The measurement of the brightness differences relatively to the normal grey is effected in the known manner by comparison with a grey scale or by reading in a photometer.

I claim:—

The method of testing liability to explo-

sion of mixtures of coal dust and mineral dust from underground mine galleries consisting in taking samples of these mixtures, measuring their brightness, and comparing this brightness with that of a mixture of the same materials which is just on the safe side of the danger-limit.

In testimony whereof I affix my signature.

MARTIN WITTE.