

PROCEEDINGS
of the
ILLINOIS MINING INSTITUTE

FOUNDED FEBRUARY, 1892



1939

Summer Meeting
on Board S. S. Golden Eagle
June 9-10-11

and

Annual Meeting
SPRINGFIELD, ILLINOIS
November 10



PAUL WEIR
President, 1939

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FOUNDED FEBRUARY, 1892

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1895	} Institute inactive.
1911	
1912-3	JOHN P. REESE, Gen. Supt., Superior Coal Co., Gillespie, Ill.
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1914-5	J. W. STARKS, State Mine Inspector, Georgetown, Ill.
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1916-7	FRED PFAHLER, Gen. Supt., Superior Coal Co., Gillespie, Ill.
1917-8	PATRICK HOGAN, State Mine Inspector, Carbon, Ill. .
1918-9	WILLIAM HALL, Miners Examining Board, Springfield, Ill.
1919-20	WILLIAM HALL, Miners Examining Board, Springfield, Ill.
1920-21	FRANK F. TIRRE, Supt., North Breese Coal & Mining Co., Breese, Ill.
1921-22	PROF. H. H. STOEK, Mining Dept., University of Illinois.
1922-23	JOHN G. MILLHOUSE, State Mine Inspector, Litchfield, Ill.
1923-24	D. D. WILCOX, C. E., Superior Coal Co., Gillespie, Ill.
1924-25	H. E. SMITH, Gen. Supt., Union Fuel Co., Springfield, Ill.
1925-26	E. G. LEWIS, Supt., Chicago-Sandoval Coal Co., Sandoval, Ill.
1926-27	WM. E. KIDD, State Mine Inspector, Peoria, Ill.
1927-28	JAMES S. ANDERSON, Supt., Madison Coal Corp., Glen Carbon, Ill.
1928-29	JOHN E. JONES, Safety Engineer, Old Ben Coal Corp., West Frankfort, Ill.
1929-30	PROF. A. C. CALLEN, University of Illinois, Urbana, Ill.
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1931-32	GEO. C. McFADDEN, Asst. Vice-Pres., Peabody Coal Co., Chicago, Ill.
1932-33	CHAS. F. HAMILTON, Vice-Pres., Pyramid Coal Co., Chicago, Ill.
1933-34	HARRY A. TREADWELL, Gen. Supt., C. W. & F. Coal Co., Benton, Ill.
1934-35	C. J. SANDOE, Vice-Pres., West Virginia Coal Co., St. Louis, Mo.
1935-36	T. J. THOMAS, Pres., Valier Coal Co., Chicago, Ill.
1936-37	W. J. JENKINS, Pres., Consolidated Coal Co., St. Louis, Mo.
1937-38	H. H. TAYLOR, JR., Franklin County Coal Corp., Chicago, Ill.
1938-39	PAUL WEIR, Consulting Mining Engineer, Chicago, Ill.

Members !!

Plan to Attend the
Twenty-Second Annual
Boat Trip
and
Summer Meeting

on the
S. S. Golden Eagle



Announcements regarding date and program
will be mailed to our membership

A WORD TO THE MEMBERS FROM THE SECRETARY

I doubt whether our members realize the tremendous amount of work connected with getting together the Year-book which is presented herewith.

Probably none of the members have ever stopped to consider what is necessary to make this book possible.

First of all, we are dependent upon the suppliers for advertisements in order to defray the expenses of the Yearbook.

This is our eleventh issue. Many of our advertisers have contributed to each issue and have expressed satisfaction in the results obtained from the space carried in the publication.

We are anxious to have this feeling prevail with our supporters, the advertisers.

It will be of great assistance for future issues if you will give the advertisers that support to which they are entitled and patronize them by using their products.

The success of this publication depends materially on this cooperation. The advertising committee has done a fine job in their untiring efforts; their cooperation with the suppliers makes this publication possible.

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ILLINOIS MINING INSTITUTE BOAT TRIP

June 9-10-11, 1939

Twenty-first Annual Summer Meeting and Boat Trip of the Illinois Mining Institute held on S. S. Golden Eagle, leaving St. Louis Friday, June 9, 1939, at 10:30 o'clock P. M., and returning to St. Louis, Sunday, June 11, 1939, at 7:30 o'clock A. M.

MORNING SESSION

Meeting called to order at 10:00 A. M., by Mr. Paul Weir, President.

President Weir: The meeting will please come to order.

Welcome to the members and guests of the Illinois Mining Institute on this, their twenty-first annual boat trip. May the trip be filled with pleasure and profit for each of you. Last year our attendance on the trip was seventy-five. This year we have an attendance of one hundred and two. Just how this works, I do not know. The Secretary informs me that there are but one hundred beds. Of those on the boat, one-half are "peddlers" and one-half are "operators." This ratio should please the peddlers, particularly so when the operators cannot escape except by swimming.

We have on board quite a few—eighteen to be exact—guests of the Institute. By guests I mean those in the industry who have not joined the Institute. We believe that these guests should have the opportunity for becoming members. There are eleven members of the Membership Committee present. Here is a real opportunity for this committee to function. I am quite sure that all of these guests will appreciate the opportunity to become members at this time.

The Secretary will please call the roll. Answer present to your names as they are called, please.

ATTENDANCE

ILLINOIS MINING INSTITUTE TWENTY-FIRST ANNUAL BOAT TRIP AND SUMMER MEETING

St. Louis, Up the Illinois River, and Return

June 9-10-11, 1939

<i>Name</i>	<i>Affiliation and Address</i>
ADAMS, ROY L.....	Old Ben Coal Corp., W. Frankfort, Ill.
ADAMS, WILLARD C.....	Koppers-Rheolaveur Co., Chicago, Ill.
BARTLETT, A. G.....	Austin Powder Co., W. Frankfort, Ill.
BEAN, FRANK M.....	B. E. Schonthal & Co., Murphysboro, Ill.
BECKER, L. O.....	Utility Mine Equipment Co., St. Louis, Mo.

Our Advertisers are our friends and fellow members. Consult them frequently.

<i>Name</i>	<i>Affiliation and Address</i>
BLAKE, ARTHUR.....	Peabody Coal Co., Taylorville, Ill.
BLANKINSHIP, G. F.....	Egyptian Sales Agency, Murphysboro, Ill.
BROWN, BYRON.....	Franklin County Coal Co., Herrin, Ill.
BUSHONG, HARRY.....	Consolidated Coal Co., Herrin, Ill.
CARTER, DALE.....	Bell & Zoller Coal & Mng. Co., Zeigler, Ill.
CARTWRIGHT, HARVEY.....	Indiana Coal Mining Inst., Terre Haute, Ind.
CLAYTON, R. R.....	Hereules Powder Co., Benton, Ill.
COOK, WALTER.....	Central Mine Equipt. Co., St. Louis, Mo.
CRAGGS, IVOR.....	Sahara Coal Co., Harrisburg, Ill.
CRAVENS, GEORGE.....	Consolidated Coal Co., Nason, Ill.
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DAWSON, HUGH.....	Bethlehem Steel Co., Herrin, Ill.
DeWITT, C. S.....	C. W. & F. Coal Co., Chicago, Ill.
DODD, A. F.....	U. S. Fuel Co., Danville, Ill.
EADIE, JOHN.....	Sahara Coal Co., Harrisburg, Ill.
EDGAR, R. L.....	Watt Car & Wheel Co., Barnesville, Ohio
ELDERS, W. M.....	Peabody Coal Co., DuQuoin, Ill.
EUBANKS, FRANK.....	Old Ben Coal Corp., W. Frankfort, Ill.
FARNSWORTH, NAT.....	Gillespie Coal Co., Gillespie, Ill.
FISHER, S. M.....	Superior Coal Co., Gillespie, Ill.
FLEMING, J. B.....	Mine Safety Appliances Co., Urbana, Ill.
FLETCHER, J. H.....	Consulting Engineer, Chicago, Ill.
GIVEN, IVAN A.....	"Coal Age," New York, N. Y.
GRIFFIN, JOHN.....	Koppers-Rheolaveur Co., Pittsburgh, Pa.
GRIGGS, E. C.....	Jeffrey Mfg. Co., Webster Groves, Mo.
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HALL, L. W.....	Goodman Mfg. Co., Benton, Ill.
HAMILTON, FRED.....	Standard Oil Co., Evansville, Ind.
HARVEY, HADLEY.....	Ohio Brass Co., Evansville, Ind.
HARWOOD, R. H.....	Mines Equipment Co., St. Louis, Mo.
HARTWELL, LEN.....	Pyramid Coal Co., Pinckneyville, Ill.
HERRINGTON, M. K.....	Dept. Mines & Minerals, Springfield, Ill.
HITT, JOS. E.....	Walter Bledsoe & Co., St. Louis, Mo.
HURLBURT, J. R.....	Mechanization, Inc., Washington, D. C.
HUFFMEISTER, BRUCE.....	County Mine Inspector, Gillespie, Ill.
JEFFERIS, J. A.....	Ill. Terminal Ry. Co., St. Louis, Mo.
JENNINGS, ARLEN "ZACK".....	Walter Bledsoe & Co., Chicago, Ill.
JENKINS, G. S.....	Consolidated Coal Co., St. Louis, Mo.
JOHNSON, E. H.....	Jeffrey Mfg. Co., Columbus, Ohio
JONES, ARCH M.....	John A. Roebling's Sons, St. Louis, Mo.
JONES, D. W.....	Princeton Mining Co., Princeton, Ind.
JONES, JOHN E.....	Old Ben Coal Corp., W. Frankfort, Ill.
JONES, WALTER M.....	Joy Mfg. Co., Centralia, Ill.
JOY, DEWEY E.....	Cutter Bit Service Co., Christopher, Ill.
KOLB, FRED.....	Jeffrey Mfg. Co., Terre Haute, Ind.
LAMBERT, M. S.....	Robins Conveying Belt Co., Chicago, Ill.
LEIGHTON, M. M.....	State Geological Survey, Urbana, Ill.

Our Advertisers are selected leaders in their respective lines.

<i>Name</i>	<i>Affiliation and Address</i>
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LINDSAY, W. L.....	Socony-Vacuum Oil Co., Benton, Ill.
LIVINGSTONE, A. R.....	Livingstone Reporting Agency, Springfield, Ill.
LYONS, FAY.....	Pyramid Coal Co., Pinckneyville, Ill.
MacFADYEN, F. R.....	Tinken Roller Bearing Co., St. Louis, Mo.
MANCHA, RAYMOND.....	Jeffrey Mfg. Co., Columbus, Ohio
McMURRER, P. D.....	American Mining Congress, Washington, D. C.
McPHAIL, ROBERT.....	Peabody No. 18, W. Frankfort, Ill.
MEAGHER, GEORGE.....	C. W. & F. Coal Co., W. Frankfort, Ill.
MILLER, FRED.....	Franklin County Coal Corp., Herrin, Ill.
MILLER, J. E.....	Mines Equipt. Co., St. Louis, Mo.
MITCHELL, A. G.....	Burton Explosives, Mt. Vernon, Ill.
MONICO, J. A.....	Illinois Powder Co., St. Louis, Mo.
MOSER, C. E.....	Socony-Vacuum Oil Co., St. Louis, Mo.
NICHOLSON, H. P.....	University of Illinois, Urbana, Ill.
NIEDRINGHAUS, R. C.....	A. Leschen & Sons Rope Co., St. Louis, Mo.
O'BRIEN, FRANK.....	American Cable Co., Harrisburg, Ill.
OLDHAM, R. J.....	Centralia Coal Co., Centralia, Ill.
PFAHLER, FRED S.....	Superior Coal Co., Chicago, Ill.
PICKARD, A. E.....	Mt. Vernon Car & Mfg. Co., Mt. Vernon, Ill.
PITTS, BENN.....	State Mine Inspector, Odin, Ill.
POWELL, JAMES.....	Superior Coal Co., Gillespie, Ill.
POWERS, F. A.....	Hulburt Oil & Grease Co., Peoria, Ill.
PRITCHARD, W.....	Goodman Mfg. Co., St. Louis, Mo.
RHINE, FRANK.....	Joy Mfg. Co., Franklin, Penn.
RICHART, FRED W.....	General Electric Co., Cartersville, Ill.
RODENBUSH, JOHN.....	C. W. & F. Coal Co., W. Frankfort, Ill.
SALSICH, NEAL.....	Jeffrey Mfg. Co., Columbus, Ohio
SANDOE, C. J.....	West Virginia Coal Co., St. Louis, Mo.
SCHONTHAL, B. E.....	Chicago, Ill.
STARKS, J. W.....	Peabody Coal Co., Marion, Ill.
STOTLAR, J. C.....	Mechanization, Inc., Benton, Ill.
THOMAS, T. J.....	Valier Coal Co., Chicago, Ill.
THOMPSON, R. A.....	Hereules Powder Co., Collinsville, Ill.
TROEGER, LOUIS.....	Consolidated Coal Co., Mt. Olive, Ill.
VERHOEFF, J. R.....	Peabody Coal Co., Chicago, Ill.
VLASAK, JOSEPH.....	St. Louis & O'Fallon Coal Co., E. St. Louis, Ill.
VON PERBANDT, LOUIS.....	Allen & Garcia Co., Chicago, Ill.
WEIR, PAUL.....	Mining Engineer, Chicago, Ill.
WEISSENBORN, FRED.....	Ill. Coal Oper. Ass'n, St. Louis, Mo.
WENTWORTH, B. K.....	C. W. & F. Coal Co., W. Frankfort, Ill.
WILKEY, FRED S.....	Ill. Coal Oper. Ass'n, Chicago, Ill.
WILLS, SAM V.....	Peabody Coal Co., Taylorville, Ill.
WILSON, J. C.....	Ohio Brass Co., Mansfield, Ohio
WINNING, W. T.....	Bituminous Casualty Corp., Rock Island, Ill.
WOOSLEY, CLYDE W.....	Pyramid Coal Co., Pinckneyville, Ill.
WRIGHT, D. D.....	Cent. Ill. Public Service, Marion, Ill.
YOUNG, W. P.....	Crescent Mining Co., Pekin, Ill.

Mentioning this publication when writing Advertisers puts friendship into business.

President Weir: Sergeant Sandoe and Sergeant Rhine, I do not think you are due a vote of thanks. There are a lot of the boys who did not answer present.

Mr. Secretary, do you have anything to bring before the meeting?

Secretary-Treasurer Schonthal: No communications, and no unfinished business.

President Weir: Therefore, we come down to the order of new business.

Mr. T. J. Thomas (Valier Coal Co., Chicago, Ill.): Mr. Chairman, there are two men in the Coal Industry that I am sure we all believe have made a fine contribution to Coal. If my memory serves me correctly, the by-laws provide that services of this kind may be recognized by the Illinois Mining Institute. The men I have reference to are Mr. Thomas Moses, Vice-President of the United States Steel Corporation, former President of the H. C. Frick Coal Company, of Pittsburgh, and Eugene McAuliffe, President of the Union Pacific Coal Company, Omaha, Nebraska.

I would like to move the adoption of a resolution that, because of the long and outstanding service to the Coal Industry rendered by these two gentlemen, the Illinois Mining Institute confer on them honorary life memberships.

Mr. C. J. Sandoe (West Virginia Coal Co., St. Louis, Mo.): I will second that motion.

President Weir: Gentlemen, you have heard the motion, properly seconded. Are there any questions?

(Whereupon said motion was unanimously adopted.)

President Weir: Is there any other new business to come before the Institute? Mr. Jones, do you have anything to suggest this morning?

Mr. John E. Jones (Old Ben Coal Corp., West Frankfort, Ill.): Mr. President, there has been some confusion regarding the history of our Boat Trip. The President a few moments ago said this was the twenty-first. In rummaging through my mind, I think he is wrong. I think it is a greater number than that.

I am quite sure you are all confused regarding the history of these trips. It occurs to me it would be well if we had that written somewhere, summarized and corrected, and have it in our Year Book this time.

The men who are best able to do this work are Jefferis and Sam Jenkins. I move, Mr. President, that we appoint Mr. Jefferis (J. A. Jefferis) as Historian of the Boat Trip, and Mr. Jenkins (S. T. Jenkins) as his able assistant, and that we have their report for our next printed Proceedings.

Mr. C. J. Sandoe (West Virginia Coal Co., St. Louis, Mo.): I will second that motion. I don't know that it is over twenty-two years.

Mr. J. A. Jefferis (Illinois Terminal Railway Co., St. Louis, Mo.): 1914 was the first trip. I know I took two trips before I lost my leg, and I lost that in January, 1916.

M. C. J. Sandoe (West Virginia Coal Co., St. Louis, Mo.): I second the motion, and I think it should be looked up and a record made.

President Weir: It has been regularly moved and seconded that a

Historian in the person of J. A. Jeffers and a Co-Historian in the person of Sam Jenkins compile a history of the boat trip, same to be printed in the next Year Book.

I think this is something in which all of us have quite a lot of interest. Some of the old boys are getting to the point where they are living in retrospect—particularly my friend in the front row.

Is there any discussion on the motion?

(Whereupon said motion was unanimously adopted.)

President Weir: The Program Committee this year has done an excellent job. There are two papers this morning and two this afternoon. It will be very helpful, and

I think very instructive, if as many take part in the discussion of these papers as possible.

Your Presiding Officer for the session this morning will be Mr. Roy Adams, of the Old Ben Coal Corporation, and also Vice-President of the Institute. Mr. Adams, will you take charge, please?

Vice-President Adams: Without any further preliminaries, I am going to go into the presentation of these two papers, and naturally we hope for a good discussion following each one. The first paper is on "Accidents from Roof and Face Falls, and Methods for Their Prevention," by Benn Pitts, State Mine Inspector, Seventh District of the State. Mr. Pitts.

ACCIDENTS FROM ROOF AND FACE FALLS AND METHODS FOR THEIR PREVENTION

By BENN PITTS

State Mine Inspector, Seventh District, Odin, Ill.

In preparing this paper it was not my intention to lay down any hard fast rules or methods that will prevent roof and face falls and accidents from such causes, as I realize how futile my efforts would be, but rather to call your attention to some of the more ordinary causes and methods used to prevent falls of roof and face, which I think we are all familiar with, but which we sometimes forget in our efforts to plug gaps elsewhere, thus overlooking many contributing factors which a few moments thought and effort might prevent. A traffic engineer once told me the best way to prevent an automobile from skidding was not to let it start. I think

the same rule can be applied to our mines with very good success, as falls of roof in many cases are much easier and safer to prevent than to clean up.

I think that the revolutionary changes which our mines are going through, or have gone through, from hand loading to mechanical loading, have thrown workmen off balance and schedule for a period of time; and in some instances the supervision has been in a quandary as to the system and method to adopt which would be best suited to their individual needs, such as, depth and width of rooms; width of entries; width of pillars; methods and system of timbering; placing of shots;

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explosives used; handling and delivering of supplies, etc. All of which contribute more or less to roof and face falls.

Approximately fifty percent of all accidents occurring in our mines are caused from falls of roof or face coal. While I will admit the total man-hours of exposure is much greater from this cause, I think with proper thought and adjustment to the conditions which confront us, accidents from these causes can be reduced. In any industry where half of the fatal accidents are attributed to any one known cause, it demands serious consideration and thought in an effort to reduce these accidents. From investigations of accidents from falls of roof and coal I have found they occur in various manners, such as failure to properly sound and examine roof and face of working place before commencing work, failure to properly set necessary timbers; and many accidents have occurred in the past from failure to set safety timbers, or to properly set them, for when it is necessary to use safety timbers it is just as necessary they be properly set. Failure to take down all loose coal and square up the working face is the cause of many falls; and where mechanical loading is being done, failure to stop machines and sound and examine the roof and face at regular intervals has resulted in many accidents.

But there is one underlying cause in many cases which I have been unable to answer satisfactorily to myself and which no one has been able to answer for me; that is, why some men will persistently take their lives in their hands and expose themselves to serious injury or possibly death by working under roof or overhanging face coal which they know to be dangerous; and many

accidents occur in this manner which could be avoided.

The roof conditions of our mines in Illinois is an ever changing problem, not only in different localities, but even in individual mines. In many cases these changes are very pronounced, sometimes the entire structure of the roof formation being changed; and often these changes appear in one or two cuts, necessitating a complete change of timbering methods to meet existing conditions. Usually the changing of temperature and moisture of the ventilating air current as it is circulated through the mine adds to the ills which confront us when roof of poor quality is encountered.

The extraction of coal in a seam leaves the roof without support at that place, and the character of the roof in our mines of Illinois is usually such that it will tend to fall in the opening unless it is properly secured by timbers. Falls of roof are also caused by driving too large an opening or carrying too small a pillar which yield under the great weight above them, thus causing the roof to break in the opening. The lack of systematic timbering or the use of a system that is not adapted to the conditions will often induce a squeeze, and cause heavy roof falls.

It is my opinion that one of the most important items to consider is the adoption of a plan of development which will be suited to conditions. The general plan of the mine should be carefully considered with respect to the nature of the roof, floor and coal, depth of cover, thickness and inclination of the seam, and amount of water in the strata. Such a system of mining should be adopted as will afford the greatest safety, as the safe way will also be the most economical way. Whatever system may be adopted pillars

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of sufficient thickness should be left to support the enormous weight which is placed on them as the coal is extracted. In many mines it has proven safer and more economical to leave barrier pillars at regular intervals. The width and depth of rooms, and width of entries should be governed by the roof and floor conditions. Any attempt to recover too much coal by robbing pillars is sure to result in serious trouble, as squeezes will develop, crushing the pillars and face coal and fracturing the roof, causing falls. Workmen trying to recover material from such areas are exposed to undue dangers from man-made conditions.

The ventilating air current frequently has a disintegrating effect on the roof, depending on the nature and susceptibility of the roof stratum to the action of the air. This is particularly noticeable where the strata contains water which is evaporated by the air current as it seeps through the roof. The cutting action of the air current is more noticeable at the ribs supporting the roof where the pressure is most felt, and assists in breaking up and disintegrating the strata at that point. Seasonal atmospheric changes have a very material effect on the roof at most mines, the alternate heat and cold, dry and moist conditions also producing a disintegration of the shale and slate forming the roof. These conditions can best be avoided where the thickness of the seam will permit by leaving a sufficient amount of coal to protect the roof, and where the coal seam is not of sufficient thickness, a systematic method of timbering should be adopted to meet conditions.

Falls of roof are also caused by the presence of gas or water in the roof strata whereby undue pressure is exerted on the roof where it spans the opening. Often holes drilled in

the roof at regular intervals to relieve this pressure has helped to remedy this condition. The proper placing of shots is very important, especially under a frail roof as holes too close to the solid, or too deep, or too high often work into the roof, weakening the top at that point which usually results in a fall later on.

I would like to say a few words here in regard to the mine examiner who plays a very important part in the general safety of our mines. The mine examiner should make a thorough examination of every working place in the mine, and should be allotted sufficient time to make such examination, for in order to determine the security of the roof in a working place it is necessary to carefully inspect the surroundings, note particularly the conditions of the supporting timbers, and observe closely what effect the roof pressure is producing on the pillars supporting the roof, study well the character of the roof and watch closely for any slips, or fault lines. Too much reliance must not be placed on sounding the roof which does not always reveal an unsafe condition. Greater dependence should be placed on a careful inspection of its condition, and that of the supporting timbers and pillars guided by a knowledge of the roof action gained by experience.

Accidents occurring from face falls especially in my district can be mostly attributed to failure to properly square up the working face. In many instances large humps are left on the face and when any faulty conditions are encountered slips, which are not visible at the time, allow the coal to loosen up and fall off, especially when being undercut. In some cases the explosives used are not suitable for the texture of the coal. The proper

placing of shots also has a very material effect on squaring up the working face. In working a brash, brittle coal which breaks down badly, a systematic method of spragging is necessary for the protection of workmen. Working places should be thoroughly examined. Both roof and face should be thoroughly sounded and examined by a competent person before loading machine or cutting machine crews move into place. Machines must be stopped and roof and face sounded and examined at regular intervals, if accidents from these causes are to be reduced.

And in conclusion let me say "*The Price of Safety Is Eternal Vigilance!*"

* * *

Vice-President Adams: Mr. Pitts has opened up the entire subject of accidents from roof falls and face falls. It is something we might talk about all day long and still not completely exhaust. Who will be the first to open the discussion on this subject and ask a question? Mr. Jones.

Mr. John E. Jones (Old Ben Coal Corporation, West Frankfort, Ill.): Mr. Pitts has very well presented the hazards of roof and face falls. He has given his practical suggestions for the prevention of that. He has again called our attention

to the deplorable fact that over fifty per cent of the fatalities in our coal mines throughout the nation have been from this one general cause.

What has been running through my mind recently is this: has enough thought, enough technical study, been given to this type of accidents? It is true that a great deal of time and money has been spent in an effort to correct the explosion hazard. Much has been accomplished. The explosion hazard has been reduced considerably. This is in spite of the fact that explosions cause some ten per cent, or did cause some ten per cent of the fatal accidents, and roof and face falls have caused some fifty-four per cent of the fatalities. I think I am right in making this statement, that the same attention in proportion has not been given this type of hazard as was given to the explosion hazard and many other hazards. We have all seen how the drainage hazard and several others have been given more relative study than the roof hazard.

I became somewhat sentimental on this some time ago, and wrote a fable. The reason I wrote the fable was to get away from the cold expression and into a different type of expression and see if it would awaken us to a better understanding of the proposition.

A FABLE

By JOHN E. JONES

Safety Engineer, Old Ben Coal Corp., West Frankfort, Ill.

Once upon a time, there was an intelligent people who gained their livelihood from an ancient forest. Some half a million men, and boys

approaching their maturity, were employed in producing and processing the fruits of this forest and by far the greater part were re-

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quired to work directly in the forest and face its hazards. Rarely, if ever, was a full day's work done in the forest without a loss of life from the beasts that lurked in its depths. These beasts killed an average of eight men and boys every day of work and badly injured three hundred others of the half a million employed.

"Gassus" was a beast regarded with great fear. With "Coldustus," this beast, breathing flame and with shocking force, once in a while would lay waste to part of the forest and take many lives before its destructive force was spent. "Monoxus" followed in their tracks and silently took many more by suffocation. Great was the clamor when these beasts made their raids on the men in the forest. Heralds cried the news abroad: "Feroocious 'Coldustus' kills two score! Survivors feared slain by 'Monoxus!'" Harkening to the voice of the people, the rulers of the land summoned the wise men to their presence and instructed them: "Study the breeding places of 'Gassus' and 'Coldustus.' Tell us how they may be found even before they grow to dangerous proportions, so that we may guard against their outbreaks."

Long did the wise men labor and hard, and great was the interest in their work. At last the teeth of "Gassus" and "Coldustus" would be drawn. A miniature forest was created in which "Gassus" and "Coldustus" were permitted and in fact incited to do their worst, while the wise men observed their habits from the outside. Much knowledge of the ways of the beasts and the methods of rendering them harmless or checking their ferocity was obtained. Instruments for detecting the beasts and measuring their capacity for harm were de-

vised, and it was ruled that men familiar with their habits should be employed in all parts of the forest and that the overseers of the work should guard against their growth and remove them when found. The findings of the wise men were made available to all and detectors of the utmost simplicity were developed, so that no man had to guess at the presence of "Gassus" and "Coldustus" or how dangerous they were. And when the beasts did take the lives of certain of the workers in the forest, it was found that the methods of detecting their presence and eliminating them were incorrectly followed or that they were not followed at all. Out of each one thousand lives lost in the forest, "Gassus" and "Coldustus" took about one hundred.

But another beast killed its tens while "Gassus" and "Coldustus" killed their ones and twos. This was "Roofus," whose mate was "Ribbus," the two together taking some five hundred fifty of each one thousand workers slain in the forest. But did the people cry out? Did the rulers call in their wise men? No. "Roofus" and "Ribbus" crushed out the lives of the workers one by one and not score by score. They did not attack with flame and concussion, but rather with quick and stealthy blows. Many did they slay while the seasons changed from Spring through Summer, Fall and Winter, back to Spring. But their killing was one by one. Heralds found little with which to impress their hearers, while fellow workers and their families accepted death at the hands of "Roofus" and "Ribbus" as the will of the gods. No voices were lifted up to the rulers that means of detecting these beasts be developed, as in the case of "Gassus," although much was written by the wise men telling the

workers to be careful and instructing them in methods of holding "Roofus" and "Ribbus" immovable.

But "Roofus" and "Ribbus" were everywhere in the forest—above the workers, to each side of them and ahead of them. Never were the workers out of their reach and seeing them usually harmless they possibly gave too little thought to their ability to do harm. Workers who had toiled safely in the forest twenty-five to fifty years seemed to be those these beasts took most delight in attacking.

But how were the workers to tell when "Roofus" and "Ribbus" were dangerous? It seems that some thinker back in the Stone Age—probably among the cliff dwellers—had discovered that by rapping these beasts on the nose he could determine when they were ready to let loose and drop on some unwary worker. Judgment was based on the sound waves striking the ear drums, and some held that the size of "Roofus" or "Ribbus," whether hare or mammoth, could be determined before the secret of analysis was lost. Generations followed in the footsteps of the cliff dweller, and at the time the intelligent people worked in the ancient forest, rapping the beasts on the nose still was the most advanced method of determining their capacity for harm. In fact, it was the only method, the men in the forest employing a working tool, a special rod or even their bare knuckles.

Outside the forest, the wise men had gone far in the science of vibration, sound and sound waves, radio waves, the seismograph and other means of determining the nature and characteristics of the things with which the people had to work. But none of this was

thought of in connection with better methods of finding out how dangerous "Roofus" and "Ribbus" were. When son went with father into the forest, parental instruction was little more than "Sound the Roofus!" And in study for certificates of competency, instruction in this important subject was contained in "Sound the Roofus." And in the pronouncements of the wise men representing the rulers, it was simply "Sound the Roofus," to which was frequently added "Be Careful." The habits of "Gassus" were studied intensely, while guessing predominated in the cases of "Roofus" and "Ribbus."

But nevertheless, "Roofus" and "Ribbus" took by far the greatest toll, and the failure to check their destructive tendencies exceeded all other failures to make the forest safe. Many hazards were taken into the forest by the workers—power, machinery, infection and the like—but even these, together with "Gassus" and "Coldustus," did not take the toll of deaths and injuries marked up against "Roofus" and "Ribbus." Men in their later days, said some, lost the art of analyzing the sound warnings developed by the cliff dweller. Yet rapping the beasts on the nose was the best method the workers had and those diligent in its use were better able to tell when treacherous "Roofus" and "Ribbus" were set to do them harm.

MORAL: To acquire and adopt knowledge of fundamental principles far supersedes guessing.

* * *

I feel, Mr. Chairman, that there has not been the application given or the study given, rather, to the subject of these accidents, which subject has been so well presented by Mr. Pitts. I hope in the future

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some better means may be discovered, some other method whereby we will cure the condition of that hazard rather than guess at it as we have always done in the past.

Mr. Raymond Mancha (Jeffrey Mfg. Co., Columbus, Ohio): I would be interested in hearing Mr. Pitts' opinion on the effect, the relative effect of temperature as against humidity. In other words, from your experience which do you think has the most beneficial effect, controlling moisture content or maintaining approximately the same temperature?

Mr. Pitts: I am not sure of that. In my opinion, from the experience I have had, I believe the temperature has more of an effect than the moisture. That is, I think if the temperature is more even the moisture would not have the effect it would if the temperature varies. That is my opinion.

Mr. Mancha: I think I get what you mean. Of course, if the temperature was even you would not be concerned in taking up or determining the moisture proposition. If you had the temperature the same, you eliminate that. The fundamental cause is what I am after.

Mr. Pitts: I do not know that I have had the experience to answer that question satisfactorily. I think the change of temperature naturally covers the change in moisture, and both of them together cause the trouble. If you can govern the temperature you can more or less govern the moisture, and that would eliminate a lot of it.

Mr. Mancha: Thank you.

Vice-President Adams: Are there any other questions, or does anyone have something in his mind to add to the discussion?

Mr. D. W. Jones (Princeton Mining Co., Princeton, Ind.): I would like to ask Mr. Pitts if the State has ever considered breaking down that large percentage of accidents caused by roof falls into more detailed information. We know a lot of roof falls are caused by slips, and that they do not respond to vibration because the mass is heavy. If we can keep some kind of record showing what percentage of those falls are due to slips and not responsive to vibration, it would put more emphasis on the—

Mr. Pitts: I do not think at the present time there is any record kept of any slips, other than just falls of roofs.

Mr. D. W. Jones: Don't you think it would be a good thought?

Mr. Pitts: I think it would be of value to us, a record of whether they are slips or just roof falls.

Mr. D. W. Jones: The State would be in a good position to do that, would they not?

Mr. Pitts: I think they would be, yes.

Mr. D. W. Jones: They have a report on each group?

Mr. Pitts: Yes, sir.

Mr. M. M. Leighton (State Geological Survey, Urbana, Ill.): Mr. Chairman, I have been very much impressed by the presentation that

has been given us here, and also by the discussion by John E. Jones following the main paper. He has expressed that in a way which points out we must look at this matter objectively.

Last fall, Dr. Cady of our Station had a long discussion with me on this particular matter. He pointed out to me the sort of work that has been done on the Illinois coals. There has been very little work on the geological factors of our mines. What report can you recall that has touched upon the geological features of our mines that affect the safety of our miners?

We all know the plant substance which formed our coal was laid down somewhat irregularly, and also that sediment put on these plant substances that now form the roof of the coal was put down very variably. We know since the strata were laid down there have been earth developments which have affected their strength, and that there has been some cementation in some places and more cementation in others. We know that these naturally vary in their mineral substance, and that the mineral substances determine the strength to a large extent.

It has been proposed that he devote some of his time to a few selected mines, to see whether or not the study of the roof conditions and of the coal itself will help to throw light on this question of accidents from face and roof falls.

Now, in the case of our coal, we know that in some places our coals are made up to a considerable extent of clarain and in other places there is more of vitrain. In some places this clarain appears in thicker bands and gives added strength. Mud occurs in bands intermingled with the vitrain, and due to the fact

the vitrain is already weakened and cracked gives rise to weakness.

With science having advanced to its present stage, not only from the standpoint of geology but from the standpoint of mining and an understanding of what happens by moisture, by drying, by changes in temperature and so forth, it is Mr. Cady's thought that probably a study of this sort in a few representative mines would disclose information of value. I am sure he will appreciate the cooperation any of you may give him. No doubt he will be seen by some of you in regard to this. If you have information to give him, I trust you will be good enough to volunteer that information and write to him on the subject.

Vice-President Adams: We still have some time left for discussion on this subject.

Mr. Arlen "Zack" Jennings (Walter Bledsoe & Company, Chicago, Ill.): I recall back in the days when I carried a safety lamp, and tapped the roof, and my reaction this morning to this discussion of a most important subject from so many points of vantage brings forth the thought in my mind this is a rare opportunity to enlist the help of the various interests on this subject toward making a most comprehensive study of the subject, together with men from various phases of the industry and the learned men of the various universities. It seems to me for the moment a rather complicated matter to get the information from the various membership represented here.

I would say this, that before we pass, I believe the men of the various mining departments, the universities and every group that would make a study, using their

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particular terminology and procedure, if they could report as separate units to some committee and that committee would more or less standardize this thing so that all would receive the benefit of the various differentiated thoughts, I might say, it would be highly beneficial. For instance, from one man's point of vantage he would look at the problem one way, and so on down the line throughout the entire industry.

That is just a thought. I do not know how far we could go, but I do feel very sympathetic toward the efforts of those who have accomplished so much in the past. I believe the Institute would be passing a rare opportunity if they do not do something which will be constructive, so that instead of working as individual units such as some companies have done in the past, the thing would cumulate into one final conclusion, and the utilization of it to the best advantage.

Mr. T. J. Thomas (Valier Coal Co., Chicago, Ill.): I would like to ask Mr. Pitts a question. You have dealt with the various phases of roof conditions, some that are not responsive, so to speak, to vibration. However, Mr. Jones pointed out and Dr. Leighton has dealt with the matter of trying to develop the geologic phase of it. But we are dealing with a human problem in the matter of roof conditions, and a matter of proper timbering, and the matter of the failure of the man on the job to do the timbering to protect himself. I think you pointed out in your paper that you were astounded to have developed the matter of the risk that the men would take toward jeopardizing their lives or breaking their limbs.

I would like to ask this, if it is not too pertinent a question, approximately what portion of the

accidents occurring in connection with the fall of roofs and the consequent fracture of limbs or loss of lives was due to man failure, and what proportion of these accidents may be due to the fact that the people in charge of the property failed to provide the necessary timbers so that proper correction can be made of roof conditions?

Mr. Pitts: I would not be in a position to answer that question. We do not keep a record of that kind.

Mr. T. J. Thomas (Valier Coal Co., Chicago): I have in mind what I have heard Alec Miller say a good many times, that he would rather have a prop sticking up in time than the judgment of the coal miner that the roof is all right.

Mr. Pitts: In my opinion, I do not think anyone can tell when loose roof will fall. There is only one safe method, either to properly timber it or take it down.

Mr. T. J. Thomas (Valier Coal Co., Chicago): But isn't much of the difficulty we are dealing with in the matter of these roof falls that cause the loss of life and injury to men—can't a great improvement in this responsibility be brought about by a constant education of the men who are doing the job at the face?

Mr. Pitts: Oh, yes. I think so. I think it can be virtually eliminated.

Mr. M. M. Leighton (State Geological Survey, Urbana, Ill.): I apologize for arising to my feet so many times.

I wonder if there isn't a considerable element, as Mr. Thomas sug-

gests, perhaps through lack of observation or lack of proper timber. On the other hand, I wonder if some of these dangers do not appear and are not recognized. We do have this important human element. I wonder if we also haven't the important task of finding out more about these things in order that we can carry on better educational work than we are doing at the present time?

I like the suggestion made, that this Institute consider appointing a committee to emphasize the importance of this study, to aid in assembling the reports, of a centralized committee on this particular subject. Those who will be working on this from one angle or another would obtain a great deal of help from the fact that the members of this committee are themselves very much interested in it. Conferences could be held when needed, and facilities could be made available through them which otherwise perhaps could not. Also, the reports so made would be brought home to those who have the decisions to make in regard to study by such action of the Institute.

When we consider that more than half of the mine accidents are due to this particular thing, it seems to me it is high time this Institute rendered every effort in encouraging such a study.

I would like to see you consider the appointment of such a committee as has been suggested. I would like to see someone make that motion.

Mr. Arlen "Zack" Jennings (Walter Bledsoe & Company, Chicago): If you will pardon me for again arising to my feet, I will make that motion.

(Which said motion was duly seconded.)

Vice-President Adams: It has been moved and seconded in line with Dr. Leighton's suggestion. As I understand the motion it provides for the appointment of a committee on scientific studies of physical conditions and improved practical analyses of the hazards of coal bed and adjacent strata which affect safety in mining in Illinois. Are you ready for the question?

Mr. T. J. Thomas (Valier Coal Co., Chicago): I would like to make an amendment to the motion, if you will accept it, that this committee either be directed or may do so voluntarily, that it cooperate not only with members of the Institute but of the Geological Survey and the Department of Mines and Minerals of Illinois, so that they will not be working at cross purposes.

Mr. Arlen "Zack" Jennings (Walter Bledsoe & Co., Chicago): I am very happy the amendment is made. I feel this way about it, it will be so comprehensive and extensive as to cover the subject throughout the entire industry, and study the subject in all of its entirety, collecting the notes from wherever they may originate, and it will be of extreme value to the industry. As, for example, the learned geologist could give us the importance of checking certain conditions and how they contribute to this problem. And another thing, even in our mines we had to make quite an exhaustive study of our conditions, the mine atmosphere and its effect upon roof conditions at certain seasons of the year, the control of humidity, and so forth. Therefore, the man who specializes in air conditions could contribute much in the way of data that would be of value in studying this problem. I know many insurance com-

panies have very competent men who would help considerably along this line. And last but not least, this industrial psychologist who could shape up the matter for the men in the mines so that they would be able to understand the information that may have been collected originally in scientific terminology. In that way they could consider practically all the facts involved in the order of their importance.

Mr. M. M. Leighton (State Geological Survey, Urbana, Ill.): As seconder of the motion, I accept the amendment. I would like to add an amendment that the Department of Mines of the University be included.

Vice-President Adams: I am quite sure that the reporter has all of this. However, it is my understanding that membership on the committee shall include members of the staff of the State Geological Survey, of the staff of the Department of Mining of the University of Illinois, of the staff of the State Department of Mines and Minerals, and of the local staff of the U. S. Bureau of Mines as well as interested operators. I think you have the whole idea in your minds. Are you ready for the question on the motion as amended?

(Whereupon said motion as amended was unanimously adopted.)

Vice-President Adams: I am sure all of you who received the report of the State Department of Mines and Minerals on the fatalities in the State every month in the year have been impressed with the fact that, as was stated by Mr. Pitts in his paper, the majority of those fatalities are from roof and face falls. If you have made a careful study of

those reports, you also have found that the majority of those roof and face fall fatalities were men of long experience in the mines, men of middle age or past middle age, and old men whom we have almost always considered as the most expert and the safest men at the face.

I am wondering if we have not been working under a false premise in assuming that our old, experienced men are always our safest men. I think that one thing is the best evidence of the need of scientific study of roof and face in our coal mines.

I am sure the operating members of the Institute will be more than willing to cooperate in every way and coordinate their efforts with those of the State Department of Mines and Minerals, the State Geological Survey, and the School of Engineering at the University, in order to accomplish all that is possible in the assembling of information on this subject of roof and face falls.

President Weir: I do not in any way deprecate the value of scientific investigation into the cause of roof falls. It would be very helpful. Anything that will save lives is worth while. However, I feel very strongly that the solution of the problem of prevention of accidents from roof falls is largely one of instilling in the minds of those who are exposed to these dangers the ever-present necessity for looking after their own safety. I think anyone who has studied the accident experience records of various mines will agree with that statement. Within a limited area you will find one mine having few accidents from roof falls and another mine with an excessive number. The mine having the better experience hardly has any more scientific in-

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formation than the other, but they probably have attacked the problem by an intensive campaign of "awareness."

Mr. John E. Jones (Old Ben Coal Corporation, West Frankfort, Ill.): Dr. Leighton asked a question the first time he was on the floor regarding publication of the accidents with respect to roof from a geological study. The proceedings of the Fourteenth Illinois Mining Institute Meeting at Danville has in it an article entitled "Roof and Roof Protrusions." This was particularly written on the roof hazards in the Danville field, and dealt almost wholly upon the geological structure. That was some twenty-five years ago when we gave thought to this subject, but got nowhere in the scientific study.

Some years ago an insurance company interested in coal mines published an address on the subject wholly from a geologic point of view, stressing changes in roof structure and in roof composition,

in view of the roof structure as the one hundred feet of peat is compressed to ten feet of coal, and what happens to those above during that period of compression. So we have given this, Dr. Leighton, some thought, although we need far more scientific instruction on it.

Vice-President Adams: Now, I think we have properly taken care of all the time we can devote to this subject at this session.

The next number on our program is "Caging and Hoisting and Increased Maintenance Due to Speed," by Dale Carter, Superintendent of No. 2 Mine of the Bell & Zoller Coal & Mining Company, Zeigler, Illinois.

Mr. Dale Carter (Bell & Zoller Coal & Mining Company, Zeigler, Illinois): Mr. Chairman and gentlemen, this is a story or recitation of our difficulties in adjustments or accomplishments rather than anything technical.

CAGING AND HOISTING AND INCREASED MAINTENANCE DUE TO SPEED

By DALE CARTER

Superintendent, No. 2 Mine, Bell & Zoller Coal & Mining Company,
Zeigler, Illinois

In 1918 at the No. 2 Mine of the Bell & Zoller Coal & Mining Company, the original tippie and preparation plant was erected. The original design of the entire plant was for a 5,000 ton maximum output. The tippie and headframe was of the conventional type steel structure erected to accommodate the double compartment shaft and the tandem mounted 8 feet diameter sheave wheels. The two hoist engines are of the Litchfield make, 28" x 42", 125 pound steam working pressure direct connected to a straight 8 feet diameter drum with 44 inch grooved face, equipped with steam operated reverse and brakes, and a Welsh over-wind safety device. The original ropes were 1 $\frac{3}{8}$ ", 6 x 19 regular lay construction with hemp core or center and of sufficient length to permit 3 $\frac{1}{2}$ dead turns and 14 $\frac{1}{2}$ active turns on the drum with 9 rope clamps on nine inch centers on the cage end. The cages are of the Eagle Iron Works self-dumping type equipped with Nolan automatic horn stops and locks and originally weighed 8 tons each.

The bottom arrangement for caging and hoisting consists of two load tracks with a total capacity of 110 cars. The loads are fed to the Nolan automatic cage by a 10-ton push motor which operates between the two tracks. The signal system for hoisting is the air bell type. 12" x 12" white oak timbers and concrete bases were used for cage land-

ings. The empties, as they are bumped off the cage, are handled by gravity on two tracks. The first mine cars were of the conventional wood and binder iron type weighing approximately two tons each, equipped with roller bearing axle boxes, three inch axles, eighteen inch cast iron wheels and Macwhyte male and female couplings. The average capacity of the car hand loaded was 4.5 tons.

Following 1918 the demand for coal was good. The underground workings rapidly expanded so that the maximum capacity of the plant was soon reached. It was decided that increased capacity of the plant would be justifiable and in line with the demand for our product. This was accomplished by a gradual remodeling and reconstruction of "bottle-necks" or weak points of capacity in the preparation plant and hoisting. Preparation facilities were increased first, leaving the hoist the remaining limiting factor.

The hoisting engines and drum are so located that the rope operates at an angle of 45°. With a straight drum at high speed this makes an unusually severe and abusive working condition on all hoisting equipment; engines, ropes, sheaves, cages, dumps and landings.

Our first difficulties encountered in speeding up the hoist were with the cages. The bails, deck sides, dump roller shafts were frequently broken. The springs and other

parts of the automatic car locks were too light and the source of much trouble. Also, the dumping quadrants were too light. Practically every part of the cage was replaced with heavier material. Castings were increased and made of steel and structural steel parts made heavier. The shafts, chains and pins were replaced with alloy steels. These changes in the cage increased the weight from 8 to 11 tons.

The ropes were changed from $1\frac{3}{8}$ " to $1\frac{1}{2}$ ". The sheave wheels were changed to suit the new size of rope and at the same time were equipped with new chrome vanadium alloy steel axles. Several of the original 8" cold rolled axles had broken causing expensive wrecks in the shaft. The new chrome vanadium steel axles have given excellent service for the past twelve years.

It was also found necessary to strengthen the tippie and head-frame. With the additional weight and increased speed the difficulties of hoisting were transferred to the hoisting engines. The bed frames and cylinders were too light for the additional load. The original cylinders and bed frames eventually were replaced by extra heavy castings which were more securely anchored. In addition to the regular stud bolts used in holding the cylinders to the bed frame it was necessary to use heavy steel bar clamps to keep the units more rigid and in alignment.

Considerable trouble was encountered with the hoist drum bearings due to improper bearing metal and poor lubricating system for this work. A bearing metal containing nickel proved satisfactory on the bearing linings. The two drum bearings were formerly lubricated

by hand controlled gravity oil reservoirs located above the bearings. This method of application was unsatisfactory and wasteful. A force feed oil pump of the type used to lubricate the steam cylinders was installed on each engine. Oil feed lines were run to the hoist drum and engine bearings where this method of application could be adopted. This resulted in a saving of approximately five gallons of oil per day with satisfactory results.

One of the many difficulties encountered with speed hoisting was that of roofing cars against the concrete brow on the bottom of the shaft. The hoisting time cycle is of such short duration that each movement and act of the hoisting engineer and the cager must be timed to a split second. This is a matter of almost instinctive knowledge, shared alike by the engineer and the cager as to the exact number of seconds required to place a car on the cage and get it moving, rather than depending entirely upon the sound of the signal bell, the bell is used, of course, but this instinctive timing, the result of years of experience is so closely coordinated with that of the signal that there is practically no time consumed in giving or reacting to signals. Most of the cars are not securely locked and dogged until after the cage has started on its way up the shaft. Sluggish moving cars caused many wrecks at the brow, stretching the ropes, smashing cars and sometimes breaking the ropes. This trouble has been reduced to a very large extent by the installation of a device for stopping the hoist which is controlled by the cager at the bottom of the shaft. This device consists of a magnetic auxiliary release attached to the Welsh over-wind

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which closes the throttle and applies the brakes.

The average cycle of hoisting is as follows:

Acceleration period 5 seconds,
distance 137 feet;

Maximum speed period $1\frac{1}{2}$ seconds,
distance 89 feet;

Retardation period 5 seconds,
distance 144 feet;

Rest period $3\frac{1}{2}$ seconds, (caging and dumping);

Total time—15 seconds;

Total lift—370 feet, which is the hoist distance from the cage landing to the dump;

Maximum speed—3,570 feet per minute.

After correcting many of the ills and the elimination of many of the delays a record annual hoist was made in 1926 when 2,011,379 tons of coal was dumped on a single shift operation by the two cages. This required 450,028 dumps, or an average of 1,607 dumps per day for the year. The mine operated 280 days with an average of 7,183.5 tons per eight hour day. The average weight of coal per dump was 4.47 tons for the year. Fourteen hoisting ropes costing \$7,000.00 were used or a cost of 3.4 mills per ton. The average tons per rope was 143,670. The average hoisting time per dump for the year, including delays, was 17.9 seconds.

On January 6th, 1928, a record for hoists and tonnage under hand loading was made in an eight hour shift. One thousand eight hundred fifty-two (1,852) hoists were made with a delay on the hoist of eighteen minutes. The average hoist cycle time was 14.9 seconds. The total tons of coal hoisted was 8,505 with an average per car of 4.59 tons.

In 1935 a new preparation plant was constructed and the method of mining changed from hand loading to mechanical loading with a division of work among all classes of labor. Steel mine cars with improved anti-friction bearings in light cast steel wheels were installed in part. These changes disorganized the old routine in all phases of operation. The weight of the old wood cars was 4,000 pounds as compared with 5,000 pounds for the new steel car. The tons of coal per car decreased from approximately 4.5 tons to 3.5 tons average with a much greater variation in the weights of individual cars. The smooth working of the hoisting cycle was disrupted by this variation in unbalanced load. The routine of the operation of the hoist was thrown out of step by light weight cars. The cage landings and dumps were subjected to unusually abusive service. These conditions were improved by loading the cars as far as practical to uniform capacity. Gum timbers decked with 2" and 3" steel plates eliminated most of the cage landing troubles.

Our best hoisting record for a seven hour day is 1,600 dumps with eleven minutes lost time. The average time per dump was 15.3 seconds. 6,248 tons were hoisted with an average of 3.9 tons per car.

Hoisting is done by two engineers who interchange between the material and coal hoist every hour and forty-five minutes during the hoisting shift.

There are seven men in the caging crew which consists of the cager, two uncouplers, push motorman, empty blocker and two empty couplers.

Four men are regularly employed for the construction and maintenance of cages, tippie and shaft.

You'll discover good merchandise advertised in this good publication.

The greater part of their time is spent in the construction and repair of cages.

Due to high speed hoisting with its sudden starts the cage and rope life is very short. To illustrate, some idea of this may be had by a brief comparison with the hoist at our mine No. 1. At this mine coal is hoisted in 9 ton skips so that the number of hoists is considerable less for the same tonnage. A conical drum on the hoist eliminates the sudden jerking start with a consequent saving in rope life. At mine 1 a rope averages 450,000 tons. At mine 2 the average is 150,000 tons. The skip life is 900,000 tons while at mine 2 the average life of the cage is 450,000 tons. In addition to the shorter life of hoisting equipment involved with high speed cage hoisting there is much more danger of ropes breaking and causing costly wrecks.

At present we are experimenting with the use of high tensile steel to replace some of the parts of the cages which were originally built of common structural steel. With the use of this new steel which will give us an increased strength and at the same time a corresponding reduction in the weight of the cage, we expect to obtain longer life from both our cages and ropes.

* * *

Vice-President Adams: Mr. Carter has given us an outstanding example of an equipment which was designed originally to do a certain job, and then for a number of years has been required to do a great deal more than it was originally designed to do. This I am sure is just one example of many experiences by many of you in your work in the mines during recent years.

Who has something to offer in discussion of this subject?

President Weir: Mr. Chairman, I would like to ask Mr. Carter the rope speed in the second and a half.

Mr. Carter: It was thirty-seven hundred feet. That is the speed during that second and a half.

Mr. Raymond Mancha (Jeffrey Mfg. Co., Columbus, Ohio): I did not quite get it. What was it you mentioned about the drum that had the extra life, I suppose, by the acceleration?

Mr. Carter: That is a conical drum, used at No. 1, if I understand right.

Mr. Raymond Mancha (Jeffrey Mfg. Co., Columbus, Ohio): Yes, sir.

Vice-President Adams: Is that strictly a cone drum, or a step drum?

Mr. Carter: Yes, sir.

Vice-President Adams: And as the acceleration point is reached, is stepped up to the large diameter in six or seven turns? Strictly a step drum, is it not?

Mr. Carter: Yes, I suppose it would be.

Mr. D. W. Jones (Princeton Mining Co., Princeton, Ind.): I would like to ask if they had to readjust the irons—

Mr. Carter: The quadrants? Yes, they were too light.

Mr. D. W. Jones (Princeton Mining Co., Princeton, Ind.): Did you make them any longer?

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Mr. Carter: I do not think there was any change in the length of them. They were the same, only of heavier material.

I do not know whether I answered Mr. Weir's question right there, but the machine speed was for a period of one and one-half seconds, and the distance traveled was eighty-nine feet. That speed was 3,570 feet. That is taken on the sheave wheel. That is as near as you can get it.

Mr. Frank Rhine (Joy Mfg. Co., Franklin, Pa.): Several years ago you discussed the problem of making side sheets and plates of aluminum. Did you ever do that?

Mr. Carter: No, sir, we did not.

Mr. T. J. Thomas (Valier Coal Co., Chicago, Ill.): I would like to ask you on this subject what is your practice with reference to changing the rope, and who determines that?

Mr. Carter: Well, we have the rope and the cages examined every evening after the shifts. The number of broken wires in any one given strand governs that. Usually if we find as much as five wires broken in any strand of twenty-four inches length, we change the rope. We do not take any chance with it.

Vice-President Adams: Mr. Carter, do you also in connection with that examination keep a record of the tonnage hoisted by each rope, and does that in any way influence your opinion of whether the rope is yet safe to use?

Mr. Carter: We give some consideration to the fact if a car has been roofed down below we probably remove that rope quicker than

we would another rope just from natural wear or broken wires. But the tonnage and the life as given here are taken over a period of seven years. It also includes rigs of all descriptions, of whatever cost.

Vice-President Adams: Do you at regular intervals reclamp your ropes?

Mr. Carter: Yes, we do.

Vice-President Adams: That is to say cut off that portion which is in the turn on the cage to make the roof, and run out an equal distance from the drum and re-clamp your rope at the cage?

Mr. Carter: No, we never remove anything. But we do sometimes move the clamp and rope on the cage end.

Mr. Dave W. Jones (Princeton Mining Co., Princeton, Ind.): Did you change to steel castings instead of iron?

Mr. Carter: No, the same castings, just heavier.

Mr. Dave W. Jones (Princeton Mining Co., Princeton, Ind.): Did you have any excessive breakage in your side frames?

Mr. Carter: No, we have never replaced a bed frame since the provision of the heavier bed frame. The cylinders, of course, give way through wear. We put on additional clamps on the bed frame, large bars, to take the pull of the hoist.

Vice-President Adams: Do you periodically anneal the clevises and bridle chains of your cage?

Mr. Carter: No, we do not.

Vice-President Adams: But you do inspect those every day, every shift?

Mr. Carter: Every shift in operation, there are two men who inspect those. They are not annealed in any way. If they are considered defective at all, the whole thing is taken off and new equipment put on.

Mr. T. J. Thomas (Valier Coal Co., Chicago, Ill.): What is the dead weight of your cage, do you recall?

Mr. Carter: The No. 1, I really cannot tell you what it is, but our cage is eleven tons, and the total there of rope, cage, car and all runs seventeen tons or a little better than that.

Mr. T. J. Thomas (Valier Coal Co., Chicago, Ill.): Have you ever considered an alloy material for a lighter cage?

Mr. Carter: Yes, we are experimenting with high tensile steels now. The cage bales is where we have the greater part of the trouble, and we have some alloy steel in on that now.

Vice-President Adams: Are there any other questions or further discussion of this paper?

Mr. Fred Miller (Franklin County Coal Corp., Herrin, Ill.): Our experience parallels Mr. Carter's experience in many respects. However, there is one point there which I believe is not covered, and that is when is the right time to take off the rope. One fact we consider very important is when a rope ceases to be stretched. We keep a

record of the amount of stretch out of a rope, and that is a daily record, until this rope gets to the point it ceases to stretch so much. Then that, plus the fact whether we have had any accidents or not, plus the broken wire we might have in any one strand, those are the influencing factors which cause us to change the rope.

It is very difficult for one man to assume the responsibility of saying they will not take the rope off, but will leave it longer. Sometimes we keep ropes on too long and sometimes take them off too quickly. It was only when we started keeping records and knew what our ropes would do under certain conditions that we began to get a uniform life.

We had a particularly bad condition in one mine where plates are very close together, and in the dumping position one of the plates is right up in the sheave. An error on the engineer's part there is serious. We follow the practice of annealing those bridle chains occasionally. That is influenced by the accidents we might have had and all those things. There is a regular two-time daily inspection of all those parts, but for the most part our experience is somewhat parallel with Mr. Carter's with respect to hoisting.

Vice-President Adams: Are there any further questions or discussions? If not, President Weir has an announcement to make before we adjourn.

President Paul Weir: Jim Miller, of the Mines Equipment Company, has a supply of Atlases which he would like to distribute gratis on the trip. I understand Mr. Miller will get them now and pass them out.

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Mr. J. E. Miller (Mines Equipment Co., St. Louis, Mo.): I would like to have you all sit still, so that you will be sure to get one of these.

(Whereupon the Atlases referred to were distributed.)

Vice-President Adams: Now, gentlemen, if you have all received your Atlas, bear in mind we have another session at 2:00 o'clock. Until that time we stand adjourned.

(Whereupon, at 11:45 o'clock A. M., a recess was taken until 2:00 P. M. of the same day.)

AFTERNOON SESSION

At 2:00 o'clock P. M., the afternoon session was opened by Mr. Paul Weir, President.

President Weir: Before turning the meeting over to the Chairman for the afternoon session, I want to make this announcement. The boat will stop at 8:00 o'clock tonight at Kampsville. At 11:00 o'clock there will be a lunch on the boat, and at 11:30 o'clock we will load up for St. Louis.

The Chairman of the afternoon session is Mr. Fred Miller of the Franklin County Coal Corporation, Herrin, Illinois.

Chairman Miller: Gentlemen, you can pick up almost any periodical today and in a short time find out we have bad breath, body odor, poor teeth, our eyes are bad, and our houses aren't heating well. We are just in a hell of a shape, as a matter of fact. It is next to impossible for us to see ourselves as others see us. But this afternoon we are going to have an opportunity of being told how other people think we ought to act and do.

With that introduction, I want to present Mr. Pat Herrington, of the State Mining Department, who will pinch-hit for Dr. Rutledge, who was unable to be here this afternoon. Mr. Herrington will read the paper prepared by Dr. J. J. Rutledge, Chief Mine Engineer, Bureau of Mines, Baltimore, Maryland, and the title is "What Qualities the Mine Employee Would Like in a Mine Foreman."

Mr. M. K. Herrington (Dept. of Mines and Minerals, Springfield, Ill.): I am going to read first Dr. Rutledge's message to Captain Buck, and what I term his personal message to the Institute members. He says:

"In sending this paper to read on the boat trip of the Illinois Mining Institute, I am very much reminded of the early days in Alton, Illinois, when the Captains Leyhe were boys. In imagination I can stand on the river front in front of the C. & A. depot in Alton and see the Steamer "Spread Eagle" coming up the Mississippi, passing Maple Island, quivering in every timber as she breasted the current of the Mississippi. Of course, the erection of the dam at Alton has changed all this.

"I can recall the time when Frank and Henry received a new blue-painted skiff which had been built by Mark Phelps at Quincy, Ill. The Leyhe brothers were the envy of all the other boys when they appeared on the river with this boat. Later Captain Ventres, the ship's carpenter on the Spread Eagle, at the request of the Leyhe brothers, took his auger and added another pair of row-locks which Frank stated were for the 'little fellow,' meaning Buck, who was the youngest of the bunch at that time. Harry, Frank's younger brother,

was permitted to watch the three others on the boat while he stood on the river front.

"I do not know whether Captain Henry or Captain Buck will be on the hurricane deck when the Illinois Mining Institute makes the

trip this year, but I am sending hearty greetings and pleasantest of recollections to the Captain, whichever of the brothers he may be."

The Doctor's paper is as follows: "What Kind of Man I Would Like My Mine Foreman To Be."

WHAT KIND OF MAN I WOULD LIKE MY MINE FOREMAN TO BE

By J. J. RUTLEDGE

Chief Mine Engineer, Maryland Bureau of Mines, Baltimore, Md.

First: I would like him to be a *real* man, honest, open and above-board, to have the courage of his convictions and to stand up for them. Brave, but not quarrelsome; firm, but not contentious. I would not want him to harbor grudges against me or any other mine employe, for grudges always dwarf a man's character. *My* mine foreman should be able to forgive and forget, and *not* still remember. My foreman should never lose his temper under any circumstances, for when he is angry his judgment is not good.

I would want him to be fair in his dealings with me and with other mine employes, and I would try to be fair with him. I would want to have payment in full for all the coal I loaded, for all the yardage driven, and payment for all deadwork provided for in the Working Agreement, but I would not expect him to pay me more than what was rightfully due me. I believe in reciprocity. If I did good work I would expect him to tell me so, without grudging, and to do so promptly. Nothing pleases a mine employe, or a mine mule, more than words of approval for work well done. Try it, some of you!

On the other hand, if my work was not done properly I would want him to tell me so, and tell me only and not others. I would want him to be just, and he could not be just if he praised only my good work and failed to condemn my poor work. My foreman must be just. If I loaded dirty coal I would expect to be disciplined and would not object to discipline properly and fairly administered. I do not believe in the system of docking as a penalty for loading dirty coal, for it is human nature to get even for dockage by loading more dirty coal when opportunity offers. A discharge is better than docking.

One matter I would insist upon and that would be a cheerful, civil greeting from my mine foreman when I chanced to meet him at the beginning of the shift, either at the mine entrance or when the foreman happened to visit my working place. Often the wife, or eldest daughter, has forgotten to place a spoon in my dinner bucket and we have had words before I left the house on the day following and consequently I am already in a bad humor and ready for a fight. My day has been spoiled, but a few cheery words

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from the foreman makes me forget all about my troubles—the clouds roll by and I am in a good humor again and ready for a good day's work. Foremen should be taught that such words of pleasant greeting are a part of the work for which they are paid by the company that employs them and pays their salaries.

I would want my share of work when work is slack, but I would not want him to give me *more than my share*. I would want to receive my statement at least one week before payday—blessed be the man that invented the statement—he certainly was a peacemaker.

I would not want the foreman to grant me any special favors or to be partial to me. I would want my foreman to be civil in his dealings with me, but I would not want him to lower his dignity by sitting down in my working place and having a long confidential chat with me—that would injure *his* prestige among the other mine employes and would hurt *me* among my buddies.

Never, under any circumstances, would I want my foreman to tell others—especially my buddies—of my faults and shortcomings, and not tell me. Such practices have ruined the influence of many a mine foreman. About the worst fault that the foreman could commit, in my estimation, is to tell me one version of a story and to tell the superintendent another version, absolutely different from the story that he told me; in other words, in mine employes' language, the foreman is "two-faced." Nothing more quickly destroys a foreman's prestige than such a practice. I would not want my foreman to be two-faced.

I would expect the foreman to be positively interested in the prevention of mine accidents and to pro-

mote the teaching and application of first-aid to injured mine employes. I know that if *he* is interested in such humanitarian work that at least *some* of the mine employes will also be interested and, as a result, we will have less accidents in our mines.

I would also want the foreman to meet and to greet the State Mine Inspector civilly when he came to inspect our mine, to accompany the Inspector on his inspection and to furnish all information requested by the Inspector, and to afford every means necessary for making a proper inspection of the mine. I would want to be able to read the Inspector's report on the condition of the mine as soon as practicable after the inspection has been completed, and notice of the inspection posted.

I would not approach the foreman on matters concerning the operation of the mine, while he was away from the mine, nor would I, under any circumstances, call upon him at his home to consult him about matters relating to the operation of the mine. I would like the foreman to respect the privacy of my home, and, since I believe in reciprocity, I would want to respect the privacy of his home.

I would want the foreman to be efficient and impartial in his management of the mine, for if he were not efficient the mine could not long operate for it would make no money for the owners, and if the mine failed to operate profitably it would soon cease operations and I would be out of a job and would have to go elsewhere to secure a new job, and travel costs money.

If the foreman were not impartial in handling the mine employes, there would sure to be trouble with mine labor and this might lead to a

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suspension of work in the mine and that would lead to my being idle. Sure, I would want the foreman to be efficient and impartial.

Like most miners and mine employes I am apt to get careless and to forget to timber my working place properly, and, as a consequence, I may get hurt by falls of roof and sides. Everyone needs to be checked up on occasionally, and I need it as well as the others. I would expect the foreman to keep me from having accidents, to make me exercise care, but if I did have accidents I would want him to be able to render me first-aid and to get me to a doctor as soon as possible. I don't think any man who has not been trained in rendering first-aid to the injured has any right to be acting as a foreman in a mine.

I would expect the foreman to have the mine workings properly and adequately ventilated, rock-dusted in an approved manner, and have electric cap lamps exclusively used if the mine was gaseous. I would expect him to have the mine employes equipped with hard hats and safety toe shoes. I would give him moral support in installing and maintaining the safety devices above mentioned.

After the foreman and the company had done their part in providing such safety devices I would do my part, and urge my buddies to do their portion, in keeping the safety equipment in the most serviceable condition. I believe I would be fair if the company installed a change house and operated a man-trip. I would do my very best to see to it that no employes committed depredations in the change-house and that all concerned conducted themselves in a lawful and orderly manner when in the man-trip and about it. I believe in the provision of man-trips, especially

in low coal mines. Any company that fails to provide man-trips, especially in thin seam mines, is not only treating the mine employes, especially the miners, unjustly and oppressively, but is also working against the best interest of the mine. A mine employe cannot do good work after he has had to crawl long distances in order to reach his working place.

Nothing will do more to increase the self-respect of the mine employes and their families, than the installation of a properly equipped and maintained change-house. Why should a mine employe be forced to go from his working place to his home, after completing his shift's work, covered with perspiration and coal dust, an object of contempt to passersby, on the streets and roads, and avoided as a leper when he attempts to ride in street-cars, buses, or other public conveyances. Why should he inflict his grime and dirt on his wife and family? Why not provide the mine employe with a good change-house where he can obtain the benefits of a good shower bath, can change from his soiled pit-clothes to his street clothes, and walk home with his head up and with the honest pride in his calling in his eyes, and be welcomed with smiles by his wife and children. Me, I'm for the man-trip and the change-house, but I'd do my darndest to see that I and other employes did no damage to such equipment and that I and other employes treated such equipment with proper respect.

You say that such foremen as I have described are not real—that there never was a mine foreman that had such virtues as I have described? Well, Mister, you are wrong—way wrong. Some years ago there was an old Scotch foreman—yes, I said Scotchman—in

the ——— field that had all of these virtues and some besides that I have not mentioned. He had the straightest entries that I ever saw, he had the best track I ever drove over, his mules pulled more coal than any other mules in the coal field, and his company never missed a payday and there were very few mistakes in men's accounts, too. I'll wager some of you old fellows listening to this talk, drove for this old Scotch Mine Manager and if you did you will recall how he used to reply when you tried to get him into an argument at "sawing time," "Tut, tut, Boy, run along now and pull your coal. That is what you are paid for doing." And you ran along as directed and we were glad to do so. Or perhaps you broke a lame-string on purpose, a half-hour before quitting time, and the old gentleman—for he was a gentleman—brought a good one, which he had repaired, from his shanty, and you got going again, and was glad to do so. Perhaps you remember that there were no labor troubles in that mine and that the old Scotchman produced the cheapest coal in the field.

I recall him telling me one day, when he was ill and confined to his home where I had to go in order to consult him about some details of his mine operations, "my 'round'

coal (by which he meant his lump coal) only costs \$1.00 per ton to produce."

* * *

Chairman Miller: I certainly want to congratulate you, Pat Harrington, on your very excellent rendition of Dr. Rutledge's remarkable paper. There is no mistaking the note of sincerity contained in that whole paper. There is no denying there is a lesson in that paper for all of us.

I wonder if there is anyone here who could or would care to add anything to Dr. Rutledge's very fine paper? In case there is not, we will proceed to the next paper.

Mr. Jack Verhoeff, Construction Engineer for the Peabody Coal Company. Jack has been assigned a difficult job to describe in a rather short paper the intricate plant of his company at Catlin, near Danville, Illinois.

Mr. Jack R. Verhoeff (Construction Engineer, Peabody Coal Co., Chicago, Ill.): Mr. Chairman, members and friends, my job is a tough assignment in describing a modern preparation plant in twelve minutes. If you will bear with me, I have written it briefly, and will do my best.

COAL PREPARATION PLANT

By JACK R. VERHOEFF

Construction Engineer, Peabody Coal Company, Chicago, Ill.

Due to the size, utility and various combinations of double duty, together with many other main and miscellaneous units serving and contained in the fifth and latest Coal Preparation Plant erected by Peabody Coal Company, also because of the brief period permitted for the reading of a paper describing the plant, it appears it would be best to eliminate details or technical discussion and confine this article to a simple general description of the plant.

The plant was erected at Peabody Coal Company Mine No. 24, Catlin, Vermilion County, Ill.

It was designed by Allen and Garcia Co., Engineers, of Chicago, Illinois, with the co-operation of the Peabody Coal Co. Executive and Engineering Departments.

Work on the general drawings was started June 1, 1938 and the plant finished in its entirety February 1, 1939, making a total of 8 months for completion.

This Preparation Plant is divided into seven sections. The divisions being the Main Head Frame and Tipple, the Dry Preparation division, the Wet Preparation division, Loading Shed, Dewatering Bin Unit, Retail Bin Unit for the storage of Plus 2" prepared coal, and Rescreener, Reassembly Plant and Retail Bins for Minus 2" prepared coal.

The plant is equipped with one steel weigh-pan discharging to an apron feeder. This feeder discharges raw run of mine coal to the primary raw shaker screen, which is designed

to separate 6" Lump, 6" x 1½", 6" x 0" or 1¼" x 0" raw coal, for feeding to the wash box, or for loading raw coal conveyed on a belt conveyor over the raw coal magnetic pulley and loaded direct to railroad cars.

The dry preparation section contains two 5 ft. wide by 14 ft. long vibrating screens each equipped with single deck 5/16" wire screen cloths for removing 5/16" x 0 from the 1¼" x 0 feed, and four 4 ft. wide by 8 ft. long electric vibrating screens each with single deck openings equivalent to 28 mesh separation for removing the 28M x 0 raw dust and making a 5/16" x 28M raw product.

This 28M x 0 raw dust is conveyed to a 100 ton capacity steel storage bin. This bin discharges to a conveyor feeding the boiler room stoker hoppers.

28M x 0 raw dust can also be withdrawn from this storage hopper, loaded into railroad cars or to retail trucks.

The raw 6" x 1¼" from the primary raw shaker screen is mixed with the raw 1¼" x 5/16" and 5/16" x 28 mesh product from the dry preparation plant and is conveyed on a belt conveyor over a magnetic pulley to a 5-compartment, 2 cell, 2 draw Baume Type Jig. This wash box has a capacity of 350 tons per hour when washing 6" x 28 mesh coal.

Jig operation is controlled by two mercury switches mounted on two wash box pedestal balance lever float rods.

Primary reject from the wash box is conveyed to a steel refuse bin and the secondary reject is delivered to a 3 ft. wide by 8 ft. long single deck vibrating screen equipped with steel wire cloth with 1" opening. The minus 1" is rejected and conveyed to the refuse bin while the plus 1" product is fed to a single roll 30" x 36" middlings crusher. This reduced size middlings product is then returned and recirculated through the wash box.

Facilities are included to discharge the secondary reject directly to the refuse bin when desired.

Washed 6" x 28M coal is sluiced from the wash box to a triple deck, crank drive, classifying screen, equipped with 3", 2", 1¼" and 5/16" round perforated plates, where it is sized and sprayed with fresh water.

These resultant 6" x 3", 3" x 2" and 2" x 1¼" washed coal products are fed from the classifying screen to apron loading booms with self contained hoists on tracks No. 2, 3 and 4 respectively. These products can be discharged either separately or collectively upon a double duty, reversible mixing conveyor discharging to loading booms into railroad cars on any track or can be conveyed to the plus 2" retail bin unit in either or any combination of sizes.

Raw 1¼" x 0 or 1¼" x 28 mesh coal when desired is conveyed by a belt conveyor over the raw coal magnetic pulley and loaded into railroad cars on track No. 1 for direct shipment or held for the track hopper preparation shift.

6" Lump coal is hand picked over a flat horizontal picking table. It can be discharged to an apron loading boom and loaded into railroad cars on track No. 5, or fed to a crusher with a 6" x 1¼" adjust-

ment, and reduced to any size within this crushing range and conveyed to the wash box or mixing conveyor, or it can be conveyed to the Plus 2" prepared coal retail bin unit.

The 6" lump picking table is equipped with a gate to by-pass any percentage of the hand picked lump coal into either the crusher or to the loading boom.

Rock picked from the 6" lump coal is conveyed to the refuse bin, and the reject picked from the 6" lump coal is fed to the middlings crusher, reduced and recirculated through the wash box.

All 1¼" x 5/16" degradation made while washing 6" x 1¼" coal is conveyed to the rescreener and reassembly plant for sizing, and discharges to various storage bins.

The 5/16" x 0 washed coal from the classifying screen is partially dewatered while being sluiced to the dewatering screens.

These dewatering screens consist of two 4 ft. wide by 16 ft. long, double deck vibrating screens operating at 914 r.p.m. with a 3/8" circle throw and equipped with wire screen cloth for 10 mesh and 28 mesh equivalent separation.

The dewatered 5/16" x 10 mesh and 10 mesh x 28 mesh coal is fed from the dewatering screens to a double compartment conveyor which carries and discharges this product to the dewatering bin unit.

This dewatering bin unit consists of six 100 ton capacity steel storage bins and contains vertical withdrawal chutes in each bin which permits coal from the top of the bins being withdrawn through the bottom of the bins.

This 5/16" x 10 mesh and 10 mesh x 28 mesh coal is then conveyed to the rescreener and reassembly plant.

The primary crusher in the main section is a 35" x 54" single roll. It crushes either raw or washed coal sizes from 6" lump down to 1 1/4" adjustment and the resultant sizes are conveyed to the wash box or rescreener and reassembly plant.

Plus 2" washed coal is conveyed, when desired, to the retail bin unit for storage of Plus 2" prepared coal.

This retail bin is a series of bins equipped with spiral chutes for various sized products which are loaded into retail trucks over rescreen shaker chutes.

The degradation made in this unit is conveyed to the boiler room or to the rescreener and reassembly plant.

Minus 2" washed coal is conveyed to the six bin rescreener and reassembly plant and fed to two 5 ft. wide by 10 ft. long, double deck, vibrating screens equipped with 1 1/4" and 3/4" wire screen cloths, and two 5 ft. wide by 10 ft. long, double deck, vibrating screens equipped with 5/16" and 28 mesh equivalent wire screen cloths.

The resultant 2" x 1 1/4", 1 1/4" x 3/4", 3/4" x 5/16" and 5/16" x 28 mesh products are lowered into their respective bins with spiral chutes. Any combination of each size of coal can be withdrawn from either bin through separate adjustable feeders and conveyed by mixing conveyor to two 4 ft. wide by 6 ft. long rescreen vibrators discharging to two belt loading booms for railroad car loading, the degradation made through these screens is carried back to the rescreener unit.

A second mixing conveyor operating under these bins and feeders convey any size or combinations of sizes to a loading boom designed to load both open and covered trucks with retail coal.

Any size or combination of sizes from the Minus 2" washed coal rescreener and reassembly plant can be returned from this unit to the main loading shed section, discharged to the mixing conveyor to mix with various other sizes and loaded into railroad cars.

Any individual size stored in the reassembly plant can be loaded into retail trucks over rescreen shaker chutes, the degradation being conveyed to top of these bins for recirculation.

A 200-ton per hour ring crusher with 1 1/4", 3/4" and 5/16" adjustment is located in the rescreener and reassembly plant, and is used to crush 2" x 1 1/4", 1 1/4" x 3/4", 3/4" x 5/16" or any combination down to 1 1/4", 3/4" and 5/16" minus products.

Sized coal which is stored in these bins can be fed to this crusher and reduced to 1 1/4", 3/4" or 5/16" top size and returned to top of reassembly bins for rescreening and recirculation.

This crusher is in closed circuit with the vibrator screens in the reassembly plant to eliminate oversize when crushing and discharging coal in these bins.

The concrete track hopper, located on track No. 1, is equipped with a 36" x 48" double roll crusher with a 3" to 6" adjustment.

Various sizes of coal fed to this track hopper can be crushed or bypassed and conveyed by belt to the main plant for preparation.

Mine rock is hoisted at the rate of 17 cars per hour. This rock is dumped into a hopper equipped with feeder and discharged to a 48" belt and conveyed to the refuse bin.

The washer reject and mine rock is hauled from the refuse bin to the rock dump in trucks.

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Circulation water is pumped from a steel pump to a 145,000 gallons capacity settling cone.

The sludge which settles at the bottom of this cone is drawn off through a valve in the cone bottom and fed to a 3 ft. wide by 8 ft. long single deck vibrator screen equipped with a 48 mesh equivalent wire screen cloth.

28 mesh x 48 mesh sludge is recovered and conveyed to the rescreener and reassembly plant bins or discharged to the refuse conveyor as desired.

The minus 48 mesh sludge is pumped to a slurry pond.

Oil sprays are provided at all loading booms and retail chutes, which permits efficient oil treating of all coal sizes loaded into railroad cars or to retail trucks.

An automatic weighing device operates on the wash box feed belt conveyor and is connected to a remote recorder located in the wash box main operating room.

This recorder indicates the tons per hour being washed and records the wash box operation over each 24 hour period.

The main preparation plant is controlled by a central control switchboard located on an elevated platform in the main wash box operating room.

This control board is 30" wide by 17 ft. long and contains a rotary switch, 150 Start and Stop lockout push buttons with pilot and running lights which indicate all motor activity.

This control board was designed so that all motors on units controlled by it must start and stop in sequence to avoid overrun of coal on other units. Motors and units may also be started and stopped manually.

The entire plant contains 130 various motors ranging from $\frac{1}{8}$ to 125 horse power with a total connected load of 1,500 horsepower.

The power current is 440 volts, 60 cycle A.C.; the lighting circuit is 220 volts, 60 cycle A.C.

All units, motors and gates together with switch boxes have been numbered.

Speed reduction is obtained through self contained gear reducers with V-belt drives on each unit.

The main circulating pump is a medium duty 4,000 gallons per minute, centrifugal pump.

Fresh water and spray pumps are two 250 gallons per minute and the slurry pump has a 50 gallons per min. capacity.

There are 1,000 tons of structural steel in the supporting structure which is covered with corrugated metal roofing and siding, and equipped with steel sash, wire glass, metal skylights and ventilators.

The floors and stairs are constructed of re-enforced concrete, steel subway grating and wood.

This plant is heated with a complete high pressure steam heating system, and includes 11 100 lb. pressure unit heaters equipped with motors, high pressure float and steam traps, strainers and hose valve connections for cleaning the heating coils.

Complete flow sheets and operation charts, showing all units, motors and operation of gates, all numbered and listed for immediate reference, together with operation charts showing push button and plant control for sixty different operating combinations of coal flow, with pumps, various valves and water line location, were made and furnished the operating organization at the mine, 60 days prior to the plant completion.

This permitted a complete knowledge of the plant by the operating personnel while it was still under construction and consequently few errors were made when the various units in the plant were started.

With the great flexibility, utility and size of this plant, having a capacity of 600 tons per hour, preparing, oil treating and loading 50 different grades and sizes of coal into both railroad cars and retail trucks at various locations, it becomes apparent that a large number of extra replacement parts are necessary to maintain an efficient and uninterrupted operation of it.

In order to standardize and minimize the number of spare parts to carry in stock for emergency and replacement use, a detailed schedule of description covering each unit was made.

Each schedule includes a complete description, type number, serial number and bulletin or spare part list number of each individual part which permits intelligent ordering of all necessary equipment.

A completely equipped analytical laboratory has been constructed at this mine where all cars are sampled while being loaded and an analysis is made of the average coal loaded into the cars.

In conclusion it appears pertinent that sound reasoning be advanced for designing and erecting such an elaborate and versatile preparation plant.

Lump coal consumption is rapidly decreasing while the demand for specially prepared smaller sizes is becoming greater each year.

This demand is due principally to the large production of various types of modern coal stokers for both railroad, commercial and domestic use.

Due to the efficiency differential of various and many types of stokers, it is and will be necessary in the future, for coal operators, during certain periods to crush a portion of their tonnage output, prepare, size and deliver either a single specific size or any mixed combination of sizes.

This preparation plant with its utility and flexibility meets all present, together with anticipated future demands.

* * *

Chairman Miller: Jack, I think you did an excellent job in describing that plant in such a short paper.

Some people say there isn't anything in this coal business. You have just heard, gentlemen, a description of one of the newest plants in the coal fields of the middle west today.

Few of our customers recognize how much trouble and expense the coal companies go to in making their product a more convenient and clean fuel to burn. I think it would be nice if we could let them know and see how this coal is prepared for their use.

Now, Jack, you have omitted nothing at this plant that I can think of except crusher units for reducing coal sizes. Have you thought about these crushers to make various sized coal for the future market?

Mr. Verhoeff: Yes, we have studied the efficiency of various types of crushers for several years, together with our anticipated future market requirements and have installed several types of crushers, in this plant to meet the future demand, as I have described in the paper. I neglected to state, however, that it is impossible to report upon the

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crusher performance at this time because this plant has operated practically full time since it began operation, and consequently we have not had the opportunity to make the proper tests necessary to determine the efficiency of any units in the plant.

Chairman Miller: To me it is always advantageous to go through any plant, for then I can see the things other people are doing. We are all trying to do the same thing, but doing it differently, that is all. I feel from the description in your paper, Jack, that if I had an opportunity to visit that plant, I will be a little better able to understand what you are trying to do.

Mr. Verhoeff: You are apparently the same as the rest of us, Fred, we all learn new things each day.

Chairman Miller: Mr. Von Perbandt, I think, might have a great deal to add to this paper.

Mr. Louis Von Perbandt (Allen & Garcia Co., Chicago, Ill.): Jack has left very little to add. One of the interesting problems during the erection of the plant was that we were allotted thirty days to raze the old structure, and begin loading coal with part of the new plant. During this period complete new foundations were constructed and some of the old equipment was reconditioned. The following four months of construction was done during five-day-a-week mine operation.

The old structure was constructed of timber and built approximately thirty years ago. After examining this structure we discovered many old hickory pins which were used for doweling the structure together,

and they were as tight as ever when we removed them.

Jack has thoroughly covered the subject so I do not believe there is any more for me to say. I am sure we will be pleased to answer any questions.

Chairman Miller: We are ready for discussion. If there are any questions any one would like to ask either Mr. Verhoeff or Mr. Von Perbandt, now is the time. I am certain there must be questions in some of your minds, since this question of coal preparation is so close to the hearts of many of us. There is a question I would like to ask, Jack. You mention you are preparing and screening 10 mesh and 28 mesh sizes. What type of screen cloth do you use? What is the clear opening between wires? Is it a slot?

Mr. Verhoeff: We have used both wedge wire and screen cloth at various mines for dewatering coal. The edges of wedge wire tend to wear off rapidly and cause many coarse particles to pass through to the minus 28 product. We believe the short life of brass and stainless steel wedge wire together with the high cost of this material prohibits the extensive use of it. For these reasons we decided to use wire cloth on the dewatering screens. One deck has a special slotted stainless steel wire cloth with an opening equal to 28 mesh or $\frac{1}{2}$ to $\frac{3}{4}$ millimeter. The other deck has a special slotted wire cloth with an opening equal to 10 mesh.

Chairman Miller: Why do you remove the minus 28 mesh coal before feeding raw coal to the wash box?

Mr. Verhoeff: The minus 28 mesh dust is removed from the raw prod-

net going to the wash box to permit the elimination of fine coal in the box and help us to recover the maximum amount of water from the slurry.

Chairman Miller: You do that with the slurry pond.

Mr. Verhoeff: Our sludge pond settles out quicker this way because we discharge the 28 x 0 slurry from the cone to a small vibrating screen and remove the 28 mesh by 48 mesh. The 48 mesh by 0 product contains a small amount of solids.

Chairman Miller: Mr. Sandoe, you have a washer plant. Haven't you some question to ask Mr. Verhoeff.

Mr. J. C. Sandoe (West Virginia Coal Co., St. Louis, Mo.): I haven't much to say at our plant, for we examined and planned and made too good a job at first, and had to send back for a second test on it. I understand they have a marvelous plant there.

Chairman Miller: Mr. Jenkins, do you have any questions.

Mr. G. S. Jenkins (Consolidated Coal Co., St. Louis, Mo.): No questions.

Chairman Miller: Do you have any comments?

Mr. G. S. Jenkins (Consolidated Coal Co., St. Louis, Mo.): The only comment I have to make is our preparation plant is still at the blueprint stage. It will be a month or two before we get ready. We do not have a washing problem on account of the southern Illinois coal having a 9% ash content, and we feel we

are wasting our time trying to wash it. Ours is a dedusting problem. We have the same trouble the gentlemen mentioned that the size of the mesh will become broken.

Our plant has been put in to handle the entire output of the mine on one-half inch basis. We go close to one-half inch and recirculate all oversize, and the entire product can be worked out on about eight mesh wire size.

Getting back to crushers, you and I have had quite a bit of argument on it. The way it is coming now, the primary crusher would be a ring crusher and the secondary a double roll. It is so arranged that we can use the ring crusher.

Chairman Miller: This subject of crushers is still alive, from what little I know of it, although we did spend some time before we decided what kind of crusher, and I suppose you did too, Jack.

Mr. Verhoeff: Yes, as I stated before, we have studied various types of crushers and their performance over a period of several years and we are not sure that we know very much about them as yet.

Chairman Miller: Mr. Young, do you have any comment? Mr. Wentworth? Mr. Adams?

A member: I am interested in Peabody's experience on dedusting, and hope if they find out anything they will tell us as they go along. Nobody seems to have an answer on dedusting. I do not know whether you do or not.

Mr. Verhoeff: We have no general specific answer on dedusting as we believe that various coals in dif-

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ferent fields present their separate dedusting problems.

Chairman Miller: Do any of the manufacturers' representatives have any comments to offer? Mr. Salsich, would you care to make any comments?

Mr. Neil E. Salsich (Jeffrey Mfg. Co., Columbus, Ohio): I am not in a position to comment on their plant, for I haven't seen it.

There are two new developments in the past year that are rather interesting, one on crushers and one on screening. The crusher is a development of a lower speed ring type crusher. It isn't exactly a ring, but a hammer with a solid ring on the head of the hammer which runs about half of the speed of the ordinary ring crusher and will produce less fines. We have run perhaps one thousand tests on different grades of coal, and there is a marked reduction in fines.

Another item of interest is the development of a new type of screen called Heller piano wire. It is made of a very hard wire, with no cross wires. The reason the cross wires can be eliminated is the wire is stretched to a very high tension until it attains a resonance.

We have had remarkable results on these screens. The finest mesh made today is about 120 mesh, but there are many of them running with one-eighth and quarter inch mesh. They show 25% to 50% increase on the tonnage because of the absence of cross wires, and a very great increase in the life of the cloth due to the use of very hard wire. It is made of light carbon steel wire, cold drawn. A piece of that wire can be laid on a soft steel plate, hit with a hammer, and will be driven into the plate without injuring the wire.

Chairman Miller: Mr. Lambert, do you have any comment to offer on the subject of dewatering or dedusting that would be of interest?

Mr. M. S. Lambert (Robins Conveying Belt Co., Chicago): I would like to know what Mr. Verhoeff considers a proper period for draining in the bins. There is a time limit, I imagine, that you can give the coal in the bin, for you must get it out as more comes along. You mention taking the coal off the top of the pile instead of the bottom.

Mr. Verhoeff: After many months of discussion as to the proper capacity and design and realizing the high cost and uncertain results which we might encounter, we erected the dewatering bins. We have been unable to make any tests in this part of the plant due to its constant operation, but we expect to gather some data covering its efficiency this summer. Mr. Von Perbandt might have some information with him as to its anticipated capacity.

Mr. Louis Von Perbandt: I haven't any figures with me, but six bins are capable of holding a daily run of that size of coal. That gives a complete cycle and lets some of it remain in the bins about twelve to fifteen hours between shifts.

Chairman Miller: Mr. Griffin, do you have any comment to offer that would be of interest to this gathering on the subject of dewatering?

Mr. John Griffin (Koppers-Rheolaveur Co., Pittsburgh): I am afraid not. I do not think of anything in particular. Everything seems to have been covered.

President Weir: I would like to ask Mr. Verhoeff what type of screens he used to make the 28 mesh separation.

Mr. Verhoeff: Do you refer to the dry 28 mesh separation?

President Weir: Yes, the dry.

Mr. Verhoeff: The plus 5/16" raw coal is scalped over two vibrating screens equipped with steel wire cloth equal to 5/16" separation. 5/16" x 0 raw coal is fed to four electric screens equipped with special stainless steel slotted wire cloth with openings equal to 28 mesh or between $\frac{1}{2}$ to $\frac{3}{4}$ millimeter

A Member: Are the dewatering screens mechanical and what speed do you run them?

Mr. Verhoeff: The dewatering screens are mechanical and are run at approximately 950 r.p.m.

A Member: Do you spray water on that separation?

Mr. Verhoeff: These dewatering screens are equipped with fresh water sprays but we have not used them.

Chairman Miller: Mr. Hitt, have you any question or comments to make?

Mr. Joseph E. Hitt (Walter Bledsoe & Co., St. Louis): No. This technical discussion was beyond my depth some time ago. I have no suggestions to offer.

Chairman Miller: Mr. Thomas?

Mr. T. J. Thomas (Valier Coal Co., Chicago): I haven't anything.

Chairman Miller: Mr. Richart, I wonder if you have anything to offer along the line of electrical equipment, or anything of that sort that would be interesting.

Mr. Fred W. Richart (General Electric Co., Carterville, Ill.): Not at the present time.

A Member: Mr. Jenkins commented on the plant he is about to build, and I think I might bring out one point. This is a straight line operation, in which it is done in such manner that by extending the building you can add capacity. I think in all plants it would be a good thing to carry out that plan. It is a good thing, for more frequently than not we run into the matter of capacity and some change in practice which makes it desirable to have additional equipment at the same time, and there is no place to put it. To carry out a straight line layout is certainly desirable to have additional capacity added.

Chairman Miller: George Meagher, you are hiding. Have you anything to say?

Mr. George Meagher (C. W. & F. Coal Co., West Frankfort, Ill.): Nothing to say.

Chairman Miller: Has anyone else anything to add to this discussion? It is still live, plenty live. The subject of dewatering and dedusting is a very vital subject, and we are all working hard on it, I know, and have a lot of different ideas. Now is a good chance to discuss them openly with people who have had probably different experience. If you have any questions, now is the time to ask them.

Our Advertisers, who make this volume possible, will appreciate your inquiries.

If there are no further questions, I will now turn the meeting back to Mr. Weir, our President.

President Weir: Mr. Miller, you have made an excellent presiding officer for this association. We express our appreciation to you for your assistance.

Is there any other business to come before the meeting? Anything for the good of the order, or anything else?

Before adjourning this session, I would like to express the appreciation we feel for the fine program which our Program Committee, under the Chairmanship of Mr. Sandoe, has arranged for us. I would like also to express my appreciation to the Sergeants-at-Arms Staff, chief of which is Mr. Sandoe. Also to each and every one of you for your attendance on the boat, your attendance at the sessions, and your interest in the work of the Institute.

Mr. Raymond Mancha (Jeffrey Mfg. Co., Columbus, Ohio): Was the Membership Committee efficient in signing up new members, as you instructed them?

President Weir: I haven't any report from the Membership Committee, although I am very frank to say there are about eighty-two or eighty-four members on board and only eighteen that are not members, and that is about five to one. We should get some results. In view of the fact, Ray, that you raised the question and that your name does not appear upon this Membership Committee, I am going to add you right now to the Membership Committee.

I hope all of you have had a good time, and that you will continue your pleasure at Kampsville this evening. Thank you, and the meeting now stands adjourned.

(Whereupon the meeting was declared to stand adjourned *sine die*.)

The following paper is reprinted through the courtesy of Stoker Manufacturers Association, presented at 22nd Annual Meeting, French Lick Springs, Indiana, June 2, 1939.

PRODUCTION AND ECONOMICS OF STOKER COALS

By PAUL WEIR

Consulting Mining Engineer, Chicago, Illinois

I greatly appreciate your kind invitation to be present and to participate in this general session of your 22nd Annual Meeting. Your Association has accomplished much for yourselves and for the coal industry. "Automatic Coal Heat" is one of the few bright spots to which the coal industry can look with hope.

Your good Secretary, Marc Bluth, made available to me a file of addresses made by representatives of the coal industry in prior years. These addresses concerned principally the important items of preparation, marketing and combustion of stoker coals. This morning I am going to attempt to tell you something of the problems in the production and preparation of coal as they relate particularly to stoker coal. At the same time I would like to tell you something of the economic aspects of this same problem.

Probably none of you have ever thought of the production of coal in terms of the operation of a slaughter house. As a youngster growing up in a small town I once heard a facetious reply by the town butcher when a small boy registered a complaint of his mother that the meat they were getting contained too much bone. The butcher's answer was that there was no such thing as a boneless steer. In mining we are not dealing with a homogeneous bed of coal any more than a butcher is dealing with a homogeneous steer. When he slaugh-

ters the animal, he divides the carcass into a number of products, some valuable, some with little value and some without value. He attempts to price the products so that they will move out together and that when he has sold off all of them he will have returned a profit on the whole. This is essentially the same problem a coal producer has.

With the exception of a very small number of beds which are made up almost entirely of splint or cannel coal, all bituminous coal beds are of the "banded" type. By this is meant that the beds are not homogeneous. Rather they contain interbedded layers of different coal forming materials and various forms of mineral matter.

Scientists have identified and named four different types of bands, namely vitrain, clarain, durain, and fusain. The bands as they occur in the bed vary in thickness from a streak to one-half inch and occasionally thicker. Each of them differs in chemical and physical properties. We may use the Illinois No. 6 bed in Southern Illinois for the purpose of illustration. The vitrain, aggregating approximately 20 per cent of the coal bed, contains less than 2 per cent of ash. The clarain, aggregating 70 per cent, contains approximately 6 to 8 per cent of ash. The fusain, representing 3 to 5 per cent of the bed, is normally a high ash constituent. Only a very small amount of durain is found. The ash

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fusion temperature of each of these constituents differs from the others as do also their coking and combustion characteristics and calorific values. Of the physical properties, resistance to shattering and degradation are the important ones. Vitrain is quite brittle and breaks down very easily. Clarain is more resistant. Fusain has very little structural strength.

In addition to the mineral matter (ash after combustion) in the banded constituents themselves, there are also frequently present in the bed horizontal and vertical stringers of the minerals pyrite, calcite and kaolinite. There may also be horizontal layers of clay or shale, commonly called "partings," ranging from less than an inch up to 12 or more inches in thickness. Of these, only pyrite has some calorific value. The fusion temperatures of these individual minerals differ one from the others as well as from the mineral matter in the bands themselves.

My purpose in introducing these "ains" and minerals is not to burden you with what is still considered by some to be of academic interest only but rather to simply establish their existence and then to tell you something of the problems introduced by them in the mining and preparation and their effect on the properties of the various sizes of coal. To those who are interested in a scientific presentation of the occurrence and properties of these constituents, there are a number of publications available.

As I have previously pointed out, with the exception of splint and cannel coal beds, these banded constituents occur in relatively thin layers, hence selective mining underground insofar as separating them is concerned, is impracticable. How-

ever, bands of clay or shale may be discarded in the working places.

The coal bed is cut, drilled and shot. The size consist of the resultant fall of coal depends not only upon the system of mining but also upon the proportions of the various bands present. Generally, the higher the proportion of clarain and durain, and the lower the proportion of the easily broken vitrain and the friable fusain, the larger the size of the individual pieces. The tendency is towards a concentration of the easily broken bands in the finer size range and of the more resistant bands in the coarser sizes. The tendency also is towards a concentration of the mineral matter in the finer sizes. I do not mean to imply that a complete separation of one band from the other is made. The individual pieces of these coarser sizes are still made up of the several bands but in proportions different from that of the entire bed and of the finer sizes. The loading into cars and transportation to the preparation plant result in additional breakage with a still further concentration of bands.

Almost invariably bituminous coal from commercial mines is screened and sized. The effect of concentrations of banded constituents and of mineral matter then becomes apparent. For the purpose of illustration we may again use a typical coal from the Illinois No. 6 Bed in Franklin County. The sizes of coal having the highest fusion point are 2 x 3 and 1½ x 2 inches. These sizes represent a concentration of clarain bands. Larger sizes have a slightly lower fusion point as do also the finer sizes. The larger sizes contain more vitrain bands while the finer sizes show some concentration of free vitrain. Large lumps fracture through the bands of vitrain and fusain. Just as there

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is a variation in fusion temperature of the ash in the various sizes, there is also a variation in combustion characteristics and the kind and amount of ash.

Mechanical cleaning (washing) results in a further concentration of the banded constituents. The basis for practically all mechanical cleaning is the difference in specific gravities of the various bands, minerals and partings which make up the coal bed. The specific gravities of the various banded constituents differ one from the other, hence all cleaning at low specific gravities may result in selective concentrations consisting predominantly of one type of band. Not only is there a reduction in the amount of minerals in a particular size, but their relationship, which may have had a beneficial effect on ash composition, may be altered.

To summarize, we start with a bed of coal which, if used as mine run, would require little discussion. However, very little coal is sold as mine run except to railroads. Through screening and sizing and mechanical cleaning we obtain products the properties of which differ very materially from the properties of the mine run and from those of each other. There may be a difference of as much as 300 to 400 degrees in fusion temperature. The character of the ash may be very different. Certain sizes may be "free burning"; others may be predominantly "caking."

What is the practical significance of all this? A "natural" size of stoker coal from a specific mine is stoker uniform in its properties over a period of time. Since the properties of this particular size differ from those of other sizes even if produced from the same mine, it is evident that if and when larger sizes of coal are crushed and added

to the "natural" size an entirely different product may result. When the demand for stoker coal exceeds the amount represented by a "natural" size, then the deficiency is made up by such crushing. Similarly, in the case of adjoining mines operating in the same coal bed, the "natural" sizes of stoker coal, even if screened to the same dimensions, may differ markedly in properties. This is the result of differences in composition of the bed, of differences in relationships of the banded constituents, and of differences in methods of mining and preparation.

According to authorities on stoker combustion, uniformity in physical, chemical and coking characteristics of the coal is highly desirable. Because of this specific relationship between the size of a stoker coal and its properties, any change in screen size, top and/or bottom, may change the properties. If there is a wide range between top and bottom sizes, there may be segregations in the stoker hopper sufficient to prevent uniformity in performance.

It is apparent that mining, together with sizing and mechanical cleaning of banded coal beds, is not a simple problem when viewed from the basis of resulting products. In general, the coal industry has been rather slow in attempting to correlate differences in performance of specific sizes of coal with the differences in the composition of the sizes. This has been due largely to lack of widespread recognition of the importance of this fundamental data. It should be clear that the constitution of banded coals is of more than academic interest.

At the same time, however, it is important that the manufacturers and users of stokers realize the complexities relating to the production and preparation of stoker coal. Instead of insisting upon a degree of

uniformity which from the standpoint of mining and preparation is impracticable, the stoker manufacturer must design his equipment such that its operation is capable of adjustments to respond to unavoidable differences in properties of stoker coal.

In very few, if any, commercial mines is the production of fine sizes intentional. The maximum amount of coarse sizes and the minimum amount of fine sizes is the objective in mining. Fine sizes can always be made by crushing coarse sizes after mining but the reverse cannot be done. When coal is sold on a mine run basis the producer has no difficulty with unequal demand for various sizes. However, at the present time practically all commercial mines do some sizing, hence they are faced with the problem of attempting to equalize movement of sizes. The usual solution applied to this problem consists of differentials in prices. Demand for the coarse sizes is more seasonal in character than for the fine sizes, hence when coarse sizes can be sold, the fine sizes must be sold. The result of this is lower prices for the fine sizes. Producers almost invariably depend upon the realization from sales of coarse sizes being sufficient to raise the average realization of the whole to a point approaching or exceeding the cost of production. The producer who is able to realize his cost of production from the sale of fine sizes is considered to be fortunate. Lump, egg and nut sizes are the steaks and the fine sizes are the cheap cuts.

To the extent that consumption of stoker coal displaces that of the coarse sizes this old relationship is disturbed. A lesser consumption of the coarse sizes means that the deficit must be met by higher prices for the finer sizes.

When double sizing of stoker coal results in the production of a very fine size ($-1/8$ inch or less) then the operator may have to find a market for this new fine size or else dispose of it as refuse. The price for stoker coal then must bear the additional loss on this fine coal plus the deficit from the decreased sales of coarse coal.

A decade ago preparation of special stoker coal was in its infancy. There seemed to be no well defined ideas as to required sizes and desirable properties. Producers were slow to install special preparation equipment because of these uncertainties together with the lack of appreciation of the future of the small stoker. They felt their way along with makeshift equipment doing a rather inferior job. Within the past five years they have acquired a better understanding of those properties necessary for good performance and "consumer satisfaction" and have installed special equipment and instituted methods which are necessary to meet the requirements. There is an ever-increasing appreciation of the opportunities presented in the field of "automatic coal heat" and a willingness to cooperate with you in the exploitation of that field by developing special sizes and grades of stoker coals.

(Reprinted from American Mining Congress 1939 Yearbook)

MECHANICAL LOADING OF DOMESTIC COAL IN THE SPRINGFIELD, ILL., DISTRICT

By GEORGE M. SMITH

Mine Superintendent, Peabody Coal Company

In approaching the subject "Mechanical Loading of Domestic Coal in the Springfield District," I would like to give a brief history of the Mining Industry in this county. It is one of the oldest mining centers in the State of Illinois. The United States census report for 1840 shows that coal was being mined in Sangamon County at that time. This coal was probably mined from a top seam, about three feet thick, found in the hills. The first shaft mines were sunk in the years 1866 and 1867, another in 1871. The latter mine is still operating today. There was a steady increase in the number of mines sunk until the year 1905, at which time there were 27 shipping mines operating in the district. Today only six of these mines are operating.

The Springfield district mines are operated in the No. 5 vein in Central Illinois, surrounding the City of Springfield. The mine I have charge of is within sight of the State Capitol building. The vein of coal lies from 230 to 250 ft. below the surface, the coal ranging from 5 ft. 2 in., to 6 ft. in thickness. Immediately overlying the coal seam there is a strata of black slate ranging from 2½ ft. to 4 ft. in thickness. This slate carries nigger-heads which extend from a few inches to 10 or 12 in. down into the coal. Above the slate there is a strata of lime-rock, varying from a few inches to 3 ft. in thickness. Underlying the coal seam there is a strata of soft fire-clay.

The characteristics of the No. 5 coal vein are: that at irregular intervals there appears in the coal, clay veins that are known locally as horsebacks or slips. They range from a few inches to three or four feet in thickness. These horsebacks do not have a regular course, but run in all directions and I have seen as many as five come together at one junction. Some of the larger ones will cut across several rooms, and then disappear. These horsebacks are usually much larger on the bottom than they are on top, and extend up into the slate. Where they cross a room at close intervals they leave a slip in the roof which is very treacherous. The slate, due to its thickness, sounds solid but it lets loose without warning.

Nigger-heads also appear in the slate at irregular intervals and extend down into the coal. Sometimes they are so numerous and of such proportions that the weight causes the slate to pull loose. This necessitates a standard system of timbering. There are two rows of props carried, with 3 ft. clearance from rail, on each side of room, within 15 ft. of the face. Due to the presence of these horsebacks in the coal, which sometimes are very hard and flinty, there was no attempt made to cut the coal with mining machines. The method of mining is to shoot the coal off the solid and load into pit cars by hand.

In the year 1928 the Peabody Coal Company installed short wall machines in their No. 51 Mine while

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the mine was still on a tonnage basis, the miners being compelled to snub by sledge and wedge. These machines worked satisfactorily but did not produce as salable a grade of coal as solid shooting, as the powder shot worked all through the seams in the coal and it would not stand handling. This is commonly described by the miners as flat cracking.

With the advent of the pit car loader the following year, the mines changed from a tonnage to a day wage basis and the snubbing by hand discontinued. The coal was then snubbed by drilling snubbing shots, which did not produce as high a percentage of larger size coal. As practically all of the production is sold for domestic purposes, it is necessary to produce a maximum amount of lump coal and this condition led to considerable experimenting to determine the best method of cutting and shooting the coal. After trying out different types of cutting machines, it was decided that the track mounted shearing machine was best adapted for this district.

This machine is equipped with a 9-ft. cutter bar, and makes the shear over the right hand rail in the center of the working face. The shear extends the entire thickness of the seam from top to bottom, and 7 ft. deep. This reduced the actual cutting 75 per cent in each place and resulted in being able to cut three times the number of places with each machine per shift. However, this increased the number and depth of holes required to shoot the coal properly.

The mines are worked on the room and pillar system, with cross entries driven off the main entry at 1,250-ft. intervals. Panel entries are driven both ways off cross entries at 520-ft. intervals. Rooms are turned off panel entries on 36-ft.

centers and are driven 250 ft. deep and 24 ft. wide.

The method of working the rooms is what is known as the advance face or step system. The advanced face is 12 ft. wide and from 7 to 9 ft. deep; the shear cut being placed in the center of this advanced face. On each side of this advanced face there is a step, 6 ft. wide by 7 ft. deep, making two advancing faces on each side of the shear cut. There are eight holes drilled in each room, with post mounted electric drills using a 2¼-in. conveyor type auger. On each side of the shear there is one bottom hole and one top hole; the bottom hole being placed about 3½ to 4 ft. from the cut, inclining downward and toward the cut. The top hole is drilled practically straight with a slight grip. There is one top and one bottom hole drilled in each step; there is a free parting from both slate and clay, leaving a fairly smooth bottom.

This method of shooting, when holes are properly charged, will give a much larger percentage of lump coal in this district than either the straight under-cut face, or the track mounted machine cutting an are face. Black powder in pellet form is used for blasting and there are from 30 to 35 tons of coal shot down with each round of shots. It is interesting to note that when we changed to this method of shearing, drilling, and shooting, that the cost, including explosives, was practically the same as preparing under-cut coal for loading, due to the increased cost on under-cutting the coal. There was no change made in the method of cutting, drilling, or shooting, with the installation of mechanical loaders.

When horsebacks are encountered in the coal seam, they usually appear first in the advance face. All coal is then shot off up to the horse-

back, the room is narrowed down to 12 ft. and the horseback shot off separately in order not to mix with coal; it is then loaded out with loading machines.

The mines are within the city limits and no refuse can be dumped on the surface. All horseback, clay, slate, and other refuse must be gobbed down in the mine. When loading coal, all visible impurities mixed with the coal are thrown out by the loading machine crews. The coal is hand picked after sizing over apron type picking tables and any combination of sizes can be obtained through the use of mixing conveyors. The coal is loaded into cars by means of flight type conveyor booms.

For retail purposes it is distributed into the different bins by means of flight and drag type conveyors. The coal passes from these bins over shaker type "Dust O Laters" and is rescreened before loading into trucks. Stoker sizes are made in a separate rescreening plant over vibrators. There is a large amount of coal thrown from the tables that has only a small sulphur or horseback stringer running through or adhering to it, and in order to eliminate this waste, the refuse is loaded into railroad cars and shipped to the company's processing plant at Carter, Ill., where all coal is recovered from the impurities.

Due to the method of shooting, the coal is scattered much more than undercut coal and is often shot back of the prop line. Where top conditions permit the props are removed on one side of the room, the coal is loaded out to the face on this side and the props reset. The operation is then repeated on the opposite side. When top conditions do not permit the removal of props, the coal is thrown over by cleanup men.

There are two types of mechanical loaders in use in the district;

the caterpillar and the track mounted loaders. The latter type has been more efficient due to scattered coal, but both types of loaders are built sufficiently low to load all ordinary size chunks. All coal is shot out free from the face and is easily loaded, the loaders have very little digging to do. Both types of loaders can load large lumps, and since installing mechanical loaders there has been a slight increase in the percentage of 6-in. lump coal.

All track and switches are laid with steel ties, with the rail and ties trenched in the clay to the depth of height of rail, in order to conserve height. The switches are laid in each cross cut for quick car change, which is carried on with mules and two pushers for each loader; the mule depositing the empties on last switch and pulling the load from the machine, the pushers getting the empty off last switch.

The mine cars being small, averaging 3,800 pounds, it requires a great many more changes per day than would be necessary with larger type cars, in order to get the tonnage from the loaders. The average car change per loader is from 155 to 165 cars per day. There is some loading time sacrificed on the loaders due to loading horseback and breaking extra large chunks, where head room does not permit them to pass.

The advantages of mechanical loading over hand or conveyor loading in this district are: that operations can be confined to a much smaller area, closer supervision can be maintained over drilling, shooting, and timbering in working places, a larger production per man employed, and a lower production cost.

Both types of loaders have come up to expectations on tonnage and cost, and are working successfully in the Springfield District.

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(Reprinted from American Mining Congress 1939 Yearbook)

DUAL SYSTEM OF HAULAGE

By JOHN H. EVANS

Mine Superintendent, Wasson Coal Company

The Wasson Coal Company is located at Harrisburg, Ill., mining coal in what is known as the Illinois No. 5 seam. This seam varies in thickness from 54 to 72 in. with an average thickness of about 60 in. This seam is overlaid by draw slate or draw rock, varying in thickness from 1 to 24 in.

The size of our mine car inside measurement is 7 x 4½ ft. and top of car is 38½ in. above the rail. The capacity of the mine car is 1.5 tons, mechanically loaded. This is a shaft mine—coal being brought to the surface in cars hoisted on cages. In changing from hand loading to mechanical loading, consideration had to be given to three things: namely, car capacity, size of shaft, and separation of draw rock from coal. After a great amount of study and experimenting, track mounted cutting machines were purchased and put into operation, thus allowing cutting to be done directly under draw rock, permitting rock to be moved before shooting. This plan definitely established this mine as a track mine. In the parts of the mine where the draw rock is thin or failed to come after cutting, we experienced tremendous difficulty in loading into the regular mine car, thereby suffering a loss of tonnage. We were also hampered in our efforts to obtain lump coal, as there wasn't enough space between the car and mine top to permit lump coal to enter the car. For the reasons above stated we were compelled to give consideration to a different type of

mine car. Due to the size of the mine shaft any change in width or length of car was limited to what we were then using.

We then fell upon the idea of a dual system of haulage and the following plan was adopted, which provides the use of large dump bottom cars behind the loading machines, while at the same time retaining the original mine car equipment for the main haulage and hoisting cycles. The use of two sizes of cars is made possible by the interposition of the dump hopper, feeder and trip loading conveyor, in the haulage circuit. Thus the loading machines are serviced with the largest possible unit commensurate with the conditions encountered, while at the same time the small cars as can be accommodated on the cages are loaded in trips without uncoupling, thus reducing the total time required for car changing in the working shift.

Time studies show that the time required for car change is practically the same with the large cars compared with the regular mine car. Derailments are fewer with the large car and as a result the loading machine is loading coal a greater per cent of the time.

We tried several plans with this large car and found that the key room system gave us the best results. We have driven rooms 1,150 ft. deep and used here a nine-room key. This method enabled us to bring the entire production from one machine on a minimum amount of track.

Buyer meets Seller in the back of this book.

Where we do not use the dual system of haulage we find that it is necessary to have storage space for at least 40 small cars, that is 20 loads and 20 empties for each machine; but with the large cars storage space is cut to the minimum, as we only need enough space to accommodate three loaded cars and same number of empties.

In using track cutting machines we have found that it is to our advantage to turn all rooms and cross cuts on 60-degree angle. But since it is desirous in having all rooms at right angles with the entry, we drive the rooms 70 ft. on 60-degree angle and then straighten up the additional 30 degrees. In addition to allowing us to cut the rooms more easily it also enables us to have a better track layout.

Prior to the installation of the dual system the machines on this section were loading an average of 156 tons per day. Since the installation we have maintained an average tonnage of 225 tons per machine.

The new equipment which was required and not on hand for this plan and had to be purchased was as follows:

Sixteen dump bottom cars of the one-two-three automatic type, furnished by the Sanford-Day Iron Works.

Dump hopper, feeder and trip-loader were furnished by the Bar-

ber-Greene Company. The car has the following dimensions: 12 ft. long and 6 ft. wide on the outside of car and 30 in. above top of rail and has the capacity of three to four tons according to surcharge placed on top of car.

The system of operation consists of the following cycles: of the 16 large cars furnished, 12 are in service at the present time serving two Joy 7BU loading machines. These 12 are divided into four trips of three cars each and the operation schedule is based on having one trip at the loading machine while the other is being hauled to the hopper—dumped and returned to the working place. Three cars have been found to be enough for the distance of the haul so far encountered. As the trip becomes longer an extra car will be added. The capacity of the hopper is 12 tons and was placed more or less in the center of a block of coal so that coal can be hauled from three different directions. The maximum haul so far has been 2,150 ft. and we have expectations of reaching out to a distance of 3,000 ft. based upon performance to the present date. This system was put into operation November, 1937, and has up until March 1, 1939, transferred from large to small car, 160,000 tons of coal. It is our belief that we will be able to handle about 300,000 tons of coal with the hopper in its present location.

(Reprinted from American Mining Congress 1939 Yearbook)

ONE THOUSAND SHIFTS WITH A 10-TON MINE CAR

By S. M. CASSIDY
Manager, Weirton Coal Company

Inasmuch as the mine car in use at the Isabella Mine of the Weirton Coal Company has aroused many questions from visitors due to its size and unusual construction features, it is felt that a few facts concerning operating experience to date might be of interest, especially as this is believed to be the largest car used in regular loading at the face of any underground coal mine in the United States.

One of the cars was borrowed by the manufacturer, the Differential Steel Car Company, and may be seen in their booth on the exhibition floor; for that reason no detailed description will be given here.

The car was designed for 10 tons of coal or 12 tons of slate, mechanically loaded. Actual average of all cars dumped over a long period is around 9.2 tons of coal. Where mining height has permitted, the average from certain sections has been over 10 tons. In the early days of use one car of slate came through weighing 16 tons, but prompt reporting of any car containing over 24,000 pounds has practically eliminated overweights and the slate cars average about one ton under the coal weights. Tare weight is 7,760 pounds. Average turnover is three per day, number of cars is 182, average round trip haul is approximately five miles. The number of cars in use is large because of certain storage conditions.

Overall width of 7 ft. and the 44 in. height at the boom end, with 10-

in. higher sides and opposite end, have proved about right under the conditions used—but it is now known that the inside body length could have been 16-ft. long instead of 14½ ft., thereby gaining another ton in capacity and still not have too long a boom on the Whaley loading machine.

Visitors to the mine are invariably curious as to frequency of derailments and how long it takes to rerail a car. As particular stress was paid to reporting of derailments right from the start, some figures are available that are believed fairly accurate, as each motorman and foreman has been trained to report car number, location and probable cause of all wrecks. During February and March there was an average of one derailment per shift. It usually requires from 10 to 20 minutes to rerail a car.

Although particular attention was paid in design to make the car stick to the track, actual results have far exceeded expectations despite trackwork that can by no means be classed as good. Track and switches in mining sections are laid on steel ties throughout. The track laid for developing is also used in pillar work with little or no additional alignment or leveling, even in the butts.

Most common causes of derailments are dirty switches and places where one rail is at a decidedly different elevation than the opposite

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Old and new type cars

rail. Track otherwise can be crooked, kinked, surface bent and dirty—but the cars will stick. A loaded car rarely derails.

The principal reason for the cars staying on the track so well is in the type of trucks used. There are four independent trucks of two wheels each, each truck swiveling vertically and horizontally about its own spring-mounted pivot cylinder. On curves the four wheels at each end make a parallelogram and go around easily without binding, as is the case with cars fitted with four-wheel conventional trucks, or with standard four wheels and axles.

Spring action is also an important feature in maintenance and ability to stay on the track. A 10-ton load lowers the body $1\frac{1}{2}$ in. and the springs still have ample play for the track irregularities as the total spring action is $2\frac{1}{4}$ in.

Visitors riding an empty wagon often remark on the smooth track whereas actually it is the spring action and type truck.

Rail weight in the mining territory is 40 pounds, with 30 pounds in one small section. The lighter rail is satisfactory as far as the cars are concerned. The men in the mine all say that the big car is easier on the track than the old 3-ton wood cars. Minimum radius is nominally 30 ft., although the cars are designed for 25 ft. No. $2\frac{1}{2}$ turnouts are used in the mining sections.

Westinghouse gathering locomotives in use are especially designed for mechanical loading. They are 8-ton, explosion-tested (actually weigh 10 tons), cable reel type, 4 m. p. h. rated speed. A limit of five cars is in effect when serving loaders. The same locomotives in relay, or swing, service are permitted to haul 10 loads maximum while the

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13-ton main line locomotive is limited to 15 loaded cars.

To gain a full picture of gathering service under which the cars are used, it is necessary to briefly describe certain mining conditions.

All work is relatively narrow; 12-ft. entries, 14-ft. rooms with 14 to 18-ft (mostly 14) lifts across the pillars. Average mining height is 6½ ft., average tons per cut are not over 30. Solid work (rooms, entries and break-throughs) furnishes 30 per cent of the production, pillars the balance, which means that a high proportion of the loading is on curves.

The roof is such that, despite top-cutting to leave 8 to 12-in. top coal, it is also necessary to timber all places with cross-bars on 4-ft. centers to within 8 ft. of the face before each cut, often right against the face.

Heaving of the floor is also troublesome in the mining areas while on main headings in solid coal it is noticeable that the rail on the clearance side (consequently nearer the middle of the entry) is always higher, resulting in haulage equipment hugging the tight-side rail.

For the above conditions of narrow work and heavy timbering, all track-mounted equipment was chosen and the advantages of such equipment have become increasingly apparent with time.

One particularly desirable feature of this type equipment is the lessened chance of knocking out posts and letting down the beams and drawslate. Not only is track equipment less prone to cause this trouble but in the car design the loading end was kept at the same height as the old small wooden wagons, 44 in., while the sides and



Trip entering dump



View of rotary dump

other end were raised 10 in. to give the increased capacity of artificial cribbing and to confine the loader boom within the car.

This has worked out particularly well in gaining capacity, preventing spillage and avoiding the knocking out of timbers.

Another reason for choosing as large a car as possible was to permit medium slow gathering speeds without sacrificing loader capacity to ear shifting time. Studies show that service time (shifting cars and going after cars) averages from 15 to 20 per cent of the total shift. The gathering crews were all green at the start and are still learning, as it was a case of changing from tail chains to motors almost overnight.

While the speed chosen has proved satisfactory the fear about car derailments knocking out timbers has been found to be almost groundless. The reason for this is that the car design and type of coupler do not permit derailed car wheels to slew more than a few inches from the rail and when such a big car does derail it slides along the "possum belly" and stops almost immediately.

Another question frequently asked is relative to the 10-in. diameter wheels and sealed-for-life ball bearings. Nothing much can be said because, so far, there has not been a single wheel or bearing replacement. Small flat spots are sometimes noticed from brakes being oc-

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asionally left on in trips, but as the wheels are cast steel these spots all soon disappear.

Maintenance cost has been low. At present two men devote most of their time to the cars, chiefly on inspection and brake adjustments but also occasionally straightening ends where hit by the loading boom and straightening up the framework of trucks or sideplates bent from heavy roof falls. The Willison automatic coupler and friction draft gear have been almost trouble free.

A rotary dump is used so the body is solid and was constructed practically water tight to eliminate coal dribble. As the wagons are heavily sprinkled (both loads and empties), are wide and long, have exceptional easy riding qualities due to the type trucks and large spring action, have tight couplings with spring and friction draft gear; the haulways remain exceptionally clean without any attention because of spillage from cars.

As the cars have no bumpers, foot steps were provided at each end with hand rails. A small red reflector, or "cat-eye," mounted at each corner has proved advantageous.

Brakes with cast iron shoes are provided on the four wheels at one end only. Provision was made to extend them to the other four wheels if desirable, but as the brakes were installed only for holding, or parking, and not for use in trips, their application on one end has proved sufficient.

A 2-ft. wide blackboard on the clearance side near the brake end is used for the snapper to record in chalk the crew number, consecutive number of car loaded that shift and the date. The rest of the car is covered with aluminum paint.

It is a pleasure to state that, so far, there has not been a single lost-time accident or one cent of cost to the compensation department chargeable to these mine cars, either directly or indirectly, this covering all handling of the cars, rerailing, repairs, coupling and uncoupling.

When the 10-ton cars were on order, and even after being put in service, there was considerable skepticism. One such visitor was taken in the mine to see the cars in operation and after watching them, shook his head and remarked, "Well, I still don't believe it."

(Reprinted from American Mining Congress 1939 Yearbook)

MACHINE MAINTENANCE, PRACTICES, PROCEDURE AND RECORDS

By ERNEST PRUDENT

Electrical Engineer, Bell & Zoller Coal & Mining Company

GENERAL REMARKS AND SCOPE OF DISCUSSION

Maintenance of mining equipment due to mechanization is rapidly becoming a specialized phase of the mining industry. With the many new pieces of equipment made possible by the ingenuity of engineering and design, the maintenance departments have many new and varied problems which make this work very interesting.

Maintenance practices are governed to a large extent by the type and size of the mining operation. Large operations are at a disadvantage to the smaller operations inasmuch as more equipment and service men are involved. However, operations on a large scale do have the advantage of being able to set up department within the maintenance department with maintenance men specially trained in one or more specialized vocations. Many times at the smaller operating mines an armature winder or other handy man is found to be a jack-of-all-trades.

This discussion will deal with the practices employed at a shaft operation with an average 7-hour capacity of 7,500 net tons of washed coal. This mine is fully mechanized with 20 mobile type loaders, 20 mining machines, 50 mine locomotives, 9 generator sets, coal drills and auxiliary equipment. Electric power is generated at the mine.

PRACTICES AND DIVISIONS OF VA- RIOUS MAINTENANCE WORK

A fully equipped surface shop is the logical place to send equipment parts or units requiring the use of many or part of this shop's machine tool equipment when rebuilding units or reclaiming parts. In order that the responsibility of the maintenance of the production equipment is not divided, the chief electrician in charge of this electrical and mechanical maintenance work is allotted a section of this surface shop. He has employed in his shop three specially trained men. These are: one mechanic, whose chief duties are the rebuilding and reclaiming of loading machine parts such as clutch units, hydraulic pumps, pressure hose and control valves. Every rebuilt machine part or unit is put in the original standard condition to the exact measurements as originally designed. All hydraulic equipment is tested at 50 per cent over the usual operating pressure. The second man is a welder, experienced and trained in the art of welding different metals. His work is largely that of the rebuilding of loading machine heads, conveyors and locomotive frames. At times when rush jobs are encountered a second welder is available on the night shift.

As this mine makes all the electrical power needed for its operations the third man of this crew is an electrician who is thoroughly ac-

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quainted with the power house equipment which consists chiefly of two 2,300-volt turbo generators, voltage regulators, switching equipment and overhead power lines to the five bore holes. Other maintenance work to the shop equipment, water treating plant, river pumping station, surface telephones and lighting, requires about 50 per cent of his time. The remaining time he carries on a systematic program of the rebuilding of loading machine trailing cables. These cables are sent to the surface on a specially constructed reel by the night repairmen when the cables have become unsafe to use due to the many splices made at the face. The cables used are entirely rubber covered and in the rebuilding, soldered sleeve splices are made. The splice is then insulated with rubber and vulcanized making the cable comparable with a new one. It has been found to be profitable to recover a piece of cable as short as 10 ft.

On the shaft bottom is located a main shop equipped with a lathe, a drill press, a power saw, are welder, acetylene-oxygen cutting and welding torch, an armature bake oven, dipping tank and a supply room.

One member of the shop crew is an armature winder who is also a lathe man. He takes care of all of the armature rewinds for the 175 d.c. motors which are used underground. During the year 1938 only 16 rewinds were required for the 966,000 tons of production and of course much of his time is spent on lathe work making small parts used on the mine locomotives and mining machines. The armature winder also assembles all bearings and housing on all armatures. Each and every spare armature is completely fitted up and made ready for the

repairmen to put in the various machines. All ball bearings are brought to a temperature of 212° F. in an electric oven before they are put on any shaft. This eliminates any damages which might be caused by driving the bearings on cold.

During any absence from this main shop of the chief electrician one man of this bottom crew who is acquainted with all the underground equipment acts as a shop foreman, directing the general routine and any other work that may be reported by phone from various sections of the mine. His other duties being that of coal drill repairing and the welding of many small parts in the process of material reclaiming.

The 50 mine locomotives used at this mine are from five different manufacturers of 11 types, 15 of which have the year of 1907 as the date of their manufacture. They have been modernized from time to time and today do a fair job of competing with present day locomotives. Six men are continuously engaged in the repairing, oil and the inspection of these locomotives. They work in pairs, one acting as a leader, the other as helper. One pair works on the first shift, one pair on the second 7-hour shift and one pair on the third 7-hour shift.

The two men on the day shift repair and reclaim any parts changed by the night shift and have these spare parts ready for the following night. This work is attended to first if there are not any locomotives in the shop for repair. These men also assemble journal boxes and bearings on the spare truck axles and have everything ready for the night repairmen so that the work of the night repairmen is very largely concerned with that of inspection and changing parts.

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The first duty of the men on the second shift is to put the 6-battery locomotives on charge. Then they start their regular work as is reported to them by the day shift.

Following the second shift, two men on the third shift finish whatever jobs are left over by the second shift and as our practice calls for the complete inspection of every locomotive every 5-operating days these two men are concerned to a large extent in the inspection work as an average of 10 locomotives must be inspected every work day. This third shift also repairs any locomotives used by the night shift that requires their service.

At the present only one type of mining machine is used in our mine. Two men are continually employed in the repairing and the rebuilding of these machines. A spare machine is ready at all times. Seventy-five per cent of all the maintenance work on these machines is done in the bottom shop. Only minor repairs are made at the working face. When machines are rebuilt the thoroughness of the rebuilding process is extended as far as a coat of protective paint. This coat of protective paint has a very great psychological effect on the operators. When an operator receives a machine that is in truly good operating condition and is all painted up as if new, he takes more precautions with it. It is the same feeling that you register when you get a new, bright shiny automobile. You are much more careful with the new automobile than you would be with the old one you just traded in. Mainly, this is the reason for the protective paint.

Just as our mining machines are repaired and rebuilt so are the loading machines. We have one spare loading machine for use in case of an emergency. The face repairs are

minor as on the mining machines, however, two men are kept continually employed on the loading machine repairs in this bottom shop but at times they are given help, depending on the size of the job and the amount of work to be done. Many times men on the day shift are switched from mine locomotive and mine machine repairs to loading machine repairs and vice versa. This, after a period of time, proves beneficial to all concerned as it acquaints the men with all types of machines.

Each loading machine foreman orders the necessary trolley wire and bonds for his individual section. By a written order to the chief electrician, the foreman states on this request the amount needed and where it is needed. If any wire can be recovered it is also noted. The foreman's requisition is placed three days before needed which allows the chief electrician the necessary time to plan his wire work.

Four regular wire men and two regular bond men take care of this work and at times when partings are moved or much recovery of wire and cable from worked out sections is encountered they are given the necessary help.

In a mine of this size, of course, there is equipment other than that previously mentioned, generator sets, block signal systems, pumps, automatic circuit breakers, telephones and so forth. One electrician looks after this and in addition finds time to make voltage surveys with graphic instruments. Also he assists the chief electrician.

INSIDE REPAIRMEN DAY SHIFT

As each production section is $2\frac{1}{2}$ miles from the shaft bottom considerable delay would result if emergency repairs to any locomotive,

loading machine, mining machine or coal drill were required during the 7-hour operating period requiring a man to be sent in from the bottom main shop. Therefore, one repairman is assigned to each of the five sections for these emergency repairs. In addition to these emergency repairs these men also take care of all the lighting required on their sections and inspect the mining machines and coal drills. At the close of the work day these repairmen spend a few minutes of their time in the making of a written report in regard to any equipment failures, stating the nature of the breakdown, the possible or known cause and the minutes of time lost in the making of the repairs. This report of equipment failures is used as a check against the loading machine foreman's report. Any repair parts changed by these inside day men are tagged as to which unit they were used and left at this section's inside repair station and are brought out to the main shop by the night repairmen.

INSIDE NIGHT REPAIRMEN

Two men, one leader and a helper, are given one section to serve. Their work consists of the repairing and the lubricating of the loading machines plus the minor repairs to mining machines and coal drills. Any major repair jobs to any loading machine, mining machine or drill would be handled by them. They would take the spare loading machine, spare mining machine or the spare drill in from the main shop and bring the bad order equipment out to the main shop where the day men would make the necessary repairs and have the equipment ready for the following night. These inside night repairmen receive their work orders from an office in the lamphouse on the surface.

These orders are made out by the chief electrician and his top mechanic on especially provided forms. The information recorded on these work forms, are, the unit number, location of machines, nature of repair needed to be made and any instructions which the supervisor thinks necessary. Some of this information is obtained from the loading machine foremen who personally report to the chief electrician at the end of each work shift. At times other information is obtained from the reports of the inside day men who, during the day, have found things which need attention that night.

These night repairmen O. K. the reported repair jobs, report the amount of oil and greases used on each machine and the amount of time required to service each machine. As one loading machine on each section is thoroughly inspected each shift, the conditions found are also reported on a weekly inspection form. Any materials or parts changed by the night repairmen are tagged by them denoting the machine number and are also brought out by them to the main shop.

To make this material or parts question clear: The quantity of materials and number of parts which are kept in the inside repair stations has been previously determined by the frequency of failures of the different parts over a period of years, this having been determined by the systematic check of all failures and time lost. It has been found that only minor parts are required near the face, such as swing ropes, hose, spare pumps, an assortment of bolts, nuts, split keys and conveyor chain parts.

The replacement of these minor parts by this method works out automatically, as for example; one

section of four loading machines has 8-swing ropes in use, two ropes for spares are located at the section's station, if one is used today or tonight it will be brought out by the night repairmen to the main shop and the following night it will be found tagged for the night men to take in. This same method is carried out on all minor parts replacements which have a high frequency failure rating. Other larger parts and units which have a low frequency failure rate are located in the main shop on the bottom where they may be obtained day or night. Loading machine failures at this mine during the past year have been accurately checked and found to be slightly less than 2 per cent of machine operating time as an average for all the machines.

PROCEDURE

Preparedness plays an important part in maintenance service.

In order that repairs be made properly and with the least possible delay, every repair job of any consequence should be carefully analyzed. This analysis will guide the maintenance men in being prepared. The essentials of preparedness for repair work at the working face are, namely, knowledge of the exact nature of the repair work, location of the machine, proper materials to use, proper tools to work with and competent service men who are familiar with the work.

Condition of Equipment. Weekly inspections are valuable not only as a guide with which repairs are to be made before machine failures occur, but as a helpful factor in the planning and the scheduling of major repairs. This allows time for preparedness, eliminating rush jobs and overtime work.

Proper Tools. On present day equipment, the monkey wrench, cold chisel and hammer are not sufficient for technical repairs which should be made with a considerable amount of workmanship. To cite one example, many spanner nuts are demolished because the proper spanner wrench was not available and instead a cold chisel was used in setting up the spanner nut. Especially made pullers for gears and pinions many times pay for themselves the first time they are used.

One way to be sure the proper tools and pullers are at hand on major face repair jobs, is to have for example, say, a clutch unit is to be changed which requires special tools and pullers. Have these things in a box with the clutch unit. The box should be fitted with a cover to keep out dirt and foreign material and these special tools and gadgets should always follow this unit. One of the important duties of the surface mechanic who rebuilds these units on the surface is that of checking and seeing that these special things are included.

Competent Workmen. Generally our repairmen work in pairs, one of them being the leader. The leader is the older man in the department's service and the more highly trained in the maintenance of special equipment. He is thoroughly familiar with the regular routine. Knowing the materials and tools necessary for the different repair jobs and all the short cuts. Men serving as helpers are promoted to leaders after they have, themselves, proven capable to fill a vacancy left by a leader. Only on rare occasions are new men employed as leaders regardless of their experience, ability and knowledge. They must start as helpers, learn the mine, get into our regular way of doing things and prove

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ing Machines and Drills. These reports were mentioned before and the only other comments I will make are these: The repairman, by having the correct location of the machines, does not lose any time finding the machine. He knows just about what he needs to do to each machine and the materials or parts needed. This is an important step in preparedness.

Inside Day Men's Reports. These reports also have been mentioned before but I would like to add this: When so many machines and so many men are involved the supervisor relies on these reports so he may keep in close touch with all the things that can occur during the work day that may need especial attention that night by his repairmen. In a very few minutes the supervisor can quickly survey the day's operation.

Daily Tonnage and Delay Report. At the close of each day a report is made by the chief electrician showing the tonnage loaded by each loading machine and any loading machine failures. The weighman leaves a report of the tonnage and the loading machine foreman leaves the delay report. And if anyone is doubtful of the value of this report which is left on file in the maintenance office where all the repairmen receive their orders, he can, on any work day, watch the night repairmen when they come into the office to receive their work orders. Invariably these men will look over this report before they look over their work orders. And I know they are pleased when they find the machines on their section with a clean slate free from machine failures and with record tonnages loaded. My assurance of their interest alone is worth the five minutes I spend in the making of this report.

Lubrication Reports. Posted in the office is also an oil and grease chart which shows the amounts used on each machine as reported by the repairmen. It also indicates when barrels were delivered and the machine shifts per barrel. This has proven its worth in the savings of oil and greases.

Inside Sub-Station Attendant's Reports. Located underground in each of the five sections is a sub-station manually operated. The station attendant grinds all the mining machine and coal drill bits used on this section. He reports each shift

S. F. 78

Mine No. _____

BELL & ZOLLER COAL AND MINING CO.

REPAIRMAN'S DAILY REPORT

JOY No. _____ Date _____

Parts Repaired _____

New Parts Used: _____

Cut. No's _____

" " _____

" " _____

" " _____

" " _____

" " _____

Hydraulic Oil, Gals. Used _____

Grease Used _____

Hours Worked _____

COAL DRILLS: _____

Parts Repaired _____

New Parts Used: _____

Hours Worked _____

CUTTING MACHINE: _____

Parts Repaired _____

New Parts Used: _____

Hours Worked _____

Repair Man Ch. No. _____

" " " " _____

Total Hours Worked _____

REMARKS: _____

WEAR YOUR
GOGGLES

the number of bits he receives from each machine, the number he re-grinds, the number he replaces and the number of bits he sends to the surface shop for re-tipping and the number of re-tipped bits he receives from the surface shop.

All of these sub-stations operate in parallel and are interconnected through various large size feeds of

the main haulage system and other tie feeders. Load exchanges are pre-determined and controlled by automatic reclosing circuit breakers. The station attendant makes a report of every power failure as it occurs every operating hour, so the supervisor may know that the power system is functioning properly every day.

Mine No.

BELL & ZOLLER COAL AND MINING CO. REPAIRMAN'S WEEKLY INSPECTION REPORT

Joy No.	Date	Location
MOTOR:		
Brushes and Commutator		
Holders, Springs and Leads		
Armature Bearings, Grease		
CONTROLLER		
Fingers and Tension		
Segments and Cylinder		
Wiring		
CIRCUIT BREAKER		
Contacts		
Tripping		
HYDRAULIC SYSTEM		
Control Valve		
Four Way Valve		
Pressure Pump	Lbs. Pressure	
Hoses and Connections		
Fwd. and Reverse Leathers		
Front Jack Leathers		
Rear Jack Leathers		
Swing Cyl. Leathers		
CLUTCHES		
Front Clutch	Slipping Amperes	
Rear Clutch	Slipping Amperes	
CONVEYORS		
Rear Chain Tension		
Front Chain Tension		
Compound Chain	Grease	
Flights Rear Conveyor		
Flights Front Conveyor		
GATHERING HEAD		
Seal Packing Rings		
Grease	Dirt	
Gathering Arms	Bolts	Bits
TRANSMISSION CASES		
Grease	Leaks	
CATERPILLAR DRIVE		
Chain Tension	Grease	
SWING ROPES		
Ropes and Clamps	Sheaves	
Remarks		
Coal Drill Inspected		
Cutting Machine Inspected		
Repairman	Ck. No.	
Helper	Ck. No.	
Total Hours		

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Discussion of an Analysis of Reports. These records and reports as heretofore mentioned are inter-departmental records, handled through the maintenance department and valuable to them in the guidance, the planning and the preparation of maintenance service.

Our company's accounting department is not so much concerned in how we accomplish our results as they are in the net results. However, this accounting department furnishes the supervisor of the maintenance department a cost statement each month showing the maintenance cost of each loading machine and the lubrication cost. They also furnish the operating department a statement showing the total tonnage loaded, the daily average tonnage, the average weight of the mine cars and the tons yielded per shell used in the preparation for each loading machine.

By watching these monthly statements from month to month I have found five important factors which govern to a large extent the maintenance cost of the loading machines. These five factors are first: Proper preparation of the coal to be loaded, which means, correct undercutting, correct drilling and the cleaning of the dust from the undercuts. Second: Power. I consider good power to mean, rate motor voltage at the motor brushes or motor leads all the time. Third: Careful operation. Proper preparations and good power stimulates careful operation. Fourth: Proper maintenance. This is vastly easier to obtain when proper preparation, good power, and careful operation is the general practice. Fifth: Close, rigid, weekly inspection of equipment. This is the only possible way to keep all the production equipment operating at

the highest possible efficiency at all times. We always find our loading machines with the highest daily average tonnage are the machines with the lowest maintenance cost, with the highest number of tons yield per shell used. Lowering the standard of the work performed as connected with any of the five factors mentioned, seriously affects the results that should be obtained from the remaining four factors.

CONCLUSION

In conclusion I wish to say to the gentlemen here, that are connected with maintenance service, that any records or statements that have been mentioned in this paper are not pointed out or held up to be feats of accomplishment by a maintenance department that has solved all its problems. Far from being so. Because you, gentlemen, know as I know that the costs of running our departments and the results we obtain are to some extent governed by conditions and factors over which we have little if any control.

This maintenance department that has been described to you has been blessed with the good fortune of being one of the few departments that has enjoyed the servicing of equipment which operates only one shift out of the 24 hours, serving an operating department which has had years of mechanical loading experience and they have wholeheartedly cooperated with us in helping solve our problems.

The shop records and practices that I have mentioned are the means we use in forearming ourselves with information that we can rely upon in the making of our decisions and forming our methods of attack on new problems.

(Reprinted from American Mining Congress 1939 Yearbook)

THE BENEFITS OF MECHANIZATION

By L. E. YOUNG

Pittsburgh, Pa.

When the Program Committee scheduled this subject for today's session of the convention, it was presumed that wage negotiations of the Appalachian Conference and of the districts comprising that area would have been concluded, and that all other districts would have negotiated new district agreements. (At the time of writing this paper, negotiations are deadlocked, and no one can foresee the outcome.)

The last Appalachian agreement provided for a Mechanized Mining Commission, which was "to make a joint study of the problems arising from mechanization of bituminous coal production by the use of conveyors and mobile loading machines for the area covered by the Appalachian joint wage agreement, including the problem of displacement of employees."

Unfortunately, the Commission could not agree on the detailed plan for the joint study, and independent studies were made by the mine workers and the operators.

Somewhat the same problems of mechanization that have existed in other fields for a number of years have been developing in parts of the Appalachian field in recent years. The Bituminous Coal Commission award of 1920 laid the foundation in collective bargaining for the introduction of new machines and new mining methods, but it was not until July 9, 1924, that the first local wage agreement covering mechanized mining was negotiated in Illinois. On September 16, 1928,

a state-wide agreement was made in Illinois to cover the use of mobile loaders, conveyors, and pit-car loaders, and the cutting and drilling equipment serving mechanical loading devices.

During the ensuing years many problems relating to the use of mechanical loading devices have been met and solved by the operators in Illinois, Indiana, Wyoming, and other states and districts in which underground mechanization progressed rapidly.

The marked increase in the use of mobile loaders and conveyors in the Appalachian field came later than the development in the Middle West and the Rocky Mountain States, and followed the inauguration of the seven-hour day and the substantial increases in wage rates. You are all familiar with the current statistics of production and the number of mobile loaders and conveyors installed in recent years.

The most striking increases in mechanically loaded tonnage have been reported from the districts in which the coal seams are thick and where other physical conditions are favorable. While the rate of growth in the thin-seam areas is slower, it is sufficient to show definite trends. Estimates of future growth are difficult to make on account of the depressed condition of industry and of the coal industry particularly, but to those who have studied the available data, and who are familiar with the physical conditions in the various fields, it seems logical that

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rapid mechanization of the fields having good physical conditions will continue until those fields are completely mechanized. At the same time, mechanization of other fields, having less favorable conditions, will progress, but at a slower rate.

It may be pointed out that so-called "mechanized mining" means a great deal more than the loading of large tonnages with powerful mobile machines. The problems arising are not the same in all districts, and the savings possible with one type of equipment or with one method of mining may have only limited local application. When thought is given to the benefits to the operator these different problems and conditions must be kept in mind.

There are various ways in which the great variety of problems relating to the face preparation and loading may be grouped:

1. Mass production with large mobile units, as illustrated by the practice in Franklin County, Ill., and Logan County, W. Va.

2. Pitching seams, with varying thicknesses, such as those in Wyoming, Utah, and the anthracite fields of Pennsylvania.

3. Thin seams, such as those in central Pennsylvania, Virginia, eastern Kentucky, Arkansas, and Alabama.

4. Concentrated and intensive mining, as illustrated by work in central and western Pennsylvania, Ohio, and parts of West Virginia.

5. Special face preparation and selective mining, as illustrated in central Pennsylvania, West Virginia, and eastern Kentucky.

6. Dead work, such as lifting bottom and taking top in narrow work, and handling roof materials and partings or boney in wide work.

Among the general problems that merit particular attention are:

1. Face preparation, particularly to reduce the amount of small sizes and at the same time loosen the coal so that the loading machine will not have to dig.

2. Increased tonnage per cut, or per move of a mobile loader.

3. Concentration of work, without congestion and confusion.

4. Intensive mining without too severe a penalty for mechanical and other failures that will put a complete stop to production from a unit or section.

Substantial progress is being made in reduction and elimination of hazards, maintenance of equipment, and organization and management. It is commendable that there is such a fine spirit in the exchange of experience and data among operators in all fields.

Because there is such a fine spirit of cooperation among the operators, it seems timely that the members of the Coal Division of the American Mining Congress should (1) review the present situation, (2) determine what can be done by joint effort to advance mechanization, (3) formulate plans to accomplish desired ends, and (4) take vigorous steps to achieve these goals.

In the fall of 1928 the American Mining Congress appointed a National Committee on Mechanized Mining and arranged a five-year program, the essential features of the work being (1) the intensive collecting of data on mechanized coal mining, (2) the analysis and publication of these data, (3) the publication annually of a textbook on the subject of mechanization to be known as *The American Mining Congress Year Book on Mechanized Mining*, (4) the supervision and sponsorship of research work on the

subject, and (5) the development of more complete cooperation in the solution of the economic problems in the field of mechanization. The benefits hoped to be attained were listed as follows:

"For the public it will mean cleaner and more economical coal; for the miner, safer working conditions through better supervised, better ventilated, concentrated working places—and an opportunity to raise materially his economic status because of the numerous specialized tasks incidental to the mechanical mining of coal; for the operator it will mean more continuous and more profitable recovery of his coal; for the manufacturer of mining equipment, it offers a great opportunity to serve the industry and assist it in arriving at that efficiency and prosperity for which it is striving."

The program as outlined in 1928 can well be reaffirmed in 1939.

A large part of the benefits and savings resulting from modernization and mechanization have been passed on to the consumer and the general public. Undoubtedly this will continue, but concerted efforts should be made to have the complete story of mechanization presented to all those who will ultimately benefit substantially by mechanization.

In discussing the benefits of mechanization, it is proposed to show that, in addition to the consumer and the operator, there are others who are or should be vitally interested in promoting and extending the use of mobile loaders, conveyors, and other devices of mechanized mining; namely, the mine workers, the mining communities, the railroads and other public utilities, and the coal-land owners.

BENEFITS TO THE MINE WORKER

The most striking example of the recognition by workers, by a community, and by an entire district of the great benefits resulting from technologic achievement and progress, and the initiative, courage, and vision of leaders, is that of the native workers who are employes of the Tata Iron and Steel Company, India. This is the largest single steel plant in the British Empire. It had its beginning in 1902 when native leaders of India realized the importance to them of finding and developing iron deposits that would permit India to make enough iron and steel to take care of her own needs.

Dr. Charles Waterhouse, professor of metallurgy at the Massachusetts Institute of Technology, has just returned from India, where he gave a series of lectures before the native employes of the great steel company which is a monument to the vision of the Indian leaders and to the technologic skill of the American engineer and metallurgist, Charles Page Perin, who designed and built the plant at the instigation of statesmanlike native leaders.

Where a jungle existed 30 years ago there is now an enterprising community of 100,000 souls, almost all natives, who appreciate what technology has done for them. Dr. Waterhouse says:

"The founders of that business are accorded a Founders Day each year, which this year ran for several consecutive days in March. The plant is thrown open to visitors who come in thousands, there are parades through the main city of Jamshedpur and neighboring towns. Floats carrying representations of the founders and of many departments and products of the plant are prominent parts of these parades,

and the various things represented on the floats, including effigies of the founders, are almost objects of worship on the part of many of the Hindoos."

The technologist has taken a new world into the remote confines of other lands, and he has worked miracles in our own country. When a new industry is created or new products are developed, the world marvels and we herald the innovations as benefiting mankind. But when the technologic advance is made within a going industry, and particularly in an industry that is struggling against great odds, we generally fail to give credit where credit is due. If an industry is forced to make innovations when there is an abundance of labor, we generally fail to appreciate the real good these innovations are doing, and think only of the small number of men who may be displaced temporarily. We do not value as highly as we should the larger good that results to the working force as a whole, and to the community supported by the industry.

It is important that the advantages and disadvantages of mechanization from the viewpoint of the mine worker be studied and the true picture be presented to the mine workers. One of the best ways to present this is locally through the mine management. It is therefore vital that the mine management understands the economic problems and results of mechanization and, as well, the ultimate disaster that befalls districts that do not modernize.

It is suggested that simple illustrated leaflets, describing graphically the effects of mechanization in specific mining communities, be prepared and distributed. Illustrated talks should be given locally

under as many auspices as possible, including the local unions.

Before real public support of mechanization can be developed it will be necessary to show the leaders among the mine workers that mechanization will "save jobs" and mechanization will "make jobs." A large part of the opposition to the installation and efficient use of new equipment can be converted into enthusiastic support if proper steps are taken.

In some of the large mines of western Pennsylvania mechanization has resulted in the elimination of much of the heaviest lifting in connection with dead work. There has been a marked reduction in the number of personal injuries, such as hernias and sprained backs, during the last two years. After the men have been trained to the new work there is a substantial reduction in other personal injuries occurring at the face—this is true both as to severity and frequency. The experience of western Pennsylvania as to safety is in accord with that of Wyoming, Illinois, Ohio, and West Virginia mines.

Part of this improvement is due to better supervision. In the hand-loading mine there has generally been 1 boss to 40 or more men—in the mechanized mine usually there is a boss for not over 20 men.

The concentration of work in a few places permits the bosses to know the working places better, and the hazards may be given personal supervision and taken care of with promptness and certainty.

The fact that men seldom work alone in a mechanized mine contributes to the elimination of hazards, for it is unlikely that the careless worker will be permitted to jeopardize the lives of his fellow workers.

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It is not the purpose of the writer to minimize the hazards of mechanization, but it is his firm conviction that the face worker labors with less chance of injury in a well-managed mechanized mine than in a well-managed hand mine.

Reference has just been made to the injuries resulting from heavy lifting. In line with this thought, it may be noted that contrary to statements made that "at the end of the day the worker in a mechanized mine has expended more energy, more foot-pounds, and is more tired out than after a day of hand-loading," it has been found that the reverse is true.

A very reliable operator is authority for the following statement, and has furnished data to support it:

"We made a very exhaustive time study and analysis of the energy used in two like places over a period of 11 consecutive working days. Both of these were in places in which pillars were being removed; one by means of hand-loading methods, the track laid in the place, and single cars hand-loaded, and the other by hand-loading onto a shaking conveyor. In the case of the hand place, the drilling was done by hand, and in the mechanized hand place, the drilling was done with an electric drill.

"As a result of very exact observations and calculations, we determined that it takes 3.8 times as much energy to load a pound of coal from the floor into a mine car (50 in. high above the floor) as it does to load it from the floor onto a shaking conveyor (average height 14 in. above the floor).

"We also determined that at the end of the day the man working as a hand-loader expended more than twice as much energy, expressed in

foot-pounds, as was expended by the man loading onto a shaking conveyor."

In a careful analysis of the practical question as to the physical effort of men employed in conveyor loading as compared with hand-loading, the records of another mine using hand-loading on conveyors show:

1. The hand loaders averaged 32 minutes more idle time per shift than the conveyor loaders.

2. Considering actual time worked and his manual effort, the conveyor loader works 54 per cent as long to earn a dollar as the hand-loader, and performs much less severe labor.

The trend is away from the heavy manual labor of "digging" coal. With the advent of the cutting machine and the power drill, much of the severe labor was eliminated. The loading machine and the self-loading conveyor have taken heavy burdens off the coal loader, and the conveyor of low height has served to reduce the drudgery of loading to a minimum.

The youth of this generation who see power-driven equipment in industry, agriculture, and transportation are trying to avoid the drudgery of loading coal, and in another generation there will be a shortage of labor to load coal if hand methods are continued.

Moreover, the maintenance of mechanical loading devices requires a crew of mechanics who prefer this class of skilled work to the manual labor of loading coal.

The foregoing statements show that the mine worker is benefited substantially by the introduction and use of mobile loaders, conveyors, and the auxiliary equipment required to serve them. For these

reasons it is anticipated that when all the facts are known, the mine workers will cooperate fully in programs of mechanization which are planned primarily to save the industry from disastrous competition.

BENEFITS TO THE MINING COMMUNITY

The importance of the bituminous coal-mining industry to the states and local communities in which coal mines are located requires little discussion—a protracted suspension soon shows how wide-reaching are the influences of the bituminous coal industry. The failure of mines to meet pay rolls and to pay taxes brings suffering and want, and results in the closing of schools or the reduction of school terms. When the coal mines do not prosper it usually results in poor roads, poor sanitation, privation, and decadence of the community.

It may not be out of place to give a few facts and authentic figures regarding the tax burden in certain coal-mining districts and show what happens in these districts when the production of coal declines or actually ceases.

In Case "A" a certain bituminous coal company pays more than 50 per cent of the school and road taxes in the township and, in addition, makes a substantial contribution to the budget of the county. The annual property taxes of the company for a number of years have ranged from \$45 to \$50 per acre of coal lands owned, even when the mines are completely idle.

In Case "B," in the anthracite region of Northumberland County, Pa., the children are being deprived of their education and the county is unable to carry on its ordinary functions because a large coal company has been unable to pay its

taxes. The company owes taxes since early in 1937, to 18 school and poor districts. Striking teachers have not been paid for a year and a half. The situation is critical, because the mining company has been relied upon to support the community by pay rolls and taxes, and can no longer pay at the old rates.

In Case "C" three bituminous coal-mining companies have discontinued paying property taxes in a township having an assessed valuation of \$4,250,000, of which \$3,250,000 is coal property. Ten years ago the assessed valuation was \$7,250,000, and now the assessed valuation of coal property is declining about \$500,000 a year. Only 20 per cent of the taxes levied on property other than coal property are being paid.

The number of men employed in coal mines within the township is, of course, declining, but the number of children enrolled in the public schools has not declined. The number of high-school graduates in 1929 was 54, while in 1938 the number was 200. The state contributed \$90,000 to support the schools in this township in 1938, and there was a deficit of more than \$30,000.

When all the coal in workable seams has been mined, the evil day of closing the mines is inevitable. But sometimes a considerable amount of pillar coal could be recovered, or thinner beds might be mined and the life of the mines thus extended, if mechanical-loading devices were installed.

Unless the community interests itself in prolonging the life of the coal mines there will be:

1. A shifting of the tax burden, formerly carried by the coal operators, to other property holders of the tax district; or

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2. A shifting of the burden of maintaining certain services to the state; or

3. A lowering of the standards of education and of living in the community.

Mechanization has brought relief to some decadent districts, it has given new life to communities, and it has made possible the opening of thin seams in areas in which all the merchantable thick coal has been mined. When threatened by the competition of open-pit mines, the shaft mines of Illinois and Indiana have been able to survive solely because of the introduction of mobile loading machines. If it had not been for the courage and vigor of leaders of the industry, schools, hospitals, asylums, and other eleemosynary institutions would have been jeopardized. Public officials and business men of many coal districts should be given the facts and should be shown that mechanization may be the means of protecting the future of many such communities.

BENEFITS TO RAILROADS AND OTHER UTILITIES

It is a well-known fact that the railroads receive in freight a larger sum per ton of coal hauled than the operator receives for the coal itself. In the year 1937 the total revenue received by the railroads for handling coal was over \$634,000,000, while in 1929 it was over \$827,000,000. In the year 1937 the railroads received 21 cents per ton more for freight than the operators received for their product. In 1938 the difference was even greater. It should be evident to the management of the railroads that, if mechanization can be used to increase the production of bituminous coal, it will be decidedly to the advantage of the railroads and their employes.

The public utilities of the country are also vitally concerned in this program, not only on account of the power used in the operation of mines but also because of the power requirements of the communities adjacent to and dependent on the coal fields. The decadence of coal-mining communities has tremendous significance to public utilities.

BENEFITS TO THE LAND OWNER

Whether the coal is owned by the farmer, the operating coal company, or a land company, the continued operation of mines, the payment of royalties or rent, and the payment of taxes by coal operators means much to the investor and to the community. The abandonment of mine openings and the failure to drain or pump portions of coal fields frequently means not only the total loss of investment in such openings and underground development but also the postponement of the working of adjacent coal lands and depreciation of values. In several instances it has been to the advantage of the land owner to assist in the financing of mechanization, because it appeared to be the only practical way of saving the original investment and of making profitable operation eventually possible. From a long-range viewpoint there is no one more vitally concerned in the modernization and mechanization program than the land owner.

SUGGESTIONS

From the foregoing statements it may be concluded that there are many different reasons for communities not only accepting mechanization as a natural step in the evolution of the bituminous coal-mining industry but for actually sponsoring—actively and aggressively—programs for the introduction of mechanical loading devices. It may

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not be visionary to propose that local chambers of commerce, business men's associations, and service clubs take steps to interest capital in mechanizing the mines of a particular community. Just as there are "drives" in support of "chests" and other community interests, so there may be drives to maintain pay rolls of communities.

The pay rolls of the community are the fundamental source of income from which we may, with self-respect, pay our share in the American way. Schools, churches, clubs, and other local organizations might properly interest themselves in the bread-and-butter pay rolls that make their existence possible. In the mining communities, this means that the mine pay roll is economic problem No. 1. The part that modernization and mechanization play should not be overlooked. They may save a community from complete collapse.

The intelligent development of the natural resources of a community is one of the true measures of

its right to survive in the struggle for economic existence. However laudable may be the development of new industries and new products, it is just as laudable and just as vital to preserve, protect, encourage, and assist the going industries and operations in a community, for they have contributed through pay rolls and taxes to maintain the community in prosperity and with self-respect.

There never was a time in the history of bituminous coal mining in the United States when the thoughtful analysis of its problems and the cooperation of all interested parties was more needed.

It is proposed, therefore, that the American Mining Congress undertake, in a systematic manner, to present the case of coal-mine modernization and mechanization to the railroads, to the public utilities, to the land owners, to the communities, and to the mine workers, so that the heartiest cooperation among all interested parties may be developed.

(Reprinted from American Mining Congress 1939 Yearbook)

FEDERAL REGULATION OF THE COAL INDUSTRY

By GEORGE B. HARRINGTON

President, Chicago, Wilmington & Franklin Coal Co., Chicago

No one denies that a foremost problem of bituminous coal today is that of federal regulation under the provisions of the Bituminous Coal Act, and the establishment of coal prices and marketing rules. The subject is not simple, and there is wide divergence of opinion on the problem within the industry. But all agree that the long delay in arriving at prices, or, more broadly, in arriving at a stabilized marketing policy, has been of tremendous handicap in an already difficult period.

So it is fitting that this subject, even if more economic, or perhaps I should say more political than the usual topic discussed at Mining Congress Conventions, should have a place on our program. But it is not an easy assignment. Nearly everything that can be said already has been said many times—in plain and fancy language. There are presentations of persuasive dignity and appeal. There are others of less convincing logic but so entertainingly phrased as to bury almost completely an obvious bias or strictly partisan viewpoint. And, of more concern to me, there are expressions of diametrically opposed opinions coming from respected leaders in our ranks,—the apparently sincere and earnest beliefs of men reared in the business, and whose intelligence and accomplishments cannot be doubted. I would be flattering myself, indeed, if I thought I could select the correct answers from all

this welter of conflicting opinions. I would waste your time if I simply add another plea either for or against the Guffey Act. And I am perhaps over-optimistic in hoping that I can say anything at all worthwhile toward the solution of this endless argument. But I firmly believe that unless we in the industry try conscientiously to solve our own problems we cannot expect others to do it very satisfactorily. It is on this basis—of trying to do my bit—that I venture to give you some impressions gained from a studious effort to review for myself the fundamentals of our position with respect to federal regulation, and the chief points on which our counsels are divided.

Fortunately I am addressing a coal mining audience and do not need to attempt to explain the numerous intricacies of our business, or to indicate the relative importance or correctness of much that can be assumed to be entirely familiar to you. Nor would it be wise to interpret such a broad title as Federal Regulation too precisely, for almost everything we do is now in some sense federally regulated. I am thinking of Federal Regulation in this talk in the light of its application to our business of the Bituminous Coal Act of 1937, or of some better way of accomplishing the same objectives with less regulation. And, of course, I include the bearing of regulation on our oil, gas, and hydro-electric competition.

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In the latter regard it may be mentioned that there are at least two items of Federal Regulation on which I find practically no division of opinion. We do not believe that coal should be disproportionately taxed, and certainly we cannot subscribe to the fairness of handicapping coal through unequal imposition of regulations or restrictions, or through denial of equal financial aid or subsidy, as compared with competing fuels and electric power.

Notwithstanding that American bituminous coal has blessed these United States with the most generous and cheapest supply of heat and energy in the world, we render a very competitive service and can expect to hold our leadership only if we successfully adjust ourselves to changing conditions and do not overlook opportunities for improvements, to assure a modern and dependable coal service at the lowest cost consistent with fair wages, reasonable profits and sound business principles. I am not afraid of oil and gas if we do our job as it can be done. But we cannot long continue to sell our product regularly below its cost.

As I see it, the business of supplying coal service at this period falls into three large divisions,—the production of coal at the mines,—transportation from the mines, and sale and distribution to the actual consumer.

On production, the industry has kept pace with technological improvements of mining and safety methods, has responded generously to government suggestions for shorter hours and higher wage rates, has shown great progress in holding down the cost of production in spite of these innovations and reduced output, and in general has given a pretty good account of itself. Though, of course, there will

be further improvements, I do not believe there is any immediate opportunity substantially to reduce costs or to improve methods in this division sufficiently to reduce the cost of coal to the consumer to any important extent.

Transportation from the mines is still chiefly by rail, and rail rates per ton are on the average higher than coal production costs at the mines. Rail rates are too high, both for the good of coal and for the best interests of the railroads. Candid rail executives do not deny this. There is real opportunity in this division of coal costs for substantial betterment, but unfortunately the railroad industry also has its own serious problems, with a plentiful supply of regulation—and, though we must strive continuously for lower transportation costs, the probabilities are that relief for coal in this division will be slow.

It is in the third division of costs—those of sale and distribution—including as a cost to the industry the losses and wastes incurred through unwise prices and destructively competitive sales practices, that I believe lies the best and most immediate chance for the coal industry to make the important savings necessary before we can hope to regain our status as an economically successful institution. Through stabilization of marketing practices,—the elimination of many actual expenses growing out of badly organized and uncoordinated sales policies, and the stopping of the tremendous losses and wastes of opportunity of blind, unreasoning price competition—there is, in my view, the greatest immediate possibility of getting the coal industry on its feet. We can readily agree on the causes of our tragic failure wisely to merchandise our product, citing, for instance, the miscarriage

of the intent of anti-trust laws in preventing essential and proper co-operation, or the defenselessness of our multitudinous and unorganized selling units against many effectively cooperating buyers. Even in our very occasional strong markets we do not always sell wisely and protect the industry from the hurt of shortsighted opportunism.

And this brings us to the pros and cons of Federal Regulation of marketing and of price-fixing, and to the merits and demerits of the Bituminous Coal Act of 1937, which is now the law of the land,—and what we should do about it. We have some who think we would be better off, bad as our record is, with no governmental regulation—or as they sometimes put it governmental “meddling,”—and with a return to the former condition of uncontrolled competition. There are many who believe that some regulation and governmental authority to enforce compliance are essential, and some of this school of thought are willing to try the present Act before seeking a new suggested cure. Most of this large group of our people who concede the necessity of various degrees of regulation, believe, however, that the present Act is impracticable of administration, goes too far towards putting the industry in a straight jacket and in taking away proper functions of management. They believe the Act must be amended and simplified. And there are still others who say they believe that the Guffey Act can and will be made to work and that in any case so much time and expense already have gone into the effort and proof one way or the other is so near that it would be foolish to do other than give the Act a friendly and cooperative trial.

Before going into these possible alternatives I would like to advance

some thoughts that have come to me during the preliminary study for this talk. The historical “record” of the industry is tremendously voluminous and is intertwined, of course, with the progress of mankind industrially, politically, scientifically and every other way since people have had to be warmed and fed. I am impressed with the evidence that many of the fundamentals of our difficulties are not greatly different from those of other industries, or from the fundamentals of similar problems that have recurred periodically without number back to the beginning of recorded civilization. Human nature and human reactions seem not to have changed nearly so much as the great technical changes of life might suggest. There are records of political New Deals and of most of our present alphabetical afflictions running back almost two thousand years, and there have been economic crises and panaceas, planned economies, attempts at production control and price-fixing, periodically ever since. The other day I read a one hundred year old report of a British Parliament Committee on the State of the Coal Trade, containing minutes of a meeting of coal owners in 1833, with their precise rules of marketing procedure, articles of agreement between producers, penalties for slipping, and so forth, which made me pinch myself and look twice to see if I was not really reading something which had been written in this country during the 1933 days of N.R.A. During the comparatively short period of history that all of us can remember our industry has been investigated, fact-finded, governmentally interfered with or aided, nearly wrecked, nearly saved, times no end.

Coal production in the United States was a relatively uneventful

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and satisfactory industrial pastime before the Great War. But war time conditions caused shortages of coal which brought fancy prices, followed by growing pains, federal maximum prices, and control of distribution. To our family coat of arms were added, as far back as '23, the mine worker rampant and a coal commission in less energetic posture, all in quick succession. In more recent times our robust health has been taxed in numerous ways during rapid technological and political changes of environment and has not been helped by many doctors not of our own choosing. It is a tribute to our tenacity of life and resourcefulness that we are still here to have our vitality tested again by a second experimental prescription named after old Dr. Guffey.

My thought on looking back is that our industry,—basic we like to call it,—is nevertheless only part of an economic whole and that, no matter how good or right we are, we will be affected by the prosperity or adversity of that whole and by changing external factors beyond our power greatly to alter. Also that in larger measure we are constituted of or dealing with a great many human beings, each presumably equipped with a mine-run assortment of human nature and human wisdom and human idiosyncrasies, living in a country of boasted freedom to speak one's piece when so moved, and reputedly governed by the will of the majority.

I would like to stress these human equation and political factors of our problem. Many of us in this convention are engineers, trained to calculate the strength and properties of our materials. It would not be good engineering to fail to allow for wide factors of safety or of error in dealing with as non-perfect mate-

rial as human nature, particularly with human nature taken collectively and reacting erratically under various forms of political inspiration. Nor, in the view of many, many examples to the contrary, would it be sound to assume that collective thought and action today can be greatly more brilliant or infallible than in the past, or suddenly free from retarding forces of self interest and misunderstanding, or with no longer need for a reinforcement of good intentions by actual authority or a stiffening of resolve by more than voluntary policing power.

Another factor which I think it is fair to mention as relatively free from controversy is that there are just as much integrity, intelligence, initiative and other high qualifications among men of the coal industry as in any other comparable walk of life, and there is no reason to impose more regulation on this industry than is absolutely needed to protect against injuries that the nature of the industry itself makes self-unpreventable, or than it is proper to impose as a safeguard against misuse of needed relaxation of other regulations—such as the anti-trust provisions. Also, it is natural and desirable for the industry to function in its requirements for collective action as nearly as may be through its own industry and trade organizations, both regional and national, and the industry has not been delinquent in establishing such organizations, nor have the latter been ineffective. Nationally the American Mining Congress and the National Coal Association have been of great help to the industry in their respective spheres, being limited from even more service only by the distressed financial conditions or by the inherent difficulties of the industry to cooperate on collective

policies. Regionally there are many operators' associations, traffic, safety, credit and other joint activities, which function beyond notable criticism. If way can be found to permit proper functioning of marketing associations without constant fear of legal prosecution, there is little reason to doubt that great improvement toward stabilizing market procedure and conditions will not be worked out satisfactorily within the industry itself.

At the present time the Coal Commission unquestionably is making a conscientious effort to arrive at price schedules and marketing rules that comply with the provisions of the Coal Act and that will stand up legally and accomplish the objective of yielding to the industry at least its average cost. The Act was signed by the President two years ago yesterday, and I have heard no convincing evidence that prices can be expected to become effective for at least four or five months more. There still remains serious question whether the price schedules will weather legal attacks or be of practical value. And through all of this waiting period the price structure of the industry has been chaotic, with a limitation of contracts to no longer than thirty days from date and a condition which someone has expressed as that of "turning the coal industry into a gigantic auction room." Realization has continued to sink and losses to mount. It is little wonder that criticism and dissatisfaction have grown to more than audible proportions.

Opponents of the Act have formed an active Committee for Amendment which has gained wide support among the operators—those representing about 145,000,000 tons of the country's commercial tonnage, I believe, have signified their support. Growing out of this activ-

ity a bill to Amend the Act was introduced on March 20th by Representative Allen of Pennsylvania. The Allen Bill would eliminate all price-fixing provisions and all taxes and assessments for administrative costs under the Guffey Act, would retain a three-man Coal Commission, and would legalize to a certain extent under supervision of this Commission voluntary marketing agencies among producers. The Amendment Bill cites as unfair trade practice certain marketing methods heretofore prohibited by the Codes. The United Mine Workers have declined to join the Committee for Amendment, and other operators have defended the Act and have replied to the arguments of the Committee.

Through these circumstances we have at hand a pretty complete, up-to-date exposition of the "Merits and Demerits of Federal Regulation of the Coal Industry." If any of you crave more of the gory details than I can give you in this short talk I can and gladly will refer to you an abundance of them. I will attempt, however, to summarize briefly for you some of the principal points on which there is the most important divergence of opinion.

With the exception of a comparatively few "rugged individualists," the record would seem to show a preponderance of belief that some Governmental regulation is desirable. I have seen only a few scattered expressions favoring State control, and the great weight of evidence points to the necessity for Federal Regulation, if any, of those activities having to do with marketing and interstate commerce.

As to the Guffey Act, proponents feel that its form "reflects majority opinion within the industry as to the best approach to the problem at

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this time" and that it was arrived at on the basis of more than twenty years' study of the coal problem, including nineteen investigations or hearings by Congress or especially created Commissions with respect to conditions in the industry. It is pointed out that a coal regulation measure of some sort has been presented to practically every Congress since the early twenties and that the Guffey Bill contained the cumulative wisdom and experience of this whole period. The view of the Amendment Committee is that "a deal was made between the United Mine Workers, and supported by some operators, and the United States Government in which the Government, at a charge of 1¢ per ton, assumed responsibility of running our business, to the extent that coal would not be sold at less than cost and that the increase in wages of April, 1937 would be passed on to the public." It is also claimed that the bill is unworkable, and, because of its "regimentation" features, is un-American.

I happen to know a good deal about the early history of this Law because I was one of a small committee which spent several months of hard work trying to agree upon desirable features and wording of a Bill to accomplish the same objectives, before our total inability to agree left our unfinished symphony in the laps of the Mine Workers from where it eventually found its way to Mr. Guffey, after having been rewritten and completed by the Mine Workers and numerous voluntary helpers from the ranks of the operators and elsewhere. It is only fair to say that the Mine Workers relied upon the wisdom and knowledge of the operators with respect to price-fixing and marketing provisions, and that if the latter

are poorly drawn it should not be charged against the miners.

As to workability, even the proponents admit that the price control provisions are extremely complicated and difficult of administration. The second annual report of the Coal Commission, which is worth reading, is replete with awesome figures of the tremendous amount of statistical work required to even arrive at a schedule of prices. I quote at random a few of these figures to give you the idea: "The total number of cost reports accepted and tabulated by the statistical bureau was over 90,000" * * * "The Commission has collected reports from 7,000 Code members to show the quality and sizes obtained at each mine, the seam operated and available chemical analyses" * * * "To prepare the work of coordination required constant reference to freight rates * * *—the completed files will contain in excess of 1,000,000 individual rates" * * * "The total number of these documents of sale to be received, checked against the price schedule, and analyzed, runs between 4,000,000 and 5,000,000 in a year." In addition to this great complexity the opponents cite that if and when the Commission arrives at coordinated prices under the provisions of the Act the latter will not mean anything because a failure to include complete water transportation and truck rates will throw the system out of balance, on top of which failure to be able to establish prices for coal from the docks, and to control and police prices on down to the consumer will make the prices further ineffective.

Progress of the Commission has been slow and the actual cost to the industry of administration has been heavy. I think that slowness by this kind of a public administration,

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particularly a brand new one handicapped by many legal uncertainties and lack of precedents, was to be expected, and that it should be put down as one of the so-called demerits of the regulatory process. The Interstate Commerce Commission with all of its years of experience is not exactly lightning. My information is that the Commission is really getting down to brass tacks, that it has overcome many of its earlier weaknesses of a political nature, and that many operators who have been in contact with the proceedings and had about given up hope are now tending toward optimism that maybe the industry will receive some benefit after all. Personally I have been skeptical about the practicability of this particular price-fixing formula, but having failed in my own above-mentioned effort to write a better scheme, I hesitate to begin throwing bricks before there is undeniable provocation. My way of tackling a complicated and doubtful task such as this one would be to start on some simpler and more flexible basis and gradually work up to the all-embracing whole. But the law prescribed a completed job at one jump, with prices to be adjusted to and coordinated with about every factor that any of the many authors could think of, sometimes specifying quite conflicting standards. Some students think this is perhaps the greatest weakness of the law, particularly in its administration. It is obviously an effort to raise prices and at the same time to freeze or allocate everybody's business where it is now. On the other hand, I think it can be fairly said that the tendency of each individual operator as he approaches the coordination proceedings will be to want to hold the business he has, at a higher price, of course, and at

the same time to try to put himself into position to get at least part of someone else's business.

Another very live item in this problem is that of marketing agencies. The proponents of the Guffey Act feel that marketing agencies have been and will of necessity be ineffective, unless provided with authority to enforce, or so-called "teeth." They say that without some such power of enforcement as is provided by the existing Law it is impossible to secure adequately complete membership and policing of decisions, or to prevent temptation of a non-member or temporarily resigned member to wreck the whole price schedule by taking unfair advantage of his independence. The contrary view is that the Appalachian decision gives the necessary freedom to producers in a given region to act collectively, that the first agencies established after the Appalachian decision were proceeding satisfactorily and would by now be doing an acceptable job but for intervention of the N. R. A. and the two subsequent Guffey Acts. But it should be borne in mind that no court construing the Sherman Law has ever held that competitors can agree by enforceable contract to prevent destructive price competition. The matter of marketing agencies is a very important one on which to be right, and on this decision, I think, depends very largely one's choice as between the new Allen Bill and some stronger method of regulation.

As to amendment of the Guffey Bill, it would seem to me inevitable that there will have to be amendments. The question on this point for the time being would seem to be whether, having gone to so much expense and taken so much time, we will let the Guffey formula have

a chance to see how effective it can be and what amendments are indicated by experience. Or shall we amend it without a trial for some other plan equally untried? The Allen Bill is something more than simple amendment of the Guffey Act, it goes closer to outright repeal. In fact, there is evidence that important support of the Allen amendments may be based more on expediency than conviction, on the theory that it is politically easier at this time to kill the Guffey Act by sweeping amendment than by undisguised repeal.

Another point provoking much conversation is a possible comparison of Federal Regulation of coal with the Interstate Commerce Commission Regulation of the railroads, —whether, if comparable, the I. C. C. constitutes a pro or con argument for the Coal Act. I have sought authoritative opinion on this question only to be convinced that it is indeed a question and itself a large one. The Interstate Commerce Act is an outstanding case of existing Federal Regulation of industry and price-fixing, but an example comprising too many "merits and demerits" of its own to be tackled here. There are many similarities of the two regulations, and experiences of the one should help study of the other. My impression is that high railroad opinion today leans toward belief that the "merits" undoubtedly outweigh the "demerits", from a railroad management viewpoint, but railroad men are quick to point out difficulties which have grown up in the development of railroad regulation which may eventually become equally troublesome in the working out of a similar regulation of coal.

Similarly, the experiences and lessons of the British Coal Act are

a subject in themselves. Though I have read and talked much about Coal Control in Britain and other countries, I have no first hand knowledge and hesitate to inject even my impressions into this paper.

In preparation for these remarks I have sought earnestly to keep an open mind and to divorce my personal interests or prejudices from this presentation. But you must allow a factor of error for human frailty. I have been the operating head of my particular coal company for almost 25 years and so have been an actual and often an active participant in the evolution of our industry during this eventful period. It would be expecting much to say that I have not accumulated some prejudices.

Also, I have many close friends in the industry who, with intimate knowledge and long experience of their own to go on, feel very sure about the correctness of their judgment on certain fundamental features of these problems, and I have just about as many and as close friends, equally as well qualified, who have formed very different opinions as to the correct solution of these same features. I have talked with mine workers, who are intensely interested in the stabilization of the industry so that it may justify a scale of wages consistent with American standards,—a position which we cannot criticize. And I have talked with members of the Coal Commission, and their staff, who for months have been sincerely trying to carry out the responsibilities imposed on them by the Coal Act.

I had hoped to be able to close these remarks without much, if any expression of my own personal views. But I would offend my plea for a contribution of best thought

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by all hands if I, myself, am not frank. I will try, therefore, to express briefly my own position.

I have for long believed that the industry could best work out its own destinies largely under its own initiative, working chiefly on a district or regional basis but tied together on national lines—to the minimum degree consistent with national and overlapping problems. On prices and market policy, I have liked the marketing agency method, but I have felt that this method is futile without more freedom from anti-trust restrictions and without some positive enforcement power. To obtain these latter essentials, I have assumed it reasonable and necessary to be willing to give up some measure of self-determination and to vest a reasonable approval or veto power in a Federal authority.

There is a whole lot in the Guffey Act that I do not like,—most particularly the price-fixing formula. It has not yet been demonstrated that the plan will work, but on the other hand, it has not been demon-

strated to my mind that it will *not* work.

The fear that a Guffey Act type of control may grow into an all-embracing Governmental operation, or straight jacket,—stifling self-management and initiative,—concerns me greatly. I would much prefer a simpler form of Act, but only if the latter can be equipped with so-called teeth.

The political picture for the next two years is as familiar to you as it is to me, but it must weigh heavily in our deliberations.

It would seem to be a practical position to seek to utilize the present situation to build up our marketing agencies and other self-governing organizations, as solidly as we can under the Guffey Act, and to cooperate with the Commission and among ourselves to give a convincing trial to the price-fixing formula on which so much time and money has been expended. Then we will be in the best position, I believe, to put our united effort and influence behind such amendments or repeals as experience indicates.

PROCEEDINGS OF ILLINOIS MINING INSTITUTE FORTY-SEVENTH ANNUAL MEETING

Held in Springfield, Illinois
FRIDAY, NOVEMBER 10, 1939

MORNING SESSION

10:00 O'clock A. M.

President Weir: The meeting will please come to order.

The Program Committee has arranged a rather lengthy but very interesting program of papers. In order to provide all possible time for the presentation and discussion of the papers, the chair will take up no more time than is necessary to transact the business of the Institute and will confine his remarks to a simple but hearty welcome to members and guests at this, the 47th anniversary of the Illinois Mining Institute. I greatly appreciate the interest of the membership during the past year in the work of the Institute.

The minutes of the last meeting have been printed in full in the Year Book. Therefore, I do not believe there is any necessity for reading them this morning, and I will entertain a motion to dispense with the reading.

Mr. W. J. Jenkins (Consolidated Coal Co., St. Louis, Mo.): Mr. Chairman, I so move.

(Whereupon said motion was duly seconded and unanimously adopted.)

President Weir: The next order of business is the report of the Secretary-Treasurer.

Secretary-Treasurer Schonthal: The Secretary-Treasurer's report is

very brief, because most of the announcements will be made by the President. You might be interested in knowing we have a total of 629 members.

The cash report is as follows:

Cash in Bank November 1, 1938	\$1,475.79
Receipts	6,231.31
	<hr/>
	\$7,707.10
Disbursements	5,325.71
	<hr/>
Balance on hand November 10, 1939	\$2,381.39

BONDS IN TREASURY

One C. B. & Q. Bond.....	\$1,000.00
One Missouri Pacific Bond	1,000.00
U. S. Government Bonds...	8,000.00
	<hr/>
	\$10,000.00

That is all. I have nothing else right now, except that I would like to make one announcement.

Professor McCabe, of the Geological Survey, has brought over a few extra football tickets. It is not going to be raining tomorrow. I am not guaranteeing that, but I do not think it will be. Anybody who wants to go to the game can get a ticket from him.

President Weir: You have heard the report of the Secretary-Treasurer. What action do you wish to take?

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Mr. T. J. Thomas (Valier Coal Company, Chicago): I move it be approved as read.

(Which said motion was duly seconded and unanimously adopted.)

President Weir: Has the Advertising Committee submitted a printed report?

Secretary-Treasurer Schonthal: No. The Advertising Committee has done a wonderful job. We have an early start on the Year Book and are preparing it. We hope to have

it in the hands of the printer by the first of January. We have about a hundred pages of advertising sold already.

President Weir: On the boat trip last year, a special committee was appointed to prepare a short history of the boat trip. This committee consisted of Mr. J. A. Jefferis and Mr. Sam T. Jenkins. I have copies of the report which have been submitted by Mr. Jefferis and which will be made a part of the minutes of this meeting and printed in the Year Book.

HISTORY OF THE ILLINOIS MINING INSTITUTE BOAT TRIPS

By J. A. JEFFERIS

Illinois Terminal Railroad System, St. Louis, Mo.

At the Spring meeting of the Illinois Mining Institute held on board the Golden Eagle on June 12, 1939 a committee was appointed, consisting of Mr. Sam T. Jenkins and myself (J. A. Jefferis) to gather information concerning the various boat trips made by the members of the Illinois Mining Institute, but more particularly something regarding the earlier trips. As Mr. Jenkins has, for some time, been confined to his home on account of illness he asked me to prepare the paper to the best of my ability and, to help me with same, he recited some of his recollections of the earlier trips to me.

Inasmuch as many of our members seem to have the impression that the Illinois Mining Institute was organized about the time of our first boat trip I believe it might be fitting at this time to correct this false impression.

The question of organizing a Coal Mining Institute was first mentioned at a dinner given by Mr. James C. Simpson, then General Manager of the Consolidated Coal Company, to the members of the Miner's Examining Board, which was held at the Mercantile Club in St. Louis some time in 1891 and at this dinner it was decided to hold a meeting at the State House in Springfield, Illinois on February 17, 1892, at which time the Illinois Mining Institute was fully organized and was duly incorporated under that name. It may interest, especially some of the older members, to know who some of the first officers were. At this preliminary meeting Mr. Richard Ramsey of Braceville, Illinois, was asked to serve as temporary Chairman and Mr. Hugh Murray of Sparta, Illinois as temporary Secretary. The following names were then placed

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in nomination for permanent officers, all of whom were duly elected:

President, James C. Simpson,
Genl. Manager, Consolidated
Coal Co.

Vice Presidents, Walton Rutledge, State Mine Inspector;
Hugh Murray, President,
Valley & Gulf Coal Co.

Treasurer, Thos. R. Stockett,
Mining Engr., Consolidated
Coal Co.

Secretary, John S. Lord,
Springfield, Ill.

There were 27 charter members and an additional 107 members elected at the first meeting. Of these 134 members there is only one, so far as I can learn, who is a member of the Institute today and that honored gentleman is Mr. Fred E. Weissenborn, whom you all know, or should know.

Much of the above information was obtained from published proceedings, which were loaned to me by Mr. Weissenborn. It is of interest to know that the proceedings for the first year were published in book form, half leather binding, and contained 355 pages of reading matter, exclusive of advertising. The first volume contained an article and discussion of 22 pages describing a new device for the cleaning of coal whereby a shaking screen was to be used. It also contained description and cuts of a new haulage locomotive and cutting machine, which somewhat resembles those in use today.

Now, to get back to my original subject regarding our boat trips. After the regular annual meeting in 1917 the question was brought up as to where the next Spring meeting was to be held. I believe it was Mr. Sam T. Jenkins, of the Goodman Manufacturing Company, who suggested that it be held on board a

river steamer. There were many objections to this, mainly on the ground that the cost would be prohibitive and sufficient funds could not be raised to defray the expenses, as there had been some little dissatisfaction expressed as to the method in which collections had been handled for previous meetings. The collections had been made from coal operators and manufacturers. However, Mr. Jenkins insisted that sufficient funds could be raised provided it was handled in a proper manner, and after two or three preliminary meetings Mr. Wm. Hall, who was President of the Institute at that time, appointed Mr. Jenkins as chairman of a committee to make the collections. Mr. Jenkins accepted with the provision that a committee be appointed to expend the funds and render a written statement of all receipts and expenditures after the trip was over. President Hall then promptly appointed Mr. Jenkins to also act as chairman of that committee, which he finally accepted. Mr. Jenkins and his committee immediately started out to get subscriptions and after much work and explanations to contributors as to how the money was to be handled, they collected a considerable amount of money and chartered the boat for our first river trip to be held in May 1918, with a guarantee to the Eagle Packet Company of 75 passengers. Someone told Captain Leyhe, of the Packet Company, that it would be an impossibility to get 75 reservations and he promptly notified the committee that they would voluntarily reduce the number to 50. Two weeks before the boat was scheduled to sail not a single reservation had been made. About that time Mr. Jenkins and his committee sent out notices that reservations were coming in so fast that late comers might be com-

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pelled to sleep on cots. This seemed to have the desired results, for reservations started to pour in and the boat sailed away on scheduled time with approximately ninety passengers on board.

Our first trip was made up the Mississippi with stops at Quincy, Illinois, and Hannibal, Missouri. The committee had made arrangements with some company at Quincy to furnish conveyances to take our members for a sight-seeing trip over the city. Naturally, the Mayor and others were on the dock at Quincy to welcome us and just as naturally one of our longest stops was made at the Brewery where refreshments were furnished and a few impromptu talks were made. At Quincy we were also met by a committee of city dignitaries from Hannibal, Missouri, who wished to join us and act as a reception committee to escort us to the various places of interest in and around Hannibal; this they did, even taking us to the famous cave of Tom Sawyer and Huckleberry Finn. They were most gracious hosts and when our committee offered to pay them for the automobiles provided for our use we were informed that our money was counterfeit in their city. Our first trip turned out to be a greater success than was anticipated and before we reached home it was generally understood that plans would be made for a trip the following year.

At our Fall meeting, held at the St. Nicholas Hotel in Springfield, Illinois, in 1918, there was much talk about the river trip, and at the evening meeting President Hall called on Mr. Jenkins to make a report of all receipts and expenditures and, to the surprise of everyone, Mr. Jenkins reported that after paying all expenses such as hiring an orchestra, a quartette of singers,

automobiles at Quincy and many other expenses which he enumerated, he had a balance on hand, including interest on same, of \$2,117.21. This report was received with great applause and, if I remember correctly, President Hall immediately appointed him to act as Chairman of the same committees for the coming year.

On our second annual river trip, held some time in May, 1919, an informal meeting was held on the boat before leaving St. Louis. Mr. Finley, personal representative of the Mayor, made an address of welcome and said many nice things about the Institute as well as set forth the many advantages offered by the City of St. Louis. At this same meeting Mr. Wm. Hall, who was still President of the Institute, presented to Mr. Jenkins, as a token of appreciation for the work he had done, a beautiful solid leather fishing tackle case, fully equipped with fishing rod and all other necessary paraphernalia. Sam was very much touched and felt happy that his efforts had been appreciated. I could not help wondering at that time if a fellow would actually take so lovely a case out fishing with him and necessarily get it all soiled. A short time ago I went out to see Sam and he spoke of that meeting on the boat and when he mentioned the fishing tackle I asked him if he had had a lot of pleasure with it. He said, "Jeff, I'll tell you a secret I have kept these many years. That tackle was for deep sea fishing and as I have never had an opportunity to indulge in that sort of sport I still have the fishing tackle put away in my room. I would like for all of the boys to know that I sometimes get it out and look at it and think how happy it made me, not only then but throughout the years." It just goes to show the kind of a good

sport Sam Jenkins is and always has been.

I will freely admit that on the first three or four boat trips we made, our conduct might not have been such that would have met with the whole-hearted approval of the W. C. T. U.; however, we soon realized the great benefits that could be derived from these trips, provided we made our business meetings the main issue with just enough time left for play to make the trips both interesting and enjoyable for all concerned. This program has been followed out, and it has been most gratifying to the officers to see the willingness displayed by many of the large operators and manufacturers in making reservations for their representatives to attend these meetings. I believe they now feel amply repaid, as for the past few years every stateroom on the boat has been filled.

During the years when donations were being solicited to help defray expenses, there were many expenses incurred which have not been considered necessary for the past several years. As mentioned above, there were orchestras and entertainers engaged and, of course, it was necessary to pay their boat fare as well as for their services. In addition there were souvenirs purchased and more elaborate badges furnished the members. For two or three years nice cloth caps were given as souvenirs and on the trip made in 1921 solid leather bill folds, with each member's name embossed in gold, were used as souvenirs. As the years went by it was decided that the boat trips must be made practically self-supporting and since that has been done the boat trips have, if anything, become more popular than ever.

The many valuable papers which have been read and discussed at our

meetings have been published in our Year Book for all to see and read, but it would be impossible and out of place to publish, or even to mention here, the many excruciatingly funny incidents which have happened on our various trips. I can still see our honored past President, W. J. Jenkins, getting a rubber "hot dog" out of the pot, where they had been boiled with the others, then trying to split it with a large butcher-knife, with no success. Perhaps some will remember the powder salesman who tried to paste a cotton poster on the wall with what he thought was glue but which turned out to be, as he said, "rheumatiz" ointment. He had it smeared from his finger tips to his elbows. Some of the members on one of our earlier trips got quite a kick out of the fellow who went on the trip to Keokuk for the sole purpose of seeing the dam and locks but who was so "under the weather" by the time he got there that he was not able to see the dam or anything else and did not know we had been to Keokuk until we reached Alton on our way home. These, and many more, may not seem funny at this time but I can assure you that at the time they happened they gave us much cause for merriment. As stated above, these have no place in our published proceedings but I consider them as much a part of the trip as the regular program. These and similar incidents helped, at least, to give us diversified amusements.

From our first boat trip in May 1918 we have held an annual river trip, with one exception. One year, I forget the date, the Institute met in Chicago and sailed across the lake and back. This was the only trip I did not make and I can tell you very little about it. I was told that the boat was so large and car-

ried so many other passengers that the members of the Institute did not seem to have that close feeling of comradeship as enjoyed on our river trips. At any rate we have stuck to the river ever since.

During the many years we have made these trips we have sailed as far north as Burlington, Iowa, south to Cairo and up the Ohio River to Paducah, Kentucky, and up the Illinois River to Starved Rock and Ottawa, Illinois, stopping at many river towns en route. For several years we sailed from St. Louis on Thursday evening, returning to St. Louis before noon on Sunday morning. As many of our members did not find it convenient to be away for so long a time our sailing day was changed to Friday evening and our return to 7:00 A. M. Sunday. This makes an ideal trip and seems to meet with general approval as it gives every one ample time to get home and back on his job by Monday morning.

We have sailed on various boats owned by the Eagle Packet Company but at this time the Golden Eagle is the only packet boat left on the Mississippi. The owners, Captain Henry and Captain "Buck" Leyhe, have put this boat in first class condition to meet with every requirement of the Government River Commission and we sincerely hope we will be able to sail on her for many years to come. Captain Henry and Captain "Buck" are everything that could be expected of a river boat captain and these two brothers know exactly just what the word Hospitality means.

While the program of procedure on these trips is pretty much alike, please do not get the impression that it is like what they say of the circus,—that is, "When you've seen one you've seen 'em all," for that is

not true. Every trip is a trip in itself and no two exactly alike, in fact, each one is better than the one before.

I wish to thank Mr. Sam T. Jenkins for some of the information furnished for this paper and I am sure that if he had been able to help me prepare it, it would have been much more worth while. In conclusion all I can say is—Any member who has not made one of these river trips has missed a wonderful opportunity to learn many things of value to him; has missed mingling with a lot of his old friends as well as the chance of making many new ones and has also missed a most enjoyable and lovely trip, which he would long remember.

* * *

President Weir: I might say at this time that Mr. Jenkins, who is one of the Daddies of the Annual Boat Trip, is in very poor health. It was with some difficulty that Mr. Jefferis was able to get permission from his nurse and doctor to interview him on the history.

There are some announcements in addition to that made by the Secretary-Treasurer. First, the request for everyone to register. The registration desk is right outside of the room. We would appreciate one hundred percent registration. The tickets for this evening's dinner are at the registration desk. The price is \$1.25 per person, and the time is 6:30 o'clock this evening. We would appreciate very much your early purchase, so that the hotel can be given intelligent information about what to expect.

Last of all, there are some exhibits of various manufacturers relating to the coal trade in this State. These exhibits will be open except during meeting hours.

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Then there is the usual announcement concerning the parking of cars. There is nothing special this year, except if you fellows get in trouble Sam Wills might be able to help you out.

This year the Chair has appointed a Committee on Resolutions, consisting of Mr. T. J. Thomas, Chairman, Mr. John E. Jones and Dr. M. M. Leighton. If any of the members desire to have the Institute go on record in favor of or against this, that or the other thing, please turn your suggestions over to the Chairman, Mr. Thomas.

During the year, the Executive Board and the Officers of the Institute have considered suggestions for expanding the activities of the Institute. At the opening of the afternoon session I will attempt to tell you in some detail about the progress on these projects.

We have scheduled this morning the report of a special committee with a rather lengthy name. We will hear that report at the end of the presentation of the formal papers.

At this time we are ready for any new business which may properly be brought before this meeting. Is there anything any of the members care to bring up at this time? If not, we will proceed with the election of officers for the coming year.

Recently we received two resignations from members of the Executive Board, Mr. Louis Ware and Dr. M. M. Leighton. Inasmuch as these resignations have been received within the last thirty or forty-five days, the vacancies have not been filled by appointment. In addition to the election of four members for a three-year term on the Executive Board, we will elect successors to these two members whose unexpired terms, I think, amount

to one year. Of course, we have a President, Vice-President and Secretary-Treasurer to elect.

At this time I would like to call for the report of the Nominating Committee, of which Mr. W. J. Jenkins is Chairman, and the other members of which are J. A. Jefferis and Fred S. Wilkey. I believe the Secretary-Treasurer has the report of the Committee.

Chairman W. J. Jenkins (Nominating Committee): The report is before the Secretary, and I suggest he present it.

REPORT OF THE NOMINATING COMMITTEE

Springfield, Illinois,
November 10th, 1939.

Mr. Paul Weir, President,
Illinois Mining Institute,

We, the undersigned Nominating Committee appointed by you, have agreed unanimously to the nomination of the following named members for offices shown:

For

President:

Mr. Roy L. Adams, Old
Ben Coal Corporation.

Vice President:

Dr. M. M. Leighton, State
Geological Survey.

Secretary and Treasurer:

Mr. B. E. Schonthal, B. E.
Schonthal & Company.

The By-Laws of the Institute provide that four members of the Executive Board be elected each year for a term of three years. This year we have two additional members to elect for a period of one year each to fill the unexpired terms of two years, caused by the resignations from the Board of Mr. Louis Ware and Dr. M. M. Leighton and we re-

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spectfully submit the following names:

THREE YEAR TERM

- Mr. Fred Miller, Franklin
County Coal Corporation.
Mr. D. D. Wilcox, Superior
Coal Company.
Mr. G. S. Jenkins, Consol-
idated Coal Company.
Mr. M. M. Moser, United
Electric Coal Companies.

ONE YEAR TO FILL UNEXPIRED TERM

- John G. Crawford, Valier
Coal Company.
A. F. Dodd, United States
Fuel Company.

Signed:

W. J. JENKINS
F. S. WILKEY
J. A. JEFFERIS

If the above named are elected
the Directorate will be:

One Year Term

- B. H. Schull
James McSherry
John G. Crawford
A. F. Dodd

Two Year Term

- D. H. Devonald
L. D. Smith
L. A. Wasson
W. P. Young

Three Year Term

- Fred Miller
D. D. Wilcox
G. S. Jenkins
M. M. Moser

President Weir: You have heard
the report of the Nominating Com-
mittee. Are there any further nom-
inations?

Mr. T. J. Thomas (Valier Coal
Company, Chicago): I move you,
Mr. Chairman, that the report be
accepted and the nominations con-
curred in.

(Whereupon said motion was
duly seconded and unanimously
adopted, and the Secretary was in-
structed to cast the ballot of the
Institute for the election of all
nominees.)

President Weir: This ends the
business, as provided by the Con-
stitution and by-laws. We are now
ready to proceed with the formal
papers of this morning's session.

The program will be in charge of
the Mining Electrical Group, which
is a voluntary association of electri-
cal engineers and mechanical engi-
neers, electricians and mechanics
from five southern Illinois counties.
This Group is about two years old,
and at the present time has a mem-
bership of two hundred and fifty
spread over five counties. I have
not had the pleasure of attending
any of their meetings, but I have
been informed that they are doing
a constructive piece of work for
themselves and for the companies
for whom they work. It is a real
pleasure to have them participate
in this morning's program.

The presiding officer will be Mr.
A. L. Reed, a former President of
the Group. Mr. Reed, will you
please take charge?

Mr. A. L. Reed: Mr. President,
officers, members and visitors of the
Illinois Mining Institute, this is in-
deed an honor and a pleasure to be
allowed to officiate in this capacity.

Speaking in behalf of the Mining
Electrical Group, I wish to thank
the Illinois Mining Institute for this
opportunity of appearing and hav-
ing a part on your program. I wish
to thank Mr. Weir for the construc-

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tive things he has said concerning the Mining Electrical Group.

I have for your approval this morning a series of three papers which deal with some of the vital problems which the present day system of mining has presented. We trust that in these papers you may find something that will be an aid in solving some of your problems.

Our first paper this morning will be presented by one whom most of you, I am sure, know, Mr. Hector Hall. Mr. Hall is a graduate of the Girard High School in the Class of 1916. He started in his work in the mines about 1918, in the ma-

chine division of the Bell & Zoller Coal Company, and advanced to the position of Chief Electrician at their No. 2 Mine, a position which he now holds. Mr. Hall's paper is entitled "Locomotive Maintenance."

It is my pleasure at this time to introduce to you Mr. Hector Hall.

Mr. Hector Hall (Bell & Zoller Coal and Mining Co.): Mr. President, Mr. Reed and gentlemen, I hope you gentlemen will be more comfortable in listening to this paper than I will be in reading it. It is exceedingly warm standing here in front of you.

LOCOMOTIVE MAINTENANCE

By HECTOR HALL

Chief Electrician, No. 2 Mine, Bell & Zoller Coal and Mining Co.,
Zeigler, Ill.

Before the seven hour, five day week and payment of time and one-half for overtime, the accepted practice of locomotive maintenance was to handle routine repair work on work days and all heavy work on an idle day or Sunday. In operations that use all of their locomotives each day the mine operates, it is an absolute necessity to follow this schedule of locomotive maintenance.

Because of the wide variation in equipment and in operating conditions, no locomotive maintenance procedure would be practicable for all operations. Therefore, in this discussion the maintenance procedure described will be that of one of the larger mines of Southern Illinois in Franklin County.

This mine uses 46 mine locomotives and with one exception they are all of the same manufacture. There are 3 sizes: 14—6 ton, 25—8

ton, and 7—13 ton locomotives. Six of the 13 ton locomotives are used on main line haulage with one being held on the bottom as an extra. Seven of the gathering type locomotives are used on relay service from the loading sections to the partings. Twenty-eight of this same type of locomotives are used as service locomotives on the loading machines. One of this type is used at the material shaft bottom for handling material. Another, on the loaded bottom, is used as a push motor. Two gathering type locomotives are kept in the shop, one as an extra and the other being overhauled or repaired.

At the present time all of the routine repair work at this mine is done on the night shift. Four men attend to all repairs as reported by the day shift motormen. Each shift these four men make a thorough inspection of two of the gathering lo-

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comotives. Two other repairmen make a thorough inspection of one gathering locomotive and one haulage locomotive. They also attend to repairs as reported by the night shift motorman. However, their work is concentrated on the haulage locomotives as one is brought to the shop each night in regular turn. This enables them to get over all the main line haulage locomotives in seven working days. One man, also on the night shift, is responsible for the lubrication of all locomotives. The axle caps and journals are oiled every other night. The armature bearings of the light locomotives are greased every three months and the armature bearings on the haulage locomotives every month.

Two men working in the shop on the day shift take care of all of the heavy repair work such as changing trucks, rebuilding and overhauling locomotives. At all times one locomotive is in the shop being overhauled and as there is also an extra locomotive in the shop, it does not affect the operation. The need for repairs or the need of changing trucks, is determined by the examination of the night repairmen.

The overhaul work in the shop consists of completely stripping the locomotive of its motors, controller, resistance, wiring, reel, and sand boxes, bumpers and trucks.

The frame is then checked to see that side and end frames are straight. If found to be bent, which seldom happens with the armor-plate frames, they are straightened, then squared and bolted tight. The deck plates in the cab and front end are tightened to the frame and then welded. Welding the ends makes a more rigid frame and helps to keep the bolts in the corner brackets from loosening. On the light locomotives, frames are made up of two 14"

channels, one on top of the other, riveted together. In overhauling this is re-riveted and welded. The height of the frames of the gathering locomotives is increased three inches by welding light angles in such a manner as to make a duct along the top of the original frame. This duct carries all lead wires from one end of the locomotive to the other, and also wires to both motors.

Journal boxes, with a set of trucks kept assembled as a unit, are placed under the frame. These trucks are equipped with new tires or tires which have been built up with the electric arc welding process. With built up tires our experience has been varied and whether or not there has been any saving is questionable. From a safety standpoint we do not do any welding on the worn journals of the locomotive axle.

An extra controller which has been rebuilt is mounted in the cab. A selective series parallel drum type controller is used. Only three types of controllers are used on the 46 locomotives in the mine. Two types of operating and reverse fingers are used on all the controllers. The same is true of the operating and reverse cylinder segments which reduces the amount of supplies carried in stock for this particular piece of equipment. Ground potential control is used on the controllers of four locomotives. The operating cylinder and fingers operate at ground potential. This is a safety factor in itself worth considering as it eliminates the possibility of a short circuit between these parts and the controller cover. All wiring at the controller and in the cab is protected as much as possible to eliminate the possibility of a short circuit which might cause a severe burn or eye injury.

A complete resistance which is kept mounted as a unit, is bolted in place in the front end of the locomotive. This resistance is of the steel strip type. If the resistance taken out of the locomotive when it was stripped was of the cast iron grid type, it is dismantled and the parts used as repair parts for other resistance of this type which may still be in service. There are three types of resistance banks in use. One of each of these three types as replacement is all that is necessary for us to carry for any one of our 46 locomotives.

As we do not have any spare motors for our locomotives, the motors have to be worked over before they can be put back in the locomotive. The field frames are split and the armatures removed. As we have an extra armature assembled with bearing housing and pinion, we only have to clean up one of the armatures taken out to complete the two motors. The armature is taken to the winding shop where the bearing housings are taken off. The commutator is turned, undercut and re-banded and if the winding is dirty or oily it is cleaned, dipped and baked. If the bearing housings are of the type that use felt packing for an oil seal they are put in the lathe and bored out to accommodate an oil seal of a leather or composition material backed up by a spring and contained in a light steel case. The field coils are tightened or replaced if necessary and the coils are reconnected with wire having no rubber in its construction. We have had best results in the motor case with wire insulated with varnished cambric and asbestos braid covering. Class "B" insulation is used throughout the field frames and armatures. When the motors are assembled the tapped holes in the motor frame which ac-

commodate the axle cap bolts are examined. If found to be bad they are either filled up by welding, drilled and tapped, or tapped for the next larger size bolts. In most cases provisions are made to add two more bolts of the same size used. This greatly strengthens the axle caps and eliminates the breakage of axle cap bolts. The motors are then mounted in the locomotive.

The locomotive is then rewired using wire of the same construction as used in the motors. The wires are placed in the duct along the top of the original frame which has openings at each motor where the wires come out through an insulator. All wires are kept concealed as much as possible to prevent mechanical injury and also to keep them from getting oil soaked.

Instead of using a fuse, a circuit breaker is installed on these locomotives when they are overhauled. We find that they are handy for the motorman to restore power. With fuses we found that a piece of cable or anything that would fit the clips was used to repair a blown fuse. Often no report was made and when found the fuse clips were burned to such extent that they had to be replaced.

While we still have some mechanically driven reels in service we do not purchase any parts to repair them. They are gradually being replaced by electrically driven reels. With this type of reel there is a resistance placed permanently in series with the reel motor in order to limit the current and the torque to a value just sufficient to properly pick up the cable on the lowest voltage on which the locomotive will have to operate. The permanent resistors are rugged and of ample capacity to operate continuously without overheating. Class

"B" insulation is used throughout on the reel motors.

Each locomotive is equipped with a double automatic transfer switch which transfers the power from either pole to the reel, depending upon which is being used.

As all trolley wire is hung eight inches outside the rail, the trolley poles are mounted as nearly as possible in a position to ride the wire without too much side drag. Each locomotive has two trolley poles.

Each locomotive is equipped with two headlights, one front and one rear. On the gathering type locomotives, 32 volt, 50 watt rough service lamps are used. On the haulage locomotives, 150 watt, 32 volt lamps are used. The resistance for these headlight lamps is of the space heater type, which is easily mounted or replaced. A single pole double throw switch is used for the headlights and the headlight is lighted front or rear at the will of the motorman. This arrangement necessitates the use of one headlight resistor for each locomotive.

The locomotive, if it is for gathering service, is equipped with a metal windshield arrangement which can be quickly and easily raised or lowered by the motorman. It is placed on top of the frame to protect the motorman from flying pieces of coal caused by chunks of coal catching the roof while going over the rear conveyor of the loading machines.

Before the locomotive leaves the shop it is given a coat of aluminum paint.

With very few exceptions we find that we can handle our locomotive maintenance as routine work. However, this entails a rigid adherence to the following course of procedure: 1. Having motormen report direct to the repairmen. 2. The replacement of parts as a unit by the repairmen on the night shift. 3. The

repairing of replaced units by mechanics on the day shift. 4. The systematic check of the locomotives and lubrication. 5. The rotation of locomotives through the shop. With this schedule of work we find that our locomotives are kept in good repair at all times.

* * *

Chairman Reed: Thank you, Mr. Hall.

Gentlemen, I am sure that the subject has been well presented. If there are any of you who desire to ask any questions in this connection, we would be glad to have Mr. Hall answer them.

Mr. A. G. Shaffer (C. W. & F. Coal Company, West Frankfort): I would like to ask Mr. Hall how the service you get with the welded tires compares with the other tires.

Mr. Hall: It is our experience that with welded tires you get about one-half the service you do with the regular tires.

Chairman Reed: Any other questions? If not, we will proceed with the next paper.

The next paper is entitled "AC and DC Sectionalizing Power Circuits." Mr. A. G. Shaffer will present this paper.

Mr. Shaffer started his career as an electrician with the Santa Fe Railroad Company in 1909 as an apprentice in the electrical shop. From there he went to another company, and finally stepped into the position as Chief Electrician in 1921 for the C. W. & F. Coal Company, which position he now has. I present to you Mr. Shaffer.

Mr. A. G. Shaffer (Chicago, Wilmington & Franklin Coal Company): I hope you will bear with me for about fifteen minutes.

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AC AND DC SECTIONALIZING

By A. G. SHAFER

Chief Electrician, Chicago, Wilmington & Franklin Coal Company,
West Frankfort, Ill.

The economic progress in coal mining can be measured by the extent of electric power applications.

Progressive companies apply electric power to every phase of its operation so as to reduce manpower requirements to a minimum.

A man of vigor and endurance can work steadily all day at a rate not to exceed one-sixth horsepower per hour and do 1-1/6 horsepower of work per seven hour day. The energy this man would expend would equal eight hundred sixty-eight watts of electrical energy. His energy efforts for all day could have been replaced at a cost of two cents had electrical energy been utilized instead of manual.

Manual energy costs are from one to five hundred times that of electrical energy. Therefore, it is the low cost rate of electrical power that gives us the economic advantage of mechanizing our coal mines.

The coal mining industry of this country is now one of the largest consumers of electrical energy. We sometimes feel the power companies' rates are unfair and much too high. Our complaints are generally aimed at the power company, especially when we are penalized with a low power factor with a high maximum demand.

We should remember that the power company rates are fixed by a State Commission and are based on a reasonable return on the power company's investment. If our bills are high due to low power factor, high maximum demand, or excessive energy charges, it is up to us

to improve our operation. The State Commission will not penalize the power company because of our neglect or faulty supervision.

The first step in trying to reduce power bills is to make a careful study of all equipment and conditions concerning the operation of same that might affect electrical consumption, maintain as high a power factor as possible and maintain protective devices on all machines, which devices will tend to lower demand charges and prevent costly breakdowns with resulting loss of tonnage. We shall have to hold transmission line and track losses to a minimum; cut the peak demands, if possible, by shifting load; pump water at night, or do the extra cutting on the second shift, etc. Main line haulage must be scheduled to prevent heavy pulls at same time, or bunching heavy trips. Locomotives with a top speed faster than necessary are wasteful as considerable energy is dissipated through resistance or by using brake and controller points to reduce speed. A low power factor increases power cost; it reduces transmission line, generator and transformer capacities. It creates losses for both the producer and consumer. Therefore, through a reduction of KW demand and with a high power factor, we can expect a reduction in the power bill. So with mechanized mining every effort should be expended to reduce delays to equipment and avoid unnecessary high power demands. Unnecessary high power demands are

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generally detrimental to a steady flow of coal. High demands are caused generally by haulage motors attempting to pull heavier trips than locomotives are capable of pulling. Rough handling of equipment and especially fast acceleration invariably increases demand charges. Protective devices on each unit limit the rough treatment to a certain extent and hold down power demands.

Recording or graphic meters indicate that rough treatment or mishandling cause the major portion of breakdowns to our machinery. It is not the loading, cutting, or hauling the coal that cause us tonnage loss and expense. Nine times out of ten, the breakdowns are avoidable.

We have passed the buck to the men so far. Let us assume some of the responsibility. We must have a power layout that will give these operators of the equipment a dependable source of power with the proper voltage. We attempt to do this by sectionalizing our power circuits. When reference is made to power sectionalizing in the mining industry, it is generally assumed such reference concerns the underground direct current trolley and feeder circuits only. This is due to a greater need for isolation of electrical disturbances in that part of the complete distribution system. However, with mechanized mining and the resulting increase of power requirements, conditions are created which require proper sectionalizing of the AC circuits as well as the DC circuits. Otherwise, a minor fault in a high voltage line can be responsible for causing a general power outage throughout the entire mine. Sectionalizing the AC circuits should be accomplished so that all branch lines can be isolated. Some means should be used to allow

the opening for test of different sections of the mains, especially if the lines are of multiple conductor cable. It enables the power men to identify faults in a minimum of time. It takes considerable time to make resistance tests for faults. The results obtained are often misleading, particularly if the system is long, or has many branch lines.

To overcome the delay in locating the fault I believe some means of automatic sectionalizing is necessary. Apparatus for sectionalizing AC lines divides itself, logically into circuit breakers, actuating relays and certain type of fuse assemblies. The breakers themselves are chosen with two principal characteristics in mind, load handling ability and rupturing capacity. Anyone contemplating the use of oil switches underground should be sure a switch with proper interrupting capacity is used, otherwise danger from fire would exist.

Other desirable characteristics of the switch chosen would be suitability for frequent operation, freedom from fire hazard, etc. However, load rating and rupture rating admit of no compromise if successful operation is to be secured. Choice of load rating itself is comparatively simple once the various circuits are laid out and power requirements established.

The factor of future growth tempers the final selection, but if growth is faster than anticipated, loads can usually be shifted and new breakers and lines added. There is often some approximate relation between breaker size and interrupting capacity, so that as breaker sizes go up, the interrupting requirements go up also. Yet this relation cannot be taken for granted. In many system layouts, breakers for small currents must have as high interrupting ability as

those for large ones. The answer to this question is obtained by making a study of the whole AC system, taking into account all units which may send power into the AC lines in case of fault.

Load rating is determined by considering the individual circuit. Interrupting rating is determined by considering all parts of the AC system. The following units which may send power into a system and into a fault include all generators, transformers handling power from other sources, and all synchronous motors, because synchronous motors act like generators during a fault and return energy to the line. Synchronous motors are often connected to loads possessing kinetic energy in rotating parts, and much of this kinetic energy in rotating parts is reconverted to electrical energy and appears at the fault as heat unless proper protective apparatus is installed.

With considerable short circuit energy available, it may be found that making all circuit breakers large enough to handle any fault in the system is not economically warranted. With a situation like this, sectionalizing gives the answer. Sectionalizing simply means breaking down the system into two or more parts when a fault occurs. This reduces the total amount of energy that can flow into the fault, and thus the interrupting rating of all circuit breakers in the system is reduced.

Sectionalizing has another advantage. By splitting the system into several parts or sections, voltage disturbances are minimized or eliminated in all parts except the circuit directly involved in the fault. In that section the unit breakers, or fuse assembly, being relieved of handling the total system short cir-

cuit energy, are able through selective action to eliminate the faulty circuit from the system properly. In sectionalizing the AC side, we do it solely for the purpose of isolating faults so that the AC section in trouble can be quickly identified, the faulty section disconnected, and the AC power restored to other parts of the mine. In mines with more than one branch of AC circuits feeding MG sets, rotary converters, or rectifiers, some form of sectionalizing AC current is necessary.

The term Sectionalizing has had more direct current significance during recent years since mechanized loading has come into more general practice. It was realized years ago at some hand loading mines that some means had to be provided to prevent DC electrical disturbance in one section of a mine from penalizing operations over a wide area. Mechanized mining with its greater concentration of machinery and activity in well defined sections increased the demand for some form of isolating electric disturbances caused by cables being run over, conveyors in the wire, grounded or short circuited circuits in any of the coal producing machines, local falls, etc.

In general, these protective equipments may be applied to any underground trolley and power feeder system after consideration of two basic application requirements. First, a need for sectionalizing feeders between substations to prevent interference on main haulage ways extending over an area served by more than two substations. Second, a need for sectionalizing secondary haulage ways active mining sections. This scheme calls for a circuit breaker at either end of the tie feeder between substations, and

usually this can be installed at or near the switch board. Where substations are located in a line with relation to each other, or where a triangle relation results, rarely is there a need for more than two automatic reclosing breakers in any one substation. Whether these substation tie lines should be further sectionalized at about the middle point by another breaker depends upon the length of the lines, the relative importance of the lines and the condition of the track and roof regarding the freedom from short circuits caused by wrecks and roof falls.

The benefits from inner substation sectionalizing are very marked and very valuable in plants having a large daily production. Main haulage is effected only by overloads and faults in small units with the result that it is possible to maintain a steady stream of coal bound for the tippie. This is important in holding closely to production schedules and keeping operation of the preparation plant steady.

In the second case, which considers the sectionalizing of mechanized mining units, the application of circuit breakers is toward protecting each mechanized mining unit generally consisting of one loading machine, a cutting machine, a gathering locomotive, a swing or relay locomotive and a drill. These interrupters should be of steel enclosed type and should be mounted clear of the track at the mouth of the working area. A high standardization of units can be had for this type of sectionalizing and, as panels work out the interrupter can be relocated in a minimum of time. A larger area, of course, can be served by an instrument of larger rating than that ordinarily required for one loading unit. The latter application may be considered ideal and

some plants may prefer to approach this scheme of starting their sectionalizing program from scratch by so locating the circuit breakers as to protect two mechanized mining units. The benefits from the single unit of sectionalizing are more and varied than inter-substation sectionalizing. The localizing of the effects of overloads and short circuits to the limited fields of their origin results in the increase in daily production which may amount to many tons per shift. Circuit breaker outages then concern only relatively small units of output and there is never any pronounced slowing down in the tippie due to localized faults. The value to loading output of this form of sectionalizing cannot be overemphasized.

Where a 300 ton production is expected to be loaded from a single machine in a single 7 hour shift, electrical delays on one machine must not be allowed to penalize the operation of other units. A delay of 20 minutes each shift for power disturbances would result in a production loss of 14 tons per shift for every unit affected by such a power disturbance. Protection against fire hazards from high resistance grounds can be achieved more thoroughly and at less expense through sectionalizing than from any other method.

Since the sectional units are adjusted to open on lower current values, they are infinitely more sensitive to grounds which otherwise might not draw sufficient current to trip a large circuit breaker protecting a large territory. In this respect the sectional circuit breaker provides a type of service which may take the place of much of the large feeder cables necessary to the proper operation of large central breakers.

Short circuits are far more common in working territories than elsewhere in the mine. Where section circuit breakers cover small territories the breaker can function more completely to protect both feeders and equipment giving better protection to the machines and longer life and greater freedom from motor and controller trouble. Mining machine and locomotive operators become more efficient when operating under company orders and not according to their individual ideas.

Automatic reclosing equipment should be of the type that is governed in reclosing by load conditions and which hold out on short circuits, thereby preventing any possibility of closing against a line condition which would draw an arc in a gaseous or dusty atmosphere and precipitate a fire or an explosion.

Power demand control schemes can be best adapted to the DC side and with less costly penalties to production. Sectionalizing permits the use of a plan for demand control which allows small units of production only to be sacrificed and with less disturbance to the entire mine.

Substation tie line breakers should be of a type that permits operation on multiple fed circuits whereas practically all working section units can be for independent or so-called stub and circuit service.

With more substation and larger generating units now in use with large feeders and heavier and better maintained track in service the total current that can flow during a short circuit is much greater than was the case a few years ago. Most manufacturers now supply circuit breakers for mining service having a minimum rupturing capacity of 20,000

amperes, a figure believed safe for all ordinary conditions.

Any plan for a sectionalized distribution system of both AC and DC systems is a living scheme changing as the power requirements change and as the mining areas advance.

* * *

Chairman Reed: Gentlemen, this subject of sectionalizing is one of importance, and I believe is worthy of much consideration. Are there any questions in regard to Mr. Shaffer's paper?

A Voice: I would like to ask what steps are taken in the operation for control of the power factors.

Mr. Shaffer: My answer is that we do not leave large transformers in service on off-peak or off-work periods. We switch over to the small ones in those periods, and also use capacitors and synchronous MG sets.

Chairman Reed: Are there any other questions? If there are no other questions, we will go ahead with the next paper.

Mr. C. C. Conway will present our next paper, entitled "Loading Machine Maintenance."

Mr. Conway is a graduate of the University of Illinois, Class of 1929. He started his professional career with a manufacturing company, saw the error of his ways, and started with the Consolidated Coal Company as Chief Electrician of their No. 7 Mine at Herrin, Illinois, advancing rapidly to his present post as Electrical Engineer for the Consolidated Coal Company. Mr. Conway's proudest moments, however, were when he was the best tackle that the Staunton, Illinois, High School football team ever had.

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LOADING MACHINE MAINTENANCE

By C. C. CONWAY

Electrical Engineer, Consolidated Coal Company, Herrin, Ill.

Mr. C. C. Conway (Consolidated Coal Company): Mr. Chairman, officers and members of the Illinois Mining Institute and guests, I am sure the mention about my being such a good tackle would be considered news to the people of Staunton.

My first reaction upon being asked to discuss this subject was the same as you are probably thinking now, "Why not give that subject a rest?" While it is true that the subject has been presented on many occasions to various groups and has been discussed in considerable detail in the trade magazines, it is a subject that is fitting in connection with the papers on maintenance that have just been presented. The subject of maintenance of equipment should be of interest to all mining men, if for no other reason than the fact that well maintained equipment is less susceptible to breakdowns and the resulting loss of production, than equipment in poor state of repair.

Perhaps Webster's definition of the word maintenance might be in order but I believe that it will be generally conceded that maintenance includes all things necessary to keep equipment in proper working condition. One writer on this subject has suggested that maintenance is based on the principle, "An ounce of prevention is worth a pound of cure," and further that it is easier to "keep out of trouble" than to "get out of trouble." A distinction might be formed between maintenance and repair with

the former referring to the "keeping out of trouble" and the latter to "getting out of trouble." Using these standards it might be said that repair work is the consequence of failure to do the proper maintenance job. This of course is not entirely true, due to the possibility of faulty or defective parts, gross mishandling of the machine, attempting to perform some duty for which the machine was not intended and other reasons beyond the control of the person or persons in charge of maintenance.

The maintenance of loading machines should be given its first consideration at the time of their purchase. Loading machines are, not selected entirely for their ease of maintenance, but factors affecting maintenance should be considered. For instance, a loading machine too high for the seam in which it is worked, will have a high maintenance cost of conveying parts due to the roofing of coal, while if the machine is too small and light for the working conditions the maintenance cost will again be high. After the machine has been selected the manufacturer has certain options to offer. Chief of these is the choice between open and permissible electrical equipment. From the standpoint of maintenance, as well as safety, permissible equipment, that is equipment bearing the approval plate issued by the Bureau of Mines, has many advantages over open equipment. An examination of a permissible machine will show that every wiring circuit is prop-

erly protected by fuses or circuit breakers so that much of the abuse due to improper handling is automatically eliminated. The motors also have overload protective devices chiefly to prevent damage to the motors and other electrical equipment, but they also limit the continuous load on the mechanical parts. Open type equipment is also protected but usually not to the extent that is necessary to merit approval by the Bureau of Mines. Open type equipment usually lacks the heavy enclosures for electrical parts which are so effective in eliminating faults due to oil and dirt, mechanical damage of electrical parts and improper operation due to unauthorized tampering. Although the wiring of open type equipment may look to be adequately protected it seldom has the heavy hose protection, the clamps preventing strain on the wiring, the packing glands at the enclosures and the heat resisting insulation all of which are necessary to obtain government approval plates.

However, this article concerns maintenance of loading machines and it is assumed that they have already been purchased and installed. Regardless of the age of the loading machine, the operating conditions or any other factors, a systematic schedule of inspection, maintenance and repair must be inaugurated in order that the machines may have a minimum of breakdowns and a low maintenance cost. Repairmen are of course required during the working shifts to keep the machines operating and repair breakdowns, but maintenance men are also required for off shift work. Maintenance is rightfully an off shift job for the reason that loading machines are available during working shifts

only for repair work necessary for them to complete the shift.

The system used in handling the maintenance of loading machines varies at different operations. These systems are more or less dependent upon local conditions, the number and type of machines to be maintained and their distribution about the mines. Many operations find it advisable, due to their loading machines being widely scattered about the mine, to place one or more men in each territory having one or more loading machines. At such mines the men located in the territory make necessary on shift repairs, often in a temporary manner, and are primarily charged with keeping the machines in operation. The actual maintenance of these machines is accomplished on an off shift with the maintenance men usually having the advantage of reports from both the loading machines operator and the repairman on the territory. Such mines usually have a central shop, located generally on the shaft bottom, where shopmen overhaul equipment and repair complete units of machines so that interchange of machines or assemblies can be quickly made at the face.

Our own system is simplified by the management concentrating the working territories into a small section of the mine. A central shop is then maintained in easy striking distance to all of the working territories. No repair men are kept in the territories. They are stationed in the central shop where they overhaul equipment, repair units or assemblies and other parts for interchange on the machine at the face. The men are subject at all times to calls from the territories but it is general practice for certain men to take the first calls so that the key men are still available in the shop

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unless called upon for help by less experienced men or unless the number of calls is unusually large. Reports are then taken, at the end of the shift, from the loading machine operators and the day repairmen for the benefit and guidance of the men doing repair and maintenance work on the off shift.

Proper lubrication is necessary in the maintenance of loading machines and conversely loading machines can be properly lubricated only when they are well maintained. The lubricating of loading machines is usually accomplished on the off shift and is therefore very often done by the maintenance men. In mines where the working territories are scattered, it is generally found that so much time is consumed by the oilers in travel from machine to machine, that it is advantageous to have the maintenance men lubricate the machines as they make their inspections. In our own case with the loaders confined to a small area, we find it practical to have our oilers do no repair work, but confine their efforts to the proper lubrication of the machines. The maintenance men are then free to allot their time strictly to their own work, it sometimes being proper to put in their entire shift on one particular loading machine.

Practically every company that is credited with having an efficient maintenance system has also an efficient system of records. The usual system includes a report for each loading machine at the end of every working shift. This report should include the tons loaded, the delays with their length and cause, the condition of the machine at the end of the shift and the repairs or adjustments thought to be necessary before the next working shift. In addition to this report it is usual for repairmen to report the delays,

the time lost, the material used to make the repairs and to recommend other repair work that they may deem necessary. A third set of reports is usually required to record the regular inspections and the repairs made by the off shift maintenance men. These last reports should also include the lubrication of the machines in sufficient detail that any abnormal amount of lubricant required for any particular part of any machine can be detected.

The reports mentioned will convey sufficient information for practically all purposes. Reported defects may be copied for use by the maintenance men. At the end of certain periods, usually one month, the lost time, as a percentage of the possible operating time, may be calculated. The cost per ton of labor, material, and lubrication can be determined. These figures are important as the only means of comparing the results obtained on the various units at the property. They are also useful in comparing with the results obtained by others operating similar units under somewhat the same conditions.

Even though the maintenance department has the advantage of reports from the loading machine operator, the section foreman and the section repairman, there is still the necessity of inspection. Many parts of loading machines give no warning of approaching failure to the operator. Periodical inspections, their frequency depending on the particular parts and previous experience, should be made and a record kept of the findings. Often inspections will bring to light conditions that may cause delays and serious breakdowns. For example, the improper adjustment of anti-friction bearing may result in many damaged parts, if the adjustment is not corrected. Again short brushes on

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a motor, if they are not replaced at the proper time, may result in such faulty commutation that changing the armature may become necessary.

Although schedules for inspections are advisable it is difficult to obtain reports on any major parts. The inspection of the many miscellaneous parts of a loading machine is generally left to the judgment of the maintenance man. It is his knowledge that a certain part on one particular machine may require attention every third shift while the remainder of his machines may require inspection of that particular part only after many more shifts. To aid the maintenance man in exercising this judgment his efforts should be concentrated, as much as possible, on machines which he may refer to as his own.

We have now entered one of the most important points to be considered in the maintenance of loading machines. I refer to our dependence upon the skill and perseverance of the man who actually does the maintenance work. The method of selecting and training men for maintenance work is a separate problem, the solution of which will be a big step in the maintenance of all equipment.

* * *

Chairman Reed: Thank you, Mr. Conway.

Gentlemen, I am sure that this paper also covers a subject of importance. Are there any questions you care to ask Mr. Conway? I would like to ask a question. Do you employ a grease truck?

Mr. Conway: We do employ a grease truck, probably not as satis-

factorily as many of you use. We have no mechanical pump, but we do maintain a truck. Carried on this truck are the tools that may be needed to replace fittings, and also all the necessary greases and oils.

Chairman Reed: Any other questions? Gentlemen, I am sure it has been a pleasure to be here this morning. We want to thank you for your undivided attention and for your consideration of these papers. I will now turn the meeting back to your President.

President Weir: Mr. Reed, Mr. Hall, Mr. Shaffer and Mr. Conway, we are deeply indebted for your participation in this morning's program. Your papers have been exceptionally interesting. I think it is quite apparent that the standards of loading machine performance which have been established in Illinois could never have been reached without the thought and experience and willingness of men such as yourselves, and the understanding with which you have explored these questions so thoroughly.

We now will have a report from a special committee which was appointed in accordance with a motion adopted on the Boat Trip last summer. The name of this committee is rather lengthy, but is as follows: "Committee on Scientific Studies of Physical Conditions and Improved Practical Analyses of the Hazards of Coal Bed and Adjacent Strata which Affect Safety in Coal Mining of Illinois." Mr. John E. Jones is Chairman of the Committee, and I will call him to the mike to make his report. Mr. Jones.

REPORT OF COMMITTEE ON SCIENTIFIC STUDIES OF PHYSICAL CONDITIONS AND IMPROVED PRACTICAL ANALYSES OF THE HAZARDS OF COAL BED AND ADJACENT STRATA WHICH AFFECT SAFETY IN COAL MINING OF ILLINOIS

Mr. President and Members:

Your committee,

Mr. James McSherry, Director,
Department of Mines and
Minerals, Springfield, Illinois

Mr. Charles A. Herbert, Supervising Engineer, United States Bureau of Mines, Vincennes, Indiana

Dr. Gilbert H. Cady, State Geological Survey, Urbana, Illinois

Prof. Hugh P. Nicholson, Mining Department, University of Illinois, Urbana, Illinois

and the chairman, John E. Jones, Old Ben Coal Corporation, West Frankfort, Illinois

expresses appreciation upon the honor of appointment upon this important committee which has as its job the problem of reducing hazards from falls of roof and sides in coal mines, such problem to be studied scientifically. The job is similar to that in Great Britain when in 1813 the Sunderland Society was organized in an effort to give coal mining men an understanding of the menace of the fire-damp, a hazard but little understood and having no means of discovery except by ignition. The Sunderland Society at once employed Sir Humphrey Davy, a leading scientist. Within three years the Davy safety lamp was invented as well as two

others, the Stevenson and the Clanny. In test of the Davy lamp Mr. Buddle, a mining expert and one of the committee to test the lamp, stated, "To my astonishment and delight, it is impossible for me to express my feelings at the time when I first suspended the lamp in the mine, and saw it red hot; if it had been a monster destroyed, I could not have felt more exulted than I did. I said to those around me, 'We have at last subdued the monster.'"

The "monster" of falls has not been subdued. He is still at large killing approximately the same percentage as when our grandfathers were in the mines. The practical mining men of three centuries have failed with this hazard. In a measure your committee desires to follow the course taken by the Sunderland Society and endeavor improvement through scientific effort.

In general the plan is as follows:

- (1) Expenditure by the Institute in a fellowship or otherwise in effort to
 - (a) Find improved practical means of roof and rib testing
 - (b) Ascertain and record fundamental facts upon present system including "sounding" of roof and ribs, such to become information of added knowledge on these hazards

- (c) Development of simple apparatus to illustrate cause of roof "sound" and variations in quality and tone
- (2) Preparation by your committee upon geological structure, explaining roof hazards and their many variations
- (3) Preparation of text book to include
 - (a) Findings of fellowship
 - (b) Explanation of "sound-ing"; why rocks ready to fall often sound solid. Graphic descriptions on the principles of sounding
 - (c) Geological structure and relative values of strength of different rocks. Slips, kettlebottoms and vertical breaks showing cause of solid sound though extremely hazardous
 - (d) Questions and answers upon the subject suggestive in usual examinations for certificates for miners, examiners and bosses

Your committee desires abbreviation in its name when spoken, this to be "The Roof Hazard Committee."

Your committee has agreed that the chairman make the following motion:

That this Institute set aside \$5,000.00 of the money now in its treasury to be used in a fellowship, part time professorship and/or other means for improved technique of present methods of roof hazard inspection, towards better and more certain means of loose rock determination and greater knowledge to the miners of the geological and excavation causes of falling roof and side hazards, the money to be used by your committee with the consent

of the president and executive board of our Institute.

Respectfully submitted,

John E. Jones,
Chairman.

I therefore, Mr. Chairman, make this motion.

President Weir: You have heard the report of the Roof Hazard Committee, the Chairman of which has made a motion. I haven't heard any second.

Mr. A. G. Shaffer (Chicago, Wilmington & Franklin Coal Company): I think these falls of roof in the mines have been one of the principal things that have caused us more worry than anything else besides the fall of the coal itself. I would like to second that motion, because I think it is a very, very important subject we must give consideration.

President Weir: Gentlemen, it has been moved and seconded. Will the Secretary please read the motion?

(Whereupon the motion was read by Secretary Schonthal.)

President Weir: Is there any discussion? Vice-President Adams, will you take the Chair for a few moments, please?

(Whereupon Vice-President Roy L. Adams assumed the Chair.)

President Weir: Mr. Chairman, I am very much in favor of work such as was outlined by this committee. I think it would be of great value not only to the industry of Illinois and of this nation but world-wide. However, I wish to call your attention to several things.

Mentioning this publication when writing Advertisers puts friendship into business.

The Institute has no \$5,000. Our current cash position is with approximately \$1,000 or \$2,000. Our income exceeds expenditures by approximately \$1,000 yearly. Of the \$10,000 of which you heard this morning as being invested in bonds and life membership, the income is available but the principal is not available.

I sincerely believe the Institute should lend its moral support to the program which Mr. Jones has outlined, but I do not see how the Institute can obligate itself to finance these matters suggested by Mr. Jones.

Vice-President Adams: Is there any further discussion on this motion?

Mr. T. J. Thomas (Valier Coal Company, Chicago): As I understood the report of the Committee and the motion that has been made, it contemplates the study deals specifically with Illinois mines. Is that correct?

Chairman John E. Jones: Yes. We are going to deal with them in our study, but it is to cover mining in general.

Mr. T. J. Thomas (Valier Coal Company, Chicago): I would like to ask, since there are representatives here from the United States Bureau of Mines, if the appropriation made by the last Congress in connection with the activities of the Bureau of Mines, does not cover rather detailed studies of this and if it could be arranged to have a man selected that would carry on this work as a government agency, and if that would not accomplish the thing that the committee has in

mind rather than obligate the Institute to an expenditure of some \$5,000 which our President has indicated is not available. I suppose the committee has given some thought to that. I would like to know just what conclusion they have arrived at.

Vice-President Adams: Will Mr. Herbert or Mr. Forbes reply to the question of Mr. Thomas?

Mr. C. A. Herbert (Bureau of Mines, Vincennes, Ind.): Mr. Chairman, I am unable to answer the question that Mr. Thomas has asked. I do not know whether the Bureau of Mines is at the present time contemplating such study, nor am I in a position to say whether or not the Bureau would undertake such a study. That is a question that would have to be taken up, of course, with the director of the Bureau of Mines. But I do feel the Bureau of Mines would be very sympathetic and would be very glad to cooperate in any way they can. Perhaps Mr. Forbes may be a little more conversant with what the Bureau is planning and undertaking along that line than I am, and possibly he can clear it up a little better.

Mr. J. J. Forbes (U. S. Bureau of Mines, Pittsburgh, Pa.): Mr. Chairman, I am sorry I am not going to be able to enlighten Mr. Thomas very much on that. I do know this, that several years ago the Bureau did some quite extensive work in our experimental mines on this very proposition. But when the cut came in 1923, the work was cut.

I think there is a little continuation of that work going on now under Mr. Greenawalt. I am unable to tell you whether or not the money

has been definitely and specifically laid out for just that particular program. As I recall, it is more along the line of mine subsidence.

Mr. Herbert has expressed my sentiments exactly, that the Bureau of Mines is solidly back of this and it is up to this institution to get in touch with the director of the Bureau of Mines and see if we can bring something to light on it. I am in thorough accord with Mr. Jones' report, that there has been little or no progress made in preventing death from falls from roof and coal over a large number of years. We have made substantial progress in the promotion of safety so far as death from explosion disaster is concerned, but there has been little or no reduction in the percentage of fifty or sixty of all lives lost being from falls of roof and coal over the past number of years.

I think it is a very, very important program for this Institute to get back of, and if necessary, as I say, write to the director of the Bureau of Mines and see if we cannot get something accomplished along that line. I think it is a real move.

Mr. T. J. Thomas (Valier Coal Company, Chicago): Mr. Chairman, I do not want to forestall the adoption of this resolution at all. That isn't the thing that is in my mind. But it does seem to me and I would like to suggest, not as an amendment but simply a suggestion to this committee, that the committee confer with the director of the Bureau of Mines and find out if there is not some way in which the Bureau may be able to set aside a reasonable sum in order to accomplish the thing the committee has in mind. Or it may be that the two may collaborate and work together in finding the answer to some extent in this problem.

I do not think it is altogether proper, until we have delved into it with the Bureau of Mines, for this Institute to assume the entire expense. That is a large problem, and we are all heavy taxpayers and are taxed to the limit. In many of these corporations today which we represent we are paying out three or four times as much in taxes as the stockholders are able to earn on the property. I would like to suggest the committee discuss this with the United States Bureau of Mines. It certainly is an important problem.

Mr. William R. Chedsey (Missouri School of Mines, Rolla, Mo.): May I second the suggestion Mr. Thomas has made?

I happen to know the Bureau of Mines has rather recently picked up some of the work it started some time ago. I cannot say just how much, but the information came to me in this way. We have a man on part time investigating work of this nature, and he reported that he was corresponding with the Bureau of Mines so that they would work together on it rather than duplicate unknowingly each other's efforts on it. I think it would be an excellent idea for the Illinois Mining Institute, and for that matter any other institute that could see their way clear to help, join in a cooperative movement with the Bureau of Mines in this important work.

Mr. T. J. Thomas (Valier Coal Company, Chicago): Mr. Adams, I would like to say one more word. It has been my experience that when you undertake to write a letter to any agency—not the Bureau of Mines in particular—it is easy to answer the letter and say "We will do this or that." I would like to suggest to this body that the reso-

lution—I understand Mr. Jones is Chairman of this committee?

Vice-President Adams: Yes, sir.

Mr. T. J. Thomas: That this Institute authorize Mr. Jones to go to Washington and to confer personally with the director of the Bureau of Mines, and that we pay his expenses to and from and while at Washington.

Vice-President Adams: Is that in the form of a motion?

Mr. T. J. Thomas: Yes, I will make that as a motion, Mr. Chairman.

Mr. M. M. Leighton (State Geological Survey, Urbana, Ill.): I want to arise to second this motion. And in seconding it I would like to make a few remarks.

As we all know, this is a very complicated problem. The reason why progress has not been made such as should have been made is probably due to that very fact.

In attacking this problem, there are various lines of attack to be made. One of those lines of attack is the study of materials with which we are concerned. There is information to be gained from the standpoint of the strata. Of course, the coal bed itself, but also the underlying material and the overlying material. A knowledge of those materials is essential. We know how they vary. Therefore, that study calls for geologic studies, and it also calls for a study of the mineralogy of the materials that underlie the coal and that overlie the coal which are responsible for the properties of those materials.

And in seconding this motion, I simply want to say this, that in this study you may be assured of the hearty cooperation of the State Geological Survey, which probably has more information in regard to geology than any other organization, but which is yet insufficient, and the Survey is willing to lend its efforts to that phase of the study. I thank you.

Vice-President Adams: The motion has been made and seconded. There is a prior motion still really before the House. I am going to call on Mr. Jones just at this time that we may dispose of the first motion.

Chairman Jones (Special Committee): Mr. Chairman, as Chairman of this committee I am pleased to postpone the motion, or possibly to set it aside, hoping or feeling we have done something, feeling some progress has been made toward this important problem.

It isn't necessary to tell you boys that no progress has been made in general. There has been specific progress made in certain mines and certain companies. I feel as though your committee has been successful in bringing forth the interest that has been manifested here this morning.

We have, as I told you in the report, been digging coal for three centuries, and possibly the very first safety act of the first fellow who opened up the first hole in the side of the mountain was to know how to sound that roof and how to sound it just about as well as we do now. We haven't progressed one iota in some respects, and I think we have gone backwards. Possibly that stone-age man had some sense, possibly a sixth sense, in knowing the hazards from sounding.

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I do know this from my study, that there is a lot of sound-deafness just as there is a lot of color-blindness. I am positive from my study of this subject, and especially the most recent study I have given it, that there isn't anything in connection with coal mines about which we are quite so ignorant as sounding roofs. We know almost nothing about it.

Examinations for Certificates of Competency carried on by the State and by the Federal Government are upon everything else but roofs. Yet roofs and sides kill fifty-five percent of the men. There isn't one question about it except "Will you sound your roof?" just as though it were understood, just as though it were simple to know about the roof.

I have examined accident after accident in which the rock was solid. In fact, I have examined more fatalities where the man was killed from the solid rock apparently than where he was killed by the bad rock.

So I repeat, Mr. Chairman, I am glad interest has been manifested here to the extent it has been. As Chairman of this committee, I feel as though I am authorized to accept that which has been presented, and that this committee will still function.

Vice-President Adams: I think perhaps all that has been said merely reminds all of us of the real seriousness of this question of roof falls. I do not think any of us have said anything particularly new, but it has tended to remind all of us of the seriousness of this undertaking which was put on the shoulders of this committee. I feel that this committee is taking their job seriously.

I want to present the last motion, since the first has been withdrawn, if there is no further discussion. Is there any further discussion before

the motion is put? I think it is not necessary to repeat the motion. Do you understand it? It amounts simply to this, a little bit of encouragement to this committee to continue its work. I am sure that it is not going to be completed within the next calendar year nor the next. It is something, I think, that is of sufficient importance that it might engage the attention of this committee or at least a committee of this Institute for a long while. There is a great deal to be done. Nobody will deny that fact.

Are you ready for the question?

(Whereupon said motion was unanimously adopted.)

Vice-President Adams: I think that concludes the program for the morning session. Therefore, we will recess until 2:00 o'clock this afternoon.

(Whereupon, at 12:20 o'clock P. M., a recess was taken until 2:00 o'clock P. M. of the same day.)

AFTERNOON SESSION

2:00 O'clock P. M.

Vice-President Adams: Gentlemen, will you please come to order?

Secretary Schonthal has a telegram which he wishes to read at this time.

Secretary-Treasurer Schonthal: This wire is from Washington, D. C., addressed to Paul Weir, President, Illinois Mining Institute. It says:

"Greetings from the American Mining Congress to the Illinois Mining Institute in Forty-Seventh Annual Meeting assembled. Your Institute has always been a most constructive influence for the development of greater safety and efficiency in the art of min-

ing coal. The American Mining Congress is wholeheartedly with you in this effort which means so much to the future welfare of our great industry.

Julian D. Conover,
Secretary."

Vice-President Adams: Now, gentlemen, we have rather a full program for the afternoon. In order that we may get along with it and not be late, and also get the full benefit of it, we want to proceed with as much dispatch as we can.

The first item on our program this afternoon will be our retiring President, Mr. Paul Weir, who has some matters in reference to his stewardship during the past year which he wants to speak briefly about at this time.

President Weir: Mr. Chairman and gentlemen, at the Annual Meeting last year I somewhat facetiously said if I could not find any constructive work or any work more constructive for the Institute to do, I would propose to the membership that they finance a home for the old and decrepit purchasing agents who compose our Advertising Committee. However, the Officers of the Institute have worked on several projects which I am quite certain will materialize in the immediate future.

First, I might tell you about the meeting had here in Springfield yesterday with representatives of the State Department of Mines and representatives of the Federal Bureau of Mines. The subject of the discussion was Ways and Means for District and State-wide First Aid Meetings, a thing which our Officers believe would be very effective in reducing the number of accidents in the mines of the State.

Out of this meeting yesterday came a committee, composed of Mr. McSherry, who is Director of the Department of Mines and Minerals of the State of Illinois, Mr. Charles Herbert representing the United States Bureau of Mines, and Mr. Roy Adams, the incoming President of the Illinois Mining Institute. The duties of this committee are to work out a program which would start off during the coming year.

Another thing which your Officers have had under consideration has been closer cooperation between the Institute and the Coal Mining Engineering Department of the University. This has not taken sufficient definite form to permit a report, but the deans of the College of Engineering and others have expressed their interest in the industry and in the work of the Institute, and the Institute is naturally interested in the University. I think sufficient progress will be made in a very short time to present something definite to you on that.

The third matter on which some work has been done is the question of vocational education by means of night schools throughout the mining areas of the State. The State of Indiana has gone quite far with their vocational educational program. I do not believe there would be any difficulty in financing such a program. I understand there is legislation, both Federal and State, which covers it. It is a question of someone getting behind the matter and pushing it through to a conclusion. The Officers of the Institute feel that comes very plainly within the scope of the Institute's activities. While I cannot report anything definite to you yet, it is a matter which will receive the continued attention of your officers.

I thank you.

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EXTEMPORANEOUS REMARKS AT MEETING OF ILLINOIS MINING INSTITUTE, SPRINGFIELD, ILLINOIS, NOVEMBER 10, 1939 *

By J. J. FORBES

Supervising Engineer, Safety Division, Federal Bureau of Mines,
Pittsburgh, Pa.

Vice-President Adams: I attended the meeting yesterday afternoon at which this matter of first-aid methods was discussed. Mr. J. J. Forbes, of the Federal Bureau of Mines, gave us some very helpful and valuable information. I know he does not expect to go into as much detail as he did at yesterday's meeting, but I do want him at this time to outline in a general way the picture of first-aid work which he gave us yesterday. Mr. J. J. Forbes, of the Federal Bureau of Mines.

Mr. J. J. Forbes (Federal Bureau of Mines): Mr. Chairman and gentlemen of the Institute, I am very happy to be here with you. This is the first opportunity I have had of attending meetings of the Illinois Mining Institute. However, from reading the proceedings of your annual meetings and from reports from our Mr. C. A. Herbert, I know that your Institute is doing real constructive safety work for the Illinois coal-mining industry. It is a pleasure to be here and to meet a number of old friends whom I have not seen for some years.

Yesterday afternoon I attended a meeting called by your president, Mr. Paul Weir, for the purpose of discussing the feasibility of starting

annual first-aid contests in the State of Illinois. Representatives were present from the State Department of Mines and Minerals and from the University of Illinois, also a number of coal-mine operators. At this meeting I related in some detail the methods used in other States to create and maintain interest in first-aid contests. All those present were favorably impressed with the idea of promoting such contests in Illinois. First-aid contest work has been carried on for many years in our coal-mining States, and there is no question that the contests have been a splendid medium for forwarding safety in coal mining.

We have men in this audience who have done much work along that line, among whom I see our good friend, Mr. W. D. Ryan. During the many years that Mr. Ryan was with the Bureau of Mines he spent a large part of his time in promoting first-aid contests as a part of his safety activity. You have on the program this afternoon Mr. Eugene McAuliffe, President, Union Pacific Coal Co., who can tell about the fine work being done at its properties at Rock Springs, Wyoming. Mr. McAuliffe's company holds an annual contest each year, and I know a great deal of good is derived from these contests.

What I am going to say this afternoon is intended not to belittle the splendid work you people have been doing here but to call your at-

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tention to some of the work being done in our eastern and other States. I do not think I will have to "sell" any of you men on the value of first-aid work. We know definitely, after over 25 years of experience with first-aid training, that such training is good accident-prevention insurance and that every company should have first-aid training as a part of its accident-prevention work. We also know—and this is a strong statement to make—that a person trained in first aid is less likely to be injured than one not so trained. I can back up this statement with sufficient information to answer any "doubting Thomas" who may question it.

In the meeting yesterday I was very much impressed with the interest displayed by the Institute and the State mining department in working out some scheme whereby this State can have district first-aid contests and culminate the district contests with a State contest. I think this is a fine move, and I hope the Institute will go on record to follow it through.

For a number of years West Virginia has carried on first-aid contest work. I have attended the contests in West Virginia for the last 12 or 14 years. I am not going into detail as to the fine work that is being done other than to tell you that effective accident-prevention work is resulting from these contests, as well as from those held in other States.

I attended a contest at Jackson's Mill, West Virginia, this year where about 46 teams participated. That is only one of 12 district contests held throughout the State of West Virginia. At least 10,000 miners and their families attended that contest, and there is no question but that each one of them carried away some safety thought.

Within the past few years the Pennsylvania bituminous fields have started these first-aid contests. Last year five district contests were held in the bituminous region of Pennsylvania. These culminated in a State contest in which the winning teams, the best teams from the districts, participated. This year we had four district contests throughout the bituminous fields of Pennsylvania. I think that about 170 first-aid teams participated in the splendid district contests, and of that number 20 percent, or approximately 33 teams, participated in the final contest.

We know that much good is derived from these contests, and I hope you people here and the mining institute will get back of it, get back of the State mining department, get back of your Bureau, and your officers here and push this work so that you can conduct these district contests and culminate them with a State contest. Later, when the Bureau has more money, maybe we can have an international contest, as we had in the past. The last international contest was held in Louisville, Kentucky, 8 or 9 years ago.

That is about all I have to say other than to express again my appreciation for being here. It has been a great pleasure, and I hope to come back and see you again. I thank you.

Vice-President Adams: The subject we had up for discussion just at the close of the morning session seems to be creating so much interest that we felt we should take this opportunity, because we will not have the opportunity at every meeting of this Institute, to hear from one of our number who has done through his own efforts and his own organization an outstand-

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ing work in accident prevention in coal mines.

I want at this time to ask Mr. Eugene McAuliffe, President of the Union Pacific Coal Company, to speak to you briefly, particularly concerning the work of his own company and his people and himself in the prevention of mine accidents. Mr. McAuliffe.

Mr. Eugene McAuliffe (Union Pacific Coal Company, Omaha, Neb.): Mr. Chairman and gentlemen, I would like very much to keep off of the personal side of this thing, because I am very fond of giving the credit for our safety performance to our men, there is a certain motive back of this. It always shocks me to hear of a man receiving a severe injury, and we never lose a man on the property without my thinking in terms of the agony suffered by his wife and children, if he has such, and his parents and relatives.

Then there is the dollar-and-cent side of mine accidents, I think we are justified in taking an interest in that. There is just as much propriety looking after the dollar-and-cent side of the accident situation, as there is in looking after the cost of haulage, or timbering or machine maintenance, such as was discussed here very ably this morning.

In the first place, with respect to roof control, which still creates more than fifty percent of all coal mine accidents, I think one precaution is essential, and that is adequate timbering. Personally I do not take sound tests very seriously. In the first place, we do not employ men because of their acuteness of hearing, and we do not train them in matters of sound. Furthermore, we are all using machinery underground, and it has been commonly held by

men who oppose the use of machinery that such makes a substantial addition to the number of accidents. If we are going to use machinery most of the time, why try to listen to some earth movement that may antedate a fall?

Some years ago I asked the Director of the U. S. Bureau of Mines to send us someone to tell us how to timber our mines. I wanted expert advice. The Director sent two men out, who were not previously known to me, and I later wrote a rather sharp letter telling the Director that their recommendations were of no value, and no good to us at all. He then sent Mr. J. W. Paul, who remained on our property for some time, working out with our men a system of timbering which we are using with very few changes today. That has been a tremendous factor in reducing roof falls on our property. We still have difficulties with falls from the face, where we are mining as much as twenty-six feet above the floor.

As to the reduction of accidents in general, I am very much concerned about roof and wall situations, but am really more concerned about all accidents. I do not know whether it makes much difference to the man if he is killed by mining machinery or by a fall of roof. At any rate there usually is a widow and children involved, and an inquest is held in most cases.

Our ambition is to get away from all possible accidents, and when I say to you we now suffer but one accident to the eight that we had a few years ago, I think I am justified in saying our plan has been at least partially successful. This plan is that of invoking the interest of the men in their own safety. We have done that by indirection, but it has apparently been done.

Another thing is that we measure our accidents by man hours of exposure, which includes all the various conditions we find including thin seams and thick seams, good and bad roofs and all that. We have everything in our mines that are found in the ordinary coal mining district, plus pitching and badly faulted seams. In the first ten years I was on the property, we had a record of a lost-time accident for every 15,973 man hours of exposure, an appalling record, to my mind, and I could not budge it for ten long years. Then suddenly things began to pick up. Last year we had 103,172 man hours, and so far, for the first ten months of this year, we show 125,300 man hours per lost-time accident. I am not guaranteeing that we will succeed in keeping this record, but we are making a desperate attempt to hold the line.

These results came about by our successfully invoking interest on the part of our men. Looking back fifteen or seventeen years, I can recall trying a thousand different things. In the last analysis we resorted to a lottery arrangement that every man could participate in, recognizing that every man is instinctively a gambler. When any one of us exceed sixty miles an hour with our automobile we are taking a big chance. When we buy one hundred shares of stock in some industrial corporation we take a chance. We take a chance on everything, even when we court our wives. Some of us at least know that.

Now, we on the property undertook to secure the interest of the men by a measure of indirection, in substance by putting up a lottery. We put up two automobiles to be raffled off at the end of the last six months, in 1932. Every

man who went through that six months without a lost time accident was promised a chance. We have carried on that plan, having experimented and changed it around as experience demonstrated, until we have our accidents down to where, mining about three million tons of coal in ten months, we had but twenty-two lost time accidents, one of which was a fatality. We do not differentiate very closely between a fatality and a major non-fatal accident, for there is practically but a second of time and perhaps but four inches in distance at times between a fatal and a non-fatal accident. If you eliminate the non-fatal accidents you will stop the fatal accidents.

I want to mention two or three elements that might be of interest in connection with the program discussed here yesterday. In the first place, there is no use in trying to invoke the interest of the men in the old conventional way, unless you are willing to wait perhaps a half century for results. You must do something different to induce the men to try for safety. There is no man so poor in temperament or background that he is not influenced by the conditions that affect the welfare of his family. When a man gets to that point he leaves the family.

We started to organize Boy and Girl Scouts some years ago, finding that one local passed a resolution against the Boy Scouts, saying they would be used some time to shoot the miners down. We paid no attention to that but went ahead and organized the girls first, that being the line of least resistance. Last year we had Boy and Girl Scouts who competed for First Aid prizes. They have sold the idea to the family, in the home, to the mother and the other children. It

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helps to satisfy the complex of the mother and the father, to have a bright child in the family, and that has been a tremendous factor toward safety.

That is one of the things you might do in your mines. Organize Boy and Girl Scout teams, have them trained under Bureau of Mines' rules, and get up contests. More people will come to see the children perform than they will to see the men. It becomes a routine matter to see the men go through these performances, but it never does with children.

May I say to you we have reduced our compensation payments for accidents more than fifty percent, and that in the face of the fact the measure of the awards due to amendments made to the State Compensation Law have increased about one hundred percent. Our awards averaged but one cent per ton last year. Check that record up with the other companies in Wyoming and the other States and get your comparison.

I would like to again make the personal appeal I have made many times, to the managers of coal properties to take more interest in safety. I wonder if there aren't too many men in the industry who fail to maintain a broad contact with their operating force and their men? We must get out on the job, and when we do, if we take the proper interest in those things I have mentioned and a great many more I could tell you about, we will begin, as an industry, to get results. Anyway, I believe that the element most lacking in the operation of our coal mines today is safety and that can only be attained by getting into the spirit of the thing.

Let me say another thing that may also seem selfish. When you

build up the morale of your men from the standpoint of safety, you have built it up from the standpoint of efficiency, and that represents dollars and cents and may represent the difference between success and failure.

Frankly, I believe you have worked out splendidly (with the help of the commercial manufacturers) the matter of clean coal, and so forth. Marketing has not yet been reduced to the exact science which preparation has, perhaps Illinois has led in preparation. You are now fully mechanized underground, and are consuming today as much electrical power and man power as you can comfortably consume. The most fertile and the least unexplored field today is the man and the human soul. Don't mix my remarks up with any Spiritual movement. I am not thinking in terms of that, but I am thinking in terms of bringing to the surface the splendid things that unfortunately lie dormant in too many mines, because of the lack of understanding and cooperation in the treatment we give them. I thank you.

Vice-President Adams: Thank you very much, Mr. McAnuliffe.

Without any lengthy introduction whatever, I want at this time to ask Dr. M. M. Leighton, Chief of the Illinois State Geological Survey, to tell us about their building program in the mineral industry.

Dr. M. M. Leighton (State Geological Survey): You have all seen the photograph on the bulletin board on the outside of the new Natural Resources Building that is in course of construction, and has now reached the stage where the steel for the roof is being put on.

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When I think of that building, I think of the Illinois Mining Institute, and in that relation am reminded of the story of the young man who, in one of his college courses, took an examination just before Christmas, and there was one question that was asked which was a very long, complicated one. He could not answer it, and he replied on his paper by saying "God only knows. I don't. Merry Christmas." When he went back to get his grade, he found written on the paper, "God, 100%; you, zero. Happy New Year."

I feel that way with regard to this building. It never would have been gotten without the help of this Institute. When I think of the work Mr. Jenkins, Mr. Thomas and the rest of you did, it is tremendous. It has been an uphill business.

When I say it will be a fine building, I am not talking about the picture of it but the facilities in the building. They are equipping us to do some work for you in return for the compliments you have expressed.

We expect to get into the building next May, and about a year from now we expect to have an opening. I have gotten up here to extend to you men an invitation to

participate in that dedication one year hence.

Vice-President Adams: Thank you, Mr. Leighton.

We have come now to the stated portion of our program. The first paper to be presented is perhaps not a new subject at all. I have an idea there may be some new ideas, but the subject is old. We will have a paper "Factors Influencing Blasting," by Mr. John L. Romig, Technical Engineer of the Atlas Powder Company, Wilmington, Delaware.

Mr. John L. Romig (Technical Engineer, Atlas Powder Co., Wilmington, Delaware): Mr. President and gentlemen, this paper I have prepared is possibly more or less of a general nature, but it contains some of the things which our men have encountered in running tests and making an investigation of complaints, and I thought a sort of a summary of the things they have found which improved the product of coal might be of general interest to you. Possibly some of the things are well known to you. Like a lot of other things, I imagine there are some of those things here which perhaps you have known but haven't paid as close attention to as you might have.

FACTORS INFLUENCING BLASTING

By JOHN L. ROMIG

Technical Engineer, Atlas Powder Co., Wilmington, Del.

While visiting coal mining operations of all sorts and classes around the country during the past few years, I have had an opportunity to notice how things are done in different places by different people. Later, while working in our laboratories, it was possible to confirm by investigation the reasons for the success of some of these practices developed by operating men on the job.

Naturally, many of these practices are good for only one set of conditions. But many are applicable, with minor adaptations, to most situations.

Basically, I have noticed that in the more progressive coal mines, safety and efficiency are considered inseparable. The newest equipment is recognized as the most efficient, and the safest. Keeping it in first class condition is known to be profitable and safer. The safest methods of work are considered the best for safety has been found to be sound business which pays its way in good-will and reduced overhead. Supervision is called the key-stone, for the best laid plans go wrong when the executive will to safety and efficiency gets lost at the face.

In choosing an explosive and in determining or correcting methods of procedure, the physical properties of the material to be blasted are of fundamental importance and vary widely. There are those seams of coal which are easily broken down into beautiful, big blocks. On the other hand, some seams are difficult to get out in any satisfactory condition.

It takes careful observation and study to select the right grade of explosive. However, even after it has been selected, differences of opinion may develop regarding the merits of that certain grade—which is usually where the sales representative calls in the technical man. These differences often resolve into certain specific operating or safety problems.

For example, the work an explosive does is influenced to a degree by some or all of the following factors:

- 1—Diameter of Cartridge.
- 2—Loading Procedure.
- 3—Drill Hole Diameter.
- 4—Stemming and Tamping.
- 5—Cutting Methods.
- 6—Bug Dusting.
- 7—Cushioning or "Space Shooting."
- 8—Method of Priming.

DIAMETER OF CARTRIDGE

Cartridges of larger diameter than the basic $1\frac{1}{4}$ x 8" size have certain advantages. The charge may be concentrated at the back of the bore hole. This means that a smaller area of coal is in direct contact with the explosive, and fines are therefore reduced. In addition, larger diameter cartridges generally stand up better under long storage. Also sensitivity is better in large sizes of any given grade than in the small sizes.

However, there is one very important, and perhaps not too well-known characteristic of explosives which must be considered when the

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merits of a grade of explosive are being discussed. The velocity of all explosives tested to date increases when cartridge diameter is increased. Velocity also increases under confinement. The rate of velocity increase depends upon the grade, and all grades do not show the same rate of increase.

Naturally, this characteristic is important in selecting the right explosive for the job. It is equally important when considering performance.

LOADING PROCEDURE

It is not uncommon to find a shot-firer in one section of a mine slitting the cartridges and tamping them firmly in the bore hole, while in another section of the same mine cartridges are loaded intact and simply pushed into the back of the hole.

The first man, in effect, is increasing the diameter of the cartridge to that of the bore hole as he tamps it back with his tamping stick.

Remembering that velocity increases as confinement and diameter increase, one would naturally expect different results from these two different procedures. As a matter of fact the coal often will look as if brought down by two different grades of explosive.

DRILL HOLE DIAMETER

Another factor that can make an explosive act like a different grade is variation in the drill hole diameter. In some cases variations have been as much as $\frac{1}{2}$ " to 1" from one section of a mine to another.

If the depth of a drill hole is kept constant the volume varies as the square of the diameter. In other words, a drill hole having a diameter of $1\frac{1}{2}$ " would have a

cross sectional area of 2.25 square inches, but a 2" hole has a cross sectional area of 4 square inches—that $\frac{1}{2}$ " difference in diameter almost doubles the volume of the second drill hole over the first.

Of course, this materially affects confinement. In the smaller hole the cartridge is a tight fit and is well confined, whereas in the larger hole the same cartridge has a good bit of air space between it and the coal and the effect of the blast is cushioned. The lesser confinement of the larger hole would also tend to keep the velocity of the explosive below what it would be in the smaller hole.

STEMMING AND TAMPING

Different types of stemming and different degrees of tamping result in varying amounts of confinement, which affect the action of the explosive.

Tamping bags that are too long and much smaller than the bore hole telescope or collapse when tamped so that only the first four or five inches are compacted and the remaining length is practically unaffected by the tamping stick. Such conditions may cause unintentional cushioning which would cause variation in velocity and possibly provide inadequate confinement. Proper diameter, shorter length tamping bags would remedy the situation, and would give the explosive a chance to work in a normal manner.

A British Bureau of Mines publication* lists the effectiveness of stemming materials in this order: sand, as the most effective; stone dust, second; clay, third—and water last. For practical purposes it also recommends the use of a mix-

* Stemming Materials Paper No. 84.

ture of three parts sand and one part clay. This has been proved very effective. The preparation and the use of proper stemming, in some localities, is something of a lost art, and it would not be amiss perhaps to review some of the main reasons for its very great importance, from both the efficiency and safety angles.

Stemming provides positive confinement, which means:

1. It prevents blown out shots and the possible projection of flame and hot gases into the surrounding atmosphere.
2. The amount of fumes is kept to a minimum.
3. It decreases the amount of explosive needed to do the work.
4. It keeps the amount of fine dust thrown into the air at a minimum.

It might be interesting in this connection to note that in Belgium they require the stemming to weigh five times as much as the explosive. In France the requirement is that at least eight inches of stemming be used for the first 3.6 ounces of explosive, and 2 inches for each additional 1.8 ounces.

Tamping should be done in a uniform manner. The general practice is to tamp the first dummy lightly, and the remaining dummies firmly into place.

Experiences of a Coal Land Holding Company

Recently I had an interesting conversation with officials of a coal land holding company. They had found their royalties were in direct proportion to the quality of the coal produced by the coal companies operating on their land. As

quality went down, so did their returns. Accordingly, they set out to find just what factors most affected the returns. Their investigation showed that the following factors definitely increased their percentage of lump coal: correct cutting, removal of all bug dust, proper placement and diameter of drill holes, and cushioned blasting. Incidentally, they had tested a great many grades of explosives and contrary to general opinion felt the grade used was of minor importance.

CUTTING METHODS

As all of you know, quality coal is produced only when the coal is properly cut. When the land holding company representatives raised the question in the different coal company mine offices, they were assured that all places were cut according to instructions. However, when they went into the actual working places they found the percentage of improper cuts was quite high. They attributed this to inadequate supervision or poorly trained machine runners. Some of the cuts were found to be pear shaped; others like trapezoids, parallelograms and all sorts of geometrical figures. As you know, it is almost impossible to locate the drill holes correctly in an irregularly cut place and produce a maximum amount of lump coal.

BUG DUSTING

These same land holding officials also found that very few places were thoroughly cleaned. A cut partly filled with bug dust is apt to prevent the coal from breaking down properly and allow for adequate roll. This usually requires hand mining to free the coal and means coal degradation. Moreover,

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ash content is likely to be higher in uncleaned cuts.

For these reasons they recommended that all working places in their mines be supplied with a long-handled shovel and special brush so that all cuts could be thoroughly cleaned.

Placement of Drill Holes

The location, depth and direction of drill holes frequently has to be modified to meet changing conditions. It is a problem that requires constant attention because of such variables as the coal seam, roof structure and method of loading. Here again, proper supervision is essential for results.

CUSHIONING

Cushioning reduces shattering and is a direct means of more or less controlling the explosive action.

Several methods are in use: one way is to use a cartridge of much smaller diameter than the drill hole—and another is to use some mechanical means of supporting the cartridge so that it is not in contact with the coal.

Several explosive companies have been doing considerable work with sheathed permissibles. The sheathing is inert material that adds greatly to the safety of fixed explosives. It cuts down both temperature and flame. This light bulky sleeve also provides a certain amount of cushioning. Naturally this is helpful in producing quality coal. In European countries sheathed explosives have been widely accepted primarily because of their additional safety.

METHOD OF PRIMING

You may feel that too much attention is being paid to small detail when I discuss which way the deto-

nator should be pointed. But it is important from a safety standpoint. There are two general ways of priming: direct and indirect and the argument is not settled yet as to which is the better.

Indirect Priming: with this method the cap is placed in the first cartridge at the back of the bore hole pointing towards the face. When shot there is a "directional projection of the products of explosion toward the face." In instances where sufficient stemming is not used, hot gases and possibly flame are expelled into the room. Such a condition might result in a mine explosion.

Direct Priming: the exploder is in the last cartridge to enter the bore hole, pointing towards the charge. Here the explosive wave and gases travel toward the back of the cut; they act like a gaseous stemming and reduce the gun barrel action of the bore hole.

From the standpoint of execution both methods have ardent defenders. Only tests and results can prove which practice is the better. It is a well established fact that the end of the detonator should always be pointed towards the charge since the cap end has a bullet like action. This method is recommended because it helps to prevent misfires.

Naturally there is much to say on many of these points for which I have not had time. The single impression I would like to leave in closing is that coal blasting is really not the simple operation it might seem at first glance. Much study has been given to it by explosive companies. Their representatives have had varied and wide experience. I feel sure both you and they would profit by close cooperation and by your providing for ade-

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quate supervision to see that the plans decided upon are carried out carefully at the face.

* * *

Vice-President Adams: Is there any discussion of this paper?

Mr. T. J. Thomas (Valier Coal Co., Chicago): I would like to ask this gentleman a question. Have you made any examination of the drilling and shooting of coal in Franklin County, Illinois?

Mr. Romig: No, I have not.

Mr. Thomas: I would like to ask you this. What have you found in your experience that is the most contributing point in the shooting of coal that will cause a crack in the roof?

(The Reporter could not hear the answer to this question.)

Mr. Thomas: Did I understand you to say with a given amount of powder, if extended out to one inch in diameter there would be a less velocity than if it were two inches?

Mr. Romig: That is right. That increase in diameter does not go on indefinitely. Our test has taken the two inch cartridge, and we have not gone much beyond that. I am speaking of the explosives used in mines. When you go from one and one-quarter inches to one and one-half inches you have a difference. When you go to one and three-quarters inches the increase is not so great. At two inches the increase is less, but that will vary with your grade of explosives, that is, the increase in velocity.

Mr. Thomas: What did I understand you to say with reference to

suspending the cartridge in the hole?

Mr. Romig: If your cartridge is suspended and is not in contact with the coal, consequently you will get a cushion of air and will not get that dust which some people attribute to the cartridge lying on the coal.

Vice-President Adams: If there is no further discussion, we will pass on to the next paper.

The next subject, I think, is one which has never been discussed before or by this Institute. The fact is I never heard it discussed, but it is a live question nowadays. "Sales Problems Created by Compensation Laws." Mr. Vaughan has, as many of you have done, made a close study of the Compensation Laws under which we have to live. Because he is the Sales Manager, it is natural that he has associated the effect of these laws and rules and regulations upon the sale of coal. Mr. Norvin H. Vaughan, District Sales Manager of the Consolidated Coal Company of Chicago, will present a paper on this subject.

Mr. Norvin H. Vaughan (District Sales Manager, Consolidated Coal Co., Chicago): Mr. Chairman and gentlemen, hearing these discussions about hazards, I was reminded about the story of the workman who went to a boss and told him he had to have a raise in salary because he had to get married. The boss told him he was sorry, he could not do a thing for him, the company was not responsible for accidents that happened off the company property.

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SALES PROBLEMS CREATED BY COMPENSATION LAWS

By NORVIN H. VAUGHAN

District Sales Mgr., Consolidated Coal Co., Chicago, Ill.

Obviously, the new Illinois Unemployment Compensation Act creates one outstanding problem—stabilization of employment. Authorities tell us that if sales departments can provide enough business to operate our mines three days per week through the summer months, the problem will be solved. Now, I have been told, facetiously or otherwise, that my job today is to tell you how to move January tonnage over into June, in other words, to tell you how to sell coal in the summer time! My answer to that is simply this—my name is Vaughan, not God. I love the classic answer of my friend, E. R. Keeler, when he was asked to write an article on how to sell coal in the summer time and replied that he did not know how, but that if he ever found out, he'd be damned if he was going to tell anybody else. I want to make it clear that I, too, am a seeker after light, that I accepted this tough assignment only for the purpose of leading this new discussion of an old subject that has been giving us hardening of the arteries for lo these many years, long before Unemployment Compensation Laws came along.

First and foremost, there is one fundamental question that must be settled, in fact, it is the cornerstone of our entire discussion. *Will the advantages of continuous operation be offset by the possible costs of accomplishing this?* I ask this question because it is in the minds of some of the leaders of our industry

in other states. Although I am not capable of answering this question, it is assumed that, so far as Illinois is concerned, our authorities are agreed that the proper answer is "No," that the advantages of continuous operation are very much to be desired.

Well, then, here are some figures which will show at a glance the size of this mountain we are going to move. Winter production (October to March) in Illinois shows a percentage of increase over summer production (April to September) which is extremely high when compared to the United States as a whole—only a very few states appear to have such a very lop-sided monthly production record:

		Excess of Winter Production over Summer Production
Year of 1929	Illinois	50.3
	United States	15.2
Year of 1931	Illinois	35.9
	United States	12.2
Year of 1934	Illinois	61.4
	United States	27.1
Year of 1936	Illinois	68.1
	United States	27.9
Year of 1938	Illinois	55.3
	United States	28.8

These particular years have been selected because they are fairly normal, represent periods when no strikes changed the trend and are intended to embrace boom periods,

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the bottom of the depression and the attempted recovery. There's our problem. We know that if two or more men stop in the street, start looking skyward intently, soon a large crowd is doing the same thing. If the commercial coal producers of Illinois will start looking upward, and inward, together, seriously and determinedly, we will surely achieve beneficial results and find an acceptable solution to some of our problems.

In Chicago, on January 20th of this year, the Illinois Coal Operators Association held an excellent all-day session on the Unemployment Compensation Act of Illinois as applied to the Illinois coal industry. The discussions made it clear that our operating departments have a heavy responsibility in establishing *internal* improvements and safeguards, as outlined in the carefully prepared papers of Roy Adams, C. W. Peterson, Kenneth Towler and others, all of which are available in written form and need no new emphasis here today. Right here, I want to inject two pertinent points brought to my attention by operators in other states which have had Unemployment Compensation Laws for some time. First, some of the miners in one of these states formerly sought employment in the summer months in the agricultural communities adjacent to the coal mines, but now Unemployment Compensation has removed the inducement for seeking this employment, the miners are drawing partial Unemployment Compensation Insurance and the farmers are confronted with a shortage of farm help during the summer season. Second, we should not overlook the unfairness of the Social Security Act in imposing payroll taxes to provide for unemployment benefits; coal is the

largest labor-employing industry of all the mineral fuels and using the payroll as a yardstick, the industry that is doing the most to cut unemployment pays the greatest benefits for unemployment.

After the operating departments have accomplished all they can, the *external* problems of the Unemployment Compensation Act are dumped right into the laps of the sales departments and of the public. Some way, somehow, we've got to hammer out those three-days-per-week-minimum-operating-time through the summer months. Since we have in the past not been able to accomplish that, it is obvious that old methods will not suffice—something new must be done. It is certainly kindergarten logic to say that since the patient is still ill, a new medicine must be provided, in fact, maybe a change of doctors in aggravated cases would be advisable. Economies in the use of its product cannot alone explain away the loss, by any industry, of forty percent of its position in the national economy in the last twenty-five years, yet that's just exactly what has happened to this ancient and honorable coal industry of ours.

Gentlemen, let's face the facts. It all simmers down to this, whether we like it or not—the coal industry as a whole has thus far done a poor job of merchandising, especially on domestic sizes which are the sizes that particularly get in our hair in the summer time. Somewhere along the line, we've fumbled the ball. This fall, I moved into a northern Chicago suburb and the vans had hardly driven away before we were courteously and efficiently solicited by the oil and gas man, besieged to buy electric water-heaters, sweepers, refrigerators and ranges, waited upon by

Buyer meets Seller in the back of this book.

the dairyman, the grocer, newspapers, cleaners, furniture and rug dealers, decorators, even by the garbage man, but, to this day, we have not heard even a whisper from a single coal man! And I am reliably informed that this is characteristic the country over, from Maine to California. Talk about selling coal in the summer time—I'm not so sure the industry knows how to sell it in the winter time! I might add right here that I had the gas burner taken out of my house and I am now burning coal although I am apparently the only one in the neighborhood who is using coal. Retail coal dealers provide our point of contact with the householders, yet we know that a regrettable percentage of retailers are poor merchandisers—dead from the neck up, over-developed in the region of the rumble seat and paralyzed in the feet. From an engineering, operating and production standpoint, bituminous coal has done a marvelous job. From the standpoint of sales, the cultivation of consumer acceptance and the fostering of proper, friendly public relations, the coal industry has, up until very recent years, been sound asleep. Along this line, here's the testimony of an outstanding coal executive, contained in a letter written me only ten days ago:

"I know of no special or particular efforts that have been made by selling organizations to level off the peaks and valleys of demand. I think sales executives are much the same the world over and I greatly fear that unless there is a great awakening in the future on the part of our selling forces, we shall continue to operate on about the same basis as we have during recent years."

And here's the comment of another executive, in an entirely different part of the country, written only a week ago:

"I am afraid that in many cases, the coal operators are careless in watching the quality of their coal, which results in a disposition on the part of coal users to try oil or gas. Oil is a standardized product, something like cement, and there is no difference between the quality of the oil being marketed by the several major oil companies. We feel that coal producers are unwise who are not constantly working toward a standardized and uniform product."

Perhaps our industry has been largely overlooking one outstanding fact—and I like to shout this fact from the housetops on every possible occasion—*The Buyer is King*. All that we do—preparation, sizing, new mines, new methods, everything—is predicated on satisfying the buyer and bringing him back for more. *Everything follows the sale*. True, the most capable sales organization in the world would come to naught without an efficient production department—the two go hand in hand—but after all is said and done, it is *sales* that provide the life blood of each and every company, large and small. Gone are the days when coal was merely coal, when the demand rolled right along and when slipshod methods sufficed. Times change—like the storekeeper who was asked, "What has become of the merchant who used to give his customer a cigar when he paid his account in full?" and who replied with the question, "What has become of the customer who used to pay his account in full?"

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And times in this coal industry are changing—we have ample evidence on every hand of an aroused and re-born industry, now fighting for its rightful place in the sun. Here are the words of Secretary Koepler of the Pocahontas Operators Association, in a recent talk at West Virginia University:

"We have been thrust into the economic situation in which we must work out our survival by research and education. We must find new uses for coal and tell the world about them. We are not in a decadent industry. We are entering a new era in coal."

One need hardly mention the importance to the coal industry of the development of the household and small industrial stoker—if most everything else has failed, these stokers would still be a life-saver for our industry. The growth of the stoker industry, in spite of the depression, has been far-reaching in effect and nothing short of spectacular. The consumption of stoker coals is now approximately five and one-half times what it was in 1932—three times what it was in 1935. I recently asked a few representative architects what, in their opinion, was keeping coal out of the new homes and buildings and, boiled down, their objections to coal were "the handling and dirt resulting therefrom." The stoker manufacturers are helping us change that and I understand some very important new developments are already under way. It is also tremendously uplifting to note the number of coal conferences, stoker schools, combustion schools and studies in utilization being sponsored by universities, schools, trade associations and individual groups. If a coal man, in any capacity, remains in the old-fashioned rut, cov-

ered up with dry rot, these days, it is simply because he is too lazy to bestir himself, to take advantage of his opportunities and at least catch onto the coat-tails of those hard-hitting, progressive souls who are definitely putting the coal industry back in the front rank. There are a lot of encouraging things taking place all around us.

A few weeks ago, the Utah Coal Operators Association announced an elaborate advertising campaign for four months to promote coal sales, using newspaper advertising, radio programs, posters for store windows, communications to all classes of consumers, architects, real estate dealers, etc. and other forms of advertising. Again, the retailers of Cincinnati are presenting the story of bituminous coal through one of the local papers, delivering to every home special advertising and they will personally see every builder of homes and contractor. Our own State Geological Survey is more active than ever in carrying on research work, developing new information on the nature of coal, how to improve the preparation and utilization of Illinois coal. Perhaps the happiest event of all has been the wonderful advertising campaign inaugurated by the National Coal Association, to instill a national consciousness in the minds of the country's architects and builders, operators of buildings, real estate men and millions of actual consumers, that bituminous coal is a clean, comfortable, safe and economical fuel. It is estimated that a total of seventeen million readers will be exposed to timely messages each month, or as planned, about seventy million messages between the first of January and September in 1940. The National, as part of its extensive program, also releases almost daily

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information and news about the coal industry that appear in hundreds and hundreds of newspapers from coast to coast. In the words of Executive Secretary John Battle, "The National Coal Association is determined to carry the message of bituminous coal to the American people."

Well, back to that problem of three-days-per-week-minimum-operating-time. To endeavor to find out what might be going on in other states in meeting the sales problems created by Unemployment Compensation Laws, I wrote key men in most all of the important coal-producing states. But I did not get much help, most of these men admitting frankly that they had not worked out their own salvation and that they would like to receive any suggestions we could give them. If time permitted, I should like to read all of these letters to you, but here at least are some of the high-lights:

State No. 1—

"Up to now, we have not been very successful in meeting these problems."

State No. 2—

"The industry as a whole is lagging behind in getting over to the actual consumers the real story of coal. The industry must, if it is to regain its rightful position, be willing to double and triple its advertising."

State No. 3—

"We have given this subject serious consideration and must confess that up to now we have not formed a solution."

State No. 4—

"The development and tipple capacity of our mines are sufficient to produce approximately

four times the quantity of coal marketed, this excess capacity being necessary to supply the demand of peak months. This over-development brings heavy financial burdens which of necessity keep coal prices up and this, in turn, affects the position of coal in relation to competing fuels."

State No. 5—

"We have done nothing to level up coal demand except lowering prices on domestic sizes beginning April 1st."

State No. 6—

"Buyers of coal have not learned to anticipate their demands and it is going to take a long time to educate these consumers."

Taking the answers as a whole, they indicated that about the only methods used to stimulate summer buying were (a) cut prices at the mines, (b) cut prices by the retail dealers and (c) advertising and sales programs, good, bad and indifferent, all of which met with varying degrees of success. One western company will work its mines practically full time and store the coal in the summer against winter needs; however, this will be accomplished by reducing the daily output by seventy-five to eighty percent and on a basis by which the annual output will be reduced by approximately sixty percent. To stabilize employment at a low level surely creates a bad situation and, of course, many mines have coal of a nature that will not store. One week ago today, the principals of six operating companies, located from the far west to the Appalachian group, discussed this serious problem and unanimously agreed that it cannot

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be overcome by the sales department of any one company alone, that it calls for a large scale program of solicitation, with very careful propaganda and collective promotion to get people to thinking about their interests in purchasing and having on hand a supply of something that they know they will need urgently when the winter months come.

This brings me to the main thing I desire to leave with you; forget everything else I have said if you must, but please let this stick. Repeating what I said at the Chicago meeting on January 20th, I suggest that we create

THE PUBLIC SERVICE DIVISION
of
THE ILLINOIS COAL OPERATORS
ASSOCIATION

This suggestion was discussed, generally approved, but so far has not been put into execution. It will be a simple matter to enroll associate or affiliated members who would participate only in the *Public Service Division* while having no connection with labor matters or other present activities of the Association. We need no new organization—we have enough already—but certainly we need a loud voice speaking authoritatively on behalf of Illinois as a whole, gathering up and making usable our collective brains, ideas and suggestions, working together to solve that problem of three-days-per-week-minimum-operating-time and accomplishing the scores of factors that will promote our common good, namely, the promotion of bituminous coal in general and of Illinois coals in particular. *There's only one way out—Better Marchandising, in all that the term implies.* When I first came up from

Missouri in 1929 into the Chicago and northwest territory, I was amazed to find that there are literally scores of towns, some of them large towns, located in what should be our normal market areas, where the retail dealers *do not attempt to handle a single pound of Illinois coals!* I should like to see a *Public Service Division* big enough, strong enough and militant enough to go to these towns, explain that we are committed to the policy of working with the established, equipped retail dealers, but warn them that, if they persist in keeping Illinois coals out of these towns, we are going to put in our own retail yards. “Wild idea,” you say? No, not wild—just plain horse-sense. There are many things such a Division could do to help us move January tonnage over into June, but I am going to take time to emphasize only three:

- (1) Our own State of Illinois, Uncle Sam himself and a great variety of political organizations or sub-divisions purchase huge quantities of coal. Certainly there is no reason on earth why they should not aid the coal industry by letting us put the wheels under some of their coal in the thin months instead of blindly following the old custom of waiting until October or November and then expecting huge shipments.
- (2) If you do not know it already, let me tell you that many political bodies in Illinois—municipalities, school boards, county commissioners, public hospitals, etc.—buy coal outside the State. Illinois money should be spent for Illinois coal.
- (3) Did you ever visualize the small army we have in the

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salesmen whose job it is to sell Illinois coal? What a force for good, for definite accomplishment, for putting a new face on old goblins this gang would be if wisely counselled, enlightened and guided to some extent by the Public Service Division instead of working under probably as many different ideas as there are companies.

This *Public Service Division* would not involve the slightest interference or change in any way in our established practices as individual companies, district groups or sales agencies; we have everything to gain and nothing to lose. Another thing—we as individuals, even as companies, are so covered up with affairs of the moment, in the multiplicity of things, that we have little or no time for quiet reflection. *Thinking* is free, but it pays big dividends. We need a state-wide *Public Service Division* to sort out the mass of material, to analyze new trends and developments, to interpret the signals of the future, to try to determine *Where* we are going and *How* and *Why*.

The Black Diamond of November 4th contained the following article which I only wish could be nailed to our walls and engraved in our hearts:

"Some day coal will come into its own, for it is the economic fuel of the nation. It needs only to tell its story to reap its reward. Its various leaders will forget their sectionalism; forget their self-interest; forget their competition within the industry. They will start on the job of fighting the battle of Coal against its competition. When they do, coal will start on the long road

back to its proper place in the economic scheme of things."

Fellows, I say to you that if we do not do these things, if we do not gird our loins and do some new things, some day the oil and the gas and the hydro-electric people will stroll through our coal fields, dig around in our remains and ask "*Whose Bones Are These?*"

* * *

Vice-President Adams: Are there any questions or any discussion? I am sure Mr. Vaughan has demonstrated he is equal to the occasion, if you have any questions to ask him.

Mr. Eugene McAuliffe (Union Pacific Coal Co., Omaha, Neb.): Have you given any thought to seasonal coal freight rates as an equalizer or stabilizer?

Mr. Vaughan: Yes, we have. We held a meeting on this subject in Chicago on June 21, 1939, under the auspices of the Central Illinois District Coal Traffic Bureau, of which I happen to be Secretary. We know that in Illinois, particularly in the central part of the State, there are many concerns that buy the bulk of their coal by truck, figuring that during the winter months when the highways are covered by snow and sleet and trucks cannot function, they can always get shipments by rail. It is manifestly unfair for the man who buys coal only two or three weeks out of the year to enjoy the same freight rate from a railroad as the man who uses coal shipped fifty-two weeks in the year by rail. The railroads were represented at this June 21st meeting and now have the matter under consideration, along with the coal producers. We feel that those who

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use rail facilities all through the year should, in some fair and equitable manner, with proper approval of the Interstate Commerce Commission, be able to make a transportation contract with the carriers that will give them a reasonable discount under the rate applicable to those who do not avail themselves of such a contract and use the railroads only intermittently in times of emergency. I would not want to say that, some day, this will not be worked out.

Vice-President Adams: Are there any other questions? If not, we will proceed with the next paper.

"The Future of Illinois Coal" is a great subject, and books might be written about it. Yet I am quite sure you will agree with me when I say it will be discussed ably by Dr. Clayton G. Ball, a Consulting Engineer of Chicago. Dr. Ball.

Dr. Clayton G. Ball (Consulting Engineer, Chicago): Mr. Chairman and members of the Institute, I know it is pretty presumptuous of me to get up here and try to tell you what is going to happen in this industry with which we are all associated. But every few years there seems to arise a need for appointing someone to take a look into the crystal ball and describe to you what he sees there.

THE FUTURE OF ILLINOIS COAL

By C. G. BALL

Consulting Engineer, Chicago, Ill.

Among many coal operators, the general reaction concerning the future of Illinois coal seems to be wholly pessimistic. This feeling is not hard to understand in view of the substantial decreases in production and the constantly increasing severity of competition with which we are all familiar. While the annual production of Illinois coal in the nineteen years between 1912 and 1930 fell below 50,000,000 tons only once, in 1927, the average annual production in the past eight years has been approximately 40,500,000 tons.

Ralph Sherman pointed out here last year that the displacement of coal in the total energy market through recent years has not been as bad as it looked. This is due to the great increases in the total en-

ergy demand of the nation and to the fact that much of the increase has been of new types that coal can not economically serve. Statistics show that whereas the energy supplied by petroleum, natural gas and hydro-electric power has maintained a fairly constant level, increasing but slightly in the past few years, that supplied by coal has fluctuated widely in close accordance with the fluctuation of the total energy demand. In other words, coal takes up the slack of industrial activity. When the industrial conditions are good, coal achieves a position of relative prominence. When conditions are bad, coal production diminishes. This relationship emphasizes the close connection between industrial activity and coal production.

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We are all pleasantly aware of the expansion of industrial activity which has occurred since the latter part of August. No one knows to what extent this increase may develop nor whether it will be long or short. Most commentators, however, seem to feel that the upturn of activity slightly preceded the declarations of war in Europe and that some degree of recovery would have been initiated even without European conflict. This combination of conditions, if continued, will undoubtedly result in increased coal production, some of which, of course, has already taken place.

This discussion of the future of Illinois coal, however, was not designed to consider only the amount of production, but rather the methods by which Illinois coal will be produced and made ready for the market and the manner in which Illinois coal will be utilized.

As with any other commodity, coal is continually faced with the problems of retaining whatever market it may have and of endeavoring to enlarge its market in every possible manner. As with any other commodity, the ability of coal to meet these problems depends upon the successful pursuit of three broad objectives; namely, decrease in cost, improvement in quality and performance, and expansion of present uses or discovery of new ones. Every activity connected with coal production, preparation, utilization and research has an improvement in some aspect of these three objectives as its fundamental purpose.

The art of prognostication, if it can be called an art, should be based upon the present and the past. If forecasts concerning the future are to fall even reasonably close to the limits of probabilities, the history

of past events and the significance of present conditions must be thoroughly considered and appraised. Through the present pattern of mechanical loading, hand loading, locomotive, conveyor and automotive haulage, shuttle cars, washed coal, raw coal, special sizing, consumer complaints and many other factors may be perceived, however dimly, at least a few of the major aspects of the future coal industry of Illinois. Naturally, many of the present practices and technique will continue for many years. It is with the evolution of some of these practices and with the possibilities of new innovations that this paper is mainly concerned.

That phase of production of coal consisting of its extraction from the seam and its transportation to the tipple or preparation plant is the one in which the opportunities for decreasing the cost of coal are most favorable. At the same time this phase provides an opportunity for initiating improvements in the quality of the coal or at least for assisting the preparation plant by furnishing coal which may be easier and less costly to treat.

The cost of production has been greatly benefited by the development of mechanical loading. In most parts of the country except Illinois, Indiana and Wyoming, mechanical loading is still in the transition stage. In Illinois, however, the percentage of mechanically loaded coal, which included stripping, to the total production of all shipping mines was 87.2 in 1938. This probably represents about the maximum concentration of mechanical loading, since the remaining hand loaded production comes mainly from marginal mines in which mechanical loading can probably not be profitably installed. The costs

of production, accordingly, can not be further decreased by increasing the percentage of mechanical loading in existing underground mines.

There are further possibilities in reduction of costs of underground mining by operation through new openings. Any mine now operating on a mechanical basis which has been converted from a hand loading basis is pretty certain to have existing man-made limitations, however efficiently it was planned before and during its development. New operations have a substantial advantage in that every phase of production can be planned to obtain the greatest benefits of completely mechanized mining. By fully mechanized mining is meant not only mechanical loading but also careful and complete integration of all phases of mining required for efficient operation at high capacities. The development of new mines may well prove to be a major aspect of the Illinois coal industry within a relatively few years. Already several fully mechanized drift and slope openings have been put in operation or are contemplated. In time completely new openings, whether drift, slope or shaft, may become prevalent.

Parenthetically, it may here be observed that although the proven coal reserves of Illinois are enormous, drill hole information shows that coal seams near the center of deep basins tend to be thinner and inferior in quality, to contain an increased number of partings, and to have poorer roof conditions. These detrimental factors in our coal reserves enhance the value of our present operations and should increase the desirability of greater coal recovery than we are now getting. This the trend towards new and completely mechanized operations should accomplish, since the

greater speed of mining will permit increased extraction.

With respect to production of Illinois coal by stripping it is quite possible that new types of equipment and new methods of operation will be developed. These will result in the addition of large potentially strippable coal areas to the present known reserves.

It is probable that future coal production in Illinois will be accomplished with careful attention to every detail, much as a factory produces watches, automobiles or radios. This involves, among many other features, better lighting, specialized jobs and improved machinery for the desired purposes.

The preparation of coal includes all the processes of screening and mechanical treatment which the coal undergoes from the time it leaves the mine until it is loaded into railroad cars, bins or trucks. This phase of coal production is the one in which the opportunities for improving the quality and performance characteristics of coal are especially favorable.

In 1938 the percentage of production by mines having mechanical cleaning plants to the production of all shipping mines was 52.9. Although not all of this production was mechanically cleaned, the important position of mechanical cleaning is unmistakable.

In addition to efficient screening devices, the equipment that may be installed at modern preparation plants include provisions for primary and secondary crushing, mechanical cleaning of one or more sizes, re-treatment of refuse from the cleaning units, de-watering and heat-drying devices, re-mixing facilities and dust-proofing treatment. A dominant trend of preparation

practice is towards greater flexibility to meet varying requirements.

These appliances and trends have done much towards improving the average quality and appearance of Illinois coal. Heretofore, however, the general conception of coal preparation has been simply the removal of as many of the impurities within the seam as possible and of the extraneous impurities added to the raw coal during mining.

There are other methods of improving the quality and especially the performance of coal by preparation, however. The character of Illinois coal is such that the processes of screening and mechanically cleaning the mine-run coal result in selective concentrations of the ingredients composing Illinois coal. Sizes which are rich in one ingredient have different burning and coking characteristics than those which are rich in another ingredient. The ash content and the character of the ash likewise vary markedly in different constituents. In this respect Illinois coal is considerably more fortunate than are the eastern coals, where the preparation process does not seem to form similar concentrations of the individual coal ingredients.

This tendency of Illinois coal to adopt different characteristics in different sizes makes it attractive for special-purpose requirements. Careful study of the characteristics of each size of coal produced at Illinois mines, followed by judicious blends and combinations of sizes, should greatly increase the acceptance of Illinois coal.

Another aspect of coal preparation which will probably compose a permanent part of its future is dust-proofing. With the discovery that high-viscosity oils are essential for satisfactory treatment of Illinois

coals, much of the former criticism of oil treatment is no longer valid.

Other important trends in preparation practices are the more precise control of mechanical cleaning and the greater endeavor to insure uniformity of the products from day to day over a long period of time. As the coal leaves the loading booms every effort has been made to screen out any fines that accumulate during the preparation process and to eliminate all oversizes. The operator of the preparation plant, however, has no control over the coal after it leaves the loading boom and before it is charged onto the consumers' grates. During this time breakage and harmful segregation of coarser and finer material in the coal as loaded are bound to take place. It is probable that many consumer complaints about the presence of excessive fines in a shipment of coal are in reality due to breakage and segregation which has taken place after the coal was originally loaded into railroad cars. Elimination of this source of trouble is difficult but undoubtedly will become more necessary if Illinois coal is to receive complete consumer acceptance.

It is possible that future coal preparation in Illinois will come to be regarded as a process of *creating* a manufactured product rather than of merely improving a mined product. There will arise the necessity of preparing the raw coal at hand for the diverse uses to which it may be put by the most efficient methods of treatment.

The utilization of coal represents that phase of the industry in which the opportunities for improving the performance of Illinois coals are most favorable. At the same time it comprises the probable field for expanding the present uses of coal

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and for discovering possible new ones.

Illinois coal, as you know, is used almost exclusively by industrial consumers for steam-raising purposes and by domestic consumers for use in home heating. The progress in combustion of Illinois coal has been substantial. With the equipment now available the efficiency of combustion of Illinois coal compares favorably with that of any other coal. A certain amount of possible improvement in performance characteristics must await probable new developments of still more efficient combustion equipment. It is possible, however, that the coal industry is capable of improving the characteristics of combustion in present plants by a more careful preparation of the coal for the equipment in which it will be used and for the purpose for which it is intended. In many cases the attempt has been made to make the equipment fit the coal.

The development of the household stoker is one of the brightest gleams in the present coal situation. There is reason to believe that the present increases of domestic stokers will continue although it is inevitable that the rate of increase will diminish. Here, likewise, it is possible that the coal industry can improve upon its service to the domestic market by striving for more satisfactory combinations of prepared coal with existing types of stokers.

Other well known methods of utilization of coal are in the main denied to Illinois coal because of defects in its inherent characteristics.

An example of this is metallurgical coking where most Illinois coal is ruled out under present conditions because of high sulphur content and weak structure. There is

no doubt that Illinois coal can be coked, however, mainly for domestic use, and perhaps eventually for certain industrial purposes. In this connection it should be pointed out that the coking of Illinois coal is one of the means of satisfying smoke ordinances now in effect in certain consuming centers and which, in all probability, will become much more prevalent in the near future. A process designed especially for the coking of Illinois coal has been in operation for several years past with encouraging results. One of the criticisms directed against the coke so manufactured has been the excessive amount of ash and sulphur which it contains because much of it has been made from fine sizes. This objection to Illinois coke can be overcome by preparation of the coal before coking. This involves the necessity for efficient treatment of fine coal, a field in which much recent progress has been made, and which will probably assume a growing importance in this state. Another means of satisfying present and future smoke ordinances is the manufacture of smokeless briquets, now under thorough investigation by the Illinois Geological Survey. Since such briquets will probably be made from the finest sizes of coal produced at Illinois mines, removal of excess ash and sulphur will be necessary in order to obtain the most satisfactory and efficient results.

The possibilities of entirely new uses for Illinois coal are not too encouraging as far as present knowledge is concerned. There are many derivatives of coal which can be used by the chemical industry but the trend appears to be towards the synthetic manufacture of such compounds from other raw materials. The present market for chemical derivatives of coal is largely confined

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to the east but in time may move further west, especially after the better deposits of coking coal in the east become exhausted.

There is more encouragement towards the future of gas manufactured from coal. The great need is for some method which will provide more complete gasification of the coal. If and when this is accomplished, there should be a considerable expansion of the market for coal gas.

The utilization of coal is a vast and complicated field. It is probable that a future trend will be the selection of certain coals for certain uses. In other words, the era of specialization, characteristic of other industries, may be that towards which the coal industry is progressing. Under such conditions coals from areas even as large as a state may be set aside for those purposes for which they are best fitted. The constant and aggressive study of the fundamental composition, chemical behaviour and performance characteristics of Illinois coal will put Illinois coal just that much ahead when its most suitable markets have been developed.

In conclusion I wish to repeat that I have had no intention of discounting present methods of operation, preparation and utilization, the best of which will undoubtedly continue for a long time. My purpose has been to suggest possible improvements and possible changes that may evolve from some aspects of the Illinois industry as it stands today.

* * *

Vice-President Adams: Are there any questions or any discussion on this subject of "The Future of Illinois Coal"?

If not, we have a committee to report, the Resolutions Committee,

composed of T. J. Thomas, Chairman, John E. Jones and M. M. Leighton. Mr. Thomas has the report.

Chairman Thomas (Committee on Resolutions): Mr. Chairman, I would like to move you the adoption of the following resolution:

"IN MEMORIAM

During the year just passed the Illinois Mining Institute has suffered the loss of six beloved members who have passed on to the Great Beyond carrying records of notable achievement and devotion dear to the hearts of Institute members. These worthy deceased members include:

John Johnson, died January 2, 1939

C. A. Blomquist, died January 9, 1939

John White, died April 15, 1939

Bruno F. Meyer, died July 21, 1939

John A. Garcia, Life Member, died August 11, 1939

A. J. Moorshead, Honorary Member, died October 16, 1939

Let it be known that our deep sense of loss is softened by our many happy memories of them which time cannot erase.

In this grateful spirit, it is hereby resolved that the Illinois Mining Institute make permanent record of the loyalty and devotion of these named beloved members, of our affection for them, and of our deep sympathy for their surviving loved ones.

Be it also resolved that a copy of this resolution be spread upon the minutes of the Institute and that a copy be placed in the hands of the bereaved families."

I move you, Mr. Chairman, the adoption of this resolution.

(Which said motion was duly seconded and unanimously adopted, and the resolution declared adopted.)

Chairman Thomas (Committee on Resolutions): Mr. Chairman and members of the Institute, I would like to offer the following resolution:

"That we extend our thanks to the following committees and organizations for their work in making this meeting a success, and bringing about also the effective work of the Institute itself:

The Program Committee.

Those who have prepared and delivered the Papers.

The Advertising Committee.

Those who have advertised in the Year Book.

The manufacturers who have exhibited their wares.

The Mining Electrical Group.

The Sergeants-At-Arms.

The Management of the Abraham Lincoln Hotel."

I move you the adoption of this resolution.

(Which said motion was duly seconded and unanimously adopted, and the resolution declared adopted.)

Chairman Thomas (Committee on Resolutions): Mr. Chairman and members of the Institute, I would like to offer on behalf of the Resolutions Committee the following resolution:

"That the Illinois Mining Institute go on record as favoring State-wide First Aid and mine rescue meetings, and that a com-

mittee be appointed to cooperate in bringing this about."

I move you the adoption of this resolution.

Vice-President Adams: I might state that committee has already been appointed.

(Which said motion was duly seconded and unanimously adopted, and the resolution declared adopted.)

Chairman Thomas (Committee on Resolutions): Mr. Chairman and members of the Institute, I would like to offer this resolution:

"That the Illinois Mining Institute go on record as favoring the appointment of a committee to foster vocational and adult education and training."

I would like to say, Mr. Chairman, that if such committee is appointed, I have been appointed by the President of the United States as a member of a committee to study education in all its phases in the elementary sections, junior colleges and universities, vocational training, and in the CCC camps of the United States and several possessions. I can make available to the members of that committee information which I think will be of advantage to them. Large sums of money have been appropriated by the Federal Government and also by the State in bringing about an effective program, particularly in connection with the matter of adult education and vocational education and training.

I move you the adoption of that resolution.

(Which said motion was duly seconded and unanimously adopted, and the resolution declared adopted.)

Chairman Thomas (Committee on Resolutions): That completes the report of the committee.

Vice-President Adams: Are there any other resolutions that should properly come before this meeting? If not, I have one or two announcements to make. The first one is this, evidently a great many of you who expect to attend the banquet tonight do not expect to eat, or else you are absent-minded, because from the sale of tickets so far it seems evident that quite a number of you are not hungry. Now, tickets are on sale in the foyer. Be sure you obtain a ticket as soon as this meeting adjourns.

Also those of you desiring tickets for the football game tomorrow may obtain them at the Geological Survey exhibit in the foyer.

Is there anything else? If not, please come back promptly at 6:30 o'clock for the banquet, and the meeting is now adjourned.

(Whereupon a recess was taken until 6:30 o'clock P. M. of the same day.)

EVENING SESSION

8:00 O'clock P. M.

President Weir: Members of the Illinois Mining Institute and guests at this, the Forty-Seventh Anniversary of the Illinois Mining Institute, we welcome you.

The officers and members of the Executive Board appreciate very much the large turn-out today and the very large attendance at the dinner this evening.

Usually there is a reason for all things. I am informed that there are three kinds of Toastmasters, and as you may expect, they are good, bad and indifferent. Another

classification of Toastmasters is probably based upon the amount of time they take up on the program. First, there is the kind that talks too much and monopolizes the time. Second, there is the kind that says very little, in fact practically nothing. Then in between these two kinds are all the different shades and colors.

Inasmuch as we have so many interesting and capable speakers this evening, your committee in preparing the program proceeded on the basis of having a toastmaster who would say very little. However, the committee did provide several assistants to the toastmaster and you will hear from them later on.

Recently there has been a decided pickup in the industry. As I look out here tonight at the operators and peddlers, I see a lot of smiles. It reminds me of a story I heard going around Chicago the other day about a certain telephone conversation. It seems the telephone rang in the bedroom of a very cozy love-nest. A very sweet voice answered "Hello," and from the other end of the line came a conversation something like this: "Honey, sorry as I can be, but a couple of good customers are in town tonight and we have been playing a little bridge. Jim Jones is here helping me out. I am a little behind. You are going to have to excuse me. I can't possibly get there at the usual time tonight." The very sweet voice came back: "Jerry, I understand all those things. It is perfectly all right with me. Why don't you stay downtown tonight?" Of course, both of them felt greatly relieved. He knew he was lying, and she knew he was lying because Jim Jones was right there with her. So as I say, things are looking up for the industry when everyone commences to smile.

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Before proceeding to the major part of the program, I would like to ask the members of the Executive Board to take a bow. Some represent the old members who are serving unexpired terms, and others represent members duly elected at the meeting today.

(Whereupon the members of the Executive Board were presented by President Weir.)

I seriously call your attention to a plan which was approved by the Institute at the last Annual Meeting, namely the bringing in of some new talent, a thing which I hope will result in increasing the activities of the Institute.

Pennsylvania has sent quite a number of mining men to the State of Illinois. Illinois has responded by sending some to Pennsylvania. The quantity, of course, from Illinois to Pennsylvania has been rather limited, but the quality has been aces. We have as one of our old members this evening one who has been very enthusiastic over the work of the Illinois Mining Institute in years gone by, but has left Illinois and is now the President of the coal producing subsidiaries of the United States Steel Corporation. I might add their production is just the trifling amount at the present time of about one hundred thousand tons of coal a day. I know all of you will be very glad to hear from Harry Moses.

Mr. Harry M. Moses (H. C. Frick Coal Co., Pittsburgh, Pa.): Mr. Toastmaster and gentlemen of the Illinois Mining Institute, as noble Anthony said to glamour-girl Cleopatra as he crawled in her bedroom window, I did not come here to talk.

It is a real pleasure after nine years to come back to the Illinois Mining Institute. It is a delightful

privilege to associate again with you gentlemen, my friends. My definition of a friend is a fellow who knows all about you and likes you anyhow. It is fun to come back. It has been a glorious last night, a glorious day, and I am looking forward to a glorious tonight. Thank you for letting me be here.

President Weir: Thank you very much, Harry. Of course, you understand everything that is said here tonight is printed in the Year Book. I think it is a damned good story.

Getting down to the more serious part of the program, on the Annual Boat Trip of the Institute this year there were elected to Honorary Membership in the Institute two men, who have performed great services for the coal industry of this nation and particularly in Illinois. As I told you before, there have been delegated to the Toastmaster several capable assistants. I would like to call at this time upon Assistant No. 1, an ex-President of the Illinois Mining Institute, Mr. Bill Starks.

Mr. J. W. Starks (Peabody Coal Co., Marion, Illinois): Mr. Chairman and fellow members of the Illinois Mining Institute and visitors, Tom Moses and I have been sitting tonight and talking of the early days of the Illinois Mining Institute. Sometime way back there was an organization formed at Champaign, which became defunct. About 1912 or 14, John P. Reese and Tom Moses, at that time representing the greatest organization in Illinois so far as safety was concerned, sponsored the present Illinois Mining Institute. John P. Reese was the first President. Tom Moses had been State Mine Inspec-

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tor of the Fifth Inspection District of Illinois, and a small group in the City Hall in Springfield elected Tom Moses the second President of the Illinois Mining Institute. At that time some fifteen or sixteen men who were just becoming somewhat interested in investigating safety measures were present.

Now, I am going to take a very short time in telling you of the very nice things that Tom Moses has done in the early days for the mining industry and in the later days his position and honors speak for themselves.

I knew Tom Moses as a pit committeeman shortly after the time the United Mine Workers were organized in Illinois. Tom Moses at that time had begun to reach for and promote for others the better things of life. I want to say that he did that ably as he was well equipped personally and mentally and passed the knack of being able to adapt himself to any surroundings. In fact although not Scotch, the Scots of Danville would have him make the address of the evening on Bobby Burns' day.

I knew Tommy Moses as Secretary of the State Mining Board, a very humble position. At that time I think it paid \$125.00. What was it, Tommy?

Mr. Thomas Moses: It was \$83.00.

Mr. Starks: A little less than I thought. Tommy Moses afterwards became State Mine Inspector. Along about the time he became State Mine Inspector, the President of the State Mining Board during his annual visit to England, said they had twelve State Mine Inspectors in the State of Illinois, and eleven of

them came from the British Empire. Tommy Moses was an American product. So he has always been a pioneer in the mining movement in Illinois.

After he became Superintendent of the United States Steel Corporation, he took cognizance of the fact that young fellows in high school would be better able to adapt themselves to the coming trend of mining, and at that time Tommy Moses realized that the old hand pick system, the old mule driver system, was going to have to pass out of the picture. He began to select boys, and in his company they are now sprinkled throughout their organization with a lot of credit.

To go back to Westville where we came from, they do not think of Tommy Moses as Vice-President of the Steel Corporation. It is just still Tommy Moses, and that has been one of the reasons why he has been so lovable and one of the reasons why that today, while we hear about the New Deal, and a new system of government and whatever it may be, he is absolute proof to the young fellow that it isn't a system of regimentation that is needed, but a government that makes Tommy Moses possible.

President Weir: Thank you very much, Mr. Starks.

Mr. Moses, in accordance with the provisions of a resolution of the Illinois Mining Institute, unanimously approved on the 1939 Boat Trip, I present you herewith a Certificate of Honorary Life Membership in this Institute. Congratulations, Good Luck and a Happy Journey through the remainder of your days.



MR. THOMAS MOSES
United States Steel Corporation, Pittsburgh, Pa.

MR. THOMAS MOSES

United States Steel Corporation, Pittsburgh, Pa.

Mr. President, Mr. Starks, gentlemen of the Illinois Mining Institute and friends, I want to thank you very much for the nice words that have been said. I think it is the first time you have said nice things about me to my face. You know I am not used to being talked to in a pleasant manner. Most of them try to find fault, and have been very successful, but I appreciate beyond words this testimonial of esteem. I cherish it, and shall always keep it with gratitude and pleasure.

I feel to be recognized in the coal mining industry as having contributed a small part to the wonderful progress that has been made since I became actively engaged in its work is recognition enough and great enough for any man to be satisfied with.

The short period of time I have served in the mining industry, only fifty-eight and a half years, has been spent principally in the State of Illinois. It has been a great pleasure to me to work in the mining industry. It has not been toil. It has been pleasant recreation, bearing in mind the multitude of pleasant recollections of friends, many of whom are here tonight and many of whom have gone on ahead.

I can recall very vividly, thanks to a good memory, the conditions under which we toiled when I became a coal miner in the State of Illinois. I can recall the hazards that we faced, the poor drainage, the poor ventilation, and the poor equipment. The task of the miner in those days was to go down and get out a day's wages and come back

if he could. If he got hurt or crippled, it was his own fault. Nobody was held responsible. If he was carried out of the mine injured, we took him into the blacksmith shop or the boiler room, regardless of the weather, we loaded him onto a coal wagon and sent him home and forgot him as quickly as possible.

The change from that intolerable condition to the present conditions of life as you gentlemen have them today in the mines in this State is only a comparison to show the great strides that have been made and the progress that has been made in behalf of the miners and in behalf of those who toil in the industry. The equipment has been wonderfully improved. We do not work in bad air any more. We have some hazards, of course. We are trying to solve them in an intelligent and fine manner such as you gentlemen exemplify in coming to these meetings year after year and recording your experience so that those who come in the future may profit by the past.

Coal mining today is wonderfully improved, but it is not perfect. And the improvements that have been recorded in my lifetime of work and which we can visualize very clearly are due to the fact that our engineers throughout the industry have been mostly responsible for the inventive genius of new plans of mining and of new tools to work with. They have lessened the hazards and the task of the men who actually produce the coal.

To the men who manage the mines of this country, and especially in this State, there must go a great

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share of credit for the wonderful improvement that exists today in the management of mines.

Many men who visualize the coal industry have been for some time referring to it as a mis-managed industry. I take issue with any man who charges the management of the coal mining industry with even short of almost miraculous management of this terrible turmoil and competition that we have had with the liquid and gaseous fuels with which we have to come into competition. If you look back—and we only know things by comparison—to the early history of the coal industry in this State, when ninety thousand tons of coal represented the loss of a human life, and measure it today with nearly one million tons to the loss of a human life, you get one measurement that certainly entitles the management of the coal industry to their credit.

On the other hand, you must understand we have stayed somewhat competitive, not quite as well as we had hoped and do hope yet to be. We have had many doctors who have prescribed homeopathic and all other kinds of remedies to cure the ills of this industry and make it prosper, but I want to say to you that coal mining management, in my opinion, is a good, hard, common-sense job in the hands of intelligent, competent and capable men today who will solve the problems of this industry as they have ever solved them, and it will not come about by any cockeyed idea from some man who calls himself a sooth-sayer artist. It will come from hard work and the application of good ideas by the men whom I think today represent the best class of management the coal industry ever had in its history.

I say we will have effective improvement in practice and in con-

ditions in the future as we have had in the past. There are more things on the way. You men will find them and will do them. You will carry on.

It has been my experience in my life in the industry to classify the people engaged in coal mining into two classes. The first one is the class of men who come into our industry temporarily, both in a business way and to work, making a stepping-stone out of it to something else they want to secure in life, taking something from the industry, giving nothing in return, and leaving it worse off from their presence here.

The other is the class of men and women who devote their entire lives to the coal mining industry, hoping they may be able by some of their activities to do something that will make pleasant and cheerful the lot of the future workers in the industry, who think more of accomplishing something of good than they do of what they get out of it.

I feel I can call myself a member of the second class, because I have had a wonderful life, a wonderful time, and enjoyed every minute of it. I have only one regret. That is that I haven't had an opportunity to contribute more than I have to this industry.

I have now, as many of you know, reached the age when in accordance with the Good Book it is said the usefulness of man ceases when he reaches the age of three score and ten. Many of our corporations and industries have copied that rule into the procedure within their organization, and the organization with which I have been connected now for nearly thirty years has seen fit to place me in the light of an old man.

I am not going back to sit under the tree back of my shack and re-

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cline in a rocking chair with a cigar and book. There are too many interesting things yet to be done, and I am going to try to be doing something. I have returned to Danville, Illinois, and will be there at home at 123 Franklin Street for some time. I do not know how long the Good Lord will let me stay there, but I hope it will be long enough to do something worthwhile for the industry. If any of you pass that way, I hope you will drop in. I will be in a row with Bill Starks, I bet you, inside of two weeks. If it isn't politics it will be something else.

But I thank you very much for this honor. I appreciate it beyond words. I hope you will always remain my friends, and that I will always be welcome here. I thank you.

President Weir: Mr. Moses, I am certain everyone in this room reciprocates in the expressions you have just given.

My No. 2 assistant happens to be another of our ex-Presidents. I am very happy at this time to call on Mr. T. J. Thomas.

Mr. T. J. Thomas (Valier Coal Co., Chicago): Mr. Weir, members of the Institute, honored guests, since one of the gentlemen to be honored here tonight is partially of Scotch ancestry, I think perhaps I should tell you a Scotch story I heard the other day.

It seems there was a salesman from Scotland who had traveled over a great part of the world. He had reached Australia. He had sold his customer there a bill of goods, and invited him out to lunch. While at lunch he undertook to tell this man about the fine things the Scotch had done. "Why," he said, "In practically all the countries of the world you will find the Scotch at

the head of the banks, at the head of the insurance companies, and most of the large industrial firms. Why," he said, "I would not be surprised if right here in the city of Sydney, if you undertake to make a survey you will find that the Scotch are at the head of practically all your major industries." Well, this customer of his being pretty well fed up on the Scotch, said, "Rabbits—not Scotch—are our pest over here."

The Illinois Mining Institute has just cause to be proud of its achievement, especially during the trying and perilous times through which we have passed in the last few years. It is altogether fitting and proper that practical men and scientific men and the representatives of the manufacturers can come together and exchange their views for the common good of the industry. It is proper, too, that this Institute should recognize the outstanding contributions made by those connected with the industry, and particularly those who at some time or other were engaged in the mining industry in the State of Illinois.

One of the gentlemen to be so honored here this evening is the son of an English Army Officer. Born in England he came to this country a young boy. The family settled near Fargo, North Dakota, then known as the Dakota territory. There this boy learned the fundamentals and rudiments of telegraphy. He entered the service of the Northern Pacific Railroad Company in their mechanical department. Later he became master mechanic for the National Railroads of Mexico. He then was advanced to Fuel Agent of the Kansas City, Fort Scott & Memphis, and later to a similar position with the Chicago & Eastern Illinois System.

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After that he became connected with the North American Company and was an executive officer of the West Kentucky Coal Company. While connected with the North American Company he opened and commenced the operation of the Kathleen Mine at Dowell.

During the World War he was a member of the staff of the United States Railroad Administration. Later he was honored with a Doctor's Degree of Engineering by the school at Rolla, Missouri. He now occupies the position of President of the Union Pacific Coal Company. With that Company he has made a notable record both in the matter of operation and in his relations with the men employed by that company.

Some time ago I had occasion to visit the city of Williamsburg, Virginia, that colonial and historical city to which our forefathers brought forth on this continent a new nation, conceived in liberty and dedicated to the proposition that all men are created equal—there I stood before the main building of the William and Mary College, and marveled at the simple lines of design and construction. Later I visited England, and while there I had occasion to examine many other structures that had received the creative touch of that great man.

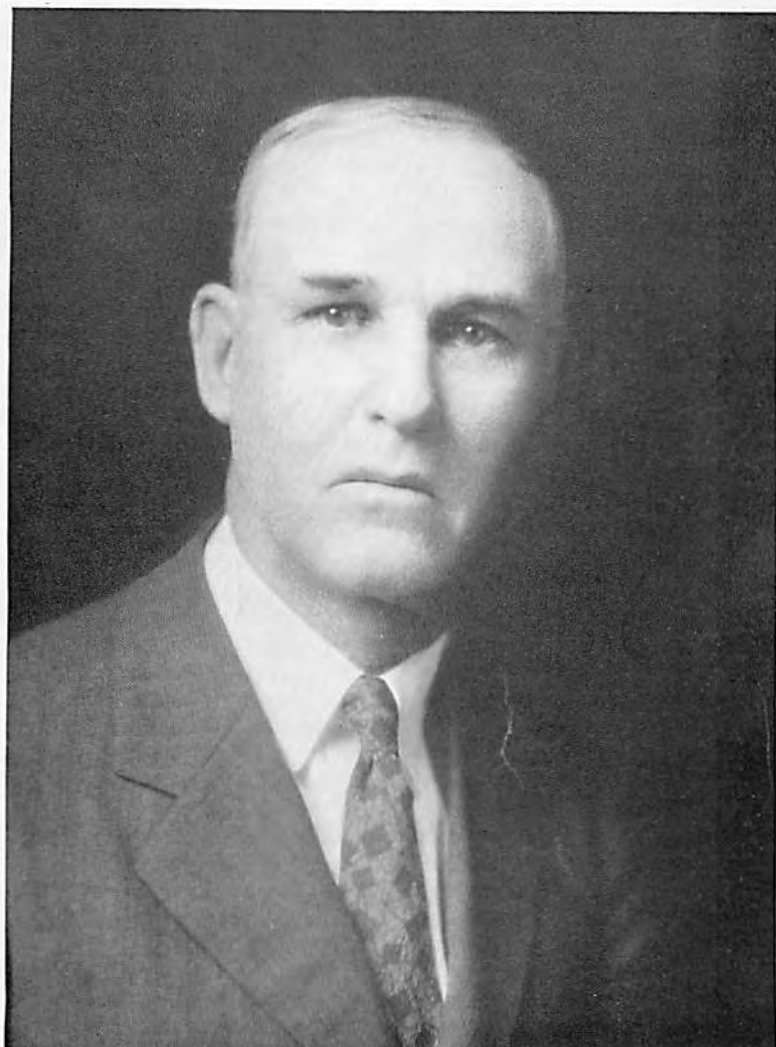
Before leaving the city of London, in St. Paul's Cathedral, I stood with lifted hat before the tomb of Christopher Wren, and inscribed upon the plain marble slab that covered the mortal remains of that great man I read this simple inscription: "Should thou seek his monument, look about thee."

This is a complex world in which we live. We first create in our minds what we build, we build what we create. And so, Mr. McAuliffe, I would endow you with this simple declaration of truth, "If you the living would seek your monument, look about you."

Mr. President, I have the pleasure of presenting to you and to the members of the Illinois Mining Institute for the signal honor you are about to bestow upon him, Mr. Eugene McAuliffe, President of the Union Pacific Coal Company.

President Weir: Thank you, Mr. Thomas.

Mr. McAuliffe, in accordance with the provisions of a resolution of the Illinois Mining Institute, unanimously approved on the 1939 Boat Trip, I present you herewith a Certificate of Honorary Life Membership in this Institute. Congratulations, Good Luck and a Happy Journey through the remainder of your days.



MR. EUGENE MCAULIFFE
President, Union Pacific Coal Company, Omaha, Neb.

MR. EUGENE McAULIFFE

President, Union Pacific Coal Company, Omaha, Neb.

Listening to the remarks addressed by the gentleman to Mr. Thomas Moses, and anticipating perhaps less kind things from Mr. Thomas than what he said, (because he has been threatening me all day), my mind went back to the reading of an essay in a copy of the *London Spectator*, published in 1711, in which the statement was made that Julius Caesar always wore a chaplet of bay leaves to cover his bald head. I wonder if Mr. Moses and myself are not being given chaplets of bay leaves this evening because we are both bald-headed rather than because we sufficiently deserve the kind things that have been said about us.

Mr. Weir, our much-loved President, said I should talk fifteen or twenty minutes. I am, however, a very indifferent speaker. First, I want to express my deep sense of appreciation for the honor that the Institute has accorded me, and for the kind words received from my friend Mr. Thomas. I am, however, given to wondering if you have not had my venerable years in mind rather than my achievements as a coal operator, when you decided to make me a lifetime member of the Institute, but be that as it may, I am deeply honored by what you have done this evening. The memories of this day will linger a long time with me.

I have a great fondness for Illinois. I often think I would like to be able to say I was an Illinoisan that I was born somewhere on its broad prairies. Some of you may not know how unfortunate it is not

to have a State you can call your native home. I happen to have been born in the British Isles. Then I was raised on a Sioux Indian Reservation. Some of my friends have said that perhaps I developed some of my peculiar characteristics by living on a reservation and associating with Indians.

However, I have laid claim to a State, a very good one, and that is Missouri, by virtue of the fact that I acquired a wife and three daughters in that State, which is a splendid commonwealth.

Some forty-six years ago, when I was very distinctly streamlined, I one day walked into the office of the managing editor of the *Chicago Herald*, and with the valor of youth and ignorance I suggested to him he should employ me to report the transportation exhibit at the Chicago World's Fair, the first Fair. I had in mind a keen desire to write up certain British and German locomotive and passenger equipment, the novelty of which rather appealed to me, being then employed in locomotive service. This man, perhaps gave me the greatest surprise of my life by accepting my tender immediately, handing me fifty dollars in gold as my first weeks pay, charging me to "keep it down to three thousand words" and to get my copy in the office by Friday afternoon. That was my first real contact with the State of Illinois.

On January 1, 1908—how time flies!—I was sent from St. Louis to Chicago to take over the fueling of 15,500 miles of railroad, and a short

time later I took over from the Receiver of the Chicago Title & Trust Company, the operation of the Dering Coal Company, with mines in Illinois and Indiana. Previous to this I had dabbled in mining in a small way in Kansas, Arkansas, Oklahoma and Alabama. It is the men I came to know in those days that I would like to say a few words about this evening.

It has often been said that coal miners are a race of individualists. That expression applies today. It was even more the case before a beneficent government undertook to regiment and regulate the industry. I will try to recall a few of our friends of the old days, a great many of whom have passed on. I wish I had time to say a few words about some of the later generation, the men that attend the business meetings of today. By and large, I think most of them are doing better than we elders did. Anyway, they are a capable lot and are doing a good job.

Before getting too far away from my connection with the Dering Coal property, I wish to make mention of three very dear friends connected with the industry in the early years of the century. First, Mr. Robert R. Hammond, whom I knew intimately when employed in the motive power department of the old Kansas City, Memphis and Birmingham Railroad. He was Division Superintendent at that time. I first met my wife in his home. I have had no regrets for that meeting.

Mr. Hammond arose in the railroad world to the position of Vice-President of the Chicago & Eastern Illinois. He resigned to organize the Dering Coal Company in connection with Mr. J. K. Dering. Mr. Hammond was a gracious gentleman, one who perhaps should have remained with the railroad business.

Mr. Dering, as you older men will recall, was a delightful gentleman who never lost his boyish manner and enthusiasm. Both of these men have passed on.

When I took over the Dering properties, I there found Mr. John A. Garcia, who passed away on August 11 of this year. Jack, as he was called by his friends, and you all knew him, was then in his prime physically, and was possessed of a brilliant mind that carried him far ahead of many of his fellow mining men. The work done by him in developing the use of the underground breathing apparatus, which in those days was the imperfect Draeger helmet, was outstanding. He also did a tremendous amount of work in connection with the adoption of permissive explosives. He taught me many things about mining. Mr. Garcia had that admixture of Celtic and Latin blood which accounted for his nervous, high-strung temperament, which in a sense set him a man almost apart. His early death came as a shock to his legion of friends.

One of the then most sincere advocates of accident prevention was Richard Newsam, an Englishman, and a kind and generous man. In those days we looked upon gas and dust explosions as the major hazard. Falling roof and other accident contributing factors were not even seriously discussed. Today, with explosions substantially out, we are trying to eliminate the so-called individual accidents that in the aggregate leave us with a record much less flattering than exists in British and Continental mines. Accident prevention has not as yet been fully explored. Uncle Dick Newsam was a splendid crusader in his day.

At the risk of speaking of one still with us, I cannot forego the splendid measure of scientific intel-

ligence as well as personal courage displayed in that day by Dr. George S. Rice, late Chief Engineer of the United States Bureau of Mines, now living in partial retirement on the banks of the Potomac near Washington. George Rice is a man who deserves the title, I think, of "gentleman unafraid."

Another Illinois man I formed a great respect for was Mr. Ed Rutledge, who blazed his own way toward success without outside help. Another very gentle soul was Edward T. Bent, who suffered inwardly during the so-called strike periods of that day, which were frequently arranged affairs for market stimulation.

This reminds me of the long strike in 1910, lasting nearly six months, during which time no railroad or factory was shut down for coal. At that time I was a member of both the Illinois and Indiana associations, one of which met in the forenoon and the other in the afternoon, when anyone oratorically inclined could have the floor to pan the United Mine Workers of America. One day, close to luncheon hour, a certain grave looking Irishman, Colonel W. P. Rand, who bore a distinct military air, sat silent while speaker after speaker, rhetorically speaking, twisted the union's tail. Our old friend, Mr. A. J. Moorshead, who passed away on October 16 last at the age of eighty-six, was President of the Illinois Association and in the Chair. Mr. Rand finally arose and addressed the Chair in the scholarly English he was noted for, and thereafter poured out a perfect barrage of classic Latin, perhaps from Caesar's Gallie wars. It was at least too vehement to be Platonic. The torrent ceased as abruptly as it began, and then the Colonel stalked out of the room.

I recall Mr. Francis S. Peabody remarked in moving for an adjournment, and in a very serious manner, that the Colonel's speech was "unanswerable." That afternoon I met the Colonel in front of the old Windsor Hotel on Michigan Avenue, saying to him in my opinion the meeting got just what it deserved. The Colonel gave me a long inquisitive look, thanked me, and went on. Perhaps I had a narrow escape, as my familiarity with Latin was very limited.

One cannot think of the strong men of that day without recalling Mr. Peabody. He was easily the leader in any gathering. Urbane, a polished and forceful speaker, he was a power in the industry. Another strong man, somewhat feared, was Mr. Thomas O'Gara, who as I recall had a five-cent differential in his favor in freight rates to Chicago. I have known that differential to invoke endless hours of discussion by operators from other Indiana and Illinois districts.

A man who was just going out as I came into the Illinois field was Mr. Mike Kelly of the Danville District, whose peculiarities were the subject of much discussion. He had the reputation of taking a coveted piece of business pretty cheaply, and thereafter inducing his mine workers to cover his losses with a cut in wages. He was a true individualist.

I will mention two gentle souls in the Illinois coal industry, Mr. Harry M. Adams and Mr. Silas A. Shaeffer, the last with a long white beard, who said little and thought much. Harry Adams was a lovely character, a man who was invariably faultlessly dressed. Of the more aggressive type was Mr. Theodore C. Keller, who made a fortune by "selling out," to come back into the industry as manager of Macou-

pin County properties, later managing a property in Utah.

Harry N. Taylor was a splendid, generous and yet forceful character, whose imprint is yet strong in the Illinois coal fields. He was an intimate friend of John Mitchell, the President of the United Mine Workers of America, and was equally close to all the large producers in the old central competitive field, western Pennsylvania, Ohio, Illinois and Indiana. He never made an enemy. His friends were legion.

Living in Chicago is another man who yet reflects honor upon the Illinois coal industry, even though no longer active in coal. I speak of Mr. Charles M. Moderwell, who at one time was very prominent in the Illinois field. His fine business characteristics have served as a model for many young men, and he has doubtless influenced some older men, including myself.

Mr. Moderwell had an associate, now passed away, Mr. A. S. Alias, of French descent, a fine polished gentleman of commanding voice and stature. It was at one of the Illinois meetings presided over by Mr. Moorshead that Mr. Alias first came seriously to my attention. One operator after another had delivered himself of more or less meaningless platitudes when Mr. Alias arose, to recite in unforgettable language the story of the death of the last soldier of the French Guard at the battle of Waterloo. I recall the way he repeated the British Captain's appealing command to the last living survivor of the Guard: "Brave Frenchman, surrender!" Mr. Alias paused for a few seconds before quoting the Guard's reply of one word, the most unspeakable word in the French language.

You later day operators do not know real coal conference oratory

such as was indulged in in the old Tomlinson Hall in Indianapolis. I recall one operator bringing into a spirited address a portion of Washington's farewell address to his troops. Today we are matching our wits against bureaucratic agencies and law school attorneys who never tried a case in court. However, even the oratory of the old days could not make the present day Guffey Act work. What we want is some form of mathematics above and beyond Einstein's theory of relativity.

There was an operator and coal broker in St. Louis in that day who was once the principal actor in an amusing episode. Mr. J. M. Browning, salesman for the St. Louis and O'Fallon "Nigger Hollow" mine coal, and later the owner of the coal company, was a driving, dynamic character. The Belleville district operators one day called a meeting in the Planters Hotel to consider a then-impending strike. Mr. Browning invited Mr. Rutledge and myself to lunch with him in the main floor dining room. Some of you will recall the magnificent stairway that came from the parlor floor to the main floor in the old Planters Hotel. They do not build stairways in the style of the old Planters today. At the foot of the stairs was a large ornate newel post of large proportions, and poised on top of the post was a carved stone lion about two feet in length. The lion's tail was a separate piece of carving, fastened to the post and to the lion's body with dowel pins and cement. Mr. Browning's wrath had reached the high point as he passed down the lower end of the stairway, where he exploded, saying "Rutledge, what I would like to do with the damned miners is to twist their damned tails together in one hard knot," and unconsciously he reached

over and tore the tail off of the stone lion; he never woke up to the fact he had it in his hand until he was twenty feet out in the middle of the floor. Then he walked over, laid it down on the hotel clerk's desk, and said, "Put this damned thing back and send me the bill."

There are other old time operators I might mention, but time forbids. I greet this legion of good fellows, living and dead, with a cheer. Looking back over two decades, we will now agree that our mining methods were then, to say the least, not over-refined. Shooting from the solid with black powder and fuse, poor ventilation, no water to allay dust, the job of firing shot offshift was a task commensurate with "going over the top" in France in 1914 to 1918. You will recall how we fought with John Mitchell, Tom Lewis and John P. White to keep wages down while giving the miners a half-turn, with the result that tonnage and yardage rates were recurringly pulled up and up. That is the penalty we paid for lacking adequate underground transportation.

But after all, our greatest shame was in our accident record. With no workmen's compensation laws, we took every fatal accident into court, trying to show that it resulted from contributory negligence, or otherwise arose from an "Act of God." I feel no regret for the fact that the non-union coal fields with their starvation wages have passed into limbo, and the workmen's compensation laws of our State, however they may be abused, are far ahead of the old common-law trial, where pressure rather than justice governed.

My mind often goes back to the days I bought mine-run coal in Franklin and Williamson Counties

for \$1.05, and in Montgomery County for \$.95 per ton. I often wonder if the margin of profit was not as high then as it is today. Your cost due to higher wages, shorter hours and legal requirements of various kinds have soared, and your tonnage has to a great extent gone over to natural gas and fuel oil. Perhaps equally serious has been the reduction in demand due to a lower unit consumption by the railroads, power plants and industrial consumers, and even household consumption where it yet exists is down.

Will you forgive me if I touch on what to a few of you may be a sore spot? You have in my opinion wasted much time and money in promoting government control of your business instead of attempting a better sales practice. Some five years ago I became, with many of you, somewhat intrigued with the siren voice of that now great commentator, who pours out a flood of invective over the radio at so much a column. You know who I mean, General Hugh S. Johnson, whom the Honorable Secretary of the Interior recently referred to as "Old Ironpants." It was he who sold us the N. R. A. with the seven hour day and time and one-half and worse—much worse—the five-day week. The N. R. A., however, did one good thing that needed doing, it established the theory of a more nearly uniform wage rate throughout the nation's coal mines. Before the N. R. A. came the industry was "half slave and half free," just as the nation was when the immortal Lincoln went from this city to Washington as President of the United States. If we as a people followed more closely in the footsteps of Lincoln rather than those who seek to substitute for a democratic form of government, a gov-

ernment of bureaucrats, we would be better off.

I am told that a few operators yet think the Guffey Act can be made to work, and that it will some time enable them to sell their coal at a profit. I have never looked upon it as more than an utterly unworkable attempt to control a great basic industry by mathematical formula, and bureau mandate. It is now driving on to a deserved end which is not far off. The Guffey Law was the only law ever passed to hog-tie an industry that is authorized to bill the industry monthly for the annoyance it causes. The railroads, banks, power companies, the oil industry and a host of other forms of business either enjoy or suffer regulation, but at least no bills are sent to them for damage done.

May I say that, in the last analysis, your business salvation, like your soul's welfare, rests with you and you alone? Mr. Peabody was not far wrong when he said thirty-five years ago "The fittest should and will survive." That is the law of life.

May I here say that in the beastly struggle that is now going on in Europe for human rights, the fittest will survive? Government by the people will rise above Hitler's Nazism and Stalin's Communism, and the religion of Jesus Christ will rise above paganism. Poland will also rise again, for time has proven that the Poles are a people with souls who cannot be destroyed.

I have already taken up too much of your time. I have had a joyous time in the seventeen years I have been in the State of Wyoming. Come out and see us, preferably on the third Friday and Saturday in June. If you do, you will see twenty-five hundred mine workers and their families at their best. I will

meet you at the train with my famous Scotch Kiltie Band.

I am sure Mr. Moses and I have both had a wonderful time this evening, and I thank you.

President Weir: Thank you, Mr. McAuliffe.

I am very certain the memory of this happy occasion will linger with us to the end of our days. The achievements of Mr. Moses and Mr. McAuliffe have furnished us with real inspiration.

(Whereupon a voice was heard as follows, although the speaker was invisible:)

"This is Station I M I, broadcasting on a frequency of once each year, from a natural hiccup. I bring you a short bulletin:

OUR SECRETARY-TREASURER

"Each year we look about us for a capable recruit

Whom we can name as President, to head our Institute;

A man whom we can honor for his work in days gone by,

To help us make a bigger and a better I. M. I.

To him belongs much credit, but who's the other man

Who does so much to help the cause in every way he can;

Who has his finger in the pie in everything that's done

From business of a serious sort to any kind of fun?

Our Secretary-Treasurer.

"Who gets us many members, and also gets their dues,

And has his ears glued to the ground for any kind of news

With reference to some meeting, to which we all should go,

Our Advertisers, who make this volume possible, will appreciate your inquiries.

Then keeps us posted on the things
that we would like to know?

Who, with his fine committee, de-
livers to us free

A Year Book that our Institute is
proud for all to see?

Who keeps the books and writes the
checks to pay our bills when due,

And keeps a balance in the bank to
see us safely through?

Our Secretary-Treasurer.

“Who looks to the arrangements
for our meetings in the Fall?

Then stays upon the job all day to
answer beck or call?

And even when the hours grow late
you'll find him everywhere

Seeing to the various wants of every
member there.

Who takes the reservations for our
boat trips in the Spring

And looks to all our comforts and
does 'most everything

To make our voyage a grand suc-
cess so when our trip is o'er

We owe a vote of thanks to him be-
fore we step on shore?

Our Secretary-Treasurer.

“Yes, we have an able President, as
I have said before,

Who does his every duty, in fact a
little more.

Vice-Presidents and Committees
work with him, hand in hand,

Which makes his sailing smoother,
as you can understand.

But the man whom he depends upon
to act as engineer

And see his plans are carried out,
throughout the entire year;

Who sits with him through meet-
ings, both in the Spring and Fall,

Is that jovial, rustling, ever hus-
tling Bale E. Schonthal.

Our Secretary-Treasurer.”

President Weir: The Unseen Voice reminds me of an anniversary. Ten years ago—in fact, I guess it is eleven years ago, at Danville, the present Secretary-Treasurer was elected for the first time. He has served ten full years. I am informed that the symbol for the tenth anniversary is tin. I do not know much about it, but I understand his rail mill has been on strike, and he has had a helluva time. A good friend suggested perhaps in view of the strike and the tenth anniversary we should hand him a tin cup so that he could continue in business.

Seriously, I really believe that in the ten years he has accomplished about fifteen years work. And I am informed also that the proper symbol of the fifteenth anniversary is crystal.

Mr. Schonthal, on behalf of the members of the Illinois Mining Institute, upon the occasion of your tenth anniversary, I present you in appreciation of your untiring efforts this set of crystal.

I am perfectly willing to let our Secretary-Treasurer say a few words, but before he does I want to pick on him a little more. It seems the committee has selected some receptacles here for—well, some cheering fluid. I understand he is going to keep these glasses in his office, and somehow he will always have on hand the things which fill the glasses. That is one of the duties of the Secretary-Treasurer. Bale, would you like to say something to the boys?

Secretary-Treasurer Schonthal: I don't know what the hell to say. I can only say this, I am glad that rail mill is working again.

As to this beautiful set, that certainly is a grand surprise. Since it will be used in the office, as Weir

Our Advertisers are our friends and fellow members. Consult them frequently.

says it will be, I will have to get that ice box stocked again.

But I do appreciate this very much. It has been a pleasure, these ten years. I appreciate the cooperation I have gotten from all the members and the officers, and I hope I may be able to be of service for a long time. I thank you very much.

President Weir: In the excitement, I forgot there were several communications, one from Chicago:

"Sincerely regret missing my first Illinois Mining Institute Fall meeting for ten years. Congratulations to officers and best wishes for a successful meeting.

(Signed) H. H. Taylor, Jr."

From Rock Springs, Wyoming, comes the following telegram:

"Illinois Mining Institute: Regret circumstances prevent my attending meetings. Extend best wishes for successful meeting all members. Institute to be congratulated on presenting life membership to Mr. McAuliffe and Mr. Moses. They both deserve much credit not only for their work but their guidance and counsel. May I join you in wishing them many more useful years.

I. N. Bayless,
The Union Pacific Coal Co."

The newly elected Vice-President, Dr. M. M. Leighton, unfortunately could not be with us this evening, and therefore I am not able to present him to you.

Your new President who was elected this morning has been engaged in the coal industry in the State of Illinois for a great many years. He is capable, sincere and has been an active worker in the Institute for a long, long time. I am certain that he will do many constructive things during his term of office. It gives me great pleasure at this time to turn over to Mr. Roy Adams, General Superintendent of the Old Ben Coal Corporation of West Frankfort, the duties and tools of the office. Mr. Adams.

President-Elect Adams: This has been a hard campaign. It has been a great day, a delightful evening, and the campaign expenses will be published in due time.

There is nothing further I know of that we should do just now, except adjourn until we meet again. Good night.

(Whereupon, at 9:30 o'clock P. M., the Convention was declared to stand adjourned *sine die*.)

The following advertisers in the 1938 Yearbook displayed merchandise of their manufacture in the Exhibit Hall at the Forty-seventh Annual Meeting. The exhibits were very well attended and created a great deal of interest.

LIST OF ADVERTISERS EXHIBITING AT FORTY-SEVENTH ANNUAL MEETING

<i>Name</i>	<i>Address</i>
Ahlberg Bearing Company.....	St. Louis, Mo.
American Brattice Cloth Corporation.....	Warsaw, Ind.
American Cable Division, American Chain & Cable Co., Inc.....	Chicago, Ill.
The American Crucible Products Co. (Promet Bearings).....	Lorain, Ohio
Asbestos Wood Mfg. Co.....	Chicago, Ill.
Atlas Powder Company.....	Wilmington, Del.
Bemis Bro. Bag Co.....	St. Louis, Mo.
Berry Bearing Co.....	Chicago, Ill.
Bituminous Casualty Corporation.....	Rock Island, Ill.
Broderick & Bascom Rope Co.....	Peoria, St. Louis, Seattle
Bureau of Mines, U. S. Dept. of the Interior.....	Vincennes, Ind.
Cardox Corporation.....	Chicago, Ill.
Central Mine Equipment Co.....	St. Louis, Mo.
Cincinnati Mine Machinery Co.....	Cincinnati, Ohio
Dept. of Mines & Minerals.....	Springfield, Ill.
E. I. du Pont de Nemours & Co.....	Wilmington, Del.
Egyptian Sales Agency, G. F. Blankinship, Sales Engr.....	Murphysboro, Ill.
Electric Storage Battery Co.....	Chicago, Ill.
The Ensign Products Co.....	Cleveland, Ohio
Evansville Electric & Mfg. Co.....	Evansville, Ind.
Fafnir Bearing Co.....	New Britain, Conn.
Gould Storage Battery Corp.....	Chicago, Ill.
W. M. Hales Co.....	Chicago, Ill.
Hereules Powder Company.....	Chicago, Ill. & St. Louis, Mo.
Hulburt Oil & Grease Co.....	Philadelphia, Pa.
I-T-E Circuit Breaker Co.....	Philadelphia, Pa.

Mentioning this publication when writing Advertisers puts friendship into business.

<i>Name</i>	<i>Address</i>
Koppers Company.....	Pittsburgh, Pa.
The Leetonia Tool Co.....	Leetonia, Ohio
A. Leschen & Sons Rope Co.....	St. Louis, Mo.
Macwhyte Wire Rope Co.....	Kenosha, Wis. & Chicago, Ill.
Mine Safety Appliances Co.....	Pittsburgh, Pa.
Modern Engineering Co., Inc.....	St. Louis, Mo.
Ohio Brass Company.....	Mansfield, Ohio
The Ohio Carbon Company.....	Cleveland, Ohio
The Okonite Co.....	Passaic, N. J.
Power Transmission Equipment Co.....	Chicago, Ill.
Frank Prox Company, Inc.....	Terre Haute, Ind.
R. J. Bearings Corp.....	St. Louis, Mo.
John A. Roebling's Sons Company.....	Chicago, Ill.
Jos. T. Ryerson & Son, Inc.....	Chicago, Ill.
Simplex Wire & Cable Co.....	Chicago, Ill.
Southwest Bolt & Nut Co.....	St. Louis, Mo.
Standard Oil Co. (Indiana).....	Peoria, Ill.
State Geological Survey.....	Urbana, Ill.
Sterling Steel Casting Co.....	East St. Louis, Ill.
Streeter-Amet Company.....	Chicago, Ill.
Templeton, Kenly & Co. "Simplex Jacks".....	Chicago, Ill.
The Tool Steel Gear & Pinion Co.....	Cincinnati, Ohio
Bertrand P. Tracy Company.....	Du Quoin, Ill.
United Iron Works Company.....	Kansas City, Mo.
United States Rubber Co.....	Chicago, Ill.
The Upson-Walton Co.....	Chicago, Ill.
U. S. Sanitary Specialties Corp.....	Chicago, Ill.
Utility Mine Equipment Company.....	St. Louis, Mo.
Watt Car & Wheel Company.....	Barnesville, Ohio
The West Virginia Rail Co.....	Huntington, W. Va.

CONSTITUTION AND BY-LAWS

Adopted June 24, 1913
Amended Nov. 12, 1926
Amended Nov. 8, 1929
Amended Nov. 8, 1935
Amended Oct. 21, 1938

ARTICLE I.

NAME AND PURPOSE.

The Illinois Mining Institute has for its object the advancement of the mining industry by encouraging and promoting the study and investigation of mining problems, by encouraging education in practical and scientific mining, and by diffusing information in regard to mining that would be of benefit to its members.

ARTICLE II.

MEMBERSHIP.

Section 1. Any person directly engaged or interested in any branch of mining, mining supplies, mining appliances, or mining machinery may become an active member of the Institute. Any person desiring to become a member of the Institute shall fill out a blank for that purpose, giving his name, residence, age, and occupation. This application shall be accompanied by one year's dues of \$3.00. Each application for membership shall be submitted to the Executive Board, who shall make an investigation as to the qualifications of the applicant, and shall be authorized to elect to membership and issue a certificate of membership to such applicant subject to the ratification of the next regular meeting of the Institute.

Section 2. Any person of distinction in mining may be elected

an honorary member of the Institute by two-thirds vote of the members present at any regular meeting. Any member who has been an active member of the Institute and shall have retired from active business in mining may become an honorary member.

Section 3. The annual dues for active members shall be \$3.00 and any person in arrears on August 1, of the current year, after having been sent two notifications of dues, to be dropped from membership. Members in arrears for dues will not receive the printed proceedings of the Institute.

Section 4. Any active member may become a life member by the payment of \$50.00. Funds received from life members are to be invested and only the income from these funds may be used in the regular operation of the Institute.

ARTICLE III.

OFFICERS.

Section 1. The officers shall consist of a President, Vice-President, Secretary-Treasurer and twelve Executive Board members. The services of all officers shall be without compensation.

Section 2. Nominations for officers and the executive board shall be made by nominating committee of three (3) appointed by the President at least thirty days before the annual November meeting, pro-

Establish your identity—mention this publication when dealing with Advertisers.

vided that anyone can be nominated on the floor of the meeting for any office for which an election is being held.

Section 3. The President, Vice-President and Secretary-Treasurer shall be elected by ballot, annually, at the regular November meeting and shall hold office for the ensuing year.

Four Executive Board members shall be elected by ballot, annually, at the regular November meeting and shall hold office for the ensuing three years.

To make effective this change, at the regular November meeting in 1938, in addition to the four Executive Board members who shall be elected for the three year term, there shall also be elected by ballot eight other Executive Board members, four for a two year term and four for a one year term.

Section 4. In case of death, resignation, or expulsion of any officer, the executive board may fill the vacancy by appointment until the next regular meeting, when the vacancy shall be filled by regular election. In case of a vacancy in the office of president, the duties shall devolve upon the vice-president.

Section 5. The executive board shall consist of the officers and twelve other board members.

ARTICLE IV.

DUTIES OF OFFICERS.

Section 1. The president shall perform the duties commonly performed by the presiding officer and chairman. He shall sign all orders for payment of money by the treasurer, and with the executive board shall exercise a general supervision over the affairs of the Institute between sessions.

Section 2. The vice-president shall preside in the absence of the president and perform all the duties of the president in his absence.

Section 3. The secretary-treasurer shall keep a record of each meeting, shall read and file all resolutions and papers that come before the Institute, countersign all orders for money which have been signed by the president, and shall purchase necessary supplies under the direction of the executive board.

He shall keep a true record of all money received by him and payments made on account of the Institute. He shall pay out no money except on an order signed by the president, and countersigned by himself, and shall retain these orders as vouchers. He shall give bond in such sum as the Institute may provide, the premium on said bond being paid by the Institute.

He shall act as editor-in-chief for the Institute and may furnish the newspapers and other periodicals such accounts of our transactions and discussions as are proper to be published. His own judgment is to prevail in such matters unless objection is lodged at a regular meeting or by the executive board.

The retiring president shall act ex-officio in any capacity for the ensuing year.

Section 4. The president shall appoint an auditing committee annually to audit the accounts of the secretary-treasurer, and said audit shall be submitted to the November meeting of the Institute.

Section 5. The Executive Board shall perform the duties specifically prescribed by this constitution; it shall supervise the expenditures and disbursements of all money of the Institute, and no expenditure other than current expenses shall

Play ball with the Advertisers who play ball with us.

be authorized without first having the approval of the Executive Committee; it shall act as program committee for each meeting to determine what is to be published in the proceedings and shall perform such other duties as may be referred to them by regular or special meeting of the Institute.

ARTICLE V.

MEETINGS.

Section 1. Regular meetings shall be held in June and November of each year and on such days and in such places as may be determined by the executive board of the Institute. Notice of all meetings shall be given at least thirty days in advance of such meetings.

Section 2. Meetings of the executive board shall be held on the call of the president, or at the request of three members of the executive board, the president shall call a meeting of the board.

ARTICLE VI.

AMENDMENTS.

Section 1. This Constitution may be altered or amended at any regularly called meeting by a majority vote of the members present, provided notice in writing has been given at a previous semi-annual meeting of said proposed change of amendment.

ARTICLE VII.

ORDER OF BUSINESS.

At all meetings, the following shall be the order of business:

- (1) Reading of minutes.
- (2) Report of executive board.
- (3) Report of officers.
- (4) Report of committees.
- (5) Election of new members.
- (6) Unfinished business.
- (7) New business.
- (8) Election of officers.
- (9) Program.
- (10) Adjournment.

ILLINOIS MINING INSTITUTE

LIFE MEMBERS

ANDERSON, JAMES S.	6212 Woodlawn Ave., Chicago, Ill.
BARROW, W. E., Pres.	Joy Mfg. Co., Franklin, Penn.
BROOKS, C. W., Contr. Engr.	Room 601, 53 W. Jackson Blvd., Chicago, Ill.
BUCHANAN, D. W., Pres.	Old Ben Coal Corp., 230 S. Clark St., Chicago, Ill.
BUTCHER, FRED E.	First National Bank Bldg., Danville, Ill.
COWIN, G. D., Pres.	Bell & Zoller Coal & Mining Co., 307 N. Michigan Ave., Chicago, Ill.
DUNCAN, W. M., Pres.	Duncan Foundry & Machinery Co., Alton, Ill.
GREEN, ARTHUR C.	Goodman Mfg. Co., 4834 S. Halsted St. Chicago, Ill.
HARRINGTON, GEO. B., Pres.	Chicago, Wilmington & Franklin C. Co., 332 S. Michigan Ave., Chicago, Ill.
HARRIS, ALLYN, Pres.	Cardox Corp., 307 N. Michigan Ave., Chicago, Ill.
JENKINS, S. T.	Goodman Mfg. Co., 322 Clark Ave., St. Louis, Mo.
JENKINS, W. J., Pres.	Consolidated Coal Co. of St. Louis, Railway Exchange Bldg., St. Louis, Mo.
JONES, JOHN E.	Old Ben Coal Corp., West Frankfort, Ill.
JOYCE, A. R.	The Wood Preserving Corp., Marietta, Ohio
KEELER, E. R., Pres.	Franklin County Coal Co., 135 S. La Salle St., Chicago, Ill.
KNOIZEN, A. S.	Joy Mfg. Co., Franklin, Pa.
LEACH, B. K., Pres.	Egyptian Tie & Timber Co., 1803 Ry. Exch. Bldg., St. Louis, Mo.
McFADDEN, GEO. C., A. V.-P.	Peabody Coal Co., 231 S. LaSalle St., Chicago, Ill.
MOSES, HARRY M., Pres.	H. C. Frick Coal Co., 1322 Frick Bldg., Pittsburgh, Pa.
PEABODY, STUYVESANT, Pres.	Peabody Coal Co., 231 S. LaSalle St., Chicago, Ill.
PELTIER, M. F., V.-P.	Peabody Coal Co., 231 S. LaSalle St., Chicago, Ill.
PFAHLER, F. S. Pres.	Superior Coal Co., 400 W. Madison St., Chicago, Ill.
POWERS, F. A.	Hulburt Oil & Grease Co., Box 21, Peoria, Ill.
RYAN, JOHN T., Pres.	Mine Safety Appliances Co., Pittsburgh, Pa.
SANDOE, C. J., V.-P. and G. M.	W. Va. Coal Co. of Mo., Boatmen's Bank Bldg., St. Louis, Mo.
SCHONTHAL, B. E., Pres.	B. E. Schonthal & Co., Inc., 28 East Jackson Blvd., Chicago, Ill.
SCHONTHAL, D. C., Pres.	West Virginia Rail Co., Huntington, W. Va.
TAYLOR, H. H., JR.	Franklin County Coal Co., 135 S. La Salle St., Chicago, Ill.
THOMAS, T. J., Pres.	Valier Coal Co., 547 W. Jackson Blvd., Chicago, Ill.
WANNER, E. W., V.-P.	Hulburt Oil & Grease Co., Philadelphia, Penn.
WARE, LOUIS, Pres.	International Agricultural Corp., 61 Broadway, New York, N. Y.
WEIR, PAUL, Consulting Engineer.	307 N. Michigan Ave., Chicago, Ill.
ZELLER, HARRY, V.-P. and G. M.	West Virginia Rail Co., Huntington, W. Va.

Value is apparent in the merchandise of our worthy Advertisers.

HONORARY MEMBERS

GOALBY, JOHN F.....	923 Kinsted St., Morris, Ill.
McAULIFFE, EUGENE, Pres.....	Union Pacific Coal Co., 1416 Dodge St., Omaha, Nebr.
MOSES, THOMAS.....	123 N. Franklin St., Danville, Ill.
MURRAY, HUGH.....	Equality, Ill.
STOCKETT, THOS. R.....	Alta Club, Salt Lake City, Utah
TIRRE, FRANK F.....	3659 Dover Place, St. Louis, Mo.

ACTIVE MEMBERS

ABRELL, JOHN, Supt.....	Peabody Coal Co., No. 7 Mine, Kincaid, Ill.
ACKERMAN, ROBERT, Mine Mgr.....	Consolidated Coal Co. of St. Louis, 612 W. Main St., Staunton, Ill.
ADAMS, R. L., Gen. Supt.....	Old Ben Coal Corp., West Frankfort, Ill.
ADAMS, W. G.....	Central Illinois Public Service Co., Quincy, Ill.
ADAMS, W. G., Mgr.....	Dooley Bros., 1201 S. Washington St., Peoria, Ill.
ADAMS, WILLARD C.....	Koppers-Rheolaveur Co., 1301 Koppers Bldg., Pittsburgh, Pa.
ADAMSON, C. H.....	Stephens-Adamson Mfg. Co., 20 N. Wacker Drive, Chicago, Ill.
AITKEN, W. L.....	Dooley Bros., 1201 S. Washington St., Peoria, Ill.
ALFORD, NEWELL G.....	Eavenson, Alford & Auchmuty, 2050 Koppers Bldg., Pittsburgh, Pa.
ALLARD, A. F.....	United States Fuel Co., Danville, Ill.
ALVERSON, RALPH, Gen. Supt.....	Carney Coal Co., Harrisburg, Ill.
ANDERSON, G. G., Mine Mgr.....	Old Ben Coal Corp., 106 S. Victor St., Christopher, Ill.
ANDERSON, J. C.....	1633 N. Vermilion St., Danville, Ill.
*ANDERSON, JAMES S.....	6212 Woodlawn Ave., Chicago, Ill.
ANDERSON, LLOYD, Supt.....	Peabody Coal Co. No. 43, Harrisburg, Ill.
ANGLIN, D. Z., Supt.....	Truax-Traer Coal Co., Elkville, Ill.
ARMS, GEORGE.....	Jeffrey Mfg. Co., Columbus, Ohio
ARMSTRONG, E. R.....	Equitable Powder Co., Collinsville, Ill.
ARNOLD, MARK R.....	A. Leschen & Sons Rope Co., 810 W. Washington Blvd., Chicago, Ill.
AUSTIN, W. J.....	Hereules Powder Co., 332 S. Michigan Ave., Chicago, Ill.
BALL, CLAYTON G.....	c/o Paul Weir, 307 N. Michigan Ave., Chicago, Ill.
BARLOW, J. E.....	Goodman Mfg. Co., 1052 Fayette St., Springfield, Ill.
BARR, ROY E., Coal Traffic Mgr.....	Illinois Central Railroad, 135 E. 11th Place, Chicago, Ill.
*BARROW, W. E., Pres.....	Joy Mfg. Co., Franklin, Penn.
BARTELS, HENRY, Asst. Mgr.....	Peabody Coal Co. No. 59, 401 S. Lincoln Ave., Springfield, Ill.
BARTLETT, A. G.....	Austin Powder Co., West Frankfort, Ill.
BASKIN, E. D., Dist. Sls. Mgr.....	The Upson-Walton Co., 737 W. Jackson Blvd., Chicago, Ill.
BASS, A. C.....	I. B. Williams & Son, 164 N. Wacker Drive, Chicago, Ill.
BAUGH, W. S.....	National Electric Coil Co., 1 Pitman Place, Kirkwood, Mo.
BAYLESS, I. N., G. M.....	Union Pacific Coal Co., Rock Springs, Wyo.
BEAN, F. M.....	B. E. Schonthal & Co., 438 Murphy St., Murphysboro, Ill.
BEAUMONT, G. L.....	Mine Timber, Cowden, Ill.

- BECKER, LESTER O., Sales Mgr.....
Utility Mine Equipment Co., 620 Tower Grove Ave., St. Louis, Mo.
- BEDA, P. W., V. P.....Old Ben Coal Corp., 230 S. Clark St., Chicago, Ill.
- BEDDOE, A. H., Pres.....Illinois-Pocahontas Coal Co., 320 N. Fourth St., St. Louis, Mo.
- BEGGS, D. W., Pres.....Macon County Coal Co., Decatur, Ill.
- BELL, J. H.....Cardox Corporation, 307 N. Michigan Ave., Chicago, Ill.
- BELLAMY, C. C., Service Engr.....
Shell Petroleum Corp., 231 S. Sycamore St., Centralia, Ill.
- BELTZ, JOHN S.....Jeffrey Mfg. Co., Columbus, Ohio
- BENDER, W. J.....Specialty Sales Div., Du Pont Company, Wilmington, Del.
- BENTLY, J. G.....The Johnson-March Corporation, P. O. Box 38, West Frankfort, Ill.
- BESS, DUDLEY C.....Central Illinois Coal Mining Co., P. O. Box 396, Springfield, Ill.
- BEVERS, P. T.....2070 E. Sixty-First St., Cleveland, Ohio
- BIAS, H. O.....B. & O. Railroad, Temple Bar Bldg., Cincinnati, Ohio
- BLAKE, ARTHUR.....Peabody Coal Co., Taylorville, Ill.
- BLAKELY, W. V.....Western Powder Mfg. Co., East Alton, Ill.
- BLANKINSHIP, G. F., Sales Engr.....Egyptian Sales Agency, Murphysboro, Ill.
- BLUTH, MARC G., Mgr. Chicago Office.....
National Coal Association, 307 N. Michigan Ave., Chicago, Ill.
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WITTEN, W. E.....	Wasson Coal Co., Harrisburg, Ill.
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WRIGHT, D. D.....	Central Ill. Public Serv. Co., Marion, Ill.
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*ZELLER, HARRY, V. P.....	West Virginia Rail Co., Huntington, W. Va.
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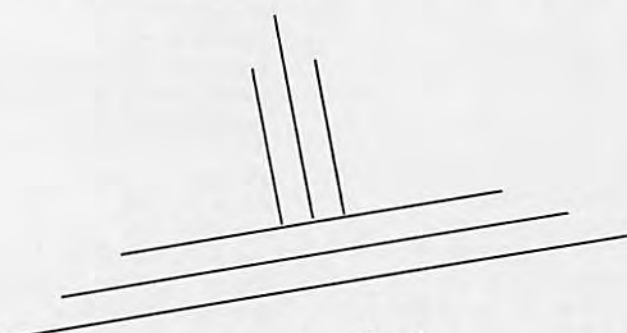
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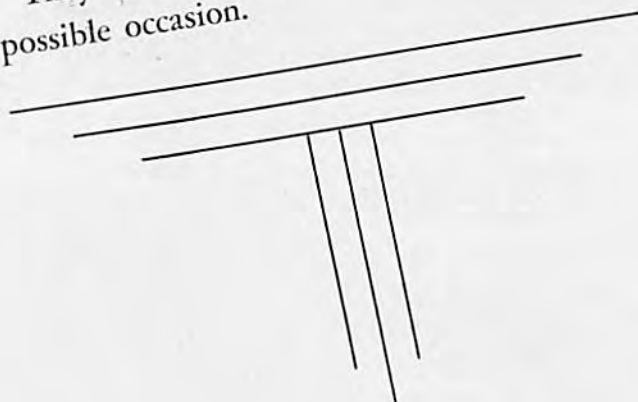
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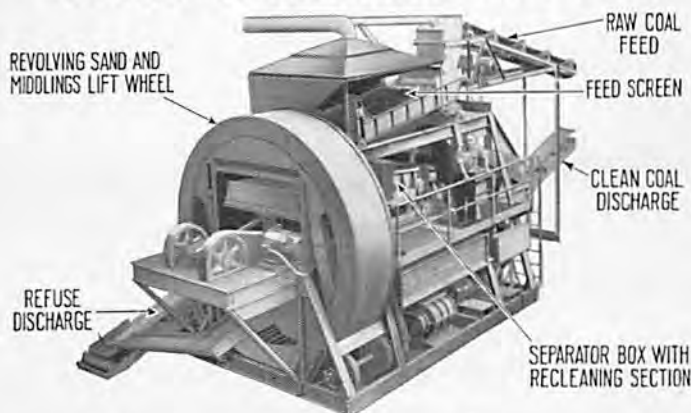
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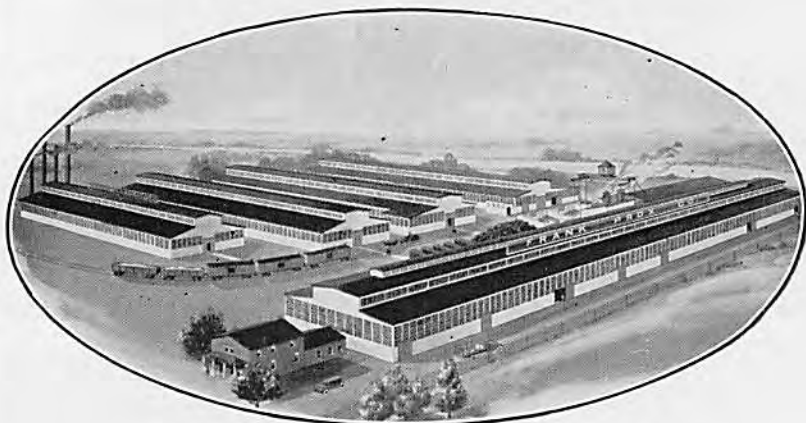
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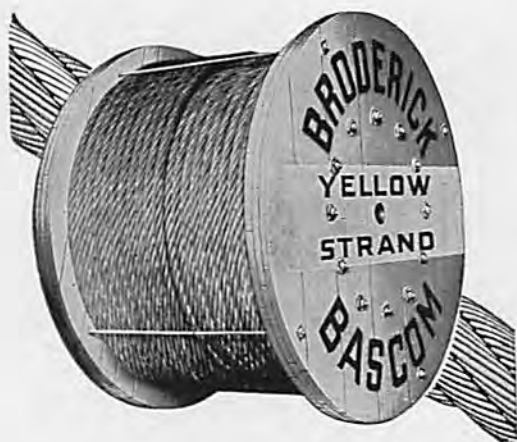
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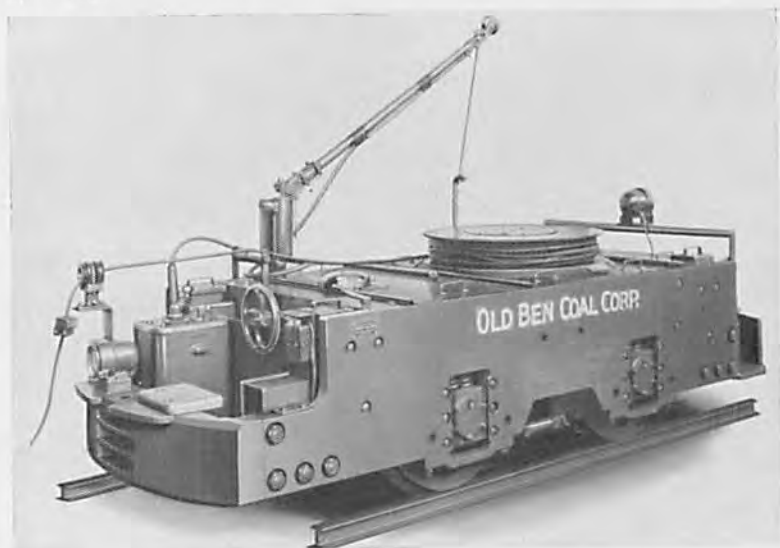
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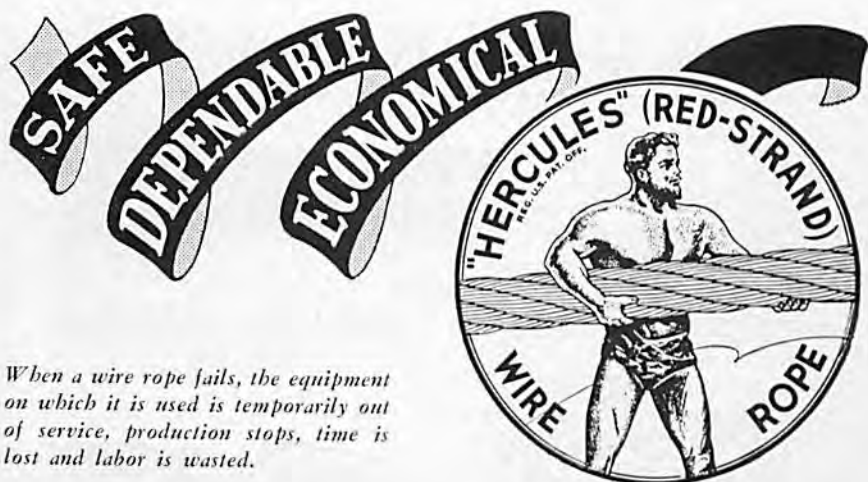
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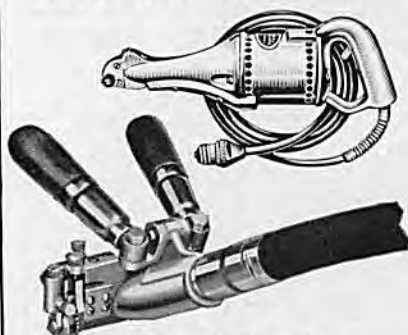
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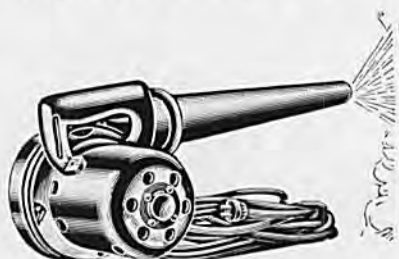


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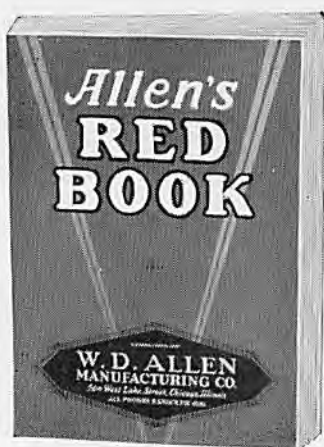
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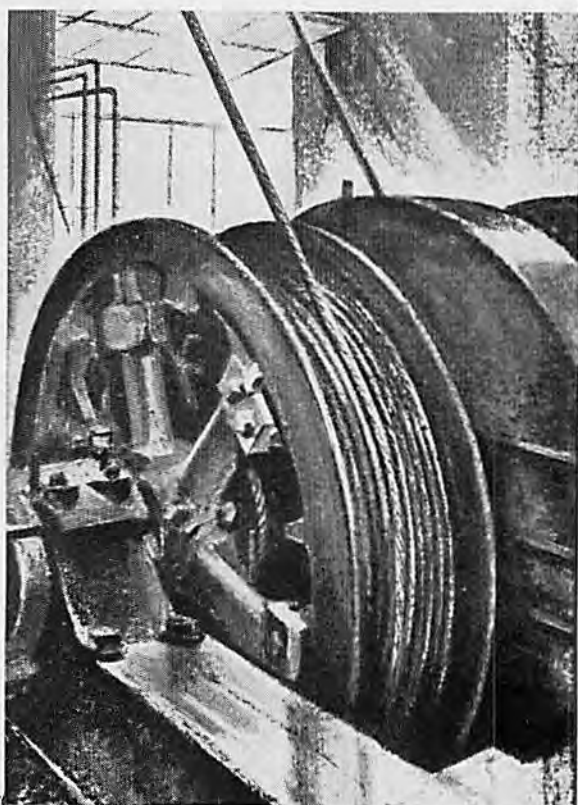
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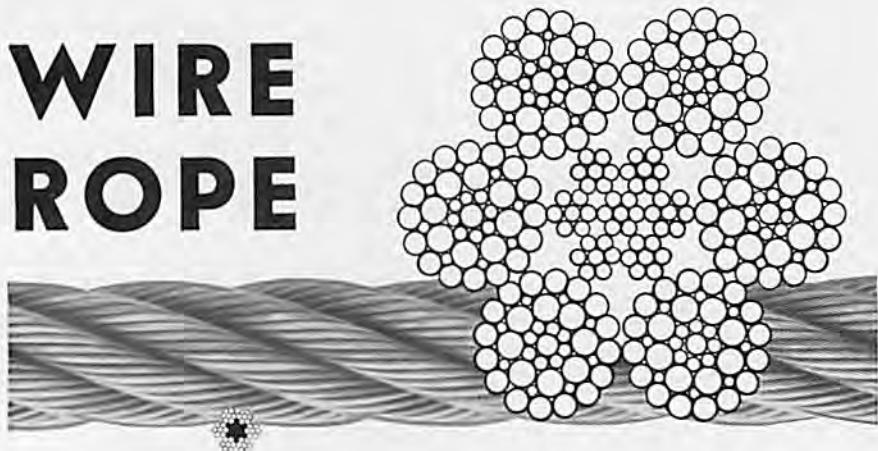
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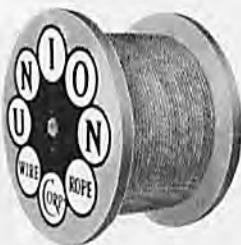
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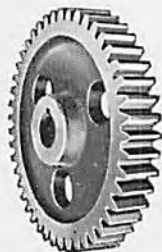
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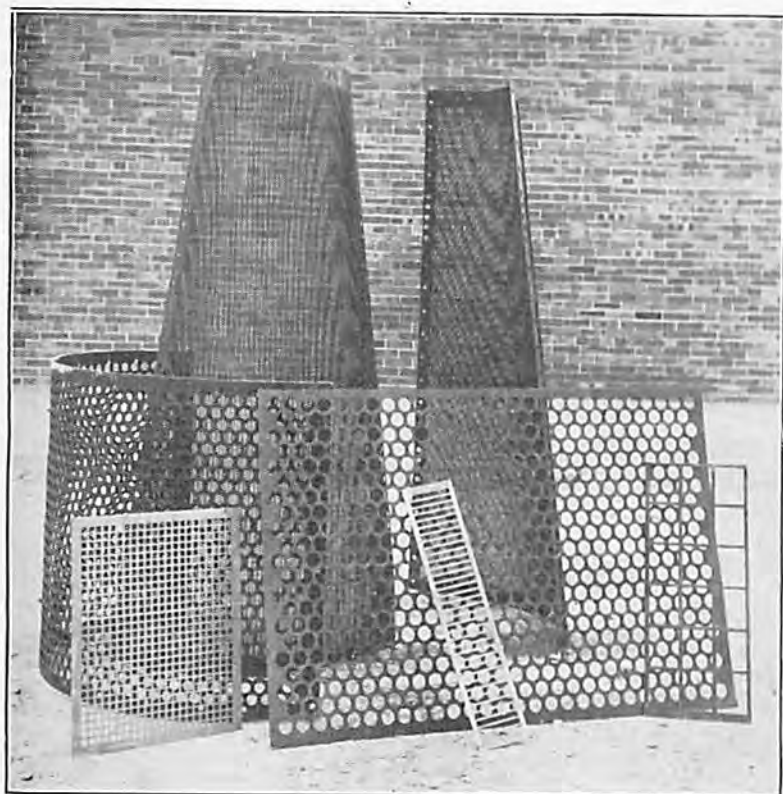
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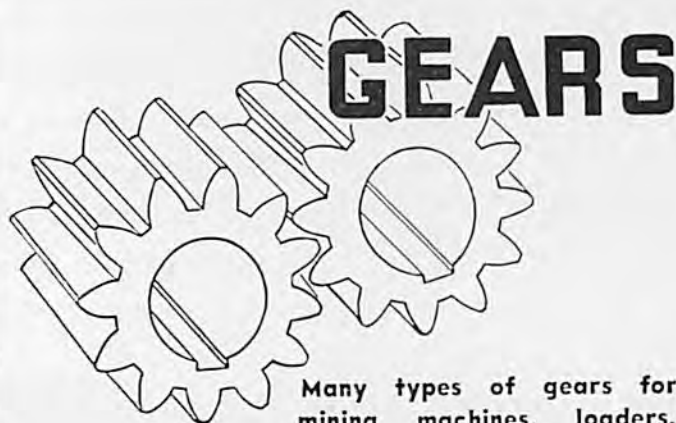
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QUESTION: Is automatic coupling a "speciality" or a significant trend?

ANSWER: The railroads of America, years ago, used link and pin coupling. The adoption of larger, heavier cars, faster haulage speeds, and safety methods made automatic coupling a "must" in this industry.



QUESTION: Am I limited to car dumping methods with this type of coupler.

ANSWER: Cars can be bottom, end and rotary dumped with O-B Couplers installed.

2070-AM



QUESTION: Is coupler fully automatic?

ANSWER: The O-B coupler engages automatically upon impact on any normal curve or straight track without prior alignment or manual adjustment.



QUESTION: How can I apply automatic couplers to my own operation?

ANSWER: Our engineers will gladly furnish a diagnosis. Please send the following information: 1. Method of dumping. 2. Center radius of shortest coupling curve. 3. Maximum vertical break in grade. 4. Blueprint showing car design. 5. Other conditions.

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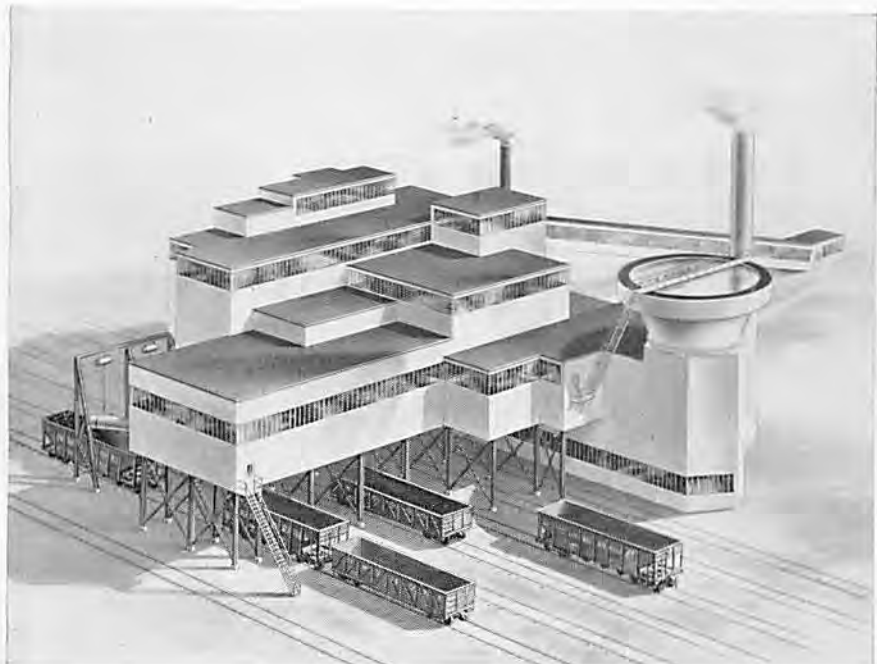
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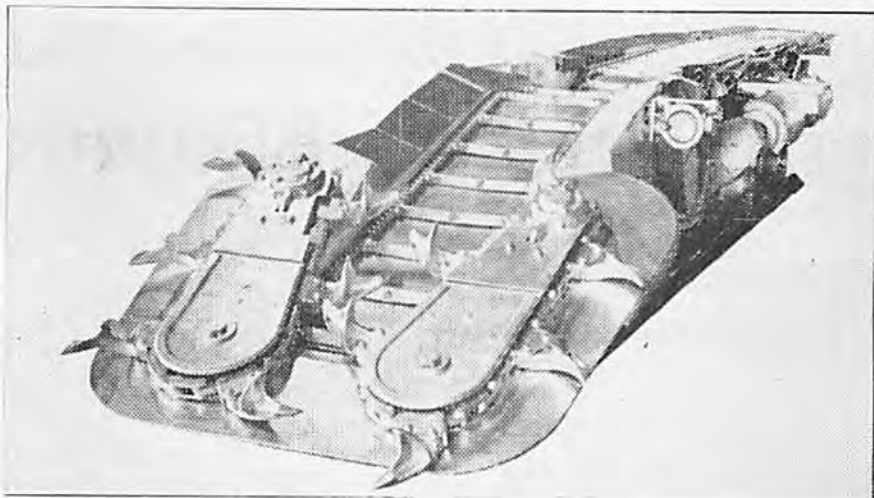
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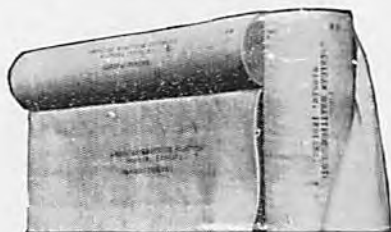


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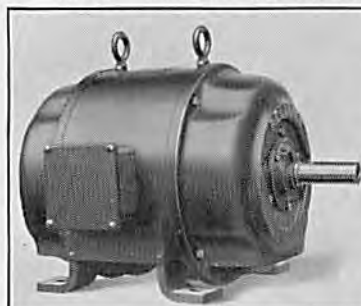
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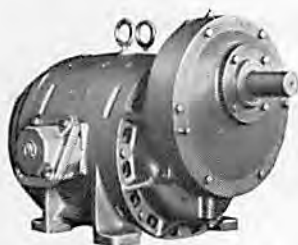
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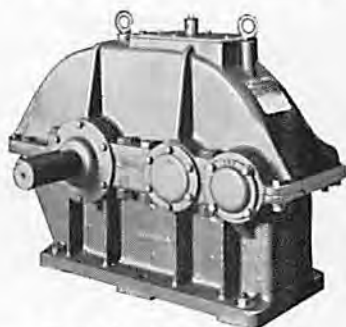
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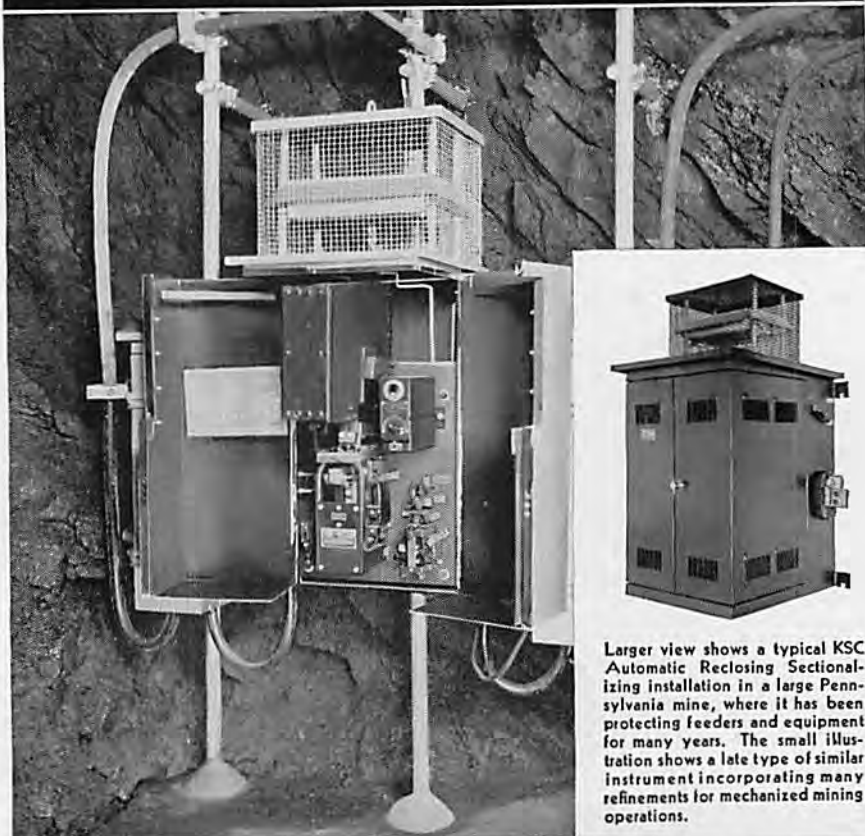
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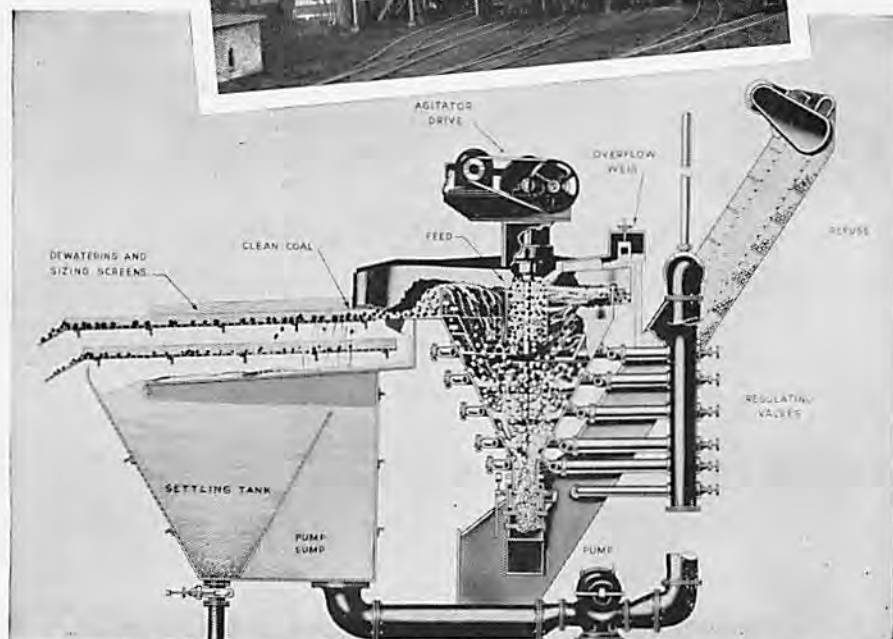
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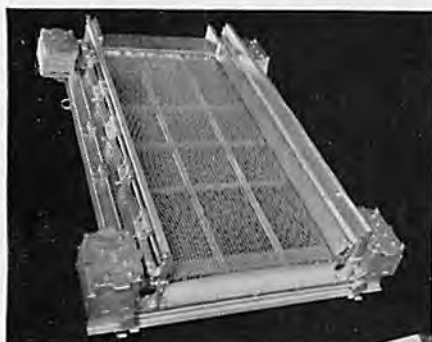
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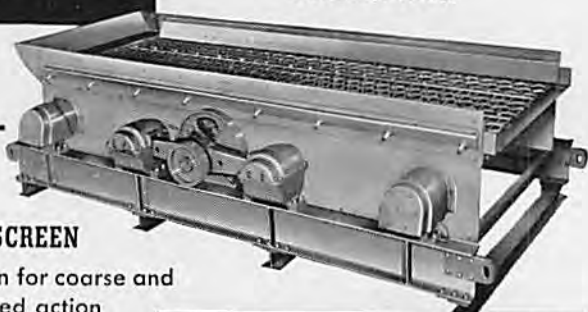


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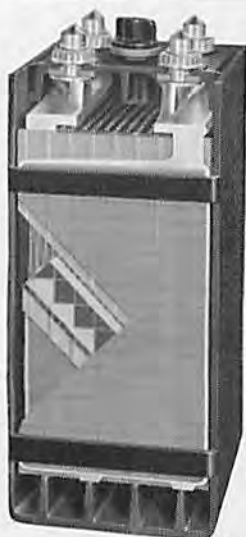
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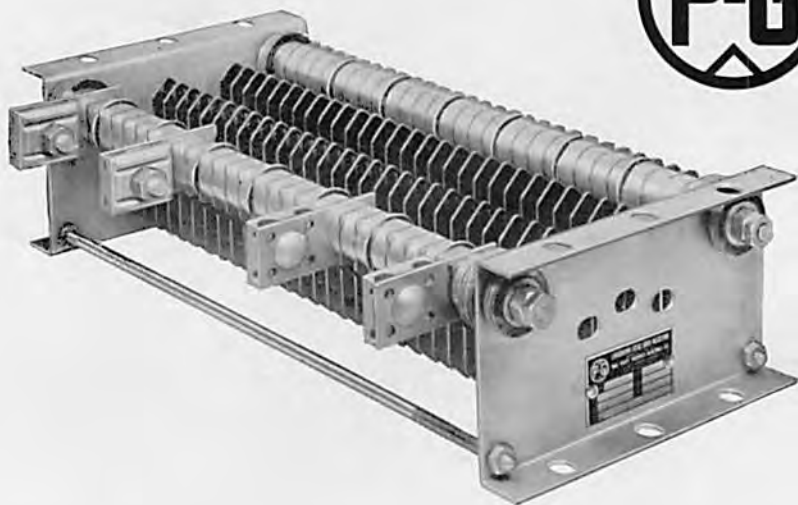
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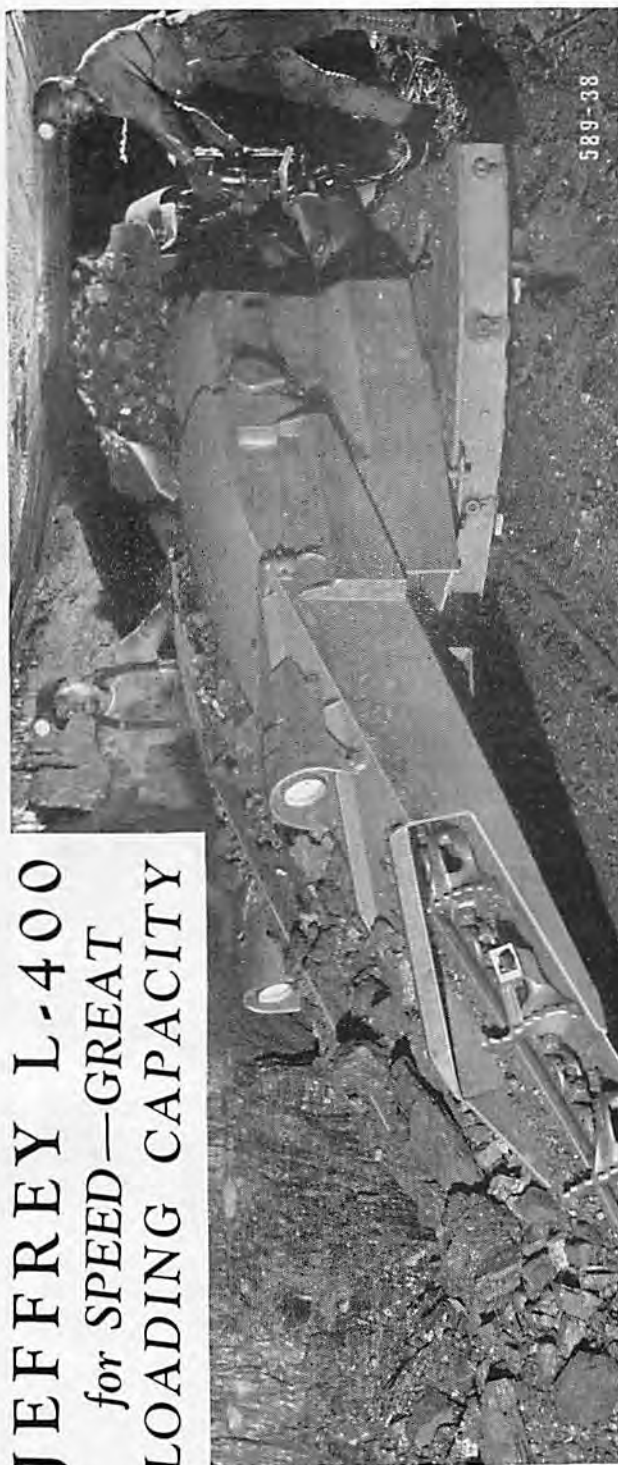
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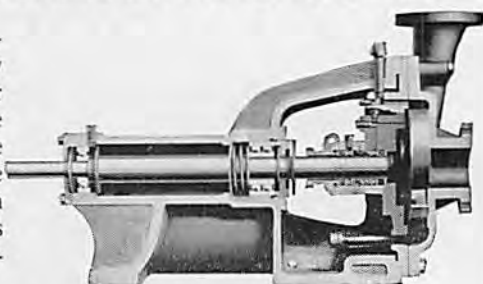
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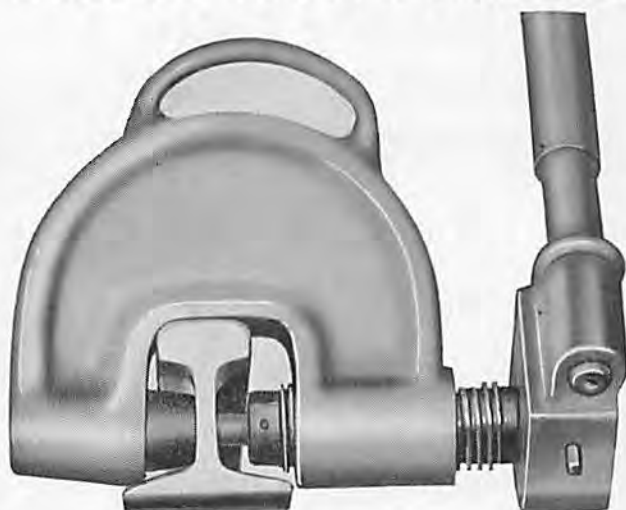
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