Circular No. 6054
November, 1927.

INFORMATION CIRCULAR

BUREAU OF MINES, DEPARTMENT OF COMMERCE

PRACTICAL UNDERGROUND EDUCATION OF THE COAL MINER[1]

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Education of the coal miner may take various forms but nearly all of his practical knowledge is attained after he enters the mine as a workman. In this paper no effort will be made to cover many well-known methods of educating the miner in safety and operating efficiency, but its purpose is to point out some features of an underground educational system developed by one mining company which may be useful to other companies.

It is believed that this is the first effort on the part of a coal-mining company to conduct an underground school of this kind, and it may be regarded as the most advanced system of underground education for teaching men the practical side of mining, safety and efficiency.

While safety is emphasized, the increased production and efficiency of operation due to the training herein outlined should not be overlooked.

It is well known that education and discipline are the two most important factors of accident prevention in any industry. This is especially true in mining owing to the inherent dangers that are always present and the diversified hazards that may be encountered. The miner may be surrounded by all the mechanical safeguards that can be installed, but unless the company officials put forth a diligent effort to teach him the dangers of his occupation and how to recognize them, and to enforce rigid discipline by compelling him to observe the State mining laws, company rules and safe practices, no permanent reduction of fatalities and injuries can be obtained.

A certain amount of educational work is always in progress in almost every mine and a large part of the mine officials' time is spent in this way. The official when making his rounds will often point out to the miner the safe and correct way of doing things, such as when and how to set a post, to test roof, and to drill holes, properly, but the official quite often assumes that the miner's knowledge is greater than it really is. This is especially likely

1 - To be presented at meeting of Coal Mining Institute of America, Pittsburgh, Pa., December 7, 1927.

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to occur when the official is dealing with an inexperienced man. Frequently such a man is employed, sent into the mine with an assistant foreman, shown his place of work, and given few, if any, instructions regarding his safety. If he should be injured, surprise is expressed at his dumbness or carelessness. Actually he probably was using all the knowledge at his command to protect himself. Inexperienced men must be educated to recognize dangerous conditions and to work safely before they can be expected to protect themselves.

Practical miners, with years of experience, when changing from one coal field to another, or one mine to another, may be injured, crippled or killed before becoming familiar with local conditions. Each coal mine probably has much the same hazards. However, many unexpected hazards are created by variations in the physical condition of different mines, in the amount of explosive gas that is likely to be encountered, in the explosibility of the coal dust, in the characteristics of roof and coal, and in the method of mining, timbering, ventilation, haulage, and shooting.

Every man, when first employed by a company, should be given sufficient instructions regarding the hazards of his job to insure his recognition of the dangers connected therewith. He should also be instructed in all safety rules and regulations which affect him, and taught the safe and practical methods of performing his work. Both during his instruction and after his practical education is completed, strict discipline should be enforced to compel him to obey laws, rules and regulations and work in a safe manner. However, discipline, while very essential in the prevention of accidents and production of coal, can not entirely take the place of education.

Carelessness on the part of the officials and workmen together with a lack of sufficient knowledge to recognize dangerous conditions are usually found to be the cause of most preventable accidents. The workman is quite often blamed with carelessness when actually the accident is due to insufficient knowledge on his part, or to insufficient knowledge or instructions by the mine officials. It is always easier to charge the workman with carelessness than it is to educate him to recognize dangerous conditions or to teach him to avoid dangerous practices. In this connection, the Practical Mining School instituted at Dawson, New Mexico, by the Stag Canon Branch of the Phelps-Dodge Corporation for the training of inexperienced men is of interest. An entry in one of the larger mines has been set apart for the use of the school and a practical miner, with teaching experience, placed in charge as instructor. When inexperienced men are employed they are placed in this school. Here they are taught the essentials of safe mining practice, the proper use of mine tools, and methods to provide for their own safety, together with the company's safety rules and practices. Under the close supervision of the instructor the new men usually develop into capable miners and acquire the safety habit. A detailed record of each student is kept by the instructor, showing name, age, nationality, previous mining experience, date enrolled, the detailed instructions given, and progress in the school. As soon as a student acquires the knowledge regarded as necessary for safe and efficient work outside the school, he is transferred to some other mine and takes his place in the regular operating department. The period of instruction is usually about 70 days, depending on the amount of previous experience and aptitude of the student.

The school not only educates the miner in safety practices, but materially assists in filling in shortage of experienced miners which has existed for a number of years in the field in which this company is operating. The school is beneficial from still another point of view, in that it enables the inexperienced man to have an earning power immediately upon entering the mine. This company has found that when "green" men have been sent into the mines, it has usually taken them some time to get started on the path to reasonable earnings, and that before this point is attained, they become discouraged and leave the service, whereas, upon entering the school the instructor encourages the men and teaches them everything that is necessary to know, and they immediately become producers and wage earners. The results accomplished in the school thus far are worthy of note, both from the standpoint of developing capable miners and reducing the number of accidents which occur among the new men, and the company feels very much encouraged with the results obtained.

Nearly 70 per cent of the men enrolled during the first nine months' operation of the school developed into good miners. With respect to accident prevention, the results have been even more encouraging. During the nine months period 30,000 tons of coal were mined in the school with only one lost time accident. This accident resulted in but three days loss of time. Among the men transferred out of the school there has not been an accident.

Duties in which the student is given specific instructions and which he must thoroughly understand before being transferred out of the school are as follows:-

1. General procedure for checking in and out.
2. Regulations and general practices regarding use of man trips.
3. Kinds of tools and equipment required.
4. Clothing best adapted for durability and safety.
5. Safety regulations of a general nature.
6. How to test a roof that looks good.
7. How to test a roof that looks bad.
8. When and how to report an unsafe place.
9. How to measure and cut a prop.
10. How to set a plain prop.
11. Use of ax and safety precautions.
12. When to set a prop for safety.
13. Regulations and practices for setting props at the face.
14. Regulations and practices for setting props for track clearance.
15. How to set a cross-bar.
16. How to measure and set a sprag.
17. Regulations and practices in setting a sprag.
18. How a dead line is marked and precautions to be observed.
19. How to use a shovel.
20. How to use a pick.
21. When to wear goggles.
22. Care of tools at working place.
23. How bosses mark for a prop.

24. How to tell rock, bone, and "iron."
25. What to do with "waste."
26. When to "brush."
27. How to "brush" in average ground.
28. How a man is paid for extra bone.
29. How a man is paid for "brushing."
30. When an how to sprinkle coal.
31. How to clean up for the cutting machine.
32. How machine men keep track of cutting jobs.
33. How to clean up after the cutting machine.
34. How to set a drilling machine.
35. How to sharpen a drill.
36. Where and how to drill.
37. How men check cars and how they are paid for coal loaded.
38. How a man is charged for explosive used.
39. How to make "dummies" and the number needed.
40. How to lay track to working face.
41. How to handle cars and the necessary blocking.
42. How to get spikes, ties and rails.
43. When and how to report injuries.
44. Care of first-aid packets.
45. Need and opportunity for first-aid instruction.

Some of the details regarding practical mining which are taught in the school are as follows:-

1. General procedure for checking in and out.
   (a) Each employee must deposit his identification check with the fire-boss each morning, before entering the mine.
   (b) He must ask the fire-boss about the condition of his working place.
   (c) He must take identification check from check board when leaving his lamp in the lamp house.
   (d) Penalty for not taking check off the board.

2. How to test roof that looks good.
   (a) Sound with pick, hammer or bar, at the same time holding the other hand against the roof.

3. How to test roof that looks bad.
   (a) Stand to one side and reach under.

4. How to measure and cut a prop.
   (a) Take two sticks or two pieces of small pipe; place one end against the roof, one end of the other stick on the floor, and allow the two ends in the hand to over-lap. Thickness of cap piece to be deducted from total length.

(b) Place the prop in a safe place before starting to cut it to proper length.
(c) Cut the larger end of the prop square and make the beveled cut on the smaller end.

5. How to set a prop.
(a) Set the prop in a vertical or upright position, wedge it tight with a cap piece several inches thick and the full width of the prop. The cap piece should extend both ways over the edge of the prop, and be set across the faces or cleats instead of with them.

6. Use of ax, and safety precautions.
(a) Maximum length of ax handle 2 feet.
(b) Head should be securely fastened on handle.
(c) In making a bevel cut, cut about half-way through the prop, then turn the prop over and repeat.
(d) Place cap on solid floor before cutting it to proper size.
(e) Always see that there is sufficient clearance.
(f) When the ax is not in use, keep it in a safe place.

7. When to set a prop for safety.
(a) If a prop is needed, NOW is the time to set it.
(b) Set a temporary prop before taking chances.

8. How to set a cross bar.
(a) First square the rib so that top coal is not overhanging.
(b) Cut the hitching in the rib large enough for the bar. (Do not cut the bar to fit the hitching).
(c) Square bottom side of other end of bar, and set prop under the extreme end.
(d) Wedge tight near ends but not in the center.

9. When to set a sprag and how.
(a) Whenever undermining by hand, first set a sprag against the face.
(b) Set the sprag in a slanting position to brace the coal from falling.

10. What is a dead-line? How is it marked? What precautions should be observed?
(a) A dead-line is a danger sign placed in the path-way as an obstruction to stop any person from entering into known danger.

(b) The danger sign is marked on a piece of lumber or a prop, in fact on anything that can be plainly written on and used as an obstruction.
(c) At no time pass over a dead-line. If the fire-boss or foreman wants men to go into a dead-lined place, he will first remove the dead-line.

11. How to use a shovel.
(a) Use the leg to help push the shovel into the coal.
(b) Partly relax the muscles while shoveling.

12. How to use a pick.
(a) Have the pick securely fastened on the handle.
(b) Do not use a handle when split.
(c) Do not hold the handle cross handed.

13. Care of tools at working place.
(a) Have tools assembled where needed instead of having them scattered.
(b) When tools are not in use keep them in a safe place.

14. How bosses mark for a prop.
(a) By placing an encircled cross on the roof with chalk.

15. What to do with waste.
(a) Waste must be picked out and thrown into the gob.
(b) Must not be loaded out with the coal.
(c) This company sells coal, not waste.

16. When to sprinkle the loose coal.
(a) Sprinkle the loose coal thoroughly before loading it into the car.
(b) After pulling down loose coal, sprinkle it again.

17. How to clean up for cutting machine.
(a) Square up the face even with the undercut. Pay special attention that the corners are squared.

18. How to clean up after cutting machine.
(a) Pull down loose coal from face.
(b) Set props near face if needed.
(c) Clean thoroughly all undercuttings or "bug dust" from under the cut.

19. How to sharpen a drill.
(a) Lay the drill on some solid object and hold it securely in place with the knee.

(b) File away from your body, not toward it.
(c) How to drill holes.

20. How to make dummies.
(a) Roll a piece of paper several times around a stick, fasten one end, and fill with adobe.
(b) Do not make dummies too big as they will not go into the hole.
(c) Furnish enough dummies to tamp each hole to the collar.

21. How to block cars at the face.
(a) Block end of track with two ties or props by crossing ahead of the last tie, with one end of each under a rail and the other end of each on top of the other rail.
(b) Do not allow the car to go beyond the last tie.

It will be noted that nothing is mentioned regarding loading, tamping or shooting, and it may be well to state that in the mines of this company all loading and tamping is done by shot-firers. The shooting is done electrically from the surface with all persons out of the mine.

The writer had the privilege of inspecting this school during the early part of this year. The school at this time consisted of about twenty-five working places, and the writer has never observed miners' places kept in such good condition. It is impossible to visit working places kept in such an admirable manner and to talk with the students, instructors, and officials in charge without being impressed with the efficiency and common-sense manner in which it is conducted, and without realizing the vast amount of good that can be accomplished by such a school in teaching practical safety and efficiency to experienced as well as inexperienced men.

It is believed that a school of this kind efficiently conducted by any fairly large company would pay for itself many times over in both safety and operating efficiency as the cost is small--the principal expense being the services of the instructor. The students in the school are paid the regular tonnage rate and their earning capacity is controlled only by their ability and willingness to work. After being transferred out of such a school to another part of the mine or another mine, the student's ability as a safe and efficient workman speedily pays for any cost involved in his practical education.

Thanks are due Mr. W. D. Brennan, manager of the Stag Canon Branch of the Phelps-Dodge Corporation, for information and assistance rendered in the preparation of this paper. -- Information Circular, Bureau of Mines, Department of Commerce.