

## SAFETY IN COAL MINING.

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### *General.*

The first thought that occurs to one on reading the title of this paper is that 'Safety in Mines' is only a relative term ; there is not now safety in coal mining and there never has been ; coal mining has always been a dangerous occupation and in spite of the vast expenditure in brains and money on the subject of increasing the safety in mines the dangers still remain, I think, as great as ever. This is not because the brains and money spent on research have been wasted, but because as mining proceeds to greater depths conditions of work become more difficult and dangerous, and also the trend of modern requirements for intensive mining, with its concentration of men and machinery in small areas for large outputs, raises problems which were very much less noticeable under the more leisurely old-fashioned methods of working.

### *Method of dealing with the subject.*

The heading safety in mines embraces a great number of practical and scientific factors relating to various phases of the working of a colliery and I propose to discuss the matter briefly as it affects the different phases of the work.

### *Safety in shafts and on haulage roads.*

Accidents in shafts are, fortunately, extremely rare except in the case of the actual sinking of the shafts ; I say fortunately because the thought of an accident in the middle of a deep shaft, in say England, where as many as 100 men may be in the two shaft cages at one time, simply appals the imagination. The reason for this lack of accidents is that the only things that can go wrong are the winding engine, winding and guide ropes and accessories and the cages themselves ; all these are governed by very strict regulations as to length of life, inspections, etc., and as in addition everything is easily accessible for inspection there is consequently very little tendency for the inspection to be neglected.

Accidents on haulage roads, on the contrary, are distressing by their frequency, and in spite of the stringent regulations enacted in all countries a glance at the annual report of the Chief Inspector of Mines of any country will show that accidents on haulage roads form a large proportion of the total number of accidents.

The reason for this is to my mind two-fold : firstly, the haulages are underground and very often stretch for long distances in-bye so that thorough

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inspection of track, signalling apparatus, safety appliances, etc. is a job which calls for extreme efficiency on the part of the subordinate staff concerned; secondly, it is the old tale of 'familiarity breeds contempt', the men working on the haulages are doing the same job day after day and unless the management are extremely strict in enforcing the rules relating to working of the haulages slackness sets in and the men start taking risks until an accident occurs.

Every mining man knows the rules the application of which will reduce his haulage accidents to a minimum, but it may not be out of place here to jot down a few of the most important:—

Manholes must be provided as required by the Act, must be of proper size and kept clean.

No person must be allowed to travel or work on the haulage road while the rope is in motion unless specially authorised to do so.

No person must ride on any set of tubs unless specially authorised to do so.

The signalling apparatus and the track must be kept in first class order throughout the length of the haulage road.

Stop blocks must be placed at the top of every brow or incline and must be kept shut.

On a main rope haulage from the dip a drag must be attached to each ascending set of tubs.

On an endless haulage on a gradient automatic jack catches must be placed at intervals to prevent the tubs from running back if they become detached from the rope.

Where men are working on a haulage road in the dip and the haulage is working above, good buffers, preferably in the shape of stout steel derrick props, must be provided.

No men must be allowed to stand or sit on the junctions where side roads join haulage roads.

Haulage engines, ropes, caples, tub links and tub drawbars must be examined regularly.

#### *Accidents due to falls of roofs or sides.*

This class of accident again is one which contributes a big percentage of the total number of accidents in mines and unfortunately it is extremely difficult, if not impossible, even to form rules which will eliminate it.

The danger from falls of roof and side is one which is inherent in mining and it is really only the practical mining knowledge of the average workmen in the mine which can keep it at bay; when a man has worked down a mine for several years he develops a sixth sense which tells him when a place is safe and when it is not, if he does not develop this sense he is booked for the casualty list, it is a result of hard practical experience and no amount of book learning will give it to a man although it is true of course that a man with his

brains sharpened by a good education will pick it up more quickly than one who has not been so fortunate.

As with haulage accidents, so with falls of roof and sides, it is often over-confidence or slackness on the part of the men concerned that causes an accident. They know that, for example, another prop should be set before they cut any more coal but perhaps they only need a few more basketfuls to complete a tub, they risk it and take the consequences.

The only safeguard against accident of this type is a very strict insistence on safe timbering and work in general by the management and subordinate officials so that a man knows that if he deliberately runs a risk he not only risks his life, but, if he gets away with it, he will still be in trouble with the management.

It is only fair however also to show the other side of the picture which is that in many cases, especially in de-pillaring work in this country in thick seams of 20'-0" or more thickness, the conditions of work are definitely dangerous and it is a wonder to many of us who have to supervise the work under these conditions that accidents are not more numerous than they are; it says a lot for the skill of the average miner at his own particular job.

#### *Accidents from shot-firing.*

The rules laid down by the Mines Act and Regulations in this country, and in most other countries as well, with regard to shot-firing in mines are very strict and it is largely owing to these rules that the accidents directly attributable to shot-firing are not actually very numerous; there is always a grave potential danger from men overcharging shot holes, firing shots without warning other workmen in the vicinity that they are going to do so, or firing shots when there is any  $\text{CH}_4$  present in the neighbourhood of the place where the shot is to be fired, but all these cases are clearly covered by the regulations under the Mines Act and these regulations are strictly enforced in any well-managed colliery.

The greatest danger from shot-firing undoubtedly is the ignition of gas or coal dust which may lead to an explosion, but the compulsory use of 'Permitted' explosives in gassy mines and the compulsory use of inert stone-dust have reduced these dangers to a minimum.

Another cause of danger from shot-firing is the mis-fired shot, the fuse of a shot is ignited or the electrical exploder is worked and the shot does not explode and there is a dangerous tendency for the man concerned just to wait about a minute and then go in and see why nothing has happened; as it is not an infrequent occurrence for the explosive to have a delayed action for some reason or other anyone doing this is running a very grave risk, and the Mines Act lays down that if a shot is mis-fired the place must be fenced off by an official and no one may go near for at least an hour, and then they may not try to examine the shot-hole or pull out the explosive but must bore

another hole, fire it and then search for the unexploded charge which must be accounted for.

If the regulations are adhered to in these cases there is very little danger.

#### *Accidents due to machinery.*

Accidents due to this cause in mines may be either on the surface or underground; on the surface they are of course no more likely to occur than in any workshop or factory, but underground there is the added difficulty that the lighting, even under the best conditions, is inferior to that on the surface, and in order to keep these accidents to a minimum it is absolutely essential that all underground machinery shall be really well fenced off and that no person shall be allowed to go inside the fencing while the machinery is in motion; another point which only applies to this country, but which is definitely most important, is that all machinery attendants and fitters must wear some kind of shorts and not dhoties which are extremely dangerous articles of apparel when there is moving machinery about.

#### *Accidents due to CO<sub>2</sub> and CO gas.*

These accidents are not common, but they do occur and they are usually due to ignorance on the part of the men concerned, or slackness on the part of the supervising staff.

It is of course essential that the officials of the mine shall be able to detect these two gases and if they find any of either gas the place must be fenced off; CO is only found when there is heating and as it is invariably accompanied by the characteristic gob stink the danger should be spotted and tackled at once if the officials are alert; if anyone gets gassed by CO when actually dealing with a fire or heating that is a mining risk which has to be taken, but even then it should not prove fatal as everyone knows that the risk is there and if small birds are kept on the job, as the law demands that they shall be, they will be the first to suffer and the men can be withdrawn before they are seriously affected.

The danger from CO<sub>2</sub> is rather more insidious as this gas has no smell and lies in any old unventilated workings of a mine; it should of course be found by the supervising staff on their inspections, but cases arise where men go into old workings for some reason without thinking of the danger and are overcome.

#### *Accidents due to fires, ignitions and explosions.*

The above subject has been dealt with in detail in my paper 'Fires and ignitions in mines' which is before this meeting, so I do not propose to deal with it any further except to remark that while accidents under these headings are the most arresting and startling they actually do not account for as many fatalities in a normal year as do falls of roof and side or haulage accidents.

*Means of increasing the safety in mines.*

The two most important factors bearing on the safety problem are research and education; a tremendous amount of research has been done in England by the Safety in Mines Research Board, and in other countries by similar bodies, and the industry is benefiting greatly by their labours; explosives, method of dealing with coal dust, heatings, haulage safety appliances and safety clothing are all subjects on which valuable work has been done and extremely valuable information obtained.

Education is another extremely important factor in safety in mines and one that is rightly receiving increasing attention in this country; for example, shot-firers are now being trained up to pass an examination qualifying them for their position; there is no doubt that if one can get the officials and workmen to appreciate more vividly the dangers inherent in the work of coal mining the accident rate will decrease.

