CIRCULAR 6153 JULY, 1929

INFORMATION CIRCULAR

DEPARTMENT OF COMMERCE -- BUREAU OF MINES

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BY

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SAFETY IN MINES[1]

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By W. D. Ryan[2]

The organic act passed by Congress in 1910 instituting the Bureau of Mines provided that the director of the bureau should promulgate such investigations as might be necessary to determine the causes of mine accidents and the best methods of preventing them. With the object of accident prevention in view, Director Joseph A. Holmes, and others who were pioneers in the bureau, conceived the plan of having first-aid and mine-rescue training as one of the major activities of the Bureau. Out of this plan grew the first-aid and mine-rescue contests, which have been featured as an incentive for men to take courses in this type of mine safety training. The first appropriation for mine-accident investigations became available on July 1, 1908, under the jurisdiction of the U. S. Geological Survey, with Dr. J. A. Holmes in active charge. During 1908 there had been some first-aid training in the Pennsylvania anthracite field and a start made in Illinois, although there appears to be no exact information as to when or where first-aid training in the mining industry first became a reality, it is generally conceded that the St. John's ambulance corps of Scotland was one of the first - if not the first - to make the work effective. In 1911, to celebrate the establishment of the Bureau of Mines and the formal opening of the Pittsburgh, Pa., station, a first-aid and mine-rescue demonstration was conducted on Forbes Field, Pittsburgh. President William Howard Taft and many other men notable in public life were present. This was the first general national contest of the kind held in the United States; and since then there have been a number of nation-wide first-aid and mine-rescue contests, as well as some which have been international in scope. There are over one hundred first-aid and mine-rescue contests of various kinds held annually in connection with mining and the allied industries.

First-aid and mine-rescue contests are unquestionably an effective part of accident-prevention work. They stimulate an active and direct interest in safety work that can be engendered by no other means. The keen spirit of

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2 - Mine Safety Commissioner, U. S. Bureau of Mines Mine Safety Office, Kansas City, Mo.

friendly competition which these contests promote attracts the attention of men to the problems of mine safety. It would be far more difficult to induce employees to take courses in safety training were it not for this spirit of competition which imparts sporting interest to the work. That the contests are indispensable can not be doubted when we consider what a formidable task it is to induce men voluntarily to devote their time to a matter which, though of vital importance to themselves, is apt to be regarded as tedious routine. Every mining man who has given the matter any thought knows how difficult it is to keep the men interested in the work of safety, and how their interest will wane unless various and frequently changed means are employed to hold their interest. Contests make safety training more agreeable and popular, and in addition the publicity which they give is most valuable in attracting attention to the safety movement. They tend to popularize the work of safety and at the same time to create a more widespread interest in the movement. It is thoroughly believed that the more widely well-directed safety activities are extended the less becomes the likelihood of accidents. It is acknowledged by many mining companies whose employees have been trained in safety work of the first-aid and mine-rescue type that the results from such training are most beneficial in reducing the number of preventable accidents, aside from the definite benefit of first-aid and rescue work in handling accidents and disasters after they have occurred. This is because people who have been trained in safety measures of any kind are naturally more alert to the possibilities of accidents and are imbued with the spirit of trying to prevent the occurrence of accidents. Their training has awakened in them a consciousness of the dangers that beset them and has accordingly taught them to be more alert and careful. When a large number of employees and employers are thus awakened to the matter of safety work and are trained in it, the invariable result is a reduction in the number of preventable accidents and an all-round improvement in safety conditions.

The practical value of safety work and the part that contests have played in making such work effective, are well stated in a paper by James Powell, assistant superintendent, Superior Coal Co., Gillespie, Ill., which was read at a recent meeting of the Illinois Mining Institute.

Mr. Powell's paper reads as follows:

> "During the year 1927 the Superior Coal Co. operated four mines and a coal washery in Illinois, employing 3,200 men, and produced 2,005,176 tons of coal without a fatal accident. The following comment was sent in letter form to all employees by General Manager F. S. Phaler:
>
> 'It gives me great pleasure to pass on to the employees of this Company the comments of the Director of Department of Mines and Minerals and the State Mine Inspector. It is a great accomplishment and a worthy one.
>
> 'The officials of the Chicago and Northwestern Railroad will be especially grateful with this record as that railway was the originator of the safety movement.

'We believe the First-Aid Movement is an accident prevention movement and the results of our safety work have been to the benefit of both employer and employees.

'The prevention of every accident means the prevention of sorrow in someone's home.

'Such a record as we have made would only be possible by the close cooperation of everyone concerned.

'I thank everyone of our employees for his part in this accomplishment and I have every reason to believe that for the best interests of all this close cooperation will continue.

Yours in the interest of Safety,

F. S. Phaler.'

"Our accident records show that employees holding First-Aid Certificates were seldom injured and if disabled it was usually in an unavoidable manner, and after a few years, plans were made to put on a 100 per cent drive.

"James Boston, our safety inspector, points with pride to the following figures:

'Men and boys trained in recent drive	3,389
Women and girls trained	495
	3,884

'The Department of Mines and Minerals issues a monthly statement showing accidents, etc., for the State, and from this report I have compiled the following figures:

Tons produced per lost-time accident:	
Illinois (District 6 excepted) 1927-28	30,138
Tons produced per lost-time accident:	
Dist. 6, Superior Coal Co., excepted	31,306
Tons produced per lost-time accident:	
Superior Coal Co.	43,388
Gain over district.	12,080
Gain over State.	13,250 '

"Is first-aid training worthwhile and does it make you any money? We say it pays. Our accident cost for the three months of 1928 shows a saving of 26 per cent over the three months of 1927 - these figures based on actural cost per ton.

"If you expect results from this movement and advocate Safety First be sure that you practice what you preach. Make every employee a safety inspector and welcome his findings when dangerous conditions exist and see that they are corrected at once and not next week, and watch your accident cost go down."

The same ideas are expressed in a letter from Mr. Argust, division superintendent of the Peabody Coal Co., Taylorville, Ill., who says:

"For a number of years the writer has been vitally interested in safety of employees in and around coal mines. I have watched the movement grow, started by a very few men, and it has now grown into a real, effective organization.

"There can be no question as to mines being safer whenever large numbers of employees become trained in first-aid and mine-rescue work. The question may be asked why first-aid training and mine-rescue work makes mines safer. I would answer this question as follows:

"Where the operator alone attempts to establish rules and discipline, it is ofttimes resented by the employees. Consequently the operator and his small operating organization do not have the cooperation of the exployees which is necessary to obtain results. When the employees are taken in and are made the major portion of the training, they naturally become more interested. By organizing teams the operator has an opportunity to meet these men frequently. Not only does he talk to them on the first-aid movement alone but he talks to them about the prevention of accidents, which is more essential than the first-aid and rescue work. Through the contact between such employees as become interested and the operator, the operator is able to educate the employee in regard to safety, and in a short time you will find that the men interested in the first-aid and rescue work are taking sides with the operator, supporting him, and defending him among other employees in carrying out discipline and safety rules.

"The members of trained teams have an opportunity to attend the frequent meetings held by miners. At these meetings many problems are discussed. Among the problems naturally come new rules put into effect by the operator for the safety of the men. The men who have been trained naturally defend the operator's position because they know that it is for the best interest of the employees, and through their contact with the operator and through the good will which has been built up they know that he is sincere in trying to protect life and limb.

"I can recall a time when a man who helped make up a first-aid team in a coal mine was looked upon in a very unfriendly way by the miners. They were very skeptical and doubted the sincerity of the mine operator's purpose. To-day in this field through the training not only do the employees cooperate and welcome the training; but they support it morally and financially.

"Through the efforts of the small group of men making up the teams in various mines and through their relationship with the operator we have been able to put over 100 per cent training among our employees, who number approximately 3,500. To have done this at the start would have been an impossibility because of the lack of confidence and cooperation. There were hundreds of employees that could not have been induced to even take the training but through the persistancy of the small numbers and the management, the idea became sold generally among the employees.

"To-day not only are the employees interested in first-aid, mine-rescue, and safety-first work, but their families at home are vitally interested. This has been demonstrated where contests have been held in the field, where wives and children were present and much interested.

"Since our employees have become 100 per cent trained in first-aid there has been a great reduction in our accidents. Naturally we must attribute it to the cooperation of the employees which has been brought about, in my opinion, through this movement.

"I dare say that the movement has even had its effect on keeping down certain labor troubles that we formerly experienced, because it has wiped out certain antagonisms and suspicions.

"It might be of interest to know that the employees in this field where money is necessary to carry out certain programs have equally helped to finance the project. Further, by agreement with the employees certain fines that are collected from employees under our joint contract with the miners are turned in to this fund, which helps to defray expenses.

"To keep the safety movement alive it requires constant thought and effort. It is naturally essential that various contests be held from time to time. It would be useless to expect members of teams to constantly keep up strenuous training without giving them a chance to demonstrate their

ability before large numbers interested in the mining game, from time to time. In other words, to keep up successful teams and interest, the team members must get action. Certainly they are called out from time to time when accidents occur; but when this happens and the mines are in operation there are not so many of their own members who have a chance to see what the teams are capable of doing, hence the necessity of public contests and demonstrations.

"In my opinion, operators of all coal mines in the country should have not only one well-trained first-aid team but a number of them in each mine to keep up the rivalry and interest among other employees. I believe that operators have made mistakes by confining the activities in the movement to one team in a mine, for the reason that the captain of a team is naturally interested in getting the best material that be can in his team, especially so where he enters into public contests and meets. As he goes along he finds that he has to weed out occasionally some of the team members. If there is no other place for them to fit in they immediately become dissatisfied employees, and they fight the movement, but by having a number of teams, there is always room for those sufficiently interested to be a team member, and as stated before, from among the teams each team is striving for first place in that mine.

"In carrying on contests naturally the operator incurs some expense, but in my opinion, laying everything else in connection with the movement aside, the good will that is built up between employer and employee through this movement alone is worth the money spent, and the movement as a whole has great possibilities and will pay good dividends to both employer and employee.

Yours truly,

W. C. Argust,
Division Superintendent,
Peabody Coal Co."

These papers are quoted at length to present the viewpoints of men who are confronted with the task of promoting safety in the mines, and whose practical experiences in everyday safety work are most valuable. No one can read these reports without observing that the writers attach the utmost importance to contests and meets as means of fostering the safety movement in their mines. By means of such events they have been able to achieve about the maximum degree of possible safety. A statement in Mr. Powell's paper that is worthy of particular emphasis is the following: "Our accident records show that employees holding first-aid certificates were seldom injured."

About a million men are employed in the mining industries in this country. The bureau, since its inception, has been able to train approximately one-third of this number, but since the labor turnover is large, and many of the trained men leave the industries for various causes, there is, of course, far less than one-third of the personnel of the industry who are trained. This shows that there is an immense amount of work yet to be done in order to place these industries upon an adequate safety basis.

One of the most cherished aims of the Bureau of Mines is accident prevention. Many of its activities are directed toward this end, and it cooperates with all other agencies which have this object in view. The unusual conditions under which men in the mining industries must work - underground, shut away from the sunlight, and subjected to many hazards peculiar to such unnatural surroundings - make the problem of safety and accident prevention particularly difficult of solution. Nevertheless, gratifying results have been achieved, and it is now believed that mining can become relatively safe, when the industry as a whole realizes the need and value of safety measures and accident-prevention work. At any rate, mines in which accident problems have been faced with intelligence and determination have been able to reduce their accident and fatality rates materially. This would indicate that when the mining industries as a whole have emulated the example of these select mines or groups of select mines, the situation as to accidents will be tremendously improved; in other words, many of the present accidents are preventable. For instance, improper equipment is the cause of accidents which could be entirely eliminated by following the bureau's suggestions as to permissible equipment. Other types of preventable accidents could be enumerated, and if these accidents of the purely avoidable type could be largely eliminated the situation would be bettered immensely.

At times it seems doubtful if we really appreciate the difficulty of the task of promoting mine safety in this country. Admittedly we have conditions to cope with that are absent in other countries. Great Britain, for instance, with something like 300,000 more coal miners than we have, has a fatality rate only about one-fourth to one-half as great as our own. Some of the reasons that may explain the higher death rate per man in our mines can be enumerated. For instance, in most foreign countries the mining area is restricted to a small portion of that country, whereas in the United States the mining area is extended over a vast domain that embraces practically the entire country. The advantages of a restricted territory are obvious. There is most likely to be an uniformity of natural conditions which once understood makes for routine stability in mining. In the United States, on the contrary, mining is carried on under so many divergent conditions that new problems are constantly to be met. Another advantage that foreign countries have is due to the fact that their miners are nearly all "bred to the trade;" that is to say, their male relatives have been miners for generations. In the United States, however, new men - often non-English-speaking foreigners - are constantly inducted into the industry. It is, of course, a serious handicap to safety work when large percentages of the working forces are unable to understand any common language.

This is a handicap that most European countries do not have to overcome. The inability of many of our miners to understand English makes the task of instructing them in safety work and measures very difficult. Possibly the best way that foreign workers can be interested in the safety movement is by direct examples of safety work as performed in safety contests. It will be seen from this how important these contests are likely to be to safety work and to the task of inculcating the spirit of safety in these men.

There is yet another reason why our fatality rate exceeds that of other countries, which probably should be mentioned; that is, that the proportion of underground workers is higher than in most other countries, which, of course, causes a larger number of men in the mines in this country to be exposed to the greatest hazard of the industry - namely, falls of roof. These are some of the reasons why our problem of mine safety is no easy one, and why we must not relax our contests and campaigns of mine-safety education.

The question of mine mechanization must also be considered when comparing our accident rates with those of foreign countries, for we have made far greater strides than any of them in mechanizing our mining industry. It has been asserted by some men interested in safety that machinery necessary for modern mechanization of mines would increase the accident hazard, and that it would take some time to educate employees in the safe and proper use of new machinery, particularly of mechanical loading devices. However, on investigation we find that in some mines where such machinery has been installed there has been a reduction in accidents, based on tonnage and men employed, as compared with former mining methods, while in other mines there has been an increase. This is an indication that when safely and sanely supervised, new mechanization methods will not increase the accident hazard. What one company can accomplish, it would seem that another can likewise accomplish under similar circumstances and conditions. It is inevitable, however, that mechanization of the mines with the consequent speeding up of production, will create many new safety problems which will have to be met with intelligence and determination. Only by keeping the men in the industry - and this means operator as well as miner - alive to the importance of safety work and up-to-date by means of contests and campaigns of safety education can we hope to reduce our accident rates. Before leaving the subject of mine mechanization it is well to quote from the Mining Congress Journal of October, 1928, an excerpt on safety as affected by mechanization:

> "The increased use of mechanization is raising the question as to whether mechanized mining is safer than the older hand methods. It has been pointed out that in group working a number of men instead of one man are exposed to possible injury. It has further been pointed out that concentrated workings, increased use of power, roof action on long faces, all may constitute new hazards that are not present in hand mining, or at least not present in the same degree. These sources of danger undoubtedly do exist but to take the view that they make mechanized mining more hazardous than hand mining is to look

through the wrong end of the telescope. The Safety of any occupation is not measured by its potential dangers but by the effectiveness of the means which may be adopted to prevent accidents from occurring. The real comparison, therefore, between the safety of hand and mechanized mining is a comparison of the degrees to which safe mining practices can be enforced in the two methods.

"In the hand mining, it is well known that any safety rules adopted by a coal company are effective only so far as the men may choose to follow the practices recommended. In the scattered workings of hand operation there is no way that the company can force a man to protect himself.

"In mechanized mining this situation is changed. The men work in groups where they are subject to constant supervision so that effective safety practices devised to eliminate the hazards brought about by new types of equipment and new methods of mining can be, and are being, enforced for the betterment of the working conditions and for greater safety to the men employed. Mechanized mining, therefore, offers to the coal industry something which it has heretofore lacked, the opportunity to devise safety rules, to formulate safe practices, to design and install safety equipment, with the assurance that the efforts along these lines will not be wasted."

High as our accident rate is, it is well to consider how much greater it would have been had there been no governmental agency such as the Bureau of Mines cooperating with the industry and directing its attention to its safety problems and training its men in this work. Since the bureau's inception over 350,000 men have been trained. These men have formed the important pioneers in the work and have undoubtedly spread their knowledge of safety measures among their fellow craftsmen to the benefit of all those employed in the industry.

The bureau is able to arouse interest in the safety movement largely by means of the contests which it sponsors. In addition to the national or international contests which it conducts, it also renders assistance to local and sectional meets wherever possible. The city in which the international contest is held is selected by the officials of the safety division with the approval of the Director of the Bureau of Mines and Secretary of Commerce only after carefully considering the location with relation to the mineral industries, transportation facilities, hotel accomodations, and other factors as to its fitness for the meeting. In addition, the city selected must guarantee the necessary money for financing the contest. After the Director of the Bureau of Mines officially notifies the agency sponsoring the contest that its request has been favorably acted upon, a local organization is effected and a committee is appointed to cooperate with officials of the Bureau of Mines. This committee takes care of the local publicity campaign while the bureau through the technical press and by special invitations to heads of mining companies, covers the

broader or national publicity. A suitable site where the contest is to be held in the chosen city is selected by this committee in close cooperation with the officials of the Bureau of Mines. An outdoor site such as a stadium or large athletic field is preferred and is usually chosen; however, an indoor or covered pavilion is also selected to be used in case of inclement weather. The places where such meetings have been held - and other statistics concerning them - are given in the following table:

Statistics concerning safety-contest meets

Place held	Date	First aid teams	Mine rescue teams 1/	States represented
Pittsburgh, Pa. 2/	Oct., 1911	41	4	10 Also
Terre Haute, Ind.	Sept., 1914	29	8	3 Canada
San Francisco, Calif.	Sept., 1915	26	7	12 And
Pittsburgh, Pa.	Sept., 1919	83	24	16 Mexico
Denver, Colo.	Sept., 1920	73	20	20
St. Louis, Mo.	Sept., 1921	63	16	17
Salt Lake City, Utah.	Aug., 1923	55	21	13
Springfield, Ill.	Sept., 1925	55	10	15
San Francisco, Calif.	Sept., 1926	44	14	13
Pittsburgh, Pa.	Aug., 1927	47	17	12
Butte, Mont.	Aug., 1928	46	12	11

1/ Note the number of mine-rescue teams. The mine-rescue contest is conducted in conjunction with the first-aid contest.

2/ The Pittsburgh meet in 1911 was merely a demonstration to arouse interest in the work.

A record of the progress of the bureau's training activities is shown in the table which follows:

Record of men trained by the Bureau of Mines in safety activities

	Initial first aid	Mine rescue	Additional first aid	Mine rescue	Total men trained
1910-1923	89,627	30,029	7,194	2,499	129,349
1923-1924	13,568	2,549	2,661	973	19,751
1924-1925	19,831	1,949	3,135	782	25,697
1925-1926	23,454	1,824	3,197	911	29,386
1926-1927	24,818	2,192	4,235	636	31,881
1927-1928	40,763	1,978	4,304	1,054	48,604
Totals	211,563	40,521	25,226	6,855	284,168

During the first 10 months of the fiscal year ending June 30, 1929, a total of 59,412 training certificates were issued, which added to the number trained given in the table bring the total trained to 343,580 as of Apr. 30, 1929.

A study of accident statistics reveals the fact that in some sections of the country where local and state contests have been abandoned, accidents have increased very considerably. It follows that where there is not enough interest manifested in safety work to organize an occasional meeting or contest that safety in general is being neglected - a condition which appears to indicate the importance of contests in promoting the work of mine safety. Those fields where state and local meets are being featured are finding that more men are taking the training, while the reverse of this is true where meetings have been abandoned. During the past year about 50 first-aid state and local contests were held throughout the country; they took place in California, Washington, Wyoming, Colorado, Louisiana, Texas, Oklahoma, Illinois, Pennsylvania, Ohio, Alabama, and West Virginia. The prospects appear good for an increase in these activities during 1929. It is to be hoped that sections which have permitted their interest to wane will arouse themselves to the necessity of renewing this type of safety work in their field. Fortunately, there are indications of a revival of interest in such sections.

Contests play an important part in bringing about that spirit of cooperation among the employees themselves and with the management which has been so well described by a prominent safety engineer in these words:

> "In accident prevention there must be not only genuine willingness on the part of those concerned, employer and employee alike, but cooperative efforts to a common end. I have spoken of the executive as key to the present situation. Do not infer, however, that action by him alone can correct it. If he is apathetic, the safety movement gets nowhere; it gets no great distance unless the employees do their part, not grudgingly or with imputations that the employer is in it solely to save money, but with the true spirit of cooperation. Safety never prospers in an atmosphere of contempt, mistrust, or ill will. It will grow only in the rich soil of unselfishness, watered with the milk of human kindness."

In conclusion, the following points as to the value of contests in accident prevention and safety work in general are emphasized:

An incentive is provided by contests for men to take the training.

The principle of safety is fostered in those who participate in the contests.

Contests constitute the best means of attracting the attention of the industry to the safety movement.

The educational feature of the contests is valuable.

Contests tend to popularize safety work in so far as it is possible to popularize it.

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