THE CONTINUATION OF COAL EXPLOITING IN THE AREAS AFFECTED BY ACTIVES ENDOGENOUS FIRES IN THE MINES OF JIU VALLEY MINING BASIN

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***Abstract**: The paper presents a solution to continue coal exploiting in an area in which spontaneous combustion has occurred.*
***Keywords**: spontaneous combustion, safety measures, fire dam, resistance dam*

1. Introduction

The spontaneous combustion of Jiu Valley pit coal is a complex phenomenon, which can generate endogenous fires based on oxidation reactions between oxygen and carbon, with gas and heat emitting. Spontaneous combustion is determined by a series of factors, with individual or synergic action /1/.

Air losses through the exploited space - unavoidable when applying the generalized method of working with undermined bank at the Jiu Valley mines - combined with coal losses as well as with fissures and crevices in the coal mass, can lead to the emergence of spontaneous combustion /3,4/.

The manifestation of endogenous fires /2/ is more frequent in seam 3, owing to the following reasons:

- higher accumulation of combustible mass;
- wider surface opened by mining works, as a result of larger amounts of heat due to spontaneous oxidation;
- the heat of the self-heated points is more difficultly transmitted in the roof and floor rocks;
- mining works are under more pressure, so that fissures, frequent falls, and large quantities of small coal appear in the coal mass;
- due to the larger quantity of coal to be mined, the preparation works must be functional for a longer period of time, a fact that triggers spontaneous oxidation.

Endogenous fires are more frequent as the dip of the seam increases, because:

- coal glides more easily on the floor determining breaking-ups, sliding surfaces on the layer's surface and small coal;
- losses of small coal occur, which accumulates in the exploited spaces, where it can self-ignite;

Endogenous fires occur often in spots where, due to tectonic accidents, the coal is crumbling and dislodged (faults, seam lamination). The danger is particularly at the laminar seam, where there's a tendency not to remove all the coal, which is crushed by the pressure of the roof resulting in self-ignition.

Suspect outbreaks are also considered the coal streaks in the floor or in the roof of the seam. In general, if the roof or the floor of the seam is irregular, coal from these irregularities is cleaned with great difficulty. Coal lenses with irregular contours than with a regular outline are more exposed to self-ignition.

2. Safety measures for further work

In the event that a firebox cannot be liquidated, for continuing the coal working of the affected panel, first it is necessary to close the working in which the endogenous fire manifests and take safety measures while observing standard specifications /5/.

The closure is made with two wooden stumps dams, which are located as follows: one in the roadway, and the second in the airway. The two dams will be made simultaneously by mining rescuers teams, specially trained for this type of work.

The fire dam will be built starting from the floor of the work (excavation), on a clay bed.

The fire dams (fig.1) are made of wooden stumps with a diameter of 150-200 mm and a length of 800 mm. For the most efficient sealing, the hollow spaces between the wooden stumps, as well as the front of the dam, will be filled and split with a mixture of clay, water, baking soda and salt, and the rows of stumps will be hardened with wooden wedges.

On the roadway, in the location of the dam, a set will be removed, after the adjacent sets have been previously strengthened (the clamp sets). Instead of the removing set, a cleft using is created with pick hammers, on the whole perimeter of the mining work, including the floor, at a depth of 0.5-1.0 m (up to compact rock) and a width of 1m.

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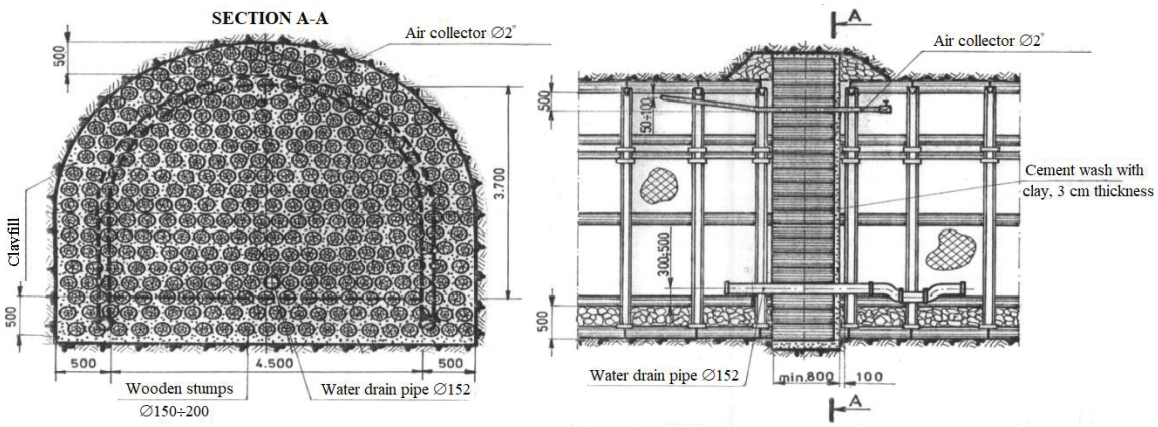

Fig.1. *Fire dam with special profile TH-6 (scale 1:50)*

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In order to control the closed space, the following pipes will be inserted through the dam in the roadway:

- air collector with Φ2"(50mm), mounted in the dam at a height of 0.5-0.8m.

It will exceed the dam extrados by 1.5m, the pipeline will be positioned at an angle of about 30° to the vault of the roadway, so that the distance between the vault and the end of the pipe ranges between 0.05 m and 0.1m. The part of the pipe in front of the dam will be provided with a threaded metal plug or valve Φ 50mm;

- water drain pipe with Φ152 mm gooseneck.

When there is danger of explosion in the isolated area, filler plugs or dams resistant to explosion will be required. Dams from sandbags or ash from the power plant will be built on a minimum length of 15m at the base and a minimum of 5m at the ceiling. The bags will be filled to 2/3 of their capacity, they will be tied and placed at a distance of 5-10 cm between them, to mitigate the blast of an eventual explosion of gas from the outbreak (fig. 2).

The constructions will be done in those places where the rocks surrounding the mining works are stable (fig.3).

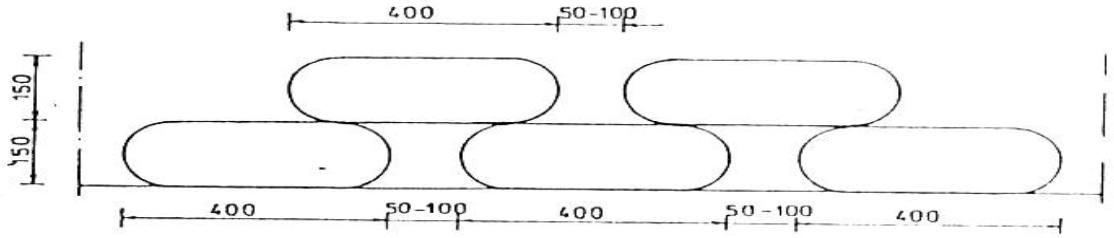

Fig. 2. *Detail of placing the bags with material (scale 1:10)*

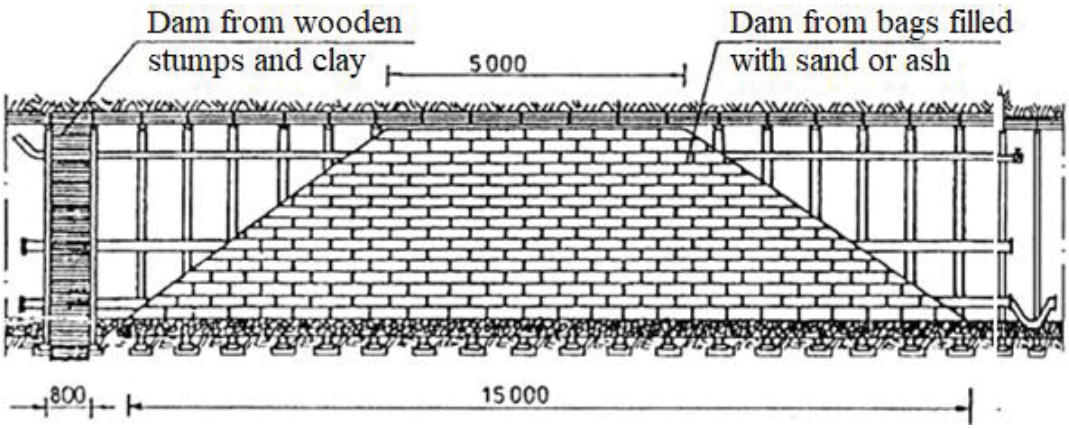

Fig. 3. *Construction of two kinds of dams (longitudinal section, scale 1:100)*

After completing the dams, at the distance of 5m towards the explosion resistant dam, they can start drifting and supporting a new run of attack. The run of attack (fig.4) should match the dimensions provided in the framework operating method.

The drifting is done by drilling-blasting and partially with pick hammers, depending on the strength of coal at the working front..

In order to support the run of attack, they should use two GSA-1250S beams in a string, which rests on four pillars SVJ-2500 (fig.5). These beams are reinforced each other through short beams that behave as stretchers resulting in a set of pre-assembled beams, which participate in retrieving and transmitting the tasks arising from the combined action of coal and rock mines.

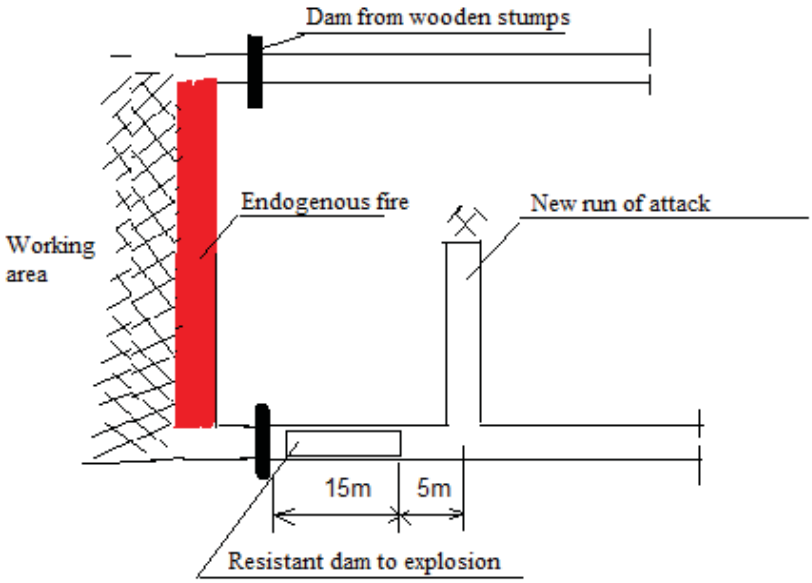

Fig. 4. *The location of the new run of attack*

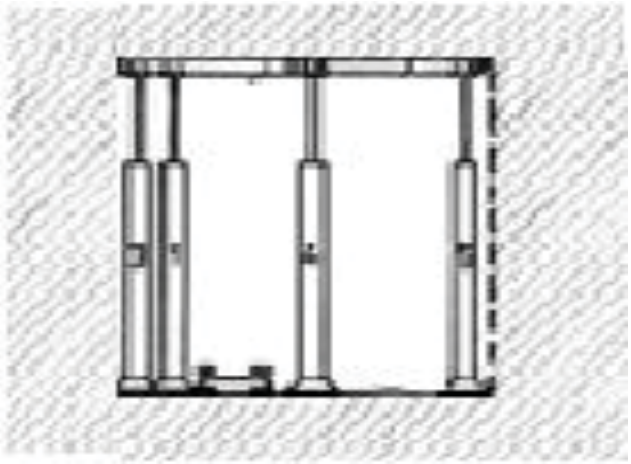

Fig. 5. *Run of attack support*

The form and the constructive characteristics of the support used in the execution of the attack plan, as well as the same type of individual metallic support applied in the further exploitation of the coal with undermined bank, are those of the approved framework method. As for the run of attack, its intersections with the two directional roadways use the same kind of support in order to ensure similar conditions of extracting coal and working in these areas of the coal mining.

The monitoring of gases coming from behind the dams, from the bottom gate, will be made throughout the mine of the run of attack and has the role to prevent and detect any problems that may arise during its mining, and that can have serious consequences upon the environment and underground workers.

After the execution of these works, the coal can be exploited in the panel affected by an endogenous fire (fig.6).

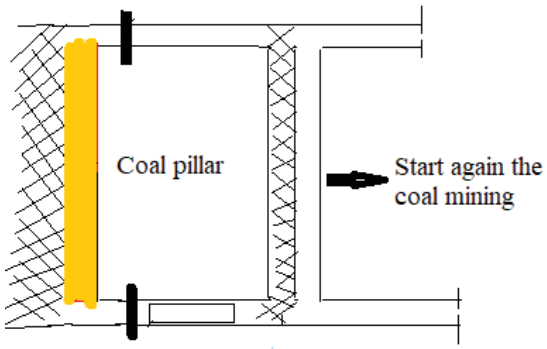

Fig. 6. *Continuation of the operation of the panel affected by endogenous fire*

3. Conclusions

The continuation of mining coal in areas with endogenous active fire can take place under the conditions of the prior isolation of the firebox through the simultaneous execution of two fire dams and one explosion resistant dam, followed by the execution of a 5m new run of attack and its providing with equipment in accordance with the method of operating framework.

With the collapse of rocks after starting the new mining works, it will produce a better sealing of the area affected by the endogenous fire, which will cause the acceleration of its liquidation.

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