PROCEEDINGS

of the

ILLINOIS MINING INSTITUTE

FOUNDED FEBRUARY, 1892

Fifty-Third Year

1945

Annual Meeting
SPRINGFIELD, ILLINOIS
October 26

OUR MINING INSTITUTE

Our meeting, held in Springfield, was really some affair,
    But it couldn't have been otherwise with so many members there.
Mining men, from near and far, with men in allied lines,
    All working close together for the betterment of our mines.
That's why we keep on growing, and the men of I. M. I.
    Are so proud of their achievements in the many years gone by.
And, yet we have some members—but maybe just a few,
    Who, like myself, are just "has beens" with nothing much to do;
But, every year, you'll find us there, sitting at our ease,
    Watching others do the work, like a drone among the bees.

I'm going to be real truthful and tell you why I go,
    For it gives me more real happiness than anything I know:
I go to meet those dear old pals, whose friendships I revere,
    As all the money in the world can't buy a thing more dear.
If our Institute meant nothing more than a place where we could share
    The comradeship of those old friends, with the new ones who were there,
We'd feel we'd had our money's worth, and 'twould pay big dividends
    To the companies who really know—"Success Is Made by Friends."
But our Institute means more than that, I'm very glad to say,
    And accomplishes its many aims by mixing work with play.

We get a lot of pleasure from those meetings in the Fall,
    As we seem to know "It's all for one" and likewise "One for All."
Supply men, or mining men, you can't tell them apart,
    For when we hear that gavel sound we're all coal men at heart.
We join in all discussions, on problems old and new,
    And absorb a lot of knowledge before the day is through.
That's why we have so many, who go from year to year,
    With a feeling they will benefit from something they will hear.
For three and fifty years we've met, and we now are going strong
    With more than a thousand members, all boosting us along.

J. A. ("JEFF") JEFFERIS

George F. Campbell

President, 1945

OFFICERS 1945

PRESIDENT

George F. Campbell
Chicago, Illinois

VICE-PRESIDENT

Joseph E. Hitt
St. Louis, Missouri

SECRETARY-TREASURER

B. E. Schonthal
28 East Jackson Boulevard
Chicago 4, Illinois

EXECUTIVE BOARD

Paul Halbersleben **
W. J. Jenkins *
L. F. Lumaghi, Jr. **
Harry M. Moses **
F. S. Pfahler *
H. A. Reid **
J. W. Starks ***
E. F. Stevens ***
H. A. Treadwell ***
H. L. Walker *
James White *
W. P. Young ***

* Term expires 1945
** Term expires 1946
*** Term expires 1947

OFFICERS 1946

PRESIDENT

Joseph E. Hitt

St. Louis, Missouri

VICE-PRESIDENT

Robert M. Medill

Springfield, Illinois

SECRETARY-TREASURER

B. E. Schonthal

28 East Jackson Boulevard

Chicago 4, Illinois

EXECUTIVE BOARD

R. L. Adams ***	Harry M. Moses *
Alex Duncan ***	H. A. Reid *
Paul Halbersleben *	J. W. Starks **
G. S. Jenkins ***	E. F. Stevens **
E. R. Keeler ***	H. A. Treadwell **
L. F. Lumaghi, Jr. *	W. P. Young **

* Term expires 1946
** Term expires 1947
*** Term expires 1948

PAST PRESIDENTS OF ILLINOIS MINING INSTITUTE

FOUNDED FEBRUARY, 1892

1892-3	JAMES C. SIMPSON, Gen. Mgr., Consolidated Coal Co., St. Louis, Mo.
1893-4	JAMES C. SIMPSON, Gen. Mgr., Consolidated Coal Co., St. Louis, Mo.
1894-5	WALTON RUTLEDGE, State Mine Inspector, Alton, Ill.
1895 1911	Institute inactive.
1912-3	JOHN P. REESE, Gen. Supt., Superior Coal Co., Gillespie, Ill.
1913-4	THOMAS MOSES, Supt., Bunsen Coal Co., Georgetown, Ill.
1914-5	J. W. STARKS, State Mine Inspector, Georgetown, Ill.
1915-6	WILLIAM BURTON, V. P., Illinois Miners, Springfield, Ill.
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.
1930-31	JOSEPH D. ZOOK, Pres., Illinois Coal Operators' Assn., Chicago, Ill.
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.
1939-40	ROY L. ADAMS, Old Ben Coal Corp., West Frankfort, Ill.
1940-41	DR. M. M. LEIGHTON, State Geological Survey, Urbana, Ill.
1941-42	J. A. JEFFERIS, Illinois Terminal Railroad Co., St. Louis, Mo.
1942-43	CARL T. HAYDEN, Sahara Coal Co., Chicago, Ill.
1943-44	BEN H. SCHULL, Binkley Mining Co., Chicago, Ill.
1944-45	GEORGE F. CAMPBELL, Old Ben Coal Corp., Chicago, Ill.

CONTENTS

FIFTY-THIRD ANNUAL MEETING

Meeting called to order by President George F. Campbell 9
Secretary's Report 9
Report of the Nominating Committee 11
Report of Scholarship Committee 12
"Safety and Mining," by Robert Weir 14
"Explosives in Coal Mining," by N. G. Johnson 17
"Coal Mine Lubrication," by Arthur M. Hughes 24
Discussion—by L. G. Hazen 28
"Evolution of Coal Cutting Machinery," by Rod Eagan 30
"Mining Electrical Group Begins Ninth Year," by Fred W. Richart 42
Discussion—by Thos. L. Garwood 45
Discussion—by Frank Eubanks 47

Evening Meeting:

Meeting called to order by President George F. Campbell 49
Introduction of John W. Kapp, Mayor of Springfield, by Toastmaster Richard F. Wood 49
Talk by Mayor John W. Kapp 49
Introduction of Guests 51
Report of Special Committee by J. A. Jefferis 52
Further Introduction of Guests, Officers, Directors 53
Letter from Marion B. Walls, Former Scholarship Student 55
Announcements of New Life Members 56
Address by Holly Stover 60
Introduction of President-Elect Jos. E. Hitt 67
Special Elections of Honorary Members 69

SPECIAL ARTICLES

"The Story of Underground Lighting," by Grant Wheat 71
"Coal Drilling," by S. J. Wills 80
"Prefabricated Track," by J. B. Haskell 83
"Freezeproofing Coal Shipments," by Wm. A. Staab 87

REPRINTS

"Seven War Years in Coal Mining," reprinted from Coal Age, September, 1945 94

"Ventilation," by Raymond Mancha, reprinted from Mechannual, 1945 97

IN MEMORIAM 115

"Machine Mining," by Edwin H. Johnson, reprinted by permission of Mining Congress Journal 117

"How to Weigh for Accuracy in Mine-Scale Operation," by Harry M. Roeser, reprinted from Coal Age, February, 1945 123

CONSTITUTION AND BY-LAWS 133

ROLL OF HONOR 136

MEMBERSHIP LIST 137

ADVERTISING SECTION 172

PROCEEDINGS OF ILLINOIS MINING INSTITUTE

FIFTY-THIRD ANNUAL MEETING

Held in Springfield, Illinois

FRIDAY, OCTOBER 26, 1945

MORNING SESSION

9:30 O'clock A. M.

The Illinois Mining Institute convened for their fifty-third annual meeting in the Ballroom, Abraham Lincoln Hotel, Springfield, Illinois, at 9:30 o'clock, with Mr. George F. Campbell, President, presiding.

President Campbell: Will you please come to order. I am glad to welcome you here today. I am also glad to be a representative of the coal industry in this, the third largest coal producing state in the Union.

Last year and the year before it was my misfortune to be unable to attend your annual meetings so I feel that I am entitled to say a few words more on this occasion than has been customary for retiring presidents to say heretofore.

I do not know of any gathering anywhere where there is as good fellowship as there is at these annual meetings. We can all read the proceedings in the yearbook but the friendly hand-clasp and the meeting with old familiar faces that one sees only a few times a year or less are experiences that cannot be had from the pages of a book.

To me, those are the things that count at the annual meetings of your institute. As I said before, Brother Schonthal has everything all mixed up here as he always has. The next order of business, gentlemen, is the reading of the minutes.

Those have been written in the yearbook and if it is in order they will be dispensed with. Is that in order, Mr. Secretary?

Secretary Schonthal: It is.

President Campbell: We will now have the Secretary's report.

SECRETARY'S REPORT

The task of preparing a report for the year just ending is a rather difficult one because of the general conditions in the industry and the disturbances throughout the world within the past year. A considerable amount of detail has continued in the activities of your organization, although the results may not appear on the surface.

Our boat trips have become more or less of a war casualty. In 1944 the Golden Eagle went out of commision, as you all probably know. The latest information we have is that there is a very poor likelihood of its being available next year. We are trying to make some arrangements, if we can, for a boat trip, but it does not lock too encouraging. It is, therefore, quite gratifying to see this large group after a period of twelve months since our last meeting.

In spite of all handicaps, our membership has been maintained very well. At the present moment our membership is approximately 950. This number includes only about 70 who paid dues in 1944 but not in 1945, whom we have carried up to this point. To follow our previous practices, these members, unless paid up before the end of this year, will be dropped from our enrollment. In the past your secretary has expressed the hope that our membership would reach 1,000. We are quite optimistic now that this goal will be reached and even exceeded. During the past year six of our regular members became Life Members.

Our financial position remains good. We have in the bank $1090.68 and own $12,000.00 in interest-paying bonds.

During the past year we had the misfortune to lose three members by death. They are:

J. C. Anderson, July 7, 1945

F. A. Flaskamp, August 12, 1945

John M. Dillavou, August 19, 1945

The usual expressions of sympathy were sent to the families by your Secretary.

It may be of interest to you to know we have carried 33 of our members without payment of dues, who have been serving in the armed forces. We had the bad fortune to lose one of these members in action sometime ago. A number of these men are returning to civilian life and have already renewed their regular memberships.

The interest shown by our members in today's meeting has been gratifying because of the uncertainties and difficulties everyone has experienced this year. I know I express the feelings of the officers and executive board as well as the members themselves for this interest.

The ready cooperation given the Secretary's Office by all officers, committees, and members is always appreciated. We look forward to the coming year as one of achievement.

B. E. SCHONTHAL, *Secretary-Treasurer*

* * *

President Campbell: It is in order, gentlemen, to have a motion to accept the report.

Mr. J. A. Jefferis (St. Louis, Missouri): I will so move and I would like to add to the motion that we give our Secretary a rising vote of thanks.

Mr. Peter Joyce (Springfield, Illinois): I second the motion.

President Campbell: You have heard the motion, gentlemen. Those in favor please rise. The motion seems to be unanimously carried judging from the applause.

The next order of business is the report of the Nominating Committee with the slate of officers for the ensuing year. Mr. Taylor, the chairman of that committee, is not present, so I will ask the Secretary to read his report which he has sent in by mail.

Secretary Schonthal: This is dated September 11 and is addressed to the Secretary-Treasurer of the Illinois Mining Institute. It reads as follows:

REPORT OF THE NOMINATING COMMITTEE

Your committee on nominations met today and after motion by Mr. Treadwell, seconded by Mr. Devonald and unanimously carried, the following slate was proposed to guide the destiny of the Illinois Mining Institute for the coming year:

President: Joseph E. Hitt

Vice President: Robert M. Medill

Secretary-Treasurer: B. E. Schonthal

For election for a three-year term to the Board of Directors:

R. L. Adams, Old Ben Coal Corporation

Alex Duncan, Superior Coal Company

G. S. Jenkins, Consolidated Coal Company

E. R. Keeler, Franklin County Coal Corporation.

The report is respectfully submitted by the Nominating Committee, H. H. Taylor, Jr., Chairman; D. H. Devonald, and H. A. Treadwell.

* * *

President Campbell: You have heard the nominations. Are there any other nominations?

Mr. Peter Joyce: If there are no further nominations I move that the report of the committee be adopted and the Secretary be instructed to cast the unanimous ballot of the Illinois Mining Institute for those nominated.

Mr. J. A. Jefferis: I second the motion.

President Campbell: Gentlemen, you have heard the motion. Is there any discussion? If not, all those in favor of the motion signify by the usual sign of voting. Opposed. The motion seems to be carried unanimously and it is so ordered.

Secretary Schonthal: The vote is cast, Mr. President.

President Campbell: Is Professor Walker here? Would you please come forward and make a report, Professor Walker, on the scholarships for the Scholarship Committee.

. . . Professor H. L. Walker, Head of the Department of Mining and Metallurgical Engineering, University of Illinois:

REPORT OF SCHOLARSHIP COMMITTEE

The Scholarship Committee's last report was made at the 52d Annual Meeting of the Institute in October 1944.

The report for the 53d Annual Meeting is very brief. There are no active holders of scholarships at the present time. Mr. Schulte Bishop held one of the scholarships for three semesters, beginning in June 1944 and concluding in June 1945, when the Scholarship was dropped by action of the Committee.

Predictions cannot be made for the coming year because registration for the next semester will not be held until November 2. The prospects are not encouraging for the present because Selective Service continues to draft young men over 18 years of age. On the other hand, the department has three returned Veterans currently enrolled in Mining Engineering and this number will undoubtedly increase as more men are returned to the United States and released from service. There are now 1400 Veterans enrolled in the various schools and colleges on our campus.

H. L. WALKER, Head
Department of Mining and
Metallurgical Engineering

* * *

President Campbell: How many students do you have in the mining course?

Professor H. L. Walker: There are twenty-two.

President Campbell: Twenty-two.

Professor H. L. Walker: Three of them are Veterans, as I mentioned before.

President Campbell: Thank you very much, Professor Walker. We are a little late now and will need to get on with the meeting. We are going to have the morning session presided over by one of our good friends and former president of the Illinois Mining Institute; a man who is not only in the mining industry, but on the side he runs a railroad. You all know him—Mr. T. J. Thomas of the Valier Coal Company, Chicago Illinois. (Applause.)

Chairman Thomas: Thank you, Mr. Campbell. Perhaps you have already heard, but I think that it is well to tell you at this time, that this Illinois Mining Institute is the largest institute in membership of any mining insitute in the United States. (Applause.)

The first paper this morning is entitled, "Safety in Mining," and will be given by Mr. Robert Weir, Assistant Director, Department of Mines and Minerals, Springfield, Illinois. Mr. Weir, will you please come forward.

SAFETY AND MINING

By ROBERT WEIR
Asst. Director, Dept. of Mines and Minerals
Springfield, Ill.

The complete story of safety in mining, as pertaining to this state, is told in the reports submitted by the coal mine operators annually to the state Department of Mines and Minerals. These reports show that over a period of several years there is a steady increase in the number of tons of coal produced per accident, both fatal and non-fatal. It is gratifying to know this; however, these results have not been accomplished easily, but have been brought about by the combined efforts of both men and management.

There is no doubt that during the last few years the war has affected mining considerably. The war has taken many of the young men from the mines into the military service and in a good many instances the jobs usually done by these younger men have been assigned to the older men who in many cases would not be considered for such jobs in normal times. This no doubt has a tendency to keep our accident rate higher than it should be. There are probably many among us who believe that with an increase in days worked and tons produced comes an increase of accidents; however, on a basis of tons produced per accident, both fatal and non-fatal, show this to be not entirely true. To give a clear picture of this, I submit the figures for the last 10 years through the years 1935 and 1944.

It is appalling to know that over this 10-year period that at the coal mines, in the State of Illinois, 876 men have been killed and 26,654 injured and shows us how much there is yet to be accomplished. As astonishing as these figures are, still we have, through the teaching and application of safety methods and appliances, steadily reduced the accident rate year by year through this same period.

Comparing the first 5 years with the last 5 years of this 10-year period, we find that from 1935 through 1939, the operators produced 238,936,254 tons with an average of 45,832 men. From 1940 through 1944, they produced 323,728,535 tons with an average of 33,306 men. This makes an average increase per man of 4,500 tons. For the period of 1935 through 1939, we had 422 fatal accidents making a production of 566,199 tons per fatal accident. For 1940 through 1944, we had 454 fatal accidents, making an average production of 713,058 tons per fatal accident; thus, we have an increase of 147,000 tons per fatal accident.

Looking at it another way, the mines produced 85,000,000 tons more in the last 5 years than they did the previous 5 with an increase of only 32 fatal accidents. This makes an increase of 2,600,000 tons per one fatal accident increase.

From 1935 to 1939, we had 13,326 non-fatal accidents for an average of 17,930 tons per non-fatal accident. From 1940 through 1944, we had 13,328 non-fatal accidents for an average of 24,289 tons per non-fatal accident; thus, we have an increase of 6,300 tons per non-fatal accident. However, the big surprise is this: the 85,000,000 tons increase was produced with an increase of only 2 non-fatal accidents; thus, we have over a period of 5 years an increase of 85,000,000 tons with an increase of 32 fatal and 2 non-fatal accidents. While this record, we think, is very good we must not let down in our safety efforts. More can be accomplished and will be accomplished with just a little more effort; so far this year our records on fatal accidents show a marked improvement. Our previous big year was 1944, with a production of 889,655 tons per fatal accident, and up-to-date for 1945, it is running better than 900,000 tons per fatal accident. However, the non-fatal accident record is not so good.

While we are far from perfect, the records show that through the practice of safety, over this 10-year period, we have reduced the accident rate considerably and it also shows how much remains to be done. It is up to the industry as a whole and the records of the next few years will show how we have met this problem. The mining industry has met with and overcome many problems in the past and while there is so much to be accomplished, I am confident that our accident rate will be greatly reduced in the coming years. (Applause.)

* * *

Chairman Thomas: Thank you, Mr. Weir. Are there any questions you would like to ask Mr. Weir? I would like to make a brief statement in connection with accidents.

You notice that Mr. Weir said there has been a substantial increase in accidents in 1944. I think it is a correct statement to make that in many instances men have not had their minds on their work. Let me illustrate to you what I mean by that. Some months ago I was down in the northwest section of our mine. As I came walking down the entry there was a man standing at the entrance to one of the rooms. Notwithstanding the fact that this man could see my lighted lamp, he apparently did not see me approaching him. I walked up to him and tapped him on the shoulder and as I did this he jumped. I was there about ten or fifteen minutes and during that time he came back and said, "Mr. Thomas, I would like to talk to you." We walked into a crosscut. He said, "You know I didn't see you when you were coming up the entry. My mind was some place else." Continuing he said, "I have two boys in the war, one in the Southwest Pacific and the other in the European Theater of War. I have not heard from one of these boys for over three months and I was thinking of that boy when you approached me coming down the entry."

I tell you, gentlemen, that men in industry today and during the period of active hostilities who had loved ones in the war had much to distract their attention from the job they were doing. Due to a situation of this sort, it has not been difficult for me to understand why and how some of these accidents have occurred in the mines and in industry generally.

The next paper on the program is entitled "Explosives in Coal Mining," by N. G. Johnson, Technical Service Section, Explosives Department, E. I. du Pont de Nemours & Co., Wilmington, Delaware. Mr. Johnson, will you please come forward.

EXPLOSIVES IN COAL MINING

By N. G. JOHNSON

Technical Service Section, Explosives Department

E. I. du Pont de Nemours & Co.
Wilmington, Delaware

The coal mining industry and the explosives industry are old friends, in fact, the first transaction between them took place about 300 years ago. Some enterprising coal operator decided that it might be a good idea to try out that new explosive he'd been hearing about—black powder.

Black powder wasn't actually new, even in 1650, but it was new in mining. Previous to that time the only tools available were the pick, hammer, wedge, crowbar and "fire setting." In the latter, a fire was built against the rock, which on cooling split and flaked off. To hasten the process, water was often thrown on the heated material.

The use of black powder grew slowly at first, for a number of reasons. Most important, probably, was the lack of suitable drilling equipment. Then, too, the art of roof control was in its infancy and many mining men were afraid of the violent action of an explosive. Other factors were wide variation in the quality of black powder and its high cost. During the 1600's black powder cost about $2.00 a pound. And dollars in those days weren't of the "rubber" variety.

Until the invention of dynamite, in 1867, black powder was the only commercial explosive available. Incidentally, dynamite's inventor, Alfred Nobel, was one of the outstanding geniuses of all time—as a scientist, a manufacturer, and a business man. In addition to inventing dynamite, he invented gelatin dynamite, perfected the blasting cap, and introduced ammonium nitrate. These are the four keystones of the modern commercial explosives industry.

Appalling frequent mine explosions soon made it evident that black powder is exceedingly hazardous in gassy and dusty coal mines. Every effort was made to reduce this hazard by modifying the powder and regulating its use, but little of real value was accomplished. It was not until the development of "permissible" dynamites that blasting could be carried out safely in *all* coal mines.

Systematic research on explosives safe for use in gassy and dusty mines began, both in Europe and the United States, in the early 1900's. The testing gallery, in which the safety characteristics of explosives are evaluated by firing them into explosive mixtures of gas and dust, was the key to solution of the problem. A testing gallery was erected by the U. S. Bureau of Mines in 1908, and during the following year 36 "permissibles" were made available to the coal mining industry. The reason why so many permissibles could be made available in so short a time was that the explosives industry had been studying the problem for many years and was prepared to take immediate advantage of the Bureau's action.

According to the Bureau of Mines' tests, the average permissible explosives of today, "have a factor of safety of at least 17 over common dynamite, and at least 45 over the black blasting powders, on the basis of their liability to ignite gas and dust." Such figures, in themselves, are meaningless. The point is: Are permissibles safe?

To answer this question, we again quote the Bureau of Mines, as follows: "The record of gas or dust ignitions from black blasting powder, dynamite and permissible explosives is taken from such reports as are available to the Bureau of Mines. These data show that no permissible explosives, when used in a permissible manner, have caused an ignition of either gas or dust." In their entire history, as a matter of fact, permissibles have been involved in only 19 gas or dust explosions, and in each case it is definitely known that at least two non-permissible practices were in effect. We think that this is a remarkable record, when it is considered that over one and one-half *billion* pounds of permissibles have been used and about ten *billion* tons of coal have been blasted with them. In this connection, we think it may be of interest to note the fact that one and one-half billion pounds of permissibles means approximately one and one-half billion separate *shots*.

At first it was enough to bring the coal down safely, but not for long. One of the first criticisms of permissibles was that they were too fast; they shattered the coal too much. This was corrected by the introduction of permissibles containing coarse ammonium nitrate. With this ingredient, speeds as low as 5,000 feet per second have been made available. This is only about one-third the speed of average dynamite, and the shattering effect is reduced accordingly.

A second criticism of the early permissibles was that they made too concentrated a load for thin seams. This objection became the more serious, of course, as the length of the cutter bars was increased. It was solved by the development of low-density permissibles.

The development of low-density, or high stick count permissibles is an interesting example of applied research. As the bulk of the explosives was increased they became insensitive, that is, they would not propagate explosion from cartridge to cartridge. This could not be corrected by the use of more nitroglycerin, because the explosives would then not pass the permissibility tests. It was finally discovered that, if the nitroglycerin could be kept on the surface of the other ingredients, rather than absorbed within them, the sensitiveness of the explosives would be much improved. This led to a literally world-wide search for ingredients having the desired characteristics. You will find patents on balsa wood, bongo wood, cat tails, and popcorn, but the materials now in most common use are sugar cane pith and a form of corn flakes known as brewer's grits. With ingredients such as these, permissible dynamites have been made available in stick counts ranging from the original 135 to 250 $1\frac{1}{4}$x8″ cartridges per 50 pounds, and the sensitiveness preserved.

Still another criticism of the early permissibles was that they lacked water resistance. This problem was partially solved by the development of first, permissible gelatins, and second, permissible semi-gelatins. These are very satisfactory for rock and slate, but are usually too fast for coal. Very recently, entirely new methods of waterproofing have been discovered. Utilizing these methods, low velocity permissibles have been developed, especially for coal-shooting, which can be loaded under water at the beginning of the shift and fired with full efficiency at the end of the shift.

So far, we have mentioned only the improvements made in explosives for underground coal. Similar improvements have been made in explosives for stripping. Much has been done, for example, to make these explosives safer to handle. The principal factor in this has been the increasing use of ammonium nitrate as a substitute for nitroglycerin. As with the permissibles, explosives for stripping have been made available in a wide range of speeds, so as to provide for all types of overburden. Low-cost water resistance has been accomplished through developments in both composition and packaging.

There have been many improvements in addition to those mentioned, as for example, in electric blasting caps, delay electric blasting caps and detonating fuse. We believe we have cited enough, however, to convince you that the explosives industry is continuously striving to give you better products.

Now we should like to discuss briefly a problem which is of particular interest in this state. This is the question of "on" versus "off-shift" shooting. The economic factors in this question were very well presented to this group in 1942, in a paper by Mr. Howard Lewis, of the Old Ben Coal Corporation. We agree entirely with every point made by Mr. Lewis, and feel that the economic penalties imposed by off-shift shooting will be even more severe in the future than they have been in the past. Furthermore, it is obvious that off-shift shooting involves the irrevocable loss of a substantial proportion of the nation's coal reserves.

Mr. Lewis also spoke briefly on the question of safety, pointing out particularly the fact that on-shift shooting materially reduces the number of accidents from falls of roof and coal. These are responsible for at least half of both the fatal and non-fatal injuries in coal mines. A fact which is not so well known is that the safety record of the on-shift states is definitely better than that of the off-shift in almost every other type of accident. The overall safety picture is clearly in favor of on-shift shooting.

The proponents of off-shift shooting claim as its principal advantage the fact that, in the event of a mine explosion due to blasting, fewer men will be involved. This, of course, is obvious. The record of the permissible explosives, however, indicates that if they were used exclusively, in a permissible manner, there would be *no* mine explosions due to blasting.

With both the economic and safety factors so clearly in favor of on-shift shooting, we of the explosive industry feel that the coal operators of this state should make a determined effort to have the archaic "off-shift" law repealed.

Although it constitutes another abrupt change in subject, we think you will be interested in a summary of the effect of the war on the commercial explosives industry.

We are very proud of the fact that we have been able to meet promptly, with no necessity for allocations or priorities, all demands for commercial explosives in this country, and in addition, to supply vast quantities for military use and Lend Lease. Several factors have contributed to make this possible, but the most important is research.

The basic raw material for practically all explosives is nitrogen. During World War I, almost the only source of nitrogen was Chile, which has enormous deposits of natural sodium nitrate. Chilean nitrate was relatively unimportant in World War II, for the reason that all of the necessary forms of nitrogen—ammonia, nitric acid, ammonium nitrate and sodium nitrate—are now made synthetically, from such widely available materials as air, water, coal and salt. The explosives industry was a leader in the research and development which made this possible.

Glycerin, a bottleneck in the first World War, was for all practical purposes removed from the list of critical materials in this war. As a matter of fact, the discontinuance of certain distribution controls has made the supply situation worse today than at any time during the war. The principal factor in the conservation of glycerin has been developments in commercial explosives which reduced the nitroglycerin requirements to half of those in effect during World War I. This was accomplished with no reduction in quality, in fact, present-day dynamites are superior in many respects to those of even the recent past. The next most important factor in glycerin conservation was the development, by American chemists, of synthetic ethylene glycol. This material, familiar to all of us as "Zerex" and "Prestone," is a perfect substitute for glycerin so far as dynamite is concerned. Lastly, American chemists have also learned how to make glycerin itself synthetically. Whereas synthetic glycerin actually was not a vital factor during World War II, its production could have been expanded readily to almost any required level.

To mention one more point in connection with American self-sufficiency in explosives, we are no longer dependent on mercury fulminate. This once essential ingredient in blasting caps has been replaced by other substances which are stronger but at the same time less hazardous.

One of the principal topics today concerns the wonderful new things which may be expected as a result of various wartime developments. We of the explosives industry are sorry to have to disappoint you in this respect. It is a fact, however, that little of commercial value has been discovered in our industry during the war. The principal reasons for this are first, that the field had already been well explored, and second, that the requirements for military explosives are quite different from those for commercial explosives. We cannot, therefore, promise you anything revolutionary. We will, however, promise you a steady succession of new products, each one a definite improvement on the product it supplants. (Applause.)

Chairman Thomas: Thank you, Mr. Johnson. We ought to have a good deal of discussion on this subject. Are there not some questions that you would like to ask Mr. Johnson?

Mr. Peter Joyce: I would like to know whether or not the Farben Industry has developed, or, rather whether you have developed, an explosive to take the place of black powder as was done by the Farben Industry?

Mr. Johnson: No, sir, we have not. I believe that black powder still remains the best explosive for shooting on solid.

Chairman Thomas: Are there any other questions? I notice that we have with us the Director of the Department of Mines and Minerals, Mr. Robert Medill. Have you something to say, Mr. Medill, on this very important subject? Won't you come up to the rostrum?

Mr. Robert Medill: Mr. Chairman and gentlemen, I have listened with very great interest to the paper just read by Mr. Johnson. I heartily agree with everything he said. Illinois is the only coal-producing state in the Union that doesn't have the privilege of on-shift shooting. I think it is the safest method we have or could have, if we could have the privilege of on-shift shooting. That is about as much as I can say at this time. Thank you. (Applause.)

Chairman Thomas: Are there any other questions? Is Mr. Howard Lewis here? I notice that his name was mentioned in this paper. Is he in this room? Gentlemen, Mr. Howard Lewis of the Old Ben Coal Corporation, Benton, Illinois.

Mr. Howard Lewis: Gentlemen, this is quite an honor and privilege to be classed as one of the proponents for on-shift shooting. I have listened with great pride to the statements and references made from my article of 1942.

I agree with Mr. Medill. I have stated many times to those whom I could get to listen to me, my arguments in regard to the value and necessity for on-shift shooting. In my opinion, in the state of Illinois, the only reason why there would be a distinction made between off-shift shooting and on-shift shooting is political and political only.

I could stand here for an hour and cite you statistics, or make statements regarding the fact that it is the only thing to insure the ultimate success or the continued success of the Illinois coal industry and to perpetuate its existence.

That is a broad statement but I believe it. I could tell you of hundreds of instances where, if we had been permitted to shoot on-shift, there would be a different story to tell regarding the accomplishments and production of the Illinois Coal Industry. This is true of the past and could be determined to be true in the future.

I believe it to be the only thing, the greatest contribution toward the future and the destiny of Illinois coal. Thank you, gentlemen. (Applause.)

Chairman Thomas: Are there any other questions? Certainly, there ought to be a number of questions on this important matter that so vitally affects mining in the State of Illinois.

I would like to say a few words about this. I was in Washington for about two years and a half. At the time I was appointed a director of the Coal Mines Administration I asked that some observations be made with reference to the matter of on-shift shooting and its relation to development work.

I was utterly amazed to discover in the reports that came to my desk from time to time that in the advance or development work in some of the large mines in the State of Illinois, much development had been lost by reason of the extraction of coal from the rooms far exceeding the advancing of the entries.

Some years ago I became very much interested and disturbed about this matter, and I assigned an engineer who spent approximately eight or ten months studying the coal deposits in the State of Illinois, particularly in one section of the state, to determine so far as possible the amount of recoverable coal still remaining in that section.

The study required an examination of maps and records at the county seats; also in the Department of Mines and Minerals at Springfield and the State Geological Survey at Urbana, and as I recall it records were studied as far back as 1886. I was utterly amazed at the result of that study. It indicated that the coal in certain sections of the state was being depleted at a more rapid rate than many of us might think. Many panel entries are not advanced in the same ratio as is the extraction of coal from the rooms. Much of the difficulty with reference to the development could be eliminated by on-shift shooting, and I am reasonably certain that by so doing we could recover at least five per cent more coal than is being recovered at mines where on-shift shooting is prohibited.

Probably some of you think that we have an inexhaustible supply of good coal in Illinois. You will be surprised if you take the time to study this important matter insofar as it affects the coal mining industry of the state. I say it is manifestly unfair to this great basic industry with the competition it is going to be obliged to meet in the near future to prohibit some form of on-shift shooting. Certainly there ought to be some questions on this important subject and we ought to address ourselves to it because it is so vital to our industry.

Is there anything else to come before the meeting? I think the Secretary has an announcement to make. Therefore, I turn the meeting over to Secretary Schonthal.

Secretary Schonthal: I would like to suggest that everybody be back here at two o'clock this afternoon because we have an interesting program. It will take a little longer time for the afternoon program.

I also suggest that from all appearances we are going to have quite a crowd here for dinner this evening, and it would be well for everybody to be on time because there are no reserved seats. Remember, if you register, you get your dinner ticket free. That is about all I have to say.

Chairman Thomas: Are there any other questions to come before the meeting? If not the meeting will stand adjourned.

(The meeting adjourned at 11:15 o'clock.)

AFTERNOON SESSION

2:00 O'clock P. M.

The Friday afternoon session of the Illinois Mining Institute convened at two o'clock, with President George F. Campbell presiding.

President Campbell: Gentlemen, come to order, please. The afternoon meeting has quite a few papers listed on the program. The chairman for the afternoon is a very good friend of mine. I don't want you to take him seriously on some things. One of them is that we are not thinking about unionizing our foremen. The name doesn't mean anything in that respect.

I want to introduce my good friend, Howard L. Lewis.

Chairman Lewis: Gentlemen, I am very glad to be here and be responsible for your good behavior and close attention this afternoon. Of course, Mr. Campbell, in introducing me and saying what he did, had to be nice to me.

He must be nice to me because, by George, I work for him. On this subject of unionization of the bosses, if they unionize me, I will be president.

We have three very interesting papers this afternoon dealing with subjects that have been highly pertinent to the success of Illinois production during this war period with all the troubles of everyday work and the unusual strain upon equipment.

I would say that two of these papers would deal very pertinently with that. The first paper is by Mr. Arthur Hughes of the Superior Coal Company, Gillespie, Illinois, and is entitled, "Coal Mine Lubrication." Mr. Hughes.

Mr. Arthur Hughes (Superior Coal Company), Gillespie, Illinois): Mr. Chairman and gentlemen of the institute. I am very happy to be here this afternoon and discuss with you for a short time an increasingly important phase of the coal mining industry.

COAL MINE LUBRICATION

By ARTHUR M. HUGHES
Superior Coal Company, Gillespie, Illinois

Modern mechanization has changed lubrication methods and theories just as much as it has changed mining systems in general; oil refineries have met this challenge with a multitude of oils and greases designed for specific purposes, and these new lubricants have developed a situation which demands a new place for lubrication in the organizational set-up, if they are to be utilized to the benefit of the consumer.

Lubrication and maintenance problems have multiplied generally, and the solution of these problems depend entirely upon the wisdom of the planning heads of companies in properly placing lubrication and maintenance, giving adequate emphasis to their importance as a phase of operations.

It is therefore important for mining people in general to take stock of their operations, and survey their lubrication and maintenance systems with the idea in mind of taking advantage of modern methods to the point where they can be utilized in increased production at lower cost.

Lubrication Systems

There are possibly a dozen or more different systems of lubrication now in use in the mines of Illinois; these systems, however, can be classified under two general heads: 1—The use of a low-priced average quality oil with the intention of changing it at fairly close intervals, and 2—The use of a high-priced, high quality oil to be used over a longer period of time by changing it and reclaiming it by filtration for further use in the same machines.

Both of these systems demand care if they are to be utilized at moderate cost. It is obvious, however, that the second will demand more attention than the first, and the success of either dependent entirely upon the efficiency of the men supervising and applying the lubricants, and the mechanical condition of the machines in which the lubricant is used.

Lubrication vs. Maintenance

Efficient lubrication systems can be totally wrecked by deficient maintenance, and on the other hand efficiently conditioned machines can be ruined by improper lubrication; orienting lubrication and maintenance therefore must take into account this close alliance between lubrication and maintenance, and their interdependence one upon the other.

Many firms recognize this alliance by uniting the two departments, while others separate them into separate departments with different supervisory heads. There is no hard and fast rule, of course, as to who will supervise lubrication, however, oil people in these modern days recommend the selection and training of a lubrication supervisor who shall oversee the details of lubrication in close cooperation with the mechanical engineer and maintenance department; this practice, of course, is advisable only in operations large enough to justify the additional expense.

Training Programs

The establishment of lubrication schools and clinics for the information and education of supervisors and employees engaged in maintenance and lubrication is highly recommended. Most of the reputable refineries have a wealth of information available which can be organized into a well-ordered educational program, and the benefits to be attained from such a program can hardly be estimated for there is a widespread misconception as to the quality of lubricants, the effects of inadequate lubrication on mine machinery, and the costliness of poor maintenance from a lubrication standpoint.

The establishment of such educational programs tend to emphasize the importance of lubrication and maintenance, and dignifies it in the eyes of the supervisor and employee.

Application Methods

The old haphazard method of applying oils and greases is out if efficient and economical operation is desired. The application of modern lubricants is a technical work, and should be performed through the medium of modern equipment. The savings effected by the installation of properly charted application systems will soon offset the initial cost of the equipment.

Many companies have enjoyed considerable savings by the installation of mobile pressure oilers, while others have found enclosed grease trucks and modernized hand oiling equipment to pay them well in savings from decreased waste and contamination.

Containers should be clearly marked, and an effort made to avoid as much as possible the mixing of oils and greases in such containers accidentally or otherwise.

Units of machines requiring grease or oil should be marked specifying the oil or grease required, for this will eliminate the excuse for applying the wrong type of oil or grease to such unit.

Each unit of a machine has a natural capacity, and usually an expansion space for gases generated by temperature; if these capacities are exceeded, and the unit overloaded with a lubricant, serious damage to oil seals and retainers can result by the generation of such gases. It is therefore important to inform the grease men and oilers to observe closely the amount of lubricant added to the units on the machine. It is a curious fact that more trouble generally is found with over-lubrication than under-lubrication, for most people theorize that "if a little oil is used, a lot of oil is better."

The setting of the time for lubrication of a machine should be flexible enough to permit, even demand the lubrication of that machine when lubrication is needed. Many companies set the time for lubrication of machinery on an idle shift, but many times the oilers' report shows the addition of excessive amounts of lubricant to the machine which is an indicaton that the machine was operating for the last couple of hours of operating time short of oil; this is not a proper method of taking care of machinery, and many machine failures can be traced to inadequate lubrication. It should be the policy of the lubrication supervisor to provide for the constant lubrication of machines, especially when lubrication is needed.

Measuring devices should be provided and used by all who have to do with handling lubricants, and accurate records assembled on consumption of oils and greases, production, cost, and lost operating time, for such records are the only reliable gage for organizing or maintaining a well-ordered lubrication system. By intelligent use of such records many defects can be spotted before machine failures develop, and a system of preventative repair can be worked out.

Choice of Lubricants

The choice of lubricants for new machinery should be carefully worked out with the advice of the industrial lubrication engineer of the refinery from whom the lubricant is to be purchased. There is a proper oil or a proper grease for each purpose, and if the wrong lubricant is used dissatisfaction will most certainly result.

There are very few laymen who are fully informed as to oil quality and chemical stability of lubricants. Such things as speed, load, temperature, film strength of lubricant required, viscosity, etc., have to be taken into consideration in the choice of lubricants, and it is the business of oil technicians to know such things. It is to the advantage of the operator to have expert opinion in choosing lubricants.

Maintenance

From the standpoint of lubrication, maintenance is probably the most important factor, together with actual operational efficiency. The old practice of waiting for a machine to break down before it is brought to the machine shop for reconditioning is rapidly being replaced by the modern system of preventative repair. Such system eventually pays for itself, for replaced parts can be reconditioned for further use, and many months of service can be salvaged from these reconditioned parts, thus decreasing the cost by eliminating the necessity for ordering as many new parts.

Miserly use of oil seals and retainers is inadvisable; very little savings, if any, can be realized by using seals too long. Loss of lubricants by leakage, high operating temperatures caused by loss of oil, and even major breakdowns can result by using defective oil retainers. It should be a policy to replace oil seals before they wear out as a part of the preventative repair program.

Gaskets and packing should be used where bolted sections are to be installed, and they should be carefully checked for leakage before the machine is sent back into service. Alignment of repaired parts should be carefully checked, for misalignment means quicker wear.

Measuring a System

The points of inquiry in the examination of a lubrication or maintenance system are generally these:

1. Are maintenance costs high or low?
2. Is the consumption of lubricants high or low?
3. Is the loss of operating time due to machine failure excessive?
4. Are production rates on a per unit basis satisfactory?
5. Are lubrication costs reasonable?
6. Is power consumption excessive?
7. Are operating temperatures constant.

Any, or all of these can be answered or corrected by an efficient system of lubrication and maintenance, and a constant check should be maintained on each of them.

Tests and Experiments

The continuity of tests and experiments is a valuable asset to a successful lubrication system; it is only by test and experiment that solution of theory is worked out, and it gives additional strength to the organization to keep them reminded that the system is under constant scrutiny.

A continuous record of temperature checks should be kept, and occasional power checks should be made to determine efficiency of operation. Samples should be taken and tests on viscosity, acidity, film strength, contamination, and oxidation run as a check on lubricant stability during use.

Conclusion

The effectiveness of lubrication as well as maintenance programs depend almost entirely upon management, and the future of efficient operations relies upon their foresight.

Lubrication can be an important part of operations, and lend valuable aid in improving operational efficiency. If the proper balance can be found between lubrication and maintenance, and responsible leadership provided each of them, the results will generally show increased production at lower cost, the goal of efficient business. (Applause.)

* * *

Chairman Lewis: That has been a very interesting paper and replete with fine suggestions and information regarding proper lubrication. Have we any comments from the audience? If there are none right now, we will listen to a discussion of that problem by Mr. L. G. Hazen, of the Socony Vacuum Oil Co., Pinckneyville, Illinois.

DISCUSSION

on paper presented by Arthur M. Hughes on

"COAL MINE LUBRICATION"

By L. G. HAZEN
Socony Vacuum Oil Co., Pinckneyville, Ill.

Mr. Chairman, Gentlemen: That Mr. Hughes' paper has been ably prepared and presented is, I am sure, an accepted fact. He is to be congratulated on having done an excellent job on a complex subject.

All of us in industry, including both producers and consumers, have a common interest in securing increased production at lower cost. It is, therefore, a privilege to have this opportunity of discussing some of the points stated in Mr. Hughes' paper in the hope they may help toward improved lubrication practices.

Benefits of Correct Lubrication

The selection and application of mining machinery lubricants may affect the production cost per ton of coal very appreciably although the direct cost of the lubricants alone may be only a fraction of a cent. As a result the benefits of correct lubrication cannot be measured in terms of lubricant cost alone. The benefits of correct lubrication are the sum of several factors, namely:

1. Maintenance costs are lower
2. Production is improved due to less down time of the machines
3. Power losses are lower because of reduced friction
4. Lubrication costs are low because of proper selection and application of lubricants

Training Program

The attainment of the above objectives requires that the right lubricant be applied in the right way and at the right place.

To do these things at any mine it is necessary to adopt a lubrication program. For any plan to be successfully carried out it is necessary to have someone accept the responsibility. The degree of success of such a program will be greater if all those concerned, work together as a team. Therefore, an educational or training program for employees which covers the fundamental principles of lubrication, and proceeds to their immediate problems aid in securing cooperation and also serves to show the importance of lubrication. Too often the lubrication of equipment is considered as merely routine.

Choice of Lubricants

The first thought to keep in mind when determining the proper oil or grease to use is that the purpose is to secure maximum economy from its use. As Mr. Hughes has stated, lubrication is very closely related to maintenance so the prevailing maintenance practices or condition of the machines, determines the quality of lubricant best suited for the job. For example, it would not be economically justified to use a high quality oil having good oxidation resistance in a gear case requiring a high percentage of daily make-up. Conversely, only a high quality oil with good oxidation resistance will be satisfactory in a gear case which leaks so little that very little or no make-up oil is required; this becomes increasingly important in gear cases which normally operate at high temperatures. Speed, load and temperature are factors which determine the viscosity and film strength of the oil best suited for the particular machine.

In each mine there are usually several different types of machines. If the lubricant best suited for each requirement were used a great many lubricants would be required and this would result in considerable confusion as to the right lubricant for each requirement. Therefore, it is usually advisable to select an oil which will adequately meet the more critical requirements and extend this lubricant to the less critical requirements. Records are simplified by using the smallest number of lubricants which will give adequate protection.

Measuring a System

Although, we know where the benefits of improved lubrication are to be found it is seldom possible to calculate the total benefits in dollars and cents. Mr. Hughes has listed seven items for examination which give a lot of valuable information. To evaluate them requires an intimate knowledge of the mining conditions.

It has been found in most industries that the records of production and maintenance cost do not show separately those costs which are directly affected by lubrication. For example, in a mine "Maintenance Cost" usually includes power cables and other electrical equipment, cutter chains, brake shoes, hydraulic hose, and other items not affected by lubrication, as well as bearings and gear replacements which are affected by lubrication. When a lubrication program is installed, however, it is generally found that it is a comparatively simple matter to set up these records to show costs directly affected by lubrication and in this way to evaluate the effectiveness of the program. (Applause.)

* * *

Chairman Lewis: Thank you, Mr. Hazen for a very interesting and illuminative discussion. Are there any comments from the audience regarding these two papers? In reviewing the discussion by Mr. Hazen, I have only one criticism to make. He neglected to tell us what was the best kind of oil to use. If anybody cares to ask him he is at liberty to do so.

Another very interesting paper that is to come before us is by Mr. Rod Eagan, of Goodman Manufacturing Company, Chicago, Illinois, regarding the "Evolution of Coal Cutting Machinery."

EVOLUTION OF COAL CUTTING MACHINERY

By ROD EAGAN
Goodman Manufacturing Company, Chicago, Ill.

It was predicted as early as the 1880s that, sooner or later, machinery would revolutionize the system of mining. The air driven puncher for dislodging coal at the face had already made its appearance, but was being used only to a very limited degree. Air and steam engines were at that time in use above ground, but their application underground presented serious obstacles. The cost of installing pipes to carry vapor or fluid underground, the considerable losses in transmission, the expense of operation and maintenance . . . all presented problems that were even more perplexing for underground haulage than for cutting. Not until some other form of power became available, a type more easily transferred from place to place, could the mechanization of underground coal mining be economically accomplished.

Even though no really satisfactory method existed for driving a coal cutter, men strove to take the pick out of the hand of the miner and place it in a machine. Inventors searched for the mechanical principle or motion that would best cut coal. In hand mining, the cutting edge was mounted upon a wooden stock—the miner's pickax. Among early mining machine patents this method was emulated by some inventors. Others multiplied the number of cutting bits and placed them around the circumference of a disc or wheel. Some mounted the bit upon a rotating bar. Still others fastened cutting edges to endless chains.

Just as the mining machine was on the verge of being made practical, a new form of power was becoming available. Electricity, known before as a laboratory phenomenon, was made more generally accessible during the last quarter of the Nineteenth Century by the development of the electric generator, the electric motor, and electric lamps. Once these devices were perfected, power could be carried underground with only inconsiderable loss, and without rendering ventilation difficult under ordinary conditions. Furthermore, it did not contain any great threat to coal as a primary source of power. In fact, it was welcomed by coal operators as a market for more of their product. Moreover, electricity could be generated on the spot, where coal was cheap, perhaps from fines or slack, for which there was no other market at that time.

The Electric Coal Cutter

In the summer of 1887, one of your Illinois coal operators, Mr. Albert Sweet, was vacationing in Wisconsin. While there he became acquainted with Mr. Elmer Sperry, a name you will recognize in connection with the gyroscope. The conversation between these two men naturally lead to technical matters. When Mr. Sweet explained the need of machinery

The Sperry Electric Puncher of 1890.

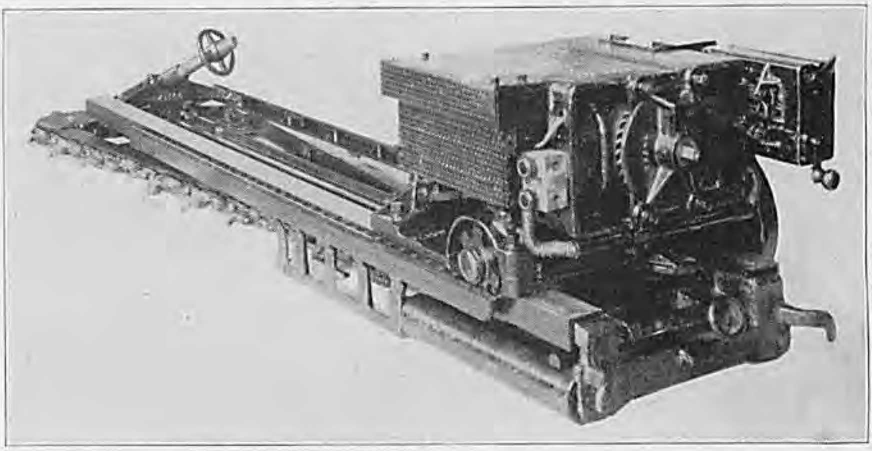
for mines and expounded his theories on the use of electrical power underground, Mr. Sperry became interested to an extent that he agreed to build an electric machine that would cut coal in Mr. Sweet's mines.

The Electric Puncher, invented by Mr. Sperry under the sponsorship of Mr. Sweet, was brought out early in 1889 and attracted much attention. It was unique, although not in its principle of attacking the coal face. Air driven punchers had employed the same method for years. It was the ingenuity of the design, which converted rotary into reciprocal motion by gearing the electric motor to a crank shaft, that set the Sperry machine apart from all previous devices. Through a clutch, the crank shaft retracted a bit weighing sixty pounds or more. The retraction of the bit compressed a powerful spring. At the end of the stroke the clutch automatically released the motor, and the spring drove the bit into the coal. As soon as the blow was struck, no matter at what extension of the bit, the clutch re-engaged the motor, which again drew back the bit and spring in order to prepare the coal cutter for its next working stroke.

An Early Longwall Machine

Although the Sperry Puncher was a forerunner of the electric coal cutter, it was soon superseded by the continuous chain type machine. Many inventors and pioneer mining machinery manufacturers were experimenting with different designs they hoped would prove successful.

One machine for long face cutting was perfected by Mr. Sperry and introduced in an Illinois mine about 1890. In principle, it was a radical departure from the electric coal puncher. For the effort to cut coal by a succession of direct blows, the new machine substituted a continuous reaping, or mowing, action. To achieve this, Mr. Sperry mounted a series of chisels upon an endless chain, rotated about a cutter arm. The machine was kept parallel to the face and the bar in constant position at a right angle to the machine. This was accomplished by a single row of toothed rails, jacked into place parallel to the coal face. The machine ran upon the smooth top surface of this guide rail and drew itself forward by engaging the teeth into the side of the rail. The machine was self-propelling and self-feeding at one and the same time. As a machine, rather than as a power tool, it freed the operator from the drudgery of lying upon his side and cutting coal by hand pick or guiding a constantly vibrating coal puncher.



The Chain Breast Type Machine, a popular design from the 1890s until superseded by the shortwall coal cutter.

The Breast Machine

In the final decade of the Nineteenth Century a still more popular machine was claiming attention—the chain type breast machine. Employing the principle of adapting a revolving pick-filled chain to the cutting, as was also used in the longwall type of cutter, the breast type machine became much more popular because of its suitability to a short working face. The construction of the machine consisted of a sliding frame to which was assembled the cutting element, the entire unit being mounted on a stationary frame. Through worm gearing, feed sprockets were operated in racks to extend the sliding frame and project the cutting element with its revolving picks into the coal seam. This machine cut only the width of its bar, about 38″ to 45″, and had to be moved to each new cutting position.

The Shortwall Coal Cutter

While the air driven Puncher and the electrically driven Chain Breast Machine were leading all cutting machines in popularity and vying with each other for markets during the first ten years of the 1900s, a new type cutter eventually destined to replace both of them was looming up on the mine horizon. All three of these machines did their cutting at the bottom of the seam.

This new machine was called a Shortwall and its advantage over other cutters of that day was an ability to make a continuous cut across a short working face without withdrawing the machine from underneath the coal once its bar has been sumped at the corner of the place to be cut. However, in spite of this advantage it was several years before the shortwall had passed through its experimental stage.

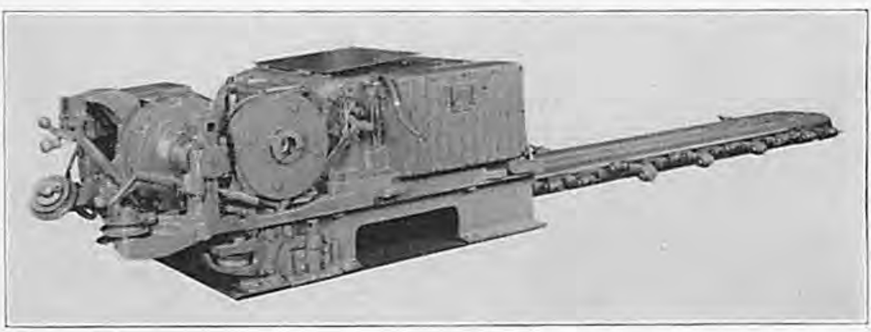
Along about 1907 the various manufacturers of mining machinery were busily concentrating on shortwall design and tests underground. Within a few short years this type of machine became so popular that hundreds of them were being sold, the demand accelerating as coal tonnages continued to reach new peaks because of the demands of World War I.

Comparison Shortwall and Other Cutters

The shortwall, a drag type machine with revolving pick filled chain, cuts at the floor, or bottom, of the seam, similarly to other early day cutting machines. This new machine was distinctive in its ability to make a rapid, continuous cut across the entire width of a short face. A typical machine of this type was mounted on a truck that was propelled by the machine motor or by hand for transporting from place to place. It could then be unloaded from the truck by means of wire cables spooled from two winding drums mounted at each side of the machine. One of the drums was powered from the machine motor; the other was free spooling, but equipped with a brake. By anchoring the cable ends to floor jacks, positioned and readjusted according to needs, the machine could be maneuvered quickly and easily through its working routine.

For these reasons it swiftly gained mine acceptance over the less rapidly performing breast machine. The breast machine had to be moved by the machine men, who used bars to lift and pry it, inch by inch, to each new cutting position, and several such moves were required in the cutting of each face. Where coal was high, 5 feet or more, men could stand on their feet and bar the breast machine over without undue exertion, but even in coal of that height the shortwall held an advantage, as it could be operated easier, faster and with equal facility in both high or low seams. The facility of the shortwall for cutting in low coal was an important factor to mines, operating in 30-inch to 40-inch seams, since it enabled them to greatly increase the tonnage formerly obtained with breast and puncher type cutters.

The popular trend towards the room and pillar system of mining preferred in America favored the shortwall method of cutting and soon accounted for a rapid decline in the use of air punchers and a more gradual, but none the less definite obsolescense of breast machines. The



An early Shortwall Coal Cutter.

longwall was still a machine of limited market, restricted to a few mines in the southwest and a foreign market that was dormant for the years of the war.

The Track Mounted Cutter

As early as 1910 a trend toward overcutting machines was in evidence. Where the common conception of cutting kerfs had been at the bottom of the seam for machines of the puncher, breast, longwall, and shortwall types, the need for a special purpose machine that would cut at high levels was indicated by certain conditions such as:

a. To cut out dirt bands and obtain cleaner coal.

b. To cut at top of seam when roof was bad, leaving a band of coal seam as protection.

Several men with similar ideas filed patents on various features for this type of machine between 1910 and 1920, including representatives of the major manufacturers of mining machinery.

In those early days there was a dual problem involved in overcutting design. There were those that argued that the mounted cutter, being a larger producer, would replace the shortwall, just as the latter machine had superseded the breast machine. However, notwithstanding the popularity of mounted cutters in later years, the shortwall is still currently in favor at hundreds of mines.

The other controversial issue was between straight face and curved face cutting. This difference of opinion was settled in much less time, but to fully understand the situation, it seems desirable to describe the operation and application of both machines.

The Straightface Machine

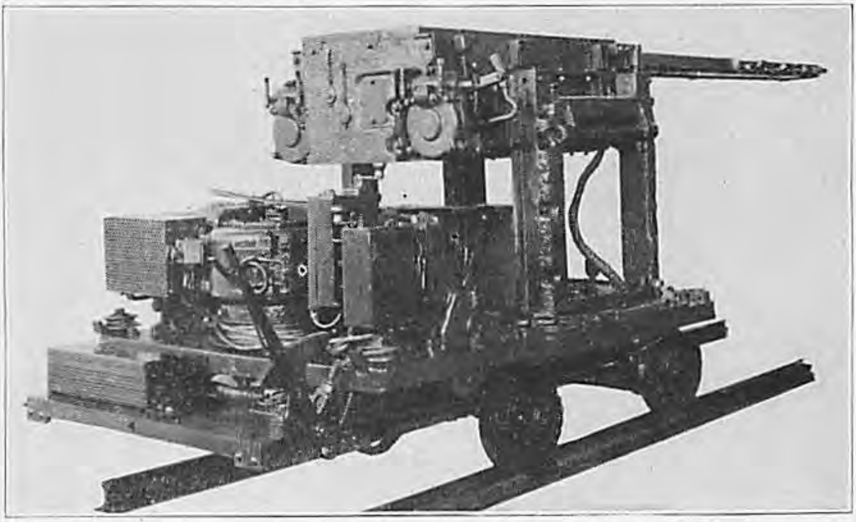
The Straightface Machine, brought out in 1914, had its cutting element mounted on racks for varying its elevation, and the entire frame, including the racks, was mounted on a turntable to swing the cutting element horizontally. The machine advanced into the room on track laid in the center and the bar swung to the right rib.

As the machine sumped, it was pulled forward on the track by a wire rope anchored in the face, and was guided to make a straight rib cut. When the sumping cut was finished, a running cut was made across the room. By an ingenious arrangement of rack and radius arm and resetting of cable, the machine maintained a straight face cut and square left rib when bar was withdrawn from underneath the coal. The machine was operated most successfully on a 20 ft. face.

The Slabbing Machine

In 1915 the Slabbing Machine made its appearance. This machine, patterned after the straight face, did not feature square place cutting. Instead, the cutter arm, mounted on a turret, was swung in a simple circle of about 180 degrees, so that slabbing work could be done with the arm at a right angle to the direction of travel along the face.

This machine was developed originally for long face cutting, and was faster and less complicated in construction and operation than the



An early design of the mounted cutter, then called a Slabbing Machine.

straightface machine. Because the prejudice against arc face cutting was less apparent in narrow development, entry driving, or pillar drawing, the arc being much less than the half circle contemplated, this machine was also used for these purposes.

Insofar as the straightface and slabbing methods were concerned, the latter proved more practical and acceptable, because the machine was simply constructed and much faster in performance.

Cutting Machine Development of the 1920s

It might be truthfully said the refinement of mine mechanization really began in the 1920s. The percentage of bituminous coal cut by mining machines rose from 60.7% in 1920 to 81% in 1930, and the net tons per man per day from 4 tons in 1920 to 5.06 tons in 1930. The manufacturers of mining machinery made definite strides in the broadening of cutting application and in the modernization of cutting machines. On the one side, mine operators were finding it necessary to reduce tonnage production costs, while the manufacturers faced a market saturated with cutting machines sold in large numbers during World War I. The market for new cutting machines was shaped by the essential need to reduce costs for the operator and extend the utility of the equipment. This situation emphasized the increasing dependance of the manufacturer and, in fact, the coal industry itself, on engineering creativeness.

The all-over picture, of course, was changing gradually but surely, because of the direct relation of cutting to mechanical loading. Mobile loaders and shaker conveyors were still in their infancy, but, beginning about 1925, their use had begun to affect the entire plan of face preparation.

Many controversial questions emerged with this new phase of cutting machine demand. Should the line of coal cutters be made so comprehensive that any cutting problem could be handled, each machine designed especially to meet a definite range? What capital investment differential would provide sufficient economic benefits to justify the installation of such specialized machines? Would the trend toward specialized machines of greater capacity eventually dry up the market for shortwall coal cutters?

The first two problems were answered by a strong demand for mounted cutters which led to new designs for cutting at various levels of the seam and shearing cuts. Machines were built in lower heights; cutting elements were inverted for combination use at bottom and top of seams; the range of application was widened—all leading to a new era of cutting machine practice.

While these track mounted cutters were more productive than the shortwall, the latter had proved itself too fundamentally suited to bottom cutting to become obsolete. Consequently, the development of both types of machines continued. The wisdom of this progressive program has proved itself in the years that followed.

An Era of Pronounced Change in Mining Practice

The Depression of the early 1930s, its aftermath, and the European situation in the late years of the decade—all had their effect on American business and industry. Probably in no other 10-year period were advances made in mine mechanization that were so definitely correlated with a complete underground system from face to surface.

Mechanical loading with mobile loaders and shaker conveyors, supplemented with chain and belt transportation underground, which had its real beginning in the late 1920s, reached a higher state of effectiveness in the 1930s. Cutting machine practice must not only parallel this trend, but, being the initial operation, must lead to better methods at lower preparation costs.

A modern Shortwall Coal Cutter of compact size, with hydraulic control, anti-friction bearings, splash lubrication, automatic disposal of cuttings—and other practical features.

A modern Shortwall Top Cutter, mounted on hydraulic jacks for cutting above the floor of the mine.

It was an era of pronounced change in underground mechanization—a period that demanded alert attention and challenged the resourcefulness of the coal mining industry and those who served it.

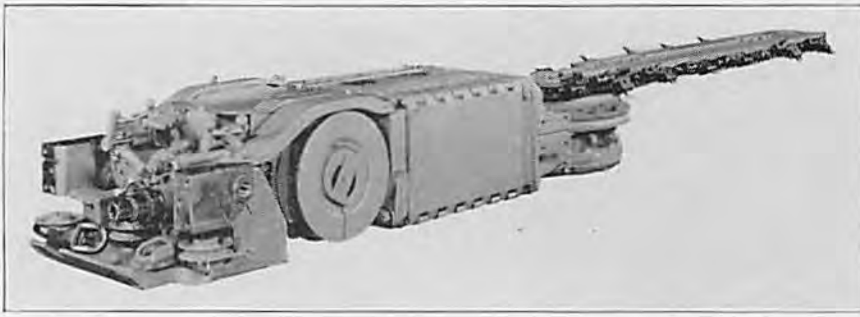
Larger machines of greater capacity, specialized machines for specific service, and machines that could be teamed up in the coordinated system—that was the cutting machine development of the 1930s.

Streamlining the Coal Cutter
The Shortwall

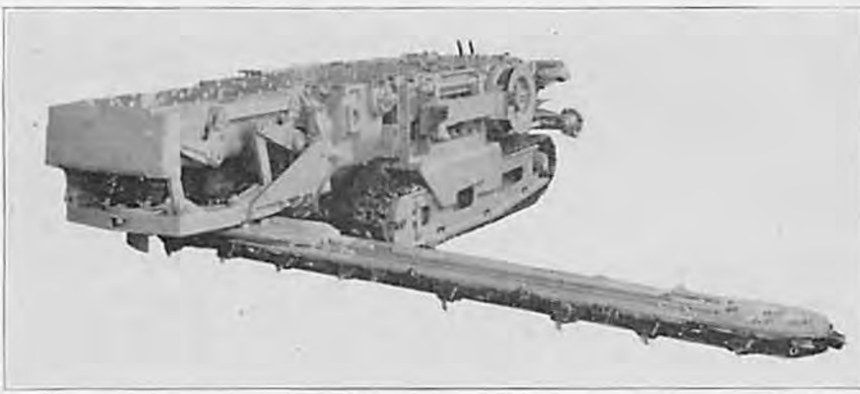
The Shortwall refinements up to 1930 had introduced into the design—reversibility of cutting direction; adaption to both direct and alternating current; enclosed construction of electrical units; power on both drums; low height machines for thin seams; increased horsepower; and other innovations of practical utility—but there was still room for additional improvements.

The decade of the 1930s brought many new designs onto the drafting boards and later into the mines. Shortwall coal cutters were built in new low heights and shorter length. Dominant features were splash lubrication, anti-friction bearings, contactor control, better insulation, full reversibility, independent two-drum control, more effective maneuverability and compact size. The success of the shaker conveyor system of mining revived and steadily increased mine demand for shortwalls. The number of machines required under the shaker system expanded through the practice of confining the use of a shortwall to fewer places, because of the concentrated areas worked.

These progressive steps continued on into the modern machine of today with hydraulic control; faster feeds; longer cutter bars and improved chain design, with optional choice of short throwaway bits or standard bits that can be sharpened—in various grades of steel; outlets at the rear for cuttings; attachments that eliminate shoveling and hand disposal of cuttings; a machine for top cutting, which can be tilted hydraulically sidewise or vertically; self-contained and self-powered trucks with automatic cable reels; rubber tired trucks for transporting



Two modern machines of the Longwall and Arc Face type. Above: This machine operated from the floor and the cutter bar can be swung or inverted. Below: A continuous tread mounted arc fade type. The bar can be swung in arc and the cutting element can be inverted.



machines, machines adapted to close posting; fast, smooth, low cost machines of modern design advancements, of low height and short length —a line offering optional selection to exactly suit the condition.

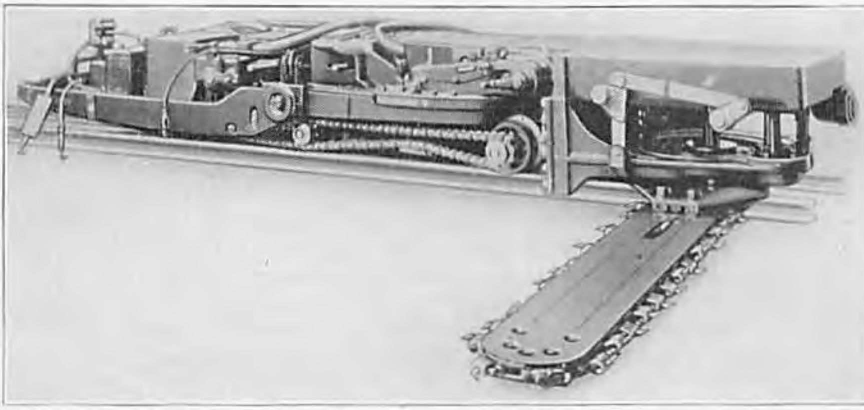
The Longwall

Longwall modernization of the 1930s offered the versatility of reversible cutting, the inverting of the bar for over cutting and bottom cutting, and the swinging of the bar for arc face cutting. Also machines mounted on track and caterpillar treads. These machines found their markets mostly in foreign fields, although some mines in Illinois, Kentucky, Pennsylvania and Canada found them suited to their requirements.

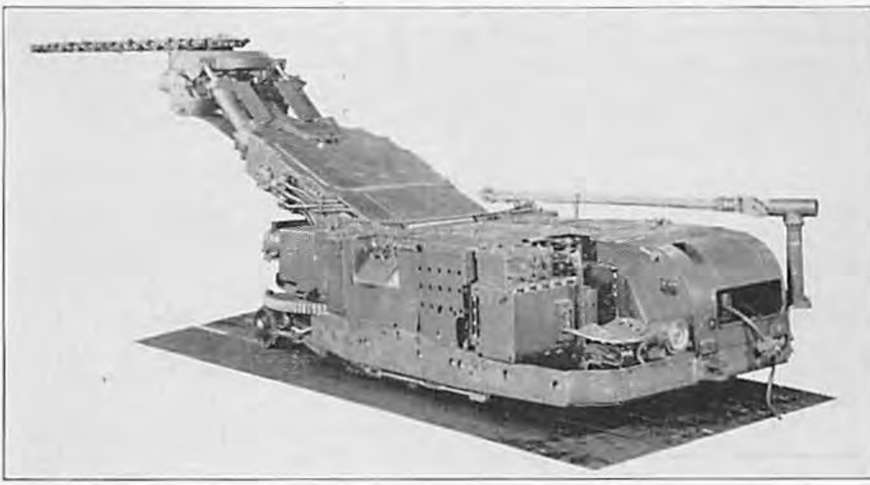
The Mounted Cutters

The development of mounted cutters accelerated after 1925, and during the next 20 years was largely influenced by these factors:

a. A machine of greater capacity that would produce greater tonnage.



Two modern track mounted coal cutters. Above: Machine is only 24" high and will cut below and above rail within limited bottom cutting range; Below: Machine of combined cutting functions that will cut anywhere in the seam, horizontally or vertically, over a wide range. Both machines feature all modern operating conveniences.



b. A machine that would fit the pattern of mobile loading systems.

c. A machine that would adapt itself not only to the mining system in use, but to the particular seam that must be cut.

d. A machine that would effect an improvement in the quality of the coal mined, thereby raising the market value of the coal.

e. A machine capable of justifying greater expenditure for the capital investment.

The array of mounted cutting machines that emerged from this transition period of the 1930s included many different types for a diversified application. There were specialized machines for bottom cutting, for top and center cutting, for shearing. There were combination machines with roll-over heads for cutting at any height in the seam. Some were built extremely low for so large a machine and the cutting heights varied from below the rail to the roof, with the range determined by the height of the machine. Other machines were designed to cut out thick impurity bands and were equipped with conveyor to gob cuttings.

The mounted cutter line today includes high capacity equipment of specialized single purpose and multiple function type in many different models. Cutting at any height over a wide vertical range and shearing from center to rib can now be accomplished by one combination machine. Application of water to cutting aids dust control. Hydraulic and modern electrical controls promote ease and speed of operation. These machines are now built for operation from the floor of the mine as well as on track rails.

The Problems of Mining Machine Design

In a technical business, like mining machinery, it requires years to develop any piece of machinery. It requires foresight and perfect timing to create and refine a design so that advantage can be taken of market demands. The successful introduction of a new machine involves risk, as there is always the danger of being ahead of market acceptance. Immediate popularity may lead to overconfidence and indifference, whereby the advantage is soon wiped out. The greatest insecurity, of course, is in being too late.

In the case of underground mining machinery, space requirements are a very restrictive factor in design, and it is seldom that commercial units of correct size and ruggedness are available. This means that the design engineer has to start from scratch, not only for the complete machine, but also for most of its component parts. Fifty or even one hundred different layout designs of mechanical arrangements may have to be tried to find one that will permit all the essential units of the machine to be assembled in the space allowed and in such manner as to eliminate all interferences.

In this kind of designing, where the mechanism to provide the maximum of efficiency must be confined within a minimum of space, an inch can well be considered a mile, since the changing of one part affects many others. The height of the coal imposes an unyielding limit to the height of a machine, and the track gauges vary from 18 to 56 inches. The lower the height and the narrower the gauge, the more difficult it is to build powerful, compact, efficient machines.

These and many other design factors, such as provision for artificial light, convenient grouping of all operating controls, and safe but durable, efficient electrical equipment, all made doubly difficult by limited space, tax the ingenuity of the designer to the utmost and require a great deal of time plus a combination of skill, imagination, common sense, and endless patience.

The collaboration between mine men and manufacturer shapes the pattern of machinery design to fit new mechanization trends.

Contributions of Mine Mechanization

We all know what an essential role has been played by the coal mining industry during the war. The peak productions obtained, in spite of man power shortages, would have been impossible without mechanization. And coal cutting machines have contributed importantly to this fine record.

It would be difficult to estimate the total number of cutting machines that have been installed in mines. There have been many thousands of them, more by far than any other distinct class of equipment used underground.

When we think back to the statistics of 1890, which reveal only 5 per cent of the bituminous coal mined was cut by machine, and compare the figures down through the years—1900, 24.9%; 1910, 41.7%; 1920, 60.7%; 1930, 81%; 1940, 88.4%; and over 90% today—we can better appreciate the tremendous advânce made in cutting mechanization in the past half century. This contribution is not confined to increased productive effort or lower costs of tonnage, as statistics will also prove that the human factor of drudgery and hazards that lead to personal injuries and fatalities have also been sharply reduced. The cutting of coal by machines has reached a higher stage of perfection and efficiency than any other activity underground, and its benefits have been so numerous that it is not inconsistent to say that there is still an opportunity for continued progressive improvement in this field of mining. (Applause.)

* * *

Chairman Lewis: Thank you, Mr. Eagan. We have heard something that is unusual. Is there any comment from anyone in the house upon this very interesting paper?

A great many of you gentlemen who have experienced difficulty in getting the coal prepared for loading should be interested in this fine article. Thank you, Mr. Eagan, again.

We have down in Southern Illinois an organization called the Mining Electrical Group. It is an organization that has done a world of good and created a lot of interest within the industry.

We are very proud to know and feel that, and are indeed proud of its accomplishments. As we look back through the years at the history of coal mining in Illinois, we recall names of many illustrious men who have given the Illinois Coal Industry their lives and ofttimes their fortunes in making it what it is and what it has been.

One of these men today will read an article on the Mining Electrical Group. He holds the respect and admiration of many people within the coal industry of Illinois. I take great pleasure in introducing Mr. Fred W. Richart, of "Coal Age", who will read this paper. (Applause.)

Mr. Fred W. Richart (Carterville, Illinois): Mr. Chairman and gentlemen, Mr. Lewis has told us something about it and those that follow me will tell the rest of the story.

MINING ELECTRICAL GROUP BEGINS NINTH YEAR

By FRED W. RICHART
Coal Age, Carterville, Illinois

The organization of Mining Electrical Group was suggested by R. E. Sontag of the Okonite Company and Russell Nash of Westinghouse Electric Corporation, both salesmen in St. Louis territory. They interviewed numerous electrical men in the coal mining field of Southern Illinois where they received sufficient encouragement to justify an invitation to meet and consider the organization of a society for the mutual discussion of their problems.

This invitation, dated October 5, 1937, pointed out the need of an association where "mutual problems as to maintenance and new developments in the industry could be brought up and discussed." It suggested the presentation of illustrated papers by members and by engineers of manufacturers of supplies and equipment as an aid to solving their maintenance troubles.

It set the following October 15th and the Franklin County Country Club as the date and place for organization. Provision had been made for a six o'clock dinner and for a paper by D. E. Renshaw, Westinghouse Electric Corporation, to follow. The subject of the paper was Mercury Arc Rectifiers, none of which were in Southern Illinois at that time. Since that date eleven have been installed.

How well that foundation was laid is attested by the eight years of increasing membership and interest that has followed. Despite four years of war restrictions and gasoline shortage, not a meeting has been cancelled. Fifty were in attendance at this first meeting. The largest delegation was 14 from Old Ben Coal Corporation, headed by General Superintendent, Roy Adams.

The officers elected at this meeting were:

President, D. D. Wright, Central Illinois Public Service Co.

Vice-Pres., William Burnett, Peabody Coal Company.

Treasurer, Frank Eubanks, Old Ben Coal Corporation.

Secretary, W. O. Faith, Chicago, Wilmington & Franklin Coal Co.

A committee of five, one each from Franklin, Jackson, Perry, Saline and Williamson Counties, was invited to meet with the officers to discuss plans and policies during the first year. Numerous such meetings were held to put the society on a solid footing.

Membership is made up of mining personnel from general manager to maintenance mechanics, and manufacturer's representatives in the fields of design, manufacture, maintenance and sales. The enrollment stands at approximately 215 total. Approximately 60% of these are connected with actual mining. Within the last two years several members have come in from the fluorspar mines around Rosiclare. Notwithstanding the distance, they attend well.

During the past year the attendance has averaged 95. Reservation cards are sent to the members about ten days before the monthly meeting, advising the subject to be presented and requesting the reply card be returned indicating the number of plates to be reserved for the dinner. One of the difficulties that besets the secretary is getting definite commitment for dinner. As many as forty have shown up without such notification, making a difficult problem for both secretary and caterer.

Official red tape is cut to a minimum. There is no constitution. By-laws are few and very simple. The affairs are conducted by the officers and a program committee. The dues are one dollar a year, payable at the beginning fall meeting.

The character of the papers is not confined to electrical subjects but covers a wide range, including mechanical problems, new materials and new mining equipment. Many papers are written, most of which will compare favorably with papers given at The American Mining Congress. Other programs are oral. Up to the present no official file of the written papers has been made for future reference, valuable as many of them are. Illustrations are often made with slides, movies or talkies. Our entertainers spare no expense to bring these programs to us, frequently sending one, two or more up to 1000 miles.

One paper that comes to mind, given by Norma-Hoffman Bearings Corp., was a model for exactness of description, demanding fine workmanship and cleanliness on the part of the maintenance man and positive in its assurance of satisfactory results when details of installation are properly carried out. The speaker was no orator but he spoke with an authority, assurance and vigor that carried conviction and held the attention of his audience in a way few have excelled.

When he had finished, some one asked, "Why won't ball bearings take the gaff?"

"They do," he replied with finality—meaning if you do your work as it should be done, don't worry about the ball bearings; they have proved their ability to take it.

Here is a list of a half dozen programs that have been given which very well represents the spread of topics discussed:

1. Gears and Pinions.
   Westinghouse Electric Corporation.
2. Fiber Glass Insulation.
   Owens-Cornng Fiber Glass Company.
3. Electric Storage Batteries.
   Electric Storage Company.
4. Electric Arc Welding.
   Lincoln Electric Company.
5. New Accomplishments in Chemistry.
   E. I. duPont de Nemours & Company.
6. Tocco Induction Heating.
   The Ohio Crankshaft Company.

"The proof of the pudding is chewing the rag." What do the members think? That is pretty well proven by the vigor of the society after eight years of activity. Judged by their continued attendance and the way they group to visit and talk shop, they like it. At the end of the discussion it often takes the speaker an hour to shake off his inquisitors.

Another indication is the average attendance which has been 95 during the last year. Still another indication is the turnout for Ladies' Night (once a year) when the wives, daughters and sweethearts swell the attendance up to 180 to see or hear a special program and carry off 30 to 50 bingo prizes donated by manufacturer's representatives—and they don't come from dime stores.

Finally, the shop viewpoint. Just a few days ago a prominent member volunteered, "The best thing about this group is the acquaintances we make with our neighbors and the salesmen who call on us. We have been too bashful. Now we know them and are not afraid to talk nor ashamed to ask."

Bob Sontag wrote this: "To me, one of the most satisfactory results has been the fact that the men in the mines now know their neighbors and have a feeling that they can call on each other for help." (Applause.)

* * *

Chairman Lewis: Thank you, Mr. Richart. That was a very interesting historical review of the Mining Electrical Group.

We have another gentleman this afternoon who has been influential and has contributed greatly to the organization and the permanent foundation of that organization. Mr. Thomas L. Garwood, of the C. W. & F. Coal Company, West Frankfort, Illinois, will discuss Mr. Richart's paper.

Mr. Thomas L. Garwood (C.W.&F. Coal Company, West Frankfort, Illinois): Mr. Chairman and gentlemen, Mr. Richart has covered the paper so well that a discussion is rather difficult. However, I have prepared a short paper here which is more or less an appreciation of the group.

DISCUSSION

By THOS. L. GARWOOD
C. W. & F. Coal Co., West Frankfort, Ill.

In every progressive company it is advisable for each person of responsibility to keep ahead of or at least abreast of his competitor. Too, the industry as a whole must keep a broad front in protecting itself against possible inroads by a competitive industry. Sure one of the methods for accomplishing this in the mining business includes the education, coordination, and confidence of all members.

We are all aware of the benefits derived from the annual meetings and machinery shows of the American Mining Congress and the semi-annual meetings of the Illinois Mining Institute. The intervals between such meetings without general conference are too great to allow the fraternizing of members necessary to accomplish these ends. Education and intimate knowledge in the mining industry requires close contact at all times.

As in schooling, the ideal period might be daily or constant contact of members, but of course such is not possible and a weekly meeting is still not practical. The ratio of times between the annual or the semi-annual and the ideal meeting of fifty-two or of twenty-six to one is too great and the monthly meeting with a ratio of four or five to one is about the maximum for local group meetings. The monthly meeting afforded by the Mining Electrical Group gives a welcome relief and get-together for enlightenment on some mining subject by an expert in his line and for refreshing acquaintances.

Too, the discussion of individual personal problems, between friends, before or after the general meeting presents a satisfaction in having helped a friend in trouble or of having been helped through the frank opinion and experience of others.

The value derived by members of the southern Illinois mining men through meetings of the Mining Electrical Group has been advertised in other areas and in other states so that men there have seen fit to meet as we do, though I am not aware of the success in these groups. Locally, we have organized a similar group, The Illinois Society of Coal Preparation Engineers and Chemists, because the problems of production underground and the problems in the preparation of coal for the market are not common to the entire mining personnel. On subjects of interest to both groups, we have held joint meetings.

Listed among the membership are representatives of about seventy-five manufacturers and suppliers, of whom fifty have so far provided material for eighty-two programs covering theory, operation, maintenance of equipment, educational programs and pure entertainment.

The friendships we have made and the confidence derived through assisting and advising the members has infinite value and much credit can be given the regular monthly meetings of the Mining Electrical Group. (Applause.)

* * *

Chairman Lewis: Thank you, Mr. Garwood. We have another gentleman, Mr. Frank Eubanks, maintenance superintendent of the Old Ben Corporation, who has done much to stimulate interest in this organization which has served Southern Illinois so well. Mr. Eubanks. (Applause.)

Mr. Frank Eubanks (Old Ben Corporation, West Frankfort, Illinois): Mr. Chairman and gentlemen of the Illinois Mining Institute, and of the Mining Electrical Group, a lot of you gentlemen around here would like to see some of the M.E.G. Would you please stand up fellows, and let the I.M.I. look you over. Don't you think that is rather a swell-looking group? (Applause.)

I would like to introduce the gentleman who was the first president of our group, Mr. D. D. Wright. Mr. Wright, will you please stand? (Applause.)

D. D., as we like to call him, is the gentleman who guided us through the first years of our group meetings in Southern Illinois and knitted us so closely together that we could not help carry on and have a successful group.

As Mr. Richart told us, this group is composed of men connected with our organization or interested in the mining industry of Southern Illinois. Its membership includes all classifications from underground repair men to vice presidents.

Gentlemen, whenever an engineer gives his paper, the first thing he does is reach up and loosen his tie. Then we know there is something coming and we really take him apart. He is ready, however, and has a good answer for us. At the end of the meeting everyone has learned something to take back in or around the mine and apply successfully.

Men just naturally like to get together in a spirit of fellowship and enjoy a good dinner, especially when mingling with others who have similar experiences and problems.

Then, as Mr. Richart mentioned, there is the social side to the group meetings, especially at the time of the annual ladies' night. And this is the time of the year when we really enjoy getting together and having a good time.

DISCUSSION

By FRANK EUBANKS
Old Ben Coal Corp., West Frankfort, Ill.

After eight years of close association with the Mining Electrical Group, or M.E.G., I am happy to have this opportunity to pay personal tribute to the two men who were responsible for the organization of the M.E.G. This group is composed of men connected with or interested in the mining industry of Southern Illinois. Its membership includes all classifications from underground repairmen to Vice-President.

The group meetings have brought informative programs to the employees of the mining companies of Southern Illinois on a wide variety of subjects. These have ranged from those purely mechanical such as gears, V-Belt drives, roller chains, bearings and rope to electrical subjects ranging from motors, transformers, controls, induction heating, to the modern electronic rectifier.

The list of sponsors of these programs includes the smallest and the largest industrial manufacturing companies of the United States.

There is an informal atmosphere at these meetings and the men who attend have an opportunity to listen to manufacturer's representatives discuss the application of their products tó the mining industry. Manufacturer's engineers have come all the way from the east coast to attend these meetings and present programs.

As Mr. Richart has mentioned, one of the interesting phases of these meetings is the question and answer period which follows the formal presentation. Men just naturally like to get together in a spirit of fellowship and enjoy a good dinner, especially when they are mingling with others who have had similar experiences and problems. These meetings afford an excellent opportunity to exchange ideas and experiences.

Many of the group members are unable to attend meetings of the Illinois Mining Institute but they attend the Group meetings much for the same reason that we are assembled here today.

The Group meetings have added to the fund of knowledge of the men who operate and maintain the equipment used in the production of coal. It would be impossible to estimate the value of this knowledge in lowering the cost of production. It seems fair to assume that some contributions to this end has been made during the eight years of the Group's existence.

We do feel that the Mining Electrical Group has made a worthwhile contribution to the Mining industry by lifting the level of education of the men in the mines.

As Mr. Richart has mentioned, there is also the social side to the Group meetings especially at the time of the annual Ladies' Night. When the West Frankfort Country Club is filled to overflowing with members, their ladies and friends, this is a big event with the Mining Electrical Group. (Applause.)

* * *

Chairman Lewis: Thank you, Mr. Eubanks. Thank you all for your observance of these things. I want to say just one thing or two. I have been a coal miner all my life. I have earned my livelihood from a small boy in the coal mines of Illinois.

I am interested in the welfare and future of the Illinois coal industry. I can lóok down through history, and see those who built the industry, and I can look in these groups, and see those who will insure its destiny.

These organizations, such as the Illinois Mining Institute and the Electrical Mining Group of Illinois, have done much in behalf of the coal industry of Illinois and we need more of them. It needs the help of every man who works in the capacity of a laborer, an executive or any of the other people who are dependent upon production of coal from Illinois.

These organizations will need it and they should be carefully and cheerfully given that cooperation.

Mr. Schonthal, do you have anything further to add to this meeting this afternoon.

Secretary Schonthal: Nothing but to remind you that the dinner is at 6:30, sharp. Come early to avoid the rush.

Chairman Lewis: To me this has been the most interesting meeting of the Illinois Mining Institute that I have attended. Some points have been brought out here that will be very beneficial to us.

If there is no further business, I declare this meeting adjourned. (Applause.)

(The meeting adjourned at 3:20 o'clock.)

EVENING SESSION

6:30 O'clock, P. M.

The dinner session of the Illinois Mining Institute convened in the Ball Room, Abraham Lincoln Hotel, Springfield, Illinois, at 6:30 o'clock, President George F. Campbell presiding.

President Campbell: Come to order, please. Now that we have the culprits here we will go on with the proceedings of the evening. I want to introduce the toastmaster of the evening.

The first time I met him was down in Washington when the National Bituminous Coal Act of 1937 was in effect. At that time all coal producing districts were trying to achieve minimum prices under Docket 15. It is needless to say that we were all doing everything possible to make our respective floor prices low enough to be competitive with other districts. Mr. Wood was acting for the Belleville district. To hear him tell it then Belleville coal was the worst in the world. He is still acting for Belleville Fuels. In the short space of six or seven years he has brought this coal up to where he says it is now the best in the west. Dick Wood. (Applause.)

(At this point the lights in the banquet hall were dimmed, and two uniformed waiters carried in a huge birthday cake, weighing approximately 150 pounds, beautifully decorated and illuminated with multitudes of candles. Mr. Wood requested the singing of "Happy Birthday" for Joe Hitt, who was celebrating his birthday that day.)

Mr. Richard Wood: You will pardon me, but we will talk about that a little later. Out of deference to the Mayor of Springfield, I am going to ask him to step up here at this time, since he has another appointment. It is now our pleasure to introduce to you the long-time mayor of Springfield, John W. Kapp. (Applause.)

Mayor John W. Kapp (Springfield, Ill.): Mr. Toastmaster, Past President Campbell, New President Hitt, and gentlemen of the Illinois Mining Institute, I first want to congratulate you upon your birthday. That is an unusual day to you, I am sure. It is a pleasure on behalf of the city of Springfield to give this outstanding organization a most cordial and sincere welcome to Springfield and say to you that we are very proud and happy to have you as our guest.

As Springfield is your host city we want you to know more about us. Of course, you know that Springfield is the home of Lincoln. When you walk upon the streets of Springfield, you are treading upon hallowed ground.

I would like for you men this evening to picture with me for just a moment the figure of a tall, gaunt man, with a shawl around his shoulders, a high hat upon his head. That was back in the days of '61 to '65 and the same thoughts were pushing through his mind at that time that today are going through your mind and mine; that thought being the preservation of this democracy and the bringing to a certain group of people in this world that thought that you and I enjoy as free men.

Gentlemen, I know that out of the busy deliberations of your Institute, if you have time, you will pay the home and final resting place of Abraham Lincoln a visit.

I was in the same position you gentlemen are in at one time. I happened to be a coal operator at Shelbytown, Illinois. Of course, I got back to my profession, if you please, of a politician after that experience. I will tell you how that happened to me.

My good old dad, who was associated with the Wabash for fifty-two years, when I was a lad of fourteen said to my mother, "What we will do with Bud, I don't know." When mother agreed, pop, in his fine way said, "Well, we will see what he wants to do."

So they, in the living room one night, brought out the fine family Bible, put it on the table; also put on the table an apple and a dollar bill. When mother asked him about it he said, "Well, mom, we will just see what he wants to do. If he picks up the Bible and reads out of it, we will make a minister out of him. If he picks up the apple and takes a bite out of it, we will make a farmer out of him. If he picks up the dollar bill and puts it in his pocket, we will make a banker out of him or a financier out of him."

I sort of fooled dad that night. I picked up the Bible, started to read it; took a bite out of the apple, and put the dollar bill in my pocket, so dad said, "There is a politician." (Laughter.)

That is how I got into politics and out of the mining game.

Gentlemen, you men certainly deserve the credit coming to you from all of America for the outstanding duty that you have performed during these war years. You know the war is over now and we are thinking about reconversion and peace.

That was brought home very forcibly to me the other evening. The kids from the high school here had a snake dance. Of course, the young ladies, about twelve or fourteen—the bobby soxers—were running around in overalls and with shirt tails hanging out.

Two G.I.'s standing on the corner of Fifth and Monroe were looking on. One said to the other, "Gee whiz, it must have been hell back on the home front while we boys were over there fighting this war from the looks of the dresses on those kids."

Finally a very charming girl, about fourteen, beautifully built and chock full of pulchritude and all those kinds of things, and singularly enough wearing a sweater, came along.

One G.I. said, "You know there is something that didn't happen before we went to the army four years ago. What do they wear those sweaters for?"

The other kid spoke up and thinking fast, "There are three reasons. The first is that she wants something to wear and the other two reasons are perfectly obvious." (Laughter.)

Gentlemen, I know from your conference today a great good has come to you. You know these conventions mean something to the men who are gathered together. You have a friendly handclasp from old friends and you can talk over the things in these meetings that mean so much to our everyday American life.

You make new friends. Those friends mean something to you and then you listen to men in your industry, and that means something to you as individuals in your community, in your state and in your nation.

As I have said, I do not know of any group of men who deserve the applause and plaudits of all the public as the men who are engaged in the coal mining business. I do hope that out of your conference today will come great good. I hope that each and everyone of you will carry back to your respective homes a pleasant memory of this, the city of the immortal Abraham Lincoln.

Thank you very much. (Applause.)

Toastmaster Wood: Thank you, Mr. Mayor. It should be explained that we put the mayor on that end of the table intentionally because he was worried. He heard about this birthday cake and he wanted to be near the door in case the candles on Joe's cake might cause a conflagration. He wanted to be able to run out and call the fire department.

Mr. Mayor, we appreciate your taking the time to come and see us. You know what we think of your city when we return here every year. I think we will be back again many, many times. I hope you will be here to greet us.

Mayor Kapp: Thank you.

Toastmaster Wood: In the excitement of this birthday song and my listening to these deep voices on this end and listening every moment for the fire department, and in our effort to get the Mayor started on his way to another meeting, I forgot to tell you about this cake.

We should give the chef here a special hand on this beautiful cake. Let's do that. I think he is waiting around the corner. (Applause.) I don't see him but I think he is around somewhere. Well, anyway, you saw him with the chef's hat on. He wanted to escort the cake in here personally.

I am glad they put that fire out. With the candles on that cake going it must be two hundred degrees Fahrenheit and no Gesundheit.

We have some introductions. I wonder if the ladies could finish these trays and leave now so that we can get on with our business. We have a lot of men here that have to drive home tonight.

I want to tell you who these people are as soon as we can get it quiet. We will give them a few minutes. I wonder if we may have the lights back on. We put this fireball out here and can't see anything.

We will run through the celebrities here so you will know whom you are looking at. On the left end of the table is Bill Bradbury of Mechanization. We always speak well of the press. Then, there is Pat McMurrer, of the Mining Congress Journal, and Fred Richart, of Coal Age.

We ran all over town to get a photographer and Fred was right here. I didn't know he had a camera with him.

I am going to skip down to the other end of the table. We have Arch Cross, Indiana Coal Mining Institute; Ernest Agee, Indiana Coal Producers Association; Jim Bristow, Illinois Coal Strippers Association; Ben H. Schull, past president, Illinois Mining Institute, of Terre Haute, Indiana; (He preceded George Campbell).

I am going back to this side. I want to introduce Stuart Jenkins, who is on the executive board of the Illinois Mining Institute. Stu's father, W. J. Jenkins, was not able to be here with us because Mrs. Jenkins is not well, but W. J. Jenkins II is here and I have this to tell you; that this is the first family of three generations to be in the Illinois Mining Institute, all three at one time. (Applause.)

We have Bill Young, executive board member of the Institute. Now, I am going to call upon Jeff, past president of the Institute to make a special report of a committee of which he has been chairman during the past six weeks. Jeff, would you like to step up here to the mike?

Mr. J. A. Jefferis: Mr. President, both incoming and outgoing, Mr. Master of Ceremonies, honored guests, and members: For me to put my little story over, it is going to be necessary for me to tell you that about three months ago I had a serious back injury.

I was laid up at home for about two months. During that time your master of ceremonies today, Dick Wood, telephoned me and said, "You know that on October 26 we expect to elect Joe Hitt president of the Illinois Mining Institute. We expect to."

He also said, "That also happens to be his birthday. Don't you think it would be a nice thing if a few of the boys here would get a committee together and do something to show our appreciation and love for Joe Hitt?"

I said, "Yes, it would be fine. What do you suggest?"

He said, "Before I suggest anything I am going to take it upon myself to appoint you chairman of the committee."

I said, "That is all right. Now, what do you suggest?"

He said, "I think it would be nice if upon Joe's induction into office we offer him a birthday present of a hundred new members."

I said, "That will be fine, and we will do it, but," I said, "I can't do much lying here in bed."

He said, "I will guarantee you won't have to do any work."

I said, "That is an easy job."

So I took the chairmanship and Dick went ahead with the work. Now, Mr. Hitt, I have nothing to give you, nothing to present you, but we did give to the secretary, and he has them enrolled, not one hundred but a hundred and twenty-nine applications for new members. (Applause.)

That is to show the love we have for Joe Hitt in St. Louis and by his other friends in the states. (Applause.)

Toastmaster Wood: Well, Jeff didn't tell you the whole story. I can go back a few years—two or three years ago—when Joe Hitt and I saw that Jeff was going to be president of the Illinois Mining Institute. He and I originated an idea and talked it over with Bale Schonthal to get a hundred new members for the Illinois Mining Institute to honor Jeff.

At that time we had a lot of marketing agency matters and other things, and with all of that on our necks we got plenty busy. So Jeff took the gavel over without that honor. Now, when it came time to do the honor for Joe Hitt, I talked it over with Bale and we thought that Jeff should be chairman of that committee so as to recover some of the honor that he did not get at that time.

Jeff told me today that he thought this was much better; that he is more proud to have been chairman of this committee, bringing in a hundred and twenty-nine new members, than he would have been to have received them as president of the Illinois Mining Institute.

I thought that was a very fine statement that Jeff made. You know that Jeff knows just how to make those statements.

Mr. J. A. Jefferis: I would like to say a little something in rebuttal. Mr. Hitt, the gentleman you really should thank for the hundred and twenty-nine new members, is our own Toastmaster, Dick Wood.

Toastmaster Wood: We are not going to let Joe Hitt talk until we are through. When we get through we will let him say a few words. We have not gotten through with the celebrities.

Here is Professor Walker, head of the Department of Mining and Metallurgical Engineering at the University of Illinois—Professor Harold L. Walker.

I think that most of you know him. (Applause.) I don't know what all the story is but he has been over in Europe or Asia or some place cooking up a lot of coal orders. We have been tearing our tail around trying to fill them and also have been shipping coal all over the world.

You know that on the boat trips, and on these meetings up here, the Engineering School is always represented and we are always glad to see them. They are a great bunch of fellows and Professor Walker is really one of the enthusiastic members of the Mining Institute, as enthusiastic as any coal man in Illinois.

I don't know how much he had to do with this booklet that I picked up. He may claim that he was out of the country when it happened but I just want to show you, in support of what I say, the wonderful contribution that the School of Engineering and Professor Walker is making for the Coal industry. Knowing the coal man as he does, no doubt, and knowing him as you do, perhaps you have received this booklet and now have it on your desk. It is entitled "Analysis of the Motion of a Rigid Body." (Laughter.)

Well, it is full of a lot of fancy curves, the like of which you never saw before in your life. I think that is a fine contribution to the coal industry, too. We can now read Professor Supley's "Analysis of the Motion of a Rigid Body." It is something I have been looking for for a long time. For those of you who would like to have a copy, you may send for Bulletin 44. I have been trying to figure that out for a long, long time.

Now, at other tables we have some celebrities who were invited to sit at the head table. There is D. W. Buchanan. Buck wouldn't come up here. He wanted to sit with the hoi polloi. Where are you, Buck? (Applause.)

Then there is R. L. Adams, executive board member of the I.M.I., and of the Old Ben Corporation. He is over there, too. (Applause.)

Down here in front we have Walter Gill, president of the Coal Producers Association. (Applause.)

There is also Spud White, life member of the I.M.I., District 10, Illinois Mine Workers. Where is Spud. He is supposed to be warming a chair down here.

Bob Medill seems to have got lost in the shuffle. Where is Bob? Bob is the incoming vice president of the Institute. He is Director of the Illinois Department of Mines and Minerals. Is Bob around there? Well, we gave him some advertising anyway.

We have here in front Paul Halbersleben, of the Sahara Coal Company and Bills Starks; J. W. Starks, also of the Executive Board, Peabody Coal Company; also Alex Duncan, of the Superior Coal Company and member of the Executive Board of the Institute.

I am going to pass these three musketeers on my left temporarily. You are supposed to know who they are anyhow so hold your applause while I tell you who they are in order. They are George Campbell, Holly Stover and Joe Hitt. We are going to hear from them very shortly.

I think I had more fun out of this dinner than anyone or all of you put together. These three started abusing each other, some time early today—I don't know what time, or whether it was last night. Anyhow, they got into an argument. I think that George and Joe were here first and they haven't given up yet.

At the table they have been pretty rough and ready about discussing each other's age; none of them knowing about the cake, of course. I will tell you now that the right number of candles are not on that cake, so that is not saying anything one way or the other.

After awhile they got to discussing each other's hair and the color of their hair and other things that go with old age. After passing these compliments a steak was set down in front of them. They tore into these steaks and also drifted into a discussion of steaks and steers and meats and each one seemed to know more about raising cattle than the other one.

I don't know so much about Stover. He is supposed to be a hill billy from West Virginia. I don't know what kind of cattle they are supposed to raise down there. He said that back in 1903 he and his father sent a carload of bulls to market.

Then, Joe, not to be outdone, had to tell that he came from the grass roots and he was a horny handed son of the soil and also a cattle raiser. He said that in 1905 he and his father shipped two carloads of bulls to the market and Holly came back and said, "In 1906 my father and I shipped two carloads of bulls to the fair and took all the prizes.

George Campbell, not to be outdone, said that he and his father had shipped bulls to St. Louis to the fair and to the Chicago fair back in the early days. He said that his bulls won all the first prizes and the grand prize ribbons.

All that I can say about those three fellows is that they are three of the biggest bull shippers I ever saw in my life. (Laughter.) I hope that the reporter will not forget to spell that right. Miss Brail will edit that in Braille.

We now come to our secretary, B. E. Schonthal. I feel silly and foolish in trying to introduce him I am not going to say much about him because I think our retiring president and incoming president, who will work on him, will take care of that matter very well.

He has a couple of reports to make and it is now my privilege to introduce him at this time. (Applause.)

Mr. B. E. Schonthal: Thank you, Mr. Wood. Gentlemen, I think you all probably remember that last year we had a young man here by the name of Marion Walls, who was our first graduate on our scholarship program and who announced at that time it was his hope that he could repay the Institute for the funds that we had advanced him that made it possible for him to get his education.

He also was very much grieved that because of ill health of his wife he had to go to Arizona to live. I was very much pleased a week or so ago to get a letter from him. I want to read it to you, if you will bear with me for a moment.

It is dated Globe, Arizona, October 8, and is addressed to B. E. Schonthal, Secretary of the Illinois Mining Institute.

* * *

"Dear Mr. Schonthal: At the last annual meeting of the I.M.I. on October 27, 1944, I said I intended to repay the scholarship I had with the request that it be put in a revolving fund to be used for further scholarships.

"I am enclosing my first payment of one hundred dollars. Please accept it with my thanks to I.M.I. for the use of it and my most sincere good wishes for the future success of the Institute.

"I am still employed with the Miami Copper Company, of Miami, Arizona and am now acting as stope engineer.

Respectfully yours,
(signed) Marion B. Walls."

* * *

I wrote him a letter on the 12th and I said:

* * *

"Dear Marion: A most pleasant surprise reached me today in the form of your letter of the 8th with the enclosure. When the scholarship was established, there was no thought in mind, of course, of any repayment by those who received the benefit of them.

"The payment of the amount you sent is therefore a very pleasant experience for me individually and naturally for the

Institute. I propose to present your letter for the record at our annual meeting and dinner to be held at Springfield, Illinois, October 26.

"I am sure that everyone present, as well as those who hear about it, will be most happy over this very fine way that you are handling the matter.

"I hope that Arizona has done for Mrs. Walls' health what you hoped it would do. Possibly some time in the not too distant future her health will permit your returning to some point nearer home.

"Please let us hear from you from time to time. With my very best wishes personally and from the Institute,

"Cordially,

(signed) B. E. Schonthal, Secretary,
Illinois Mining Institute."

* * *

I am sure that everybody here will appreciate the spirit in which this boy is handling this matter. It shows that he is made of the right stuff, and it shows the Institute that it made no mistake in putting him through school. (Applause.)

Now, those are all the communications we had, Mr. Toastmaster. As to you, Mr. Hitt, I want to say to you that the first official act that you are going to have to do is to sign a certificate of life membership that I have taken out in this Institute for my son, Joe. (Applause.)

Toastmaster Wood: Well, that will also be your first job, Joe. Already the secretary is telling you what you are going to do. All you have to do is do it.

It is a nice thing, you know. We stirred up the hundred and twenty-nine memberships and got him so excited that he had to join in and toss in a life membership for good luck.

He called me to the telephone and said that he was so pleased with the idea and not to tell Joe Hitt about it, but he was going to have a big surprise; that the first duty Joe Hitt would have as the new president, the first official act, would be to sign a life membership for his son.

Well, the evening is full of surprises. You know you never can tell. This membership thing has got to roll along and Jeff tells me about what a job, what a swell job it was, to raise a hundred and twenty-nine members.

I am here to tell you that it wasn't much of a job at all. It was just like pie—all crust and apple sauce. The memberships started rolling in from all directions and people would stop me on the street and hand me three dollars and I would write "cash" on the slip. Then the first thing I knew I was going wrong and was trying to write checks for applications that I had taken for cash.

When we got them all in I came back to the office with some of them sticking out of my pockets. Let's see what this is. Hell, there is one I forgot. Here is an application for a life membership with check attached for Holly Stover, President, Chicago and Eastern Illinois Railway.

(Applause.) Yes, that is the Chicago and Eastern Illinois Railway. I can't see up here very well. I thought he was a coal man, but now he is a railroad president.

I may say to the rest of you that this is also a surprise to Bale Schonthal.

Secretary Schonthal: I gave you the idea, didn't I?

Toastmaster Wood: He didn't know a damned thing about it. I got hold of Stover with the idea, "Do you think you can come up here and talk to us for nothing? They don't pay you a fee, but you have to pay and it will cost you fifty bucks."

That is the way it was done.

Secretary Schonthal: This is a surprise for you. (Handing check to Mr. Wood.)

Toastmaster Wood: Here is a surprise for me! This is something I certainly didn't know. Here is Professor Harold L. Walker's application for a life membership. (Applause.)

Well, you know, Stover and these fellows are all right, but when we get these young fellows, their memberships are no good; I mean their life memberships.

Here is another note. Somebody is always telling me what to do and what to say about Joe Hitt or Stover or somebody. No, this is a check, too. Oh, this is an application for life membership, and it is a surprise to all of us.

It is from Wayne Johnston, president of the Illinois Central Railroad. (Applause.) I don't know, I guess if I go through my pockets. Holy criminy, yes, that is what it is. It is an application for life membership with a check attached. It is from L. W. Baldwin, Chief Executive Officer of the Missouri Pacific Line. What do you know about that? (Applause.)

You know, Bale, you don't spend this money. It says in the constitution that it all goes into the pot some place, with no handle on the pot.

Here is something, I don't know what it is. Damned if it ain't. Check attached to application for life membership from I. B. Tigrett, Gulf, Mobile and Ohio Railroad. That runs right along Joe's coal mine. (Applause.)

How are you doing, Bale?

Secretary Schonthal: Okey, brother.

Toastmaster Wood: Have we made expenses? I remember one time that Joe Hitt gave Bale Schonthal a sack of kosher salt on his birthday. I thought Bale would reciprocate some way or other.

Secretary Schonthal: I have a sack of kosher jello but forgot to bring it up here. It is downstairs.

Toastmaster Wood: I thought jello was made from horses' hoofs.

Secretary Schonthal: Kosher horses. Have you got any more of these before I put them away?

Toastmaster Wood: Don't close the books. We might inspire a lot of people here today to take out life memberships. We want these gray haired fellows. If we take in the young fellows we might lose on percentage there. We will do better on that with the old fellows.

Well, these things surprised me as much as anyone. We do have a telegram, a message to read to Joe Hitt: "Regret unable to be with you. Heartiest congratulations both on occasion of birthday and election as president of the Institute. W. C. Taylor."

He must have heard it was Joe's birthday. That was your old friend, Clint Taylor. I don't know whether we have covered all the announcements. Have we?

Secretary Schonthal: Yes.

Toastmaster Wood: I haven't got any more of those things sticking around in my pocket. I made some notes today, though.

Secretary Schonthal: Better look again.

Toastmaster Wood: I wanted to cover everything. When I was asked to take this job I said to Campbell and Schonthal that they would have to tell me who was going to be the guest speaker; that we were going to bark this thing up and get a big crowd out.

When they told me who it was, I said, "Okeh, it is a deal." So we are pushing this right along and not going into any oratory in introducing our speakers. I don't know whether the University of Illinois was thinking about our speaker's business, or the railroad business, or if this has anything to do with the railroad business when they put out bulletin No. 47. I do know that the three musketeers put in a pretty good day together and I had this bulletin handed to me from the University of Illinois School of Engineering. It covers the "Progress Reports and Investments of Railroad Rails and Joint Bars."

The only "bar," the only "joint bar," I know of is down stairs.

Our speaker told me tonight that he was never told what subject to take. I said that was all right; if they didn't tell him or if he didn't hear them it is like my boys when their mother tries to get them to eat certain things. They will make a deal with each other and maybe trade an apple for an orange or something like that. And when they do they always say, "No backs." That means it's a firm deal.

The other morning Mother didn't happen to have the particular kind of cereal that our six-year-old likes, so when she put the cereal down in front of Timmy, she said, "This is not the kind you like best, but eat it and no backs."

Within three minutes he was trying to trade Tom out of something else. Mother said, "Didn't I tell you, no backs?"

Timmy said, "You must have told it to God. I didn't hear you."

I guess that is what happened to the instructions to the speaker tonight. If they told him what to talk about, he did not hear them. I looked around for some information on Holly Stover. I found it was not a very difficult thing to get information about our speaker, who is president of the C. & E. I. He has held that position since October, 1944.

He came up from a coal operator. They tell me he is still a coal man; that he likes to visit the mines; he likes to go down under and see the face; that he always insists upon going down there.

He is a very genial, rough and ready, rugged type of fellow, as those of you who met him know. We know that he speculates rather freely on the future of Illinois coal. He is a real enthusiast.

I have a clipping here. I won't read it all, but I will read a part of it. It is what one newspaper man said about him. First it quotes him. It says:

"Holly Stover said, 'If I have been a success, it is because I have tried to make it a policy to help instead of harm. It is because I have been fair in my dealings with others and because I have tried to work hard and to provide for my security.' "

We should think of those things, especially these days when we hear of the "fifth freedom." You know what that is—"freedom from work." I will give you some of his background and will give it to you from the newspaper clipping.

"Stover spent several years in Washington." Is that right? That is what this says. I don't know what that means, except the other night when I was listening to Edgar Bergen and Charlie McCarthy, Edgar, after awhile gets tired of Charlie and takes over Mortimer Snerd.

You have all heard that, and after he gets disgusted with Mortimer Snerd, he says, "Mortimer, how can you be so stupid?"

Mortimer replies, "I don't know, Mr. Bergen, unless it is because I spent the last few months in Washington."

"Stover bears the mark of the Commoner. (These are not my words but the words of the editorial.) He surrounds himself with none of the 'difficult to pierce' atmosphere with which executives of the railroad caliber so frequently fortify themselves, behind paneled walls and secretarial censors.

"No, this fellow is going to town. Stover believes the way to build a railroad, to build a great railroad, is to make service attractive to the area it serves; to learn to know those people and to aid in improving the community along its lines. That, in short, would be big, good-natured Stover's manner of doing it with the C. & E. I."

I don't know whether he is going to tell us about that tonight or whether he is going to tell us the story about "prune-sock." It is all right, though. There are no reporters present except the official reporter, and we can censor him.

Gentlemen, it is my pleasure to introduce to you our guest speaker, Mr. Holly Stover, president of the C. & E. I., and new life member of the Illinois Mining Institute. Mr. Stover. (Applause.)

ADDRESS

By HOLLY STOVER
President, Chicago & Eastern Illinois RR. Co.
Chicago, Ill.

Mr. Toastmaster, the past and the new presidents, I am happy to be here tonight and happy to see so many men here.

Last week you didn't produce any coal because another group of men were not working. Doubtless very little will be produced this week because the men that actually produce the coal are here tonight.

When George Campbell asked me to come here tonight, he didn't tell me what to do or what to say. Had I known that this gathering would be so large, I might have reduced to writing some message of interest to you, but I have always been a little leery of trying to read anything, especially to an intelligent audience, because it takes me back to the hills where I was raised.

You know the mountain folks in the hill-billy section, in addition to making moonshine, also like their churches and all through that section of the mountains—the Blue Ridge and the Alleghenies—we have these little forks-of-the-road churches.

One of these little churches had the misfortune to have the old preacher pass on. The elders got together and brought in a new one. He came from some distant part of the state. Well, he came in new and for two or three Sundays he did the best he could.

His elders got together and waited upon this old parson. They said to him, "We are sorry but our mountain folks don't like it. You are just not our kind of preacher and we regret to tell you that we will have to let you go."

Well, the old preacher, of course, wanted to keep the job. He said, "I know I have been here under rather difficult circumstances and I want you to give me another opportunity. I think the next sermon that I deliver to you good people will make you like me better."

That was fair enough, so they gave this old preacher another opportunity. He worked all week over it, poring over his Bible, and he whipped up what he thought would be his masterpiece.

On Sunday all of the boys from the hills and the gals, the whole congregation gathered at the church. This old boy did the best he could and they took up the collection, of course, and sang that old familiar song, "On Jordan's Stormy Banks I Stand."

He dismissed the audience, rushed out to the vestibule of the little church to greet the sisters and brothers as they made their exit. He was beaming and shaking hands with everyone and hoping that his sermon went over.

He came to an old, hard-boiled member. He said, "Brother, how did you like the sermon?"

The old boy said, "I didn't like it for three reasons."

Well, the preacher looked at him for a moment and then said, "Would you mind telling me the three reasons?"

He said, "No. The first reason is that you read your sermon. The second reason is that you didn't read it very well, and the third reason is that it wasn't worth reading."

So don't be alarmed. I am not going to read you anything, but I have made some notes here. However, if George Campbell sold to this group of fellow mine workers any idea that I was a public speaker he misrepresented the man because at the conclusion of my remarks the decision is yours and I know what it will be.

I don't believe George or any other of the coal operators misrepresent their products. That isn't cricket among good coal operators, to misrepresent anything.

Now, gentlemen, here in Illinois I know you are all proud to be a native of Illinois. I am proud once more to be a citizen of Illinois. Illinois is one of the great states of this Union. First, its location in the center of a hundred and thirty million people makes it accessible and it has the old Mississippi River flowing along its southern border and western border and it has the magnificent Lake Michigan on the north.

Then in Chicago and fanning out from Chicago is the greatest network of railroads in the world and those railroads cover every nook and cranny of Illinois. There are, along the railroads, hundreds of towns and hamlets with all types of industries where you produce everything from pins and needles to locomotives.

Then, again, on the surface Illinois is the richest farming land, possibly, in the Union, where these magnificent crops are produced. Then below the surface, millions of years ago the Creator created and hid away these magnificent seams of coal, layer on top of layer, to wait for the arrival of man.

Now Illinois should be way up here in the top in the annual production of coal but Illinois, like some of your neighboring states, has been faced with many conditions in coal production over which you had no control.

For instance, let's just turn back the pages of history, say, to 1900. At that time, down in the great Appalachian region these marvelous seams of coal were literally sticking out of the ground. Men, or a few men, could get together, put in a spur track and in thirty days' time recover from the mine many tons of coal and shipment of that coal began to roll away.

That coal area was developed rapidly. Mines sprang up like mushrooms. There was plenty of needed labor, but there was no flooring under the wages of that labor and many of you men here instead of increasing your annual production from your own mines in your own markets saw cheaper coal rolling in.

That went on for over thirty years and instead of your annual output growing, in many instances you were forced to curtail your annual production of coal.

Well, something happened. In 1933, in the great incubator in Washington that was well stocked with all types of newly laid eggs, there was one funny looking and funny shaped egg and from that egg the great Blue Eagle was hatched.

We all know about the Blue Eagle. Its wings spread from the Atlantic to the Pacific. Not only coal but all industry came under the wings of that Eagle and along with that Eagle it gave to Uncle John what he had been praying for and figuring for and fighting for—the aid and the power of the federal government.

He reached out and all the mines in all parts of this nation then were under John's wing. At last there was a flooring put under the wages of all of this great coal production to the south and today as you know John has the valve in his right hand. He can turn it off and turn it on at his pleasure and I don't believe there is a coal operator in this room who will stand again gazing at an idle mine and see great trains of coal from other states rolling by his mine to industrial plants or utilities within gunshot of your mines.

Those days are gone forever. I think at last Illinois is coming into the position that you so justly deserve and that you have earned in your annual coal production.

I made a few notes. I want to kind of touch on these things as I go along because I am no speaker. There are many things, of course, that are being created that are not helpful to the nation's coal industry.

Now I make reference to all the millions that Congress from their pork barrel in Washington appropriate annually for these cockeyed schemes of harnessing all the rivers. You have heard nothing for the last ten or twelve years except about the great Tennessee Valley Authority and what it was going to do with this cheap power from all these wild mountain streams.

Well, there has been upward of thirteen hundred million dollars spent in the TVA and the irony of that is that with all that money spent to harness all the rivers, they at last had to build a steam plant to generate some real power by coal.

They went out in the far West. You all know about the great Coulee Dam along the Columbia River in Washington, which all the taxpayers, the taxpayers of Illinois and you people here are called upon to put up the money for to make cheaper domestic and industrial power for the far West.

That is going on all the time and the last scheme—thank God, the senate killed it in committee—was another TVA project. That was the Missouri Valley Authority.

All those things were reducing the consumption of coal and it is the highest priced power ever created in this nation if they kept their books like you coal operators keep your books. If it wasn't done with public money there would be no TVA or Grand Coulee Dam or Boulder Dam because private industry wouldn't get into such an undertaking, but they are here and what are we going to do about it?

Another thing, let's take a look at the inland waterways. That is a real sweetheart of these boys that have got the dough to kick out of the pork barrel. You take these rivers like the Kanawha river that reaches down into Southern West Virginia, the Allegheny, the Ohio, the Tennessee, and the Mississippi rivers.

Millions and millions are pouring into those streams for federal barge lines, all of them competing against the railroads. All the people are paying for that and they are out trying to haul freight cheaper than any legitimate transportation facility could haul it.

But we can't get rid of them. They are here and probably will stay here, so I say to you gentlemen that as long as they are here and spending all the people's money on that type of project, the Illinois coal operators ought to get something out of these inland waterways.

I am trying to interest the people now connected with these railroads whereby that adequate dumping facilities might be thrown up either on the Mississippi or Ohio so Illinois coal might go up the river to the Twin Cities or go down the river as far as economic conditions will permit you to reach. (Applause.)

Coupled with that are your Great Lakes. I am not taking credit for being the father of that idea, but I certainly conceived the idea a long time ago that you operators in Illinois ought to have a real dumping plant at the lakes where you can, during the slack season when there is no demand for your domestic sizes, find an outlet for a large volume of coal to go up the Great Lakes.

You all know that some twenty-five or thirty million tons of ore comes down from Duluth and Superior for Gary, Indiana Harbor and South Chicago. Those boats all go back in water ballast. Those boats should be carrying Illinois coal back across these lakes. You have got the coal.

Here in this war, when the Canadian National and the Canadian Pacific couldn't get this cheaper coal from the East that came across the docks at Toledo, from Sandusky, and Ashtabula and went to the head of the lakes, they drew coal from Indiana and Illinois and the records show in the motive power division of these two roads that you evaporate as much water in a locomotive with Illinois coal that you can evaporate with Pittsburgh Number 8; therefore, you fellows are entitled to your full share of the business that goes up into the northwest because Illinois is taking the wheat and other grains and bringing those grains down to make food stuffs for the people of Illinois. So much for the Great Lakes.

I am just talking, boys, and rather rambling. Never mind, if I slip a cog or two don't throw me out. I might make a little reference to the railroads. Every railroad in America that is privileged to serve a coal mine should be vitally and enthusiastically interested in coal production and coal consumption and make all the contributions that are humanly possible to widen the markets and increase the demand and the consumption for the coal that is produced along their lines.

I want to say to you gentlemen here that I don't want you to feel that the president of this organization, who was good enough to allow me to come here and meet you and say a few words to you, would have to admit that my visit here was for selfish purposes and that I am here looking for traffic, because the very day when I feel that this little railroad that I represent cannot, by good service and good treatment, earn the traffic, we don't want the traffic. I have never stood on any corner with a tin cup begging for charity, but I do say and I hope, even coming from as small a person as I am in this industry, that I can arouse and awaken your railroads to help you and give you better facilities at the lake front. (Applause.)

As all of you and as my friend, George Campbell, know, I have considerable amount of money myself invested in coal mines. I am not your competitor; I am your neighbor. What I have got doesn't interfere with you. It is something else, but I think all of us who have invested our hard-earned money in these coal mines are facing a real crisis today.

Now this little backward step that cousin John took the other day in Washington is just a silence for the time being. John is coming back. He is coming back the first of April.

You know the coal industry has a mighty payroll monthly and annually for John's organization. He is doing a marvelous job and it is too bad he isn't a coal operator, but John is too smart to invest his own money in coal mining. He would rather spend yours, but I do think that the coal industry needs real public relations.

When I say public relations I say there should be a campaign to go out and educate the American people on what goes into a ton of coal and what the men get that are actually working in these mechanical mines. Every time you have one of these annual strikes your press never speaks of the producer with any favor and the majority of the people of this country feel that the coal operators have always ground them down on prices and up until there was a floor put under the coal industry, first by the Blue Eagle and then by the Guffey Coal Bill, there weren't a dozen mines in the United States that paid any federal taxes because they didn't earn anything.

Why didn't they earn anything? It is because your coal mines are exactly like the American farms; there are too many of them; there are too many individual mines, but for the farmer, oh, boy, the Congress wants to put a flooring under the wheat, under the corn, and barley and everything else.

Why? Because at the ballot box the farmers are the balance of power. There are only a few coal operators. They are in the minority. The farmers need some protection because like the majority of the coal industry, grain is shipped into a market and the buyer beats them down to prices that he cannot produce the grain for. That same story is true of the coal operator.

We can't get together here in this room tonight and say we are going to fix prices on coal. No, sir. If we did that the strong right arm of the Department of Justice would reach out tomorrow and pick us up.

The only way that we can legally fix prices is to have some federal agency that is operated on the same high plane that the Interstate Commerce Commission operates that fixes railroad rates, come in and take over that duty, or that function.

There is a uniform freight rate and a uniform passenger rate in the country and there should be a uniform and fair rate on bituminous coal so the operators can live and earn something in the most hazardous enterprise of the whole nation. There is no other enterprise in the world that has as many hazards as the coal industry because if you are manufacturing, as you grow and increase your production of manufactured articles, you enhance the value of your plant, but as you increase the volume of your tonnage you are depreciating your property because you are digging the coal away and only God can put it back.

So I feel, as much as I dislike any type of governmental supervision, that there should be a coal bill created by Congress that coal men themselves can operate that will be fair to the public, be fair to the operators, and bring about fair wages to the men who produce the coal. I think that would be a fine and fair thing for America. (Applause.)

I may have been off key on that, but I still think it is the only savior of this industry that I know of.

Now, gentlemen, I have rambled on here at considerable length. I told George and I told Joe that whatever I had to say to you would be brief. I hope I haven't bored you. It is an honor for me to come here. It is always a joy and a delightful occasion to mingle and mix with coal operators because I know your language and I hope to God you know mine. Goodnight. (Applause.)

* * *

Toastmaster Wood: Mr. Stover, in behalf of the members of the Illinois Mining Institute I want to express their thanks and appreciation for this very fine talk.

We all know now as we learned before, that here is a man who likes to face the facts and not to point out just one thing about his talk but to use that as an example, I would like to reiterate that we must wake up to these things.

We must know what it is all about. If you don't know what it is all about you must learn to face the facts. A fellow named Charley Brown down in St. Louis, a young fellow, started out many years ago to raise a family. When he found out his wife was "that way" he was passing the cigars around six or seven months ahead of the time that he was due to have a son and heir.

Lo and behold! When the time came he was very much embarrassed for he wanted a boy and got a girl. However, he told the fellows that the next time it would be a boy. Time rolled on and he again was doing a great deal of bragging, but lo and behold! It was another girl.

He swore to the office force, and his wife and family and neighbors and friends that he was going to keep on until he had a boy. However the next "boy" he had was a girl. He had eight girls in a row.

Finally the time came along when he said this is positively going to be a boy and I am going to celebrate for a week, and a boy it was. The night the boy arrived he went out to celebrate and he celebrated. He broke all records and made a lot of new records in celebrating for a week.

On the seventh day he was standing up at the bar, weaving around, buying drinks for friends and telling them all about it.

One of them said, "Charley, that is sure swell. You finally got a boy after eight times. Who does he look like; you or your wife?"

Charley said, "Hell, I don't know. We haven't looked at his face yet." (Laughter.)

A lot of us haven't faced the facts on TVA and MVA and some of these other things that Mr. Stover has told us about tonight.

I think there is one more report. Another precinct came in. I will have to call Mr. Schonthal again.

Secretary Schonthal: Mr. Chairman, I want to announce that we now have a life membership from Stuart Jenkins and one from William J. Jenkins, II, which puts three generations of the Jenkins family on the life membership roll. (Applause.)

Toastmaster Wood: We are bringing you around to the end of the row here, like we promised, in a hurry. George Campbell is getting excited and wants to take over here before I say something about him.

I have a lot to say. He should tell us the story about the first time he came to Springfield but for fear he won't I will do so. That was back in the old days at the Leland Hotel before it burned down. Isn't that it, George?

Ex-President Campbell: I don't know.

Toastmaster Wood: That was before the old Leland Hotel burned down. He was sent down here on some business at the court house of Sangamon County. He didn't know where it was. He got to bed and the next morning he started to the court house.

He stopped in the lobby and asked the clerk how to get there. The clerk said, "You go out the door and it is two blocks to your left and one block to the right."

George went out the wrong door. He went two blocks to the left and one block to the right and found himself approaching the residential district of the city. He thought, "That court house can't be here."

He stopped the first man he came to and asked, "Where is the court house?"

The old fellow said, "Heh?"

George said, "Where is your court house?"

The old man said, "I am a little hard of hearing. You will have to speak louder."

George yelled, "Where is the court house?"

"Oh," the old man said, "we don't have them here. You will have to come out in the evening and pick them up on the street like the hometown boys do." (Laughter.)

George is going to make his swan song and turn the gavel over to Joe Hitt. This is also my swan song. It has been a pleasure to be with you tonight. (Applause.)

Ex-President Campbell: Thank you, Dick Wood. Thank you, Holly Stover. I appreciate your coming here tonight. I know every member of this Illinois Mining Institute appreciates it.

I wish now to give the incoming president a few pointers on how to conduct himself in this honorary office. The duties of this office at present are very exacting. It takes a high-powered executive in command of all his faculties every minute to handle it successfully.

You have to be close to the telephone constantly because about twice a year Bale Schonthal will call you up. He will want an answer. You will have to make a very important decision. He wants an answer of yes or no. He will tell you the answer before you give it but you have to keep yourself in condition so you can articulate "yes" or "no." You must be prepared to answer affirmatively or negatively. Mr. Joseph Hitt. (Applause.)

President Hitt: Thank you, Mr. Campbell.

Richard Wood: "Happy birthday."

President Hitt: Mr. Wood says a happy birthday. Mr. Retiring President, honored guests, Mr. Toastmaster, and members, I am naturally very much embarrassed tonight. I didn't know about the cake.

I was asked to register great surprise when they told me about the hundred and twenty-nine members they had found in and around St. Louis and which they were going to present to me or to the Secretary with their compliments.

I naturally didn't want to know about it but many fellows hurried over to my office to tell me they were members, so I really did know a great deal about it, although I didn't know there were one hundred and twenty-nine new members to be presented tonight.

I haven't seen the list yet, but if the hundred and twenty-nine fellows who bought these memberships because they were friends of Joe Hitt's or said they were, it is all the bunk. I am sure when I see that list of memberships, I will find that there was a lot of blackmail and bull involved in getting them. I don't think there are that many fellows who would buy memberships just because I am President of the Institute.

I appreciate it, however, a great deal and I think it is a fine compliment to me even if the fellows were blackmailed.

As to the cake, there has been some misrepresentation. Mr. Wood told you that the number of candles on that cake did not represent my age. Now the chef told me how many candles were on the cake.

Of course, you fellows cannot count them all because you cannot see all sides of the cake, but I am inclined to believe the chef when he told me there are sixty-seven candles on the cake and that leads up to another misrepresentation made by Mr. Wood.

He said that my father shipped a load of bulls to Chicago.

Toastmaster Wood: How?

President Hitt: By the C. & E. I. RR. He said that Holly Stover's father shipped two carloads of bulls and George's father shipped three carloads of bulls. Now I am inclined to believe that he was correct when he said that their fathers did it. However, it wasn't my father who shipped my carload of bulls. I shipped them. These fellows are just boys, you know. Later we all three got into the coal business, then we quit shipping bulls, but have been throwing it and have continued to do so ever since. Even tonight some has been thrown.

I was much interested this morning in hearing our Secretary make the statement that this association, the Illinois Mining Institute, is the largest institute representing coal in the United States. I wasn't inclined to doubt that, but I did turn over in my mind why this Institute is so large, and, first what are the benefits derived by it. I have operated in all mining districts of Illinois and in Indiana and down in Kentucky, and I have never found in the two latter states the fine feeling of friendship that pertains among mining men of Illinois.

I find it among the coal men in Illinois—I don't mean the executives or the sales departments, I mean the fellows that made Illinois the third largest coal producing state in the country—the fellows that produce the coal have developed as between each other a fine companionship, a wholesome comradeship that I do not find exists in any other state where I have operated.

I believe that no small part of that good fellowship came through our association and gathering once and sometimes twice a year at meetings of the Illinois Mining Institute. I think it is definitely because of that fine comradeship that Illinois has grown as she has grown as a coal-producing state.

We fellows all know each other. Many of us never would have met if it hadn't been for these annual meetings. They are of great benefit and a good job has been done. For that no small amount of credit is due to our Secretary. None of that can be taken away from him.

The President has told you of the responsibilities of this job. The fact of the matter is that when he was fully awake this morning, after Holly Stover and I gently awakened him, he told me there really wasn't any work for the President. However, he had only been in bed an hour and may have forgotten some of his many responsibilities throughout the year.

Then the work starts and I find that Secretary Schonthal's first job for me is to sign a membership for his son, Joe, so there are responsibilities to this job that has been assigned to me.

However, seriously, I do think that the President and the Vice President of this Institute can perform for you a lot of good. They can be very helpful to the Secretary, and this is no reflection upon Mr. Campbell, for everything that he touches goes along all right; but that doesn't go for me. If I don't hear from Secretary Schonthal more than twice a year he is going to hear from me. I won't tell him what to do. I will ask him what he is doing, that is all, and he will have to tell me. (Laughter.)

That is all I have to say except that I will make every effort in the world that I can, fellows, not to disappoint you and I don't know that there is any more that I can say at this time. (Applause.)

Is there any more business? Mr. Schonthal says that he has a statement to make.

Secretary Schonthal (shaking hands with President Hitt): Mr. Hitt, and members, when the committee that I referred to last year met in 1929 to re-write the by-laws, we provided for three classes of membership. If you recall, one was regular membership; another was life membership; and the third was honorary membership.

The honorary membership classification provides when a man has done some outstanding thing in the industry or for the Institute, he would be eligible for election to honorary membership.

I would like, Mr. Hitt, to offer a suggestion tonight. I think the Dean of Mining in this state, who unfortunately isn't with us tonight, our good friend and loyal member, Mr. William J. Jenkins, who is now a life member and who heads the first of three generations of the Jenkins family, should be made an honorary life member.

I should like further to suggest, in recognition of the loyal support and active help he has given over the years, that we give an honorary life membership to our good friend Jeff. I offer that as a suggestion to you, if you please. (Applause.)

President Hitt: I am happy, gentlemen, to make this my first duty as President of the Illinois Mining Institute. I have known Mr. Jenkins for many, many years. He has been an honor to the industry. He has been a helpful worker for the Institute all these years.

He has always been on the job when he was needed, and now his son has come along and his grandson is here tonight. The youngster will probably feel about it as his father did in following his father. I think it would be appropriate to ask someone to make a motion that we elect Mr. Jenkins to an honorary life membership of the Illinois Mining Institute. Do I hear a motion?

Mr. Campbell: I so move.

Mr. Jefferis: I second the motion.

President Hitt: Gentlemen, you have heard the motion. All in favor, signify by saying, "aye." The response is so unanimous there is no need for a call for those opposed. It is unanimously voted to bestow an honorary life membership upon Mr. Jenkins.

Now I have another very pleasant duty. We have another fellow—Little Jeff, as I have called him for many years and shall continue to do so as long as I live, and he probably will be living when I die.

Jeff has been a faithful worker. Jeff has the record of having been the only member of the Illinois Mining Institute who has taken every boat trip that we have had. Jeff has been with us on all the trips, twenty-six. He is always on the job. He has been the President of this Institute and I would now like to hear a motion that Mr. Jefferis be elected to an honorary life membership.

Mr. Joyce: I move that Mr. Jefferis be elected an honorary life member of this Institute.

Mr. Fred Richart: I second the motion.

President Hitt: The motion has been made and seconded that Mr. Jefferis be elected an honorary member of this Institute. All in favor say, "Aye." The vote is unanimous and Mr. Jefferis, you are elected.

Mr. Jefferis: I thank you. I can't say more.

President Hitt: There is just one other little thing that I wanted to do and which I had almost forgotten. Our Secretary talked to you this morning about next year's boat trip. I remember distinctly that last year I told you that I had talked to the Leyhe boys and they thought the boat would be ready for a trip this year, but their inability to get equipment that they wanted, the scarcity of help, and the priorities made it impossible to get the boat ready.

Day before yesterday, Henry Leyhe called me up to tell me that they had the boilers. He said, "I think I can assure you that we will have the boat ready."

Then Captain Buck Leyhe told me, "I am in a pretty crippled condition now. I may have to ride in a wheel chair, but I would like to make my last trip on the Mississippi River, my valedictory trip, a trip with the Illinois Mining Institute, if possible."

And you can depend upon it that the Leyhe Brothers are going to deliver that boat to us next May or June, if it can be done. (Applause.)

Is there any other business?

Secretary Schonthal: No sir, Mr. Hitt.

President Hitt: Does anyone have any suggestions to make for the good of our organization? If not, gentlemen, I thank you for being here today and tonight. It is not out of order to say that this is the biggest meeting this year that the Illinois Mining Institute has ever had.

Secretary Schonthal: Here is an announcement.

President Hitt: The Secretary tells me that there were six hundred registrations today, which is an all-time record. I think it is a compliment to him and it is a compliment to you fellows who have come, and I feel greatly complimented on the night of my induction into office. If there is nothing else, gentlemen, we will adjourn. I hope and I believe that you will get a call from Secretary Schonthal to join us in St. Louis in May or June of next year for a trip up or down the Mississippi River in the old Golden Eagle. I thank you. (Applause.)

(The meeting adjourned at 9:55 o'clock.)

1—Temple of Vesta.

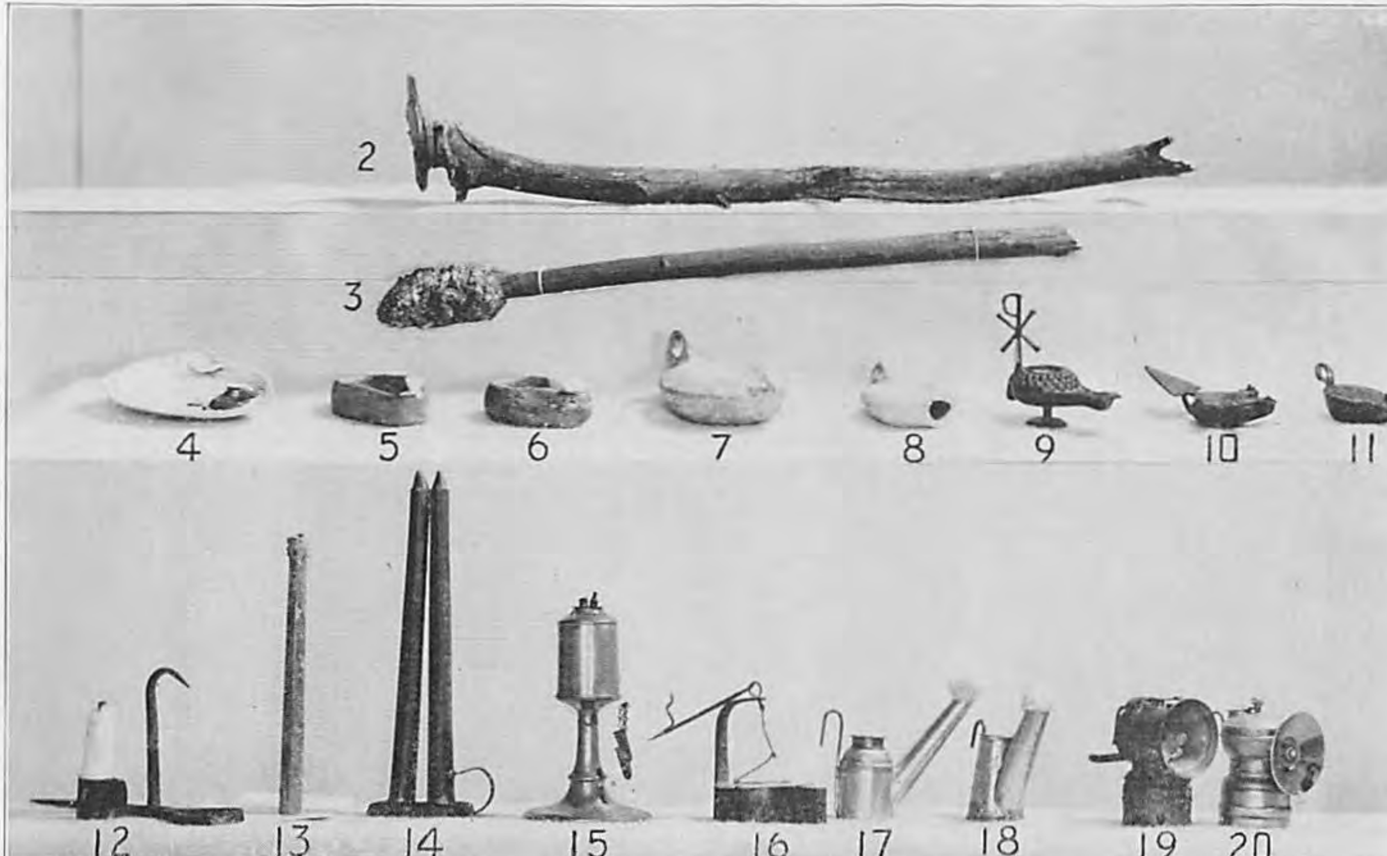
THE STORY OF UNDERGROUND LIGHTING

GRANT WHEAT
Koehler Mfg. Co., Wheat Lamp Laboratory, Marlboro, Mass.

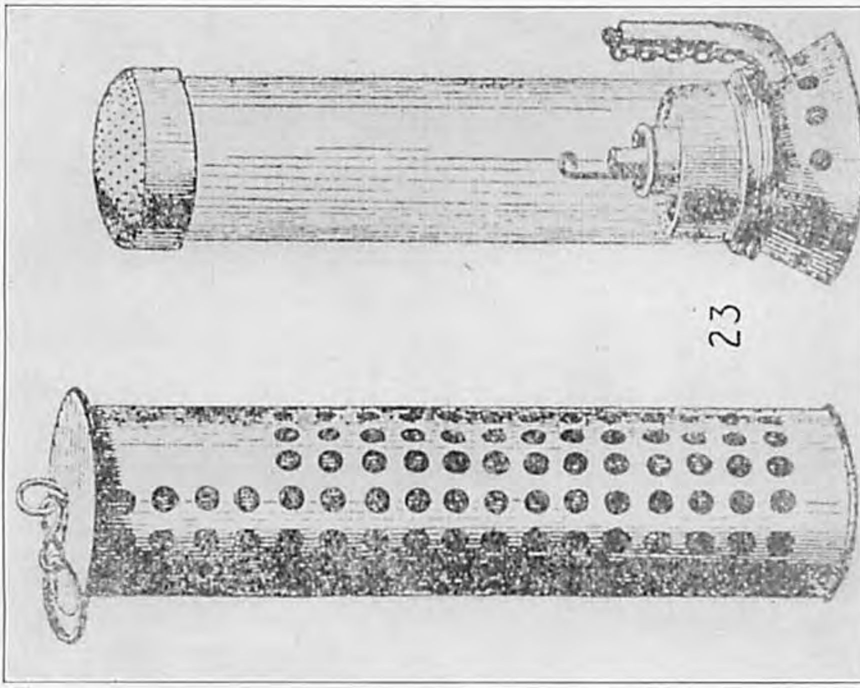
The earliest records of underground lighting from all tribes of the earth came after their knowledge of fire and its use. Where fire was considered important and sacred is revealed in the history of Rome. For more than 2,000 years before Christ a sacred fire was maintained in the Temple of Vesta which means "Goddess of the Hearth." This temple is located on an island in the Tiber, at the foot of the Palatine Hill, residence of the ruling family of Rome. The fire maintained in this temple was originally brought from Troy and was guarded by six vestal virgins chosen from the most noble families of Rome.

The sale of fire was used as a means of obtaining revenue, and to increase this revenue the citizens were required to extinguish their fires on the first of March each year and obtain a new fire from the temple. The fire at the temple was extinguished and relighted by the high priest and vestal virgins with the aid of the Sun Goddess (and condensed rays of the sun).

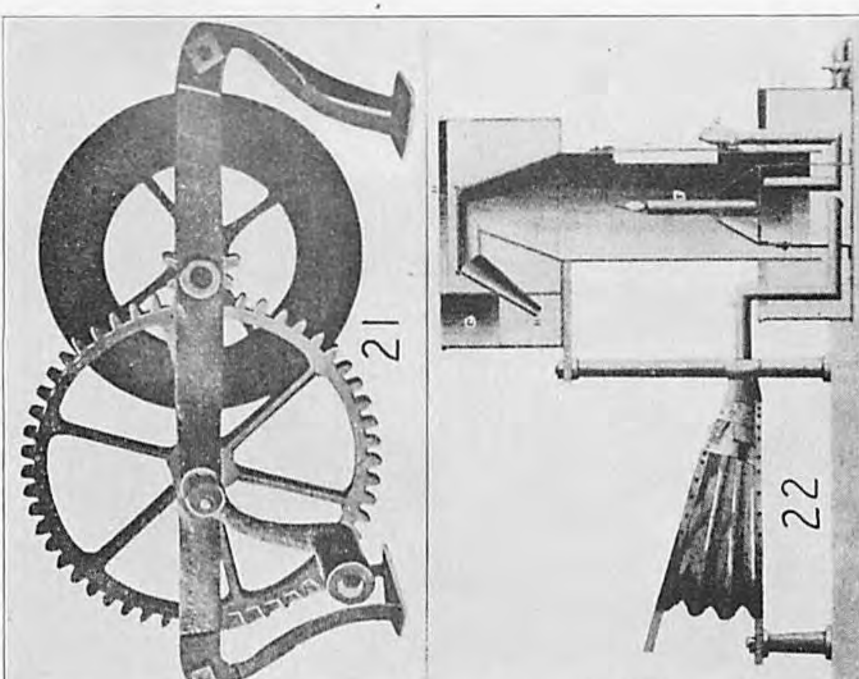
The early cave dwellers kept a fire at the entrance of their caves which provided them with light, as well as protection from wild beasts, a means of cooking their food and warmth. When they wished to go back into the cave beyond the range of the light from their fire, they



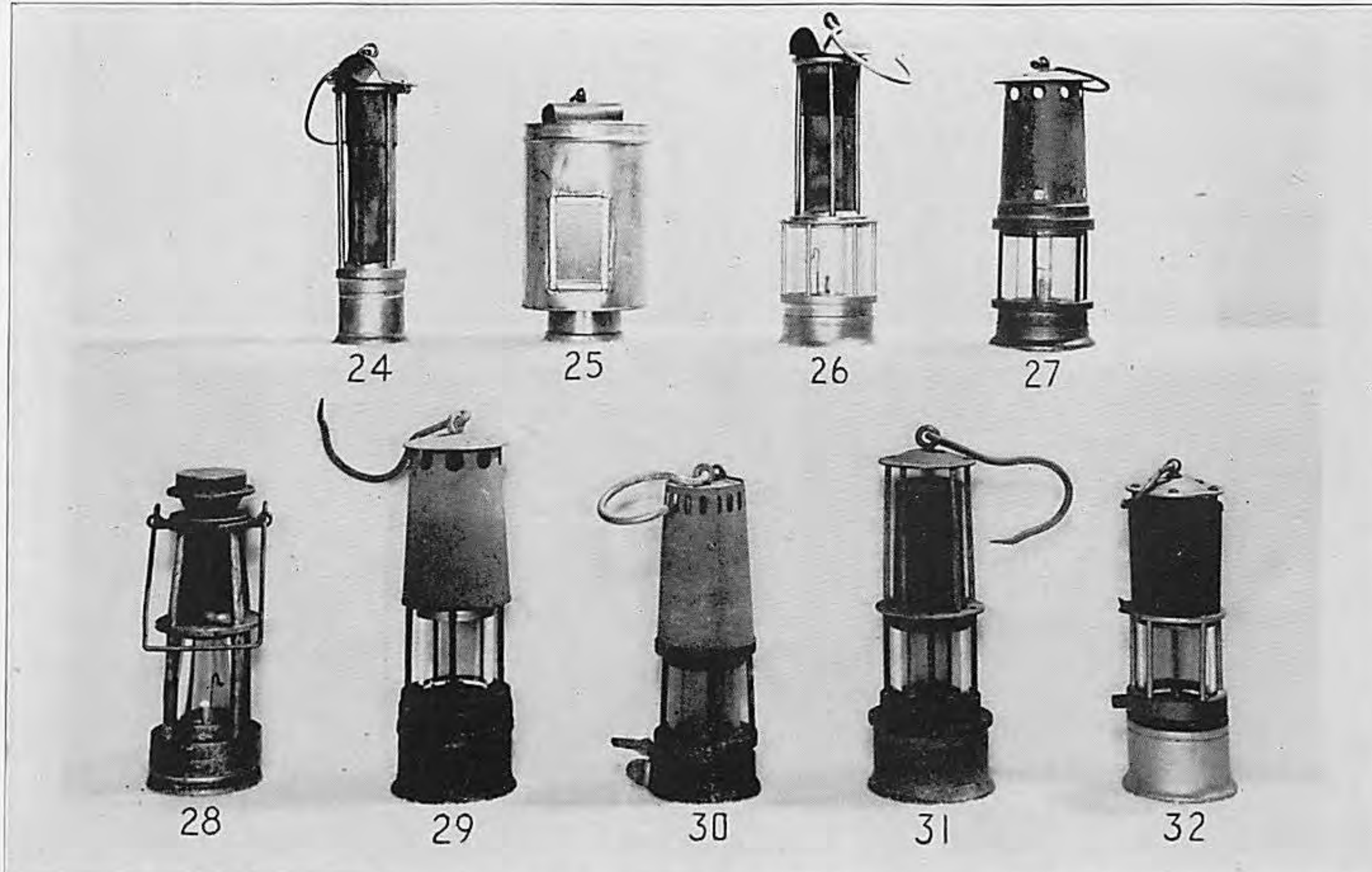
2—Pine Knot. 3—Pitch or Rosin Torch. 4—Clam Shell Lamp with Wick Through Stone. 5—Open Pottery Lamp. 6—Pottery Lamp with Sides Turned In. 7—Original Pottery Lamp from Pompei Nearly 2000 Years Old. 8—Original Pottery Lamp Used By the Early Christians In the Catacombs. 9, 10, 11—Little Bronze Lamps from Pompei. 12—Dipped Candle In Mine Type Candle Holder. 13—Moulded Candle. 14—Candle Mould. 15—250-Year-Old Whale Oil Lamp Used In England. 16—300-Year-Old "Betty" Type Lamp Used In the Silver Mines of Mexico. 17, 18—Coal Oil Lamps Used In U. S. A. 19, 20—Carbide Lamps Used In U. S. A.



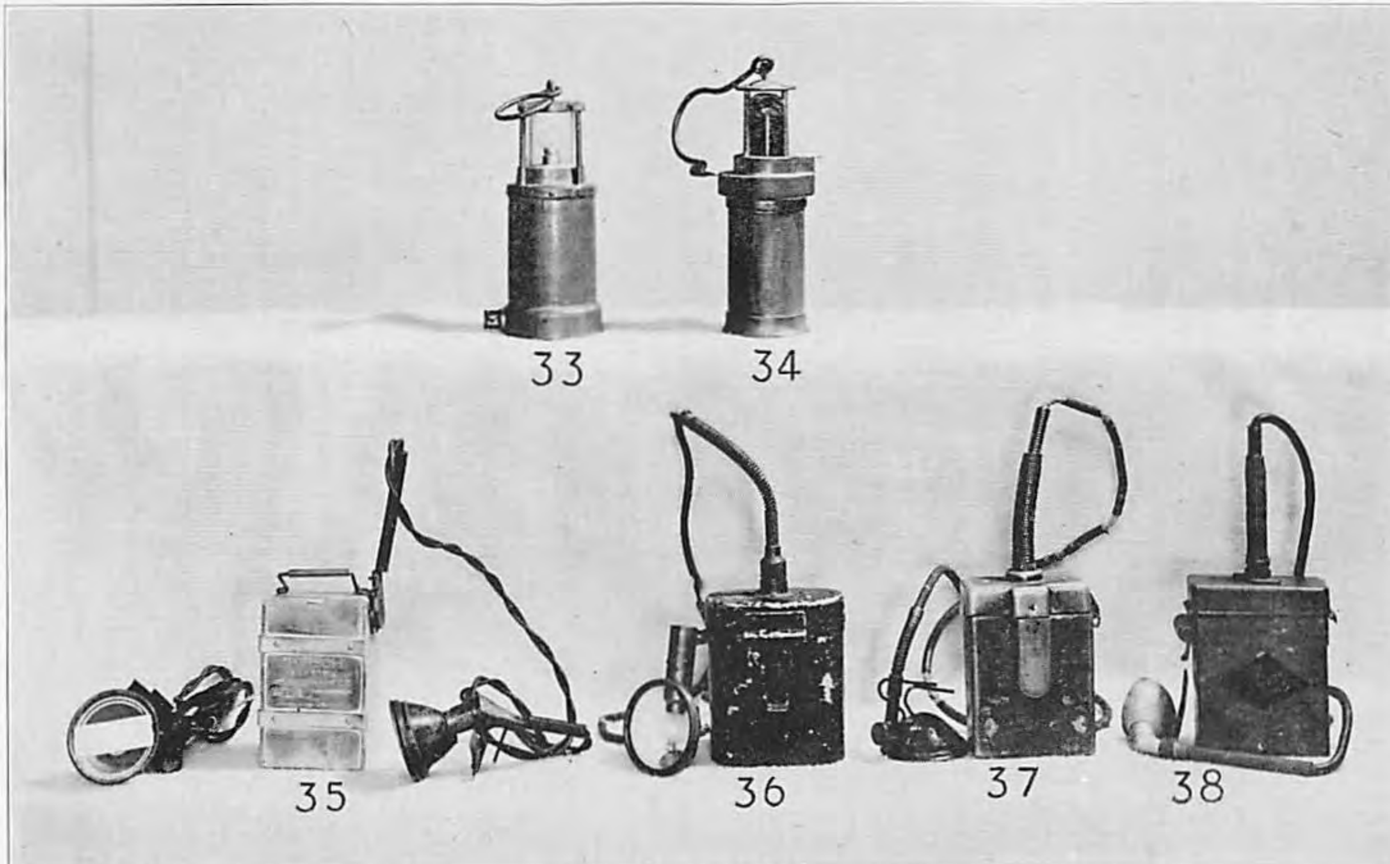
23—Stephenson's Lamp, 3rd Model.



21—Steel Mill. 22—Clanny Bellows Lamp.



24—Davy Flame Safety Lamp. 25—Davy in a Can. 26—Clanny Safety Lamp. 27—Evan Thomas Lamp Similar to the Marsaut Lamp. 28—Ashworth-Hepplewhite-Gray Lamp. 29, 30, 31—Old Models, Safety Lamps. 32—Early Wolf Lamp from Germany.



33—First Model Hand Lamp, Oldham, Denton, Manchester, England. 34—"Ceag" Hand Lamp, Concordia Electric Co., Germany. 35—First Hirsch Electric Cap Lamp Showing Safety Strip of Glass In Headpiece. 36—Early Concordia Electric Cap Lamp. 37—Early Wico Lamp Made By Witherbee Igniter Co., Springfield, Mass. 38—First Model Cap Lamp, Oldham, Denton, Manchester, England.

took a burning stick from the fire. They discovered that a pine knot or a piece of fatty pine would burn longer than the ordinary stick. They also discovered that by dipping a stick into pitch or rosin from the trees it would provide a torch which would last longer than the ordinary stick. It was further discovered that by wrapping some fibrous material on the stick and then dipping it into pitch or rosin, a torch was made producing a flame which would last still longer.

The earliest lamp was probably olive oil in a clam shell with some sort of fibre as a wick. This was possibly in Southern Europe or Asia, while in the northern part a clam shell was used with animal fat, such as tallow.

The first pottery lamps were made like the clam shell, excepting that they had a flat bottom to prevent their being easily tipped over. The next improvement came by rolling in the sides of the pottery lamp which provided an outlet for the wick and prevented spillage. Following this came the complete covering of the top of the vessel which left a hole for the wick and one for replenishing the olive oil.

Among the very early mining operations on record are those of the plaster mines of Rome, now known as the Catacombs. The product of these mines was a very soft stone or volcanic deposit of a kind of lava. It was very porous and had the ability of absorbing all odors. When pulverized and mixed with other materials and water it made a mortar which was used in laying the brick in building ancient Rome, some walls of which still stand today. These mines were dug with the assistance of light from olive oil lamps and it was in these mines that St. Peter made his first converts to Christianity, although history sometimes refers to them as caves. Worked out sections of these mines were used as burial grounds by the early Christians. The nature of the volcanic earth made it possible to make notches in the walls of the entry, into which a body could be placed with a stone slab used to seal the enclosure. An olive oil lamp was placed at the head and foot of this grave and kept lighted.

At the time of the destruction of Pompei other olive oil lamps were in use which were made of cast bronze and known as petite bronze. In addition to the regular table lamp, they were also made as hanging lamps.

In the north where olive trees did not grow, animal fats were used as fuel in lamps called grease pots. As an improvement over the grease pot came the dipped candle which was a wick of fibre dipped many times in hot fat, such as tallow, until it became large enough to burn as a candle. A still further development was the candle mold which held the wick in place, the hot tallow being poured around it.

The earliest recorded coal mining appears to come from Great Britain where the candle was used for many years. In the mines it was used with a suitable candle holder. This was followed by fish or sperm oil open lamps. When the mines had reached a depth at which gas was found, trouble by ignition of gas from open lights was experienced. This caused much concern, as it was thought that deep coal mining would be impossible. Many types of lighting equipment were tried.

The "Steel Mill" was invented by Spedding in England in 1750. This consisted of a steel disk made to revolve by a set of gears turned by a handle. Against this revolving disk or wheel a piece of flint was held, giving a shower of sparks. It was first thought that these sparks could not ignite gas. However, numerous explosions have been attributed to sparks from these mills.

Charcoal glowing at a temperature too low to ignite gas was tried. It is claimed that phosphorus, sometimes produced from decayed fish, and even fireflies in bottles were experimented with.

In England about 1813, William Reid Clanny, a fellow member of the Royal Philosophical Society, produced a lamp which consists of a candle in an airtight circular can having a glass section for the light to come through. The air necessary to supply oxygen to the flame was pumped in by a bellows through a water valve at both the input and exhaust ports. This lamp, like the Steel Mill, required an assistant to pump the lamp constantly. This Clanny lamp was used but little, if ever, for working coal, as it was soon followed by other important developments.

In England in 1815, Sir Humphrey Davy proved that the flame from methane gas would not pass through a gauze and ignite gas on the other side. He used a closed cylinder of gauze with the flame of a fish oil lamp on the inside. This invention taught the world a principle which is still recognized.

Also in England at about the same time, 1815, George Stephenson produced a safety lamp, the "Geordie," otherwise known as the Porcupine. This lamp employed small apertures in the form of tubes. The fact that Stephenson's invention took place almost simultaneously with that of Davy gave rise to a long controversy between their respective friends and supporters.

During the years which followed many improvements were made in safety lamps, the first of which was probably the Davy in a can, the can being used to prevent drafts of air from blowing out the flame. This was further improved by Clanny in his 6th model of the Clanny lamp, which consisted of a glass cylinder being added to the Davy lamp, surrounding its flame. This Clanny lamp greatly increased the available light and was considerably safer than the Davy lamp.

It would appear that credit for both the double gauze principle and the shield or bonnet of a safety lamp should go to M. Marsaut, who used both of these in the Marsaut Lamp, which he produced in England in 1883.

In the United States, the early story of coal mining is similar to that of England, although American mining started at a much later period. The early mining was done by the use of candles. This was the practice up to the discovery of petroleum or coal oil in about 1870, when the coal oil miners cap lamp was produced. This was followed in about 1900 by the carbide lamp, which was very popular and was used in nearly all mines where gas had not as yet been found. Where gas had been found, imported flame safety lamps, also some made in this country, were used.

The Koehler Flame Safety Lamp was the first safety lamp approved by the U. S. Bureau of Mines, and has ever since been widely used for the detection of gas. This was followed by the Wolf Lamp, which was originally imported from Germany. The Koehler Lamp and the Wolf Lamp today represent the two outstanding flame safety lamps used in underground mining operations for gas detection in the United States.

One of the earliest electric lamps for working coal was the Gray-Sussman, made in 1899 and used in the north of England. This was a hand lamp generally used by officials and considered a novelty. The bulb of these lamps had a carbon filament but no base. The bulb wires were attached directly to the power wires. The development of the tungsten filament for miniature electric lamp bulbs greatly increased their efficiency.

In 1912 Sir Charles Markham, controlling a group of collieries in Chesterfield, England, offered a prize of 1000 pounds for an electric lamp which would fulfill the following requirements:

Give a minimum of 1 C.P.

Weigh under 6 lbs.

Be safe and practical.

A further condition was that a price and delivery on 5000 lamps had to be given.

This prize was awarded to the Concordia Electric Co. of Germany for their Ceag hand lamp. The Oldham Co., Denton, Manchester, England, received the second prize of 50 pounds for their hand lamp. Many hand lamps made by both these companies are in use, principally in Europe.

The United States Bureau of Mines was created by Act of Congress, July 1, 1910, for the investigation of the causes of mine explosions. Tests by the Bureau's Electrical Section proved the possibility of mine gas ignition by accidental breakage of the glass of an unprotected mine lamp bulb.

In Europe the electric bulb was protected by a heavy glass dome or chimney on the hand lamps. This dome was thought to be sufficiently unbreakable to be reasonably safe.

About this time, 1911-1912, the first safety device used on a cap lamp was produced by the Hirsch Co. of Philadelphia, Pa. This device consisted of a headpiece having an electric bulb in the center and a normally open electric spring switch on the side of the headpiece, connected in series with this bulb and battery. A strip of thin glass placed across the headpiece underneath the glass front held this switch closed. It was intended that should an accident happen to the headpiece, it would break this glass and allow the switch to open the circuit before breaking the bulb.

As authorized by Act of Congress of February 25, 1913, the Bureau of Mines on April 13, 1913, issued a schedule of safety requirements under which portable electric lamps could be tested and approved for use in gassy mines.

The writer was a member of the Hirsch organization which made the first application and received the first Approval for an Electric Miners' Cap Lamp from the U. S. Bureau of Mines under the first schedule. Several lamps were approved under the first schedule which was, however, revoked in 1915, and a new schedule written. A number of approvals have since been granted under this and subsequent schedules.

The many improvements found in the present day cap lamp have been effected over a period of years by the close cooperation of the manufacturer and the U. S. Bureau of Mines.

The first approval of a cap lamp by the Mines Dept. of Great Britain was granted the Oldham Co. of Denton, Manchester, in 1920.

Today there are two electric cap lamps which are recognized throughout the mining industry, namely, the Wheat Electric Cap Lamp, manufactured by the Koehler Mfg. Company of Marlboro, Mass., also Oldham & Son Limited of Denton, Manchester, England; and the Edison Electric Cap Lamp, manufactured by Thomas A. Edison, Inc., of West Orange, N. J.

Vast strides have been taken in perfecting underground lighting since its early inception. Much credit is due the U. S. Bureau of Mines who have been most active in promoting the development of the electric cap lamp in that they have maintained for a number of years a schedule of high standards based on the utmost safety commensurate with the greatest efficiency.

The writer wishes to acknowledge the assistance given by Mr. E. J. Gleim and Mr. A. B. Hooker of the U. S. Bureau of Mines, Pittsburgh, Penn.

39—Koehler Flame Safety Lamp.

40—Wheat Electric Cap Lamp.

COAL DRILLING

By S. J. WILLS
Peabody Coal Co., Mine No. 57, Springfield, Ill.

Writing an article on coal drilling which is to be read by technical mining men is a difficult assignment, as the reader may have as much or more experience and knowledge as the writer. However, in the hope that some benefit may be gained by the reader in new knowledge, or remind him of points already known, we present the following facts and points.

Powered coal drilling today is being performed with many types of drills, auger equipment, and cutting bits. Prior to the war the manufacturers were introducing new drills, improvements to the existing ones, and other accessories to keep pace with modern mechanized mining. We find on the market pneumatic hand held and mounted percussive, and rotary drills and electric hand held and mounted drills of many voltages, including the use of hi-cycle current in order to obtain more power per pound of tool weight.

It does not suffice to say that drilling equipment used on one project in a particular seam of coal would give equal results on a project in another mine being worked in a different seam. Drilling has been known to vary in the same mine and same seam. This variation in coal texture affects the cost of drilling by higher maintenance, bit replacement, and labor; especially when hand held drills are being used and man power has to be added to obtain penetration.

Careful consideration should be given the drilling equipment being used, or to be used on projects using mechanical loading equipment, in order to obtain the most effective equipment and lowest operating costs. Proper coal preparation is one of the main factors in successful mechanical loading project. It is therefore obvious that the drilling equipment is an important item to consider.

Pneumatic powered drills, percussive and rotary, are being used in some mines where the use of electric power is not available. This is especially true of mines on the continent and some English mines where the writer has spent seventeen months installing and supervising Chicago Pneumatic 574 postmounted drills. The pneumatic drills seemingly are very effective; but the cost of keeping an adequate air supply to the face exceeds that of the electric powered faces.

It is the opinion of the writer that we in American mines have not taken full advantage of the many pneumatic powered tools for use in our mines on grading and brushing. There are many of these tools available that could be used in conjunction with portable compressors that would materially reduce the costs of grading, brushing, drilling of trolley cable feeder and telephone hanger holes. On main line extensions one could use this type of equipment for spike driving, ballast tamping and many other uses. Substantial savings and more work could be accomplished if the many pneumatic powered tools were used in the machine repair shops both below ground and on the surface.

A hand held electric powered coal drill, due to its portability, light weight and ruggedness, is a very good tool for drilling coal holes. However, we find conditions whereby drilling costs are excessive due to man power being added to get penetration and a high bit replacement cost. The answer for hard, impure coal seams is a postmounted drill. Uniform penetration by the mechanical feed of the postmounted drill results in savings on bits and power. Corrective shot placement is possible as there is no physical effort required of the operator to place holes in the hards of the seam. More ruggedness and power is built in the postmounted drill as weight is not restricted. The postmounted drill also serves as a dual-purpose drill when brushing, or grading is being done simultaneously with the advance of the coal face in development entries.

Although the manufacturers have built in many safety features in coal drills and issued operating and maintenance instructions, we find by personal examination, complete disregard for them in some mines. As a result of this disregard for advice, high accident and drilling costs are obtained. It might be of benefit at this point to enumerate some of these bad operating and maintenance faults.

Auger bind is one of the larger contributors to accidents with hand-held drills. This can be caused by exerting too much force on the drill for penetration, thereby jamming the cutting head, or auger shaft with excessive drill cuttings. On some hand-held drills a friction type clutch has been installed to eliminate this hazard, but we find that they are not regularly inspected to insure that they are always in working condition, thereby losing their effectiveness.

Loose clothing, gloves, and finger rings are a source of accidents around drills. Safety equipment such as clutches, boxings, and chucks should be installed and maintained on all drilling equipment. We find that there is a tendency for the operator to continue to use the equipment indefinitely after having broken a part if it does not hinder the operation of the drill. This is a very bad practice as many accidents result.

Attempting to guide a starting auger with the hands or feet is another bad operating practice. Time and many accidents can be saved by digging a shallow hole for the starting auger.

"Drill whip" which is caused by improper fitting of the auger in the chuck, bent auger shafts, worn drive bearings, and improper aligning of posts should be remedied as it is the source of accidents and is also injurious to the equipment.

Cable failure near the drill, due to splice failures and undue wear at the cable entry glands is the source of many severe electric burns. To eliminate this type of accident one should not have splices in the cable near the drill—the operator should be cautioned about dragging the drill on the mine floor by the cable, and a cable drag link should be installed on the drill to take the strain off the cable at the entry gland. An excessively worn "lead in" cable should always be replaced as soon as possible.

Coal dust, cuttings, and mine "grit" is the chief source of breakdowns, high maintenance and replacement costs on coal drills. By allowing the drill to be thrown to the mine floor when not in use, abrasive coal dust soon cuts out the grease seals and then starts its destructive work on the bearings. Most drill operators have the erroneous opinion that oil on the thread bars of post-mounted drills improves the working of the drill and the life of the threadbar and boxing. Experience has taught us that oil on the threadbar soon accumulate abrasive coal dust, coal cuttings, and mine grit to form a perfect grinding paste that soon wears out liners and threadbars. This accumulation also tends to make the safety boxing work stiff and does not allow the boxing to fit down properly on the threadbar, which puts all the strain on the top of the boxing threads.

Not much can be said concerning the type of cutting bits or augers one should use as drilling conditions and personal opinions vary to a great extent on this subject. However, the throw-away hi-carbon steel bits are the most popular in American mines. On the continent and in England the tungston carbide tipped bit is favored. This bit was introduced to coal mining by the Germans prior to the war and is very effective in conjunction with hand-held drills in soft coal. We find that in hard drilling where impurities are encountered, that there is excessive chipping which makes a high maintenance and replacement cost. The tungston carbide bit has been tried out in American coal seams without success.

PREFABRICATED TRACK

By J. B. HASKELL
West Virginia Steel & Mfg. Co., Huntington, West Virginia

It is quite likely that no single item plays a more important part in the problem of transportation than the part that is taken by track. A major portion of the nation's products and the equipment necessary to manufacture or market those products moves on tracks. This track may vary from the light parallel ribbons of steel used in industry and on plantations to the heavy well-constructed railway lines that have played such an important part in winning the recent war.

But these steel highways of transportation have not always been the convenient and efficient traffic pathways that they now are. Within the memory of this generation stringers of wood served as rails. With the aim of both reducing rapid wear on the rails and reducing haulage resistance, iron straps were next fastened on the running surfaces of the wood rails. As facilities were bettered, weights and traffic increased and the protective straps proved inadequate. Rectangular bars of iron were next tried in the race between traffic and the means of efficiently handling that traffic. These bars, soon failing in their assigned job, a flanged base rail with a pear-shaped head was developed and used extensively. This rail, like the rectangular bar, was rolled from iron. The next step in the development of rail to the tee shape and the beginning of the use of steel as rail material occurred at about the same time.

However, during all of this period of development the earlier types of rail, even including the wooden stringers, were used in mine and industrial tracks. The advent of the tee section and the use of steel as a material made possible the various sections and sizes of light rail that we have today.

In mining operations where light loads, slow speeds and animal haulage prevailed, small rails weighing no more than twelve, sixteen or twenty pounds per yard, rendered good service. They still do where these conditions exist, but in the majority of mines and in all of the so-called mechanized mines car weights have greatly increased, required speed of movement has doubled or tripled and electric haulage has supplanted animal motive power. Heavy cutting and loading machines are also moved over the track, all with the result that rail sizes have increased to thirty, forty and sixty pounds per yard with numerous mines having even heavier main haulage track. Room tracks, though, for mechanized mines are usually made of thirty or forty pound rail with the latter size proving the best size for heavy work.

A certain part of the cost of the mining of coal is the expense of transporting that coal from the face to the tipple. An important part of this transportation cost is the expense of purchasing and installing track. The purchase cost of certain track is only charged up to the track once but the installation and removal cost is repeated many times. Thus, although the purchase cost of track should be watched carefully, it is obvious that the greatest opportunity for saving in track cost is in the expense of its installation and removal. It likewise follows that if track of a little higher purchase price would effect labor savings in installation, this higher priced track would be the most economical to buy. Then if this higher priced track were so made that the installed layout would give better alignment and more even and smoother curves, power cost would be reduced, wrecks lessened and transportation speeded up. These accomplishments would result in additional quite apparent savings. These considerations all seem to point to the desirability of trackwork so designed and manufactured as to offer every known economy of installation and removal and to make easily possible the securing of smooth well-aligned haulage ways.

Rail, ties, turnouts and accessories must all be purchased to make any track installation or layout. In general it has been the practice to buy all of these materials as unrelated or independent units. The rails might likely be of run-of-mill lengths which would frequently require cutting, punching, bending and curving before installation. This work would usually be done in the mine under difficult conditions and with inadequate equipment. Naturally, the cost of doing this work would be excessive and the possibility of doing it with accuracy rather remote. Rails so cut and bent combined with turnout parts and accessories purchased as semi-unrelated parts have made a heavy contribution toward high cost of track laying and in many cases unsatisfactory track conditions. Especially is this true where fully mechanized mining produces heavy and severe track traffic conditions and frequent movement of those tracks. This situation is made even more difficult because, in general, wage scales have not been so set as to attract skilled labor to the job of track laying and the work of cutting, punching and bending of rails, in addition to the necessary laying, spiking and bolting of rails and turnouts is most frequently done by casual, untrained labor.

In looking for a remedy for this situation, some operators have turned entirely away from track mining to other means of handling the coal. Some of these measures have shown decided savings over the previous track costs but in many cases the comparisons have been misleading, for results secured by a well-planned layout functioning with new and modernly designed equipment, tailored to the specific location, were compared to an outmoded track installation rendered ineffective by lack of maintenance, failure to redesign and rebuild to suit new conditions and only kept in an operative condition by minimum purchases of the most urgently needed track supplies.

Only comparatively recently have track manufacturers made serious and successful attempts to provide operators the means to reduce track costs and at the same time make it easier to install good track. The operators themselves have rendered invaluable assistance in the search for a means of reducing track costs. Their efforts have been described in the phrase, "Prefabricated Track." This term really means trackwork that has been planned for the specific installation and is shop fabricated. By fabrication is usually meant that all track parts are planned, machined, assembled, cut to length and bent or curved in such manner as to be interchangeable parts of a track layout, designed to fit the needs of a particular mine and its projected mining system. The term particularly applies to the track such as entry and room tracks that are to be used in many locations at different times. Such a carefully planned system promotes a good car supply, fast gathering service, low labor costs in the installation or removal of turnouts and track and insures the carrying out of projected mine development insofar as transportation is concerned.

A system designed to serve a panel of thirty or more rooms may have as few as thirteen different cut or curved rails. The track will be laid on standard steel ties or on composite wood-steel ties. The switches are laid on standard switch tie sets which are as easily erected as standard mine ties. Joints are loosely but permenantly fastened to the rails. All rails are cut to length and, where necessary, are curved. Rails are made in multiple relationship so as to promote flexibility of room location where the standard mine plan, because of local conditions, must be deviated from. This system helps to offset the track labor shortage in the mine as the amount of labor required for prefabricated track may be less than half the amount required to secure equal track footage of the type purchased in the usual manner.

Figure 1 shows an outline of a prefabricated layout for a typical set of rooms. Dimensions and details may vary but this merely means that rail lengths, curves, etc., are designed to fit the particular mine layout. Figure 2 illustrates a standard universal turnout using special switch ties and standard mine ties on the straight line and curves. All parts of the turnout are standardized and may be used right hand or left hand.

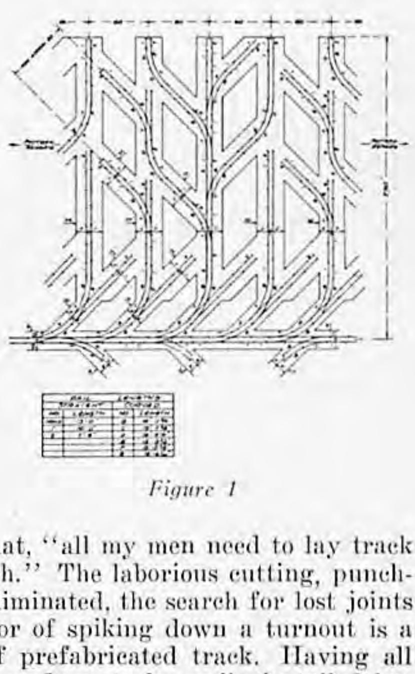


Figure 1

Mines using this prefabricated track have found that a turnout is usually laid by two men in one hour or less and that three men can remove all track from one and one-half rooms and deliver it to its new location in one shift. One mine superintendent made the statement that, "all my men need to lay track is a blueprint, a hammer and a wrench." The laborious cutting, punching or curving of rail in the mine is eliminated, the search for lost joints is at an end, and the time-taking labor of spiking down a turnout is a thing of the past with the advent of prefabricated track. Having all parts ready, properly marked and so made as to be easily installed has been found by experience to greatly reduce track laying costs. As track changes become more frequent with the increased tempo of mechanical mining, the savings increase. The greatest savings are, of course, realized in a new installation where the entire mining scheme, track, machinery and cars are properly correlated. Old mines can effect worth-while savings but, of course, only proportionate to the percentage of modernization that can be carried out.

In January 1945, "Coal Age" carried a paper given by Lindsay Cobb of the Norton Coal Corporation before the Kentucky Mining Institute, describing the installation and use of prefabricated track designed to fit some existing conditions. He describes the equipment and its use as a complete success, using a minimum of room track labor and delivering an average of four hundred and ninety-five tons of coal per shift. This layout was designed with a total of fifty-two different pieces of rail and with the turnouts being made either right hand or left hand. Refinement of design has brought the number of different rails down to thirteen pieces and the turnouts may be used either right hand or left hand. In the same trend toward convenience and saving of labor all bolts in the track, ties and turnouts are made one size so that the track man need only have one wrench for all of his track laying work.

"Prefabricated Track" is not a cure-all for high track costs but it does give mine management an efficient tool with which to attack these costs and a tool that, where properly used, has given very worth-while results.

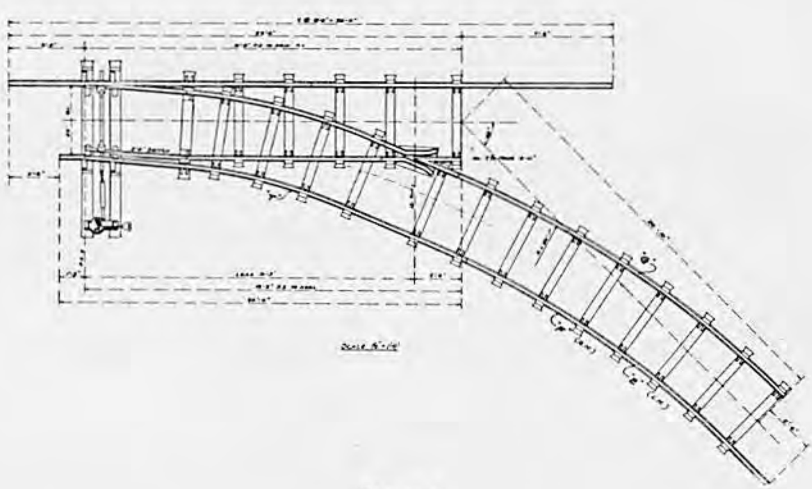


Figure 2

FREEZEPROOFING COAL SHIPMENTS

By WM. A. STAAB

Mining Engineer, Calcium Chloride Association, Detroit, Michigan

The cold weather of December 1945 again focuses the attention of both shipper and consignee to the high costs and delays involved in unloading frozen material from railroad cars. At the time of writing this article many of our coal mines are working less than half time due to the shortage of empties. An Associated Press dispatch from Baltimore, Maryland, dated December 18, 1945, follows:

"Embargoes on the shipment of coal from mines to docks in Baltimore have been imposed by the Baltimore and Ohio and Pennsylvania railroads, because of the accumulation of coal-filled cars in local terminals, railroad officials announced yesterday.

"Temporary suspension of the flow of export coal to this port, made with the approval of the Interstate Commerce Commission, was necessitated because of the disruption of unloading schedules by the current cold wave, which has made it impossible to dump coal with anything like normal speed.

"Crowbars, oil torches and sledge hammers are necessary to get the coal separated and unloading of cars has become a 'herculean' task, an official said.

"A port authority said that he believed movement of coal from Baltimore by ship will be cut in half."—end of AP dispatch.

The good old-fashioned methods of unloading frozen coal by thrawing or second mining using brute strength are not fast enough to keep the wheels of modern industry moving.

One answer to this troublesome problem is the use of chemicals. Coal shipments adequately treated with calcium chloride will remain free-flowing under normal winter conditions. Salt is also used for this purpose and some claims have been made in favor of oil. For years many coal companies have been helping this problem by applying calcium chloride to their coal at the shipping point, but until recently no specific treatment has been recommended.

During the winter of 1944-45 field studies on freezeproofing coal were conducted by Battelle Memorial Institute. In the October-December 1945 issue, Vol. 5, No. 4, of "Bituminous Coal Research," John F. Foster and Ralph Sherman submit the following table as a useful guide:

DENSITIES, FREEZING POINTS AND CONCENTRATIONS OF CALCIUM CHLORIDE BRINES.

*SPECIFIC GRAVITY 60/60°F.	°BAUME' AT 60°F. (AM. STD.)	SALIMETER READING AT 60°F	WEIGHT OF BRINE AT 60°F.		% $CaCl_2$ ACTUAL	FREEZING POINT °F.	LBS. 73-75% SOLID $CaCl_2$		LBS. 77-80% FLAKE $CaCl_2$		**LBS. PER GALLON OF WATER AT 60°F.		***FINAL VOLUME IN GALS. AT 60°F.
			LBS. PER GALLON	LBS. PER CU. FT.			LBS. PER GALLON OF BRINE AT 60°F.	LBS. PER CU. FT. OF BRINE AT 60°F.	LBS. PER GALLON OF BRINE AT 60°F.	LBS. PER CU. FT. OF BRINE AT 60°F.	SOLID 73-75 $CaCl_2$	FLAKE 77-80 $CaCl_2$	
1.000	0.0	4.0	8.34	62.37	0	+32.0	—	—	—	—	—	—	1.000
1.009	1.3	5.2	8.41	62.93	**1.0**	+31.1	0.11	0.86	0.10	0.81	0.11	0.10	1.004
1.010	1.4	5.6	8.42	62.99	1.2	+31.0	0.14	1.03	0.13	0.97	0.14	0.13	1.006
1.018	2.5	10.0	8.49	63.49	**2.0**	+30.4	0.23	1.73	0.22	1.63	0.23	0.22	1.008
1.020	2.8	11.2	8.50	63.61	2.3	+30.2	0.27	1.99	0.25	1.88	0.27	0.25	1.011
1.026	3.7	14.8	8.55	63.99	**3.0**	+29.5	0.35	2.61	0.33	2.46	0.36	0.33	1.014
1.030	4.2	16.8	8.59	64.24	3.5	+29.1	0.41	3.06	0.39	2.88	0.42	0.40	1.017
1.034	4.8	19.2	8.62	64.49	**4.0**	+28.6	0.47	3.51	0.44	3.31	0.48	0.45	1.020
1.040	5.6	22.4	8.67	64.86	4.6	+28.0	0.54	4.06	0.51	3.83	0.55	0.52	1.022
1.043	6.0	24.0	8.70	65.05	**5.0**	+27.7	0.59	4.43	0.56	4.17	0.61	0.57	1.024
1.050	6.9	27.6	8.75	65.48	5.9	+27.0	0.70	5.26	0.66	4.96	0.72	0.68	1.030
1.052	7.1	28.4	8.77	65:61	**6.0**	+26.8	0.72	5.36	0.68	5.05	0.75	0.70	1.031
1.060	8.2	32.8	8.84	66.11	**7.0**	+25.9	0.84	6.30	0.79	5.94	0.88	0.82	1.036
1.069	9.4	37.6	8.91	66.67	**8.0**	+24.6	0.97	7.26	0.91	6.84	1.02	0.95	1.043
1.070	9.5	38.0	8.92	66.73	8.1	+24.6	0.98	7.35	0.92	6.93	1.03	0.96	1.043
1.078	10.5	42.0	8.99	67.23	**9.0**	+23.5	1.10	8.23	1.04	7.76	1.16	1.09	1.049
1.080	10.7	42.8	9.00	67.36	9.2	+23.2	1.13	8.43	1.06	7.94	1.20	1.11	1.050
1.087	11.6	46.4	9.06	67.79	**10.0**	+22.3	1.23	9.22	1.16	8.69	1.31	1.22	1.055
1.090	12.0	48.0	9.09	67.98	10.3	+21.9	1.27	9.53	1.20	8.89	1.36	1.28	1.058
1.096	12.7	50.8	9.14	68.35	**11.0**	+20.8	1.37	10.23	1.29	9.64	1.47	1.37	1.062
1.100	13.2	52.8	9.17	68.60	11.4	+20.3	1.42	10.64	1.34	10.03	1.53	1.43	1.065
1.105	13.8	55.2	9.21	68.92	**12.0**	+19.3	1.50	11.25	1.41	10.60	1.62	1.51	1.069
1.110	14.3	57.2	9.25	69.23	12.4	+18.7	1.56	11.68	1.47	11.01	1.69	1.57	1.071
1.115	15.0	60.0	9.30	69.54	13.0	+17.6	1.64	12.30	1.55	11.59	1.79	1.67	1.076
1.120	15.5	62.0	9.34	69.85	13.5	+16.5	1.72	12.83	1.62	12.09	1.88	1.75	1.080
1.125	16.1	64.4	9.38	70.16	**14.0**	+15.5	1.79	13.36	1.69	12.59	1.97	1.83	1.084
1.130	16.7	66.8	9.42	70.47	14.5	+14.5	1.86	13.90	1.75	13.10	2.05	1.90	1.087
1.135	17.2	68.8	9.45	70.79	**15.0**	+13.5	1.93	14.45	1.82	13.62	2.14	1.99	1.092
1.140	17.8	71.2	9.50	71.10	15.6	+12.2	2.02	15.09	1.90	14.22	2.25	2.08	1.096
1.145	18.4	73.6	9.55	71.41	**16.0**	+11.2	2.08	15.54	1.96	14.64	2.32	2.16	1.099
1.150	18.9	75.6	9.59	71.72	16.6	+ 9.7	2.17	16.20	2.04	15.27	2.44	2.25	1.104
1.155	19.4	77.6	9.63	72.03	**17.0**	+ 8.6	2.23	16.66	2.10	15.70	2.51	2.33	1.109
1.160	20.0	80.0	9.67	72.35	17.6	+ 7.0	2.32	17.32	2.19	16.32	2.63	2.44	1.113
1.165	20.5	82.0	9.71	72.66	**18.0**	+ 5.9	2.38	17.79	2.24	16.76	2.71	2.50	1.118
1.170	21.1	84.4	9.75	72.97	18.6	+ 4.1	2.47	18.47	2.33	17.40	2.83	2.62	1.122
1.175	21.6	86.4	9.80	73.28	**19.0**	+ 2.8	2.53	18.94	2.38	17.85	2.90	2.68	1.127
1.180	22.1	88.4	9.84	73.59	19.5	+ 1.2	2.61	19.52	2.46	18.39	3.01	2.78	1.131
1 186	22.7	90.8	9.89	73.97	**20.0**	— 0.4	2.69	20.13	2.53	18.97	3.12	2.87	1.137
1.190	23.2	92.8	9.92	74.22	20.6	— 2.0	2.78	20.80	2.62	19.60	3.25	2.99	1.142
1 195	23.7	94.8	9.96	74.53	**21.0**	— 3.9	2.85	21.29	2.69	20.06	3.34	3.08	1.147

1.200	24.2	96.8	10.00	74.84	21.5	−5.8	2.93	21.89	2.76	20.63	3.45	3.18	1.152
1.206	24.8	99.2	10.05	75.21	**22.0**	−7.8	3.01	22.51	2.84	21.21	3.56	3.28	1.157
1.210	25.2	100.8	10.09	75.46	22.4	−9.4	3.08	23.00	2.90	21.67	3.67	3.36	1.160
1.218	25.9	103.6	10.15	75.96	**23.0**	−11.9	3.18	23.77	3.00	22.40	3.80	3.50	1.168
1.220	26.2	104.8	10.17	76.09	23.3	−13.2	3.22	24.12	3.03	22.73	3.86	3.54	1.170
1.228	26.9	107.6	10.24	76.59	**24.0**	−16.2	3.34	25.01	3.15	23.57	4.04	3.71	1.178
1.230	27.1	108.4	10.25	76.71	24.2	−17.1	3.37	25.26	3.18	23.80	4.08	3.75	1.180
1.239	28.0	112.0	10.33	77.27	**25.0**	−21.0	3.51	26.28	3.31	24.76	4.29	3.93	1.189
1.240	28.1	112.4	10.34	77.33	25.1	−21.5	3.53	26.41	3.33	24.89	4.32	3.96	1.190
1.250	29.0	116.0	10.42	77.96	**26.0**	−25.8	3.69	27.58	3.48	25.99	4.57	4.18	1.202
1.260	29.9	119.6	10.50	78.58	**27.0**	−31.2	3.86	28.87	3.64	27.20	4.84	4.42	1.215
1.270	30.8	—	10.59	79.21	27.8	−37.1	4.01	29.96	3.79	28.23	5.08	4.65	1.227
1.272	31.0	—	10.60	79.33	**28.0**	−37.8	4.04	30.22	3.81	28.48	5.13	4.68	1.228
1.280	31.7	—	10.67	79.83	28.7	−44.3	4.17	31.17	3.93	29.37	5.35	4.86	1.237
1.283	32.0	—	10.70	80.02	**29.0**	−49.4	4.22	31.57	3.98	29.75	5.43	4.94	1.241
1.290	32.6	—	10.75	80.45	29.6	−59.8	4.33	32.40	4.08	30.53	5.62	5.10	1.250
1.295	33.0	—	10.80	80.76	**30.0**	−50.8	4.41	32.96	4.16	31.06	5.76	5.23	1.256
1.300	33.5	—	10.84	81.08	30.5	−41.8	4.50	33.65	4.24	31.71	5.92	5.36	1.264
1.306	34.0	—	10.89	81.45	**31.0**	−33.2	4.59	34.35	4.33	32.37	6.08	5.51	1.272
1.310	34.3	—	10.92	81.70	31.3	−29.2	4.65	34.79	4.38	32.78	6.18	5.58	1.278
1.317	34.9	—	10.98	82.14	**32.0**	−19.5	4.78	35.76	4.50	33.70	6.43	5.79	1.288
1.320	35.1	—	11.01	82.32	32.2	−17.0	4.82	36.06	4.54	33.98	6.50	5.86	1.293
1.328	35.8	—	11.07	82.82	**33.0**	−6.9	4.97	37.18	4.68	35.03	6.79	6.11	1.305
1.330	36.0	—	11.09	82.95	33.2	−4.7	5.01	37.47	4.72	35.31	6.87	6.18	1.309
1.340	36.8	—	11.17	83.57	**34.0**	+4.3	5.17	38.66	4.87	36.43	7.19	6.45	1.324
1.350	37.6	—	11.26	84.19	34.9	+14.3	5.35	39.98	5.04	37.67	7.56	6.76	1.341
1.351	37.7	—	11.26	84.26	**35.0**	+14.4	5.36	40.12	5.05	37.81	7.57	6.78	1.343
1.360	38.4	—	11.34	84.82	35.8	+21.7	5.52	41.31	5.20	38.93	7.91	7.07	1.359
1.363	38.6	—	11.36	85.01	**36.0**	+24.1	5.56	41.64	5.24	39.24	8.00	7.14	1.363
1.370	39.0	—	11.42	85.44	36.4	+30.0	5.66	42.31	5.33	39.87	8.19	7.30	1.375
1.374	39.5	—	11.46	85.69	**37.0**	+33.4	5.77	43.14	5.44	40.65	8.47	7.54	1.383
1.380	39.9	—	11.51	86.07	37.4	+37.0	5.86	43.80	5.52	41.27	8.66	7.69	1.393
1.386	40.4	—	11.56	86.44	**38.0**	+42.1	5.98	44.69	5.63	42.11	8.95	7.93	1.407
1.390	40.7	—	11.59	86.69	38.3	+44.4	6.04	45.17	5.69	42.56	9.08	8.05	1.414
1.398	41.3	—	11.66	87.19	**39.0**	+49.6	6.19	46.26	5.83	43.59	9.45	8.35	1.431
1.400	41.4	—	11.67	87.31	39.2	+50.9	6.22	46.57	5.86	43.88	9.52	8.41	1.435
1.410	42.2	—	11.76	87.94	**40.0**	+55.9	6.40	47.86	6.03	45.10	9.97	8.79	1.457
					40.9	+61.0							
					41.0	+61.5							
					41.7	+64.8							
					42.0	+65.8							
					42.5	+68.0							
					43.0	+69.8							
					43.3	+70.9							
					44.0	+73.0							
					44.2	+73.6							
					45.0	+75.6							

* Hydrometers giving specific gravities and freezing points of calcium chloride brines can be obtained from any calcium chloride producer.

** Pounds of solid or flake calcium chloride per cubic foot if water at 60° F. may be obtained by multiplying the quantity in pounds per gallon by 7.481.

*** Final volume in gallons at 60° F. when quantity of flake calcium chloride shown in previous column is added to one gallon of water.

NOTE

At concentrations above 40.8% calcium chloride solutions contain suspended crystals at 60° F., and therefore hydrometer readings at 60° F. are of little value. For data at higher concentrations and temperatures see tables on pages 17 and 18.

Pounds of Rock Salt or Flake Calcium Chloride Suggested for Freezeproofing Coal Shipments

Anticipated Outdoor Temp., °F.	*Surface Moisture, per cent* 3% *Per Ton*	*Per 50 Ton Car*	6% *Per Ton*	*Per 50 Ton Car*	9% *Per Ton*	*Per 50 Ton Car*
20	3.4 lbs.	170	6.8 lbs.	340	10.2 lbs.	510
10	5.0	250	10.0	500	15.0	750
0	6.6	330	13.2	660	19.8	990
—10*	8.2	410	16.4	820	24.6	1230
—20*	9.2	460	18.4	920	27.6	1380

*Calcium chloride must be used for temperatures below —6°F.

They further state that "either flake calcium chloride or rock salt may be used for the milder freezing temperatures, but for a protection below —6°F., calcium chloride must be used."

The same authorities also suggest the following distribution of the solid chemicals:

"One-fourth of the total amount to be used in the treatment should be applied by hand to the coal in the hoppers and near the bottom surface of the car. The remaining three-fourths is distributed uniformly throughout the coal."

Messrs. Foster and Sherman also mention the use of calcium chloride in solution but lean strongly to the use of chloride in the flake or solid form.

Again during the winter of 1944-1945, the Dow Chemical Company treated thousands of tons of 3/8" x 0" Pocahontas coal with calcium chloride and found that the benefits derived from using treated coal far exceeded the cost of treatment. At the same time Mr. Herman H. Miller, head of the Dowflake research department conducted a series of experiments on freezeproofing coal. The trend of these tests was most significant and these tests results warrant close inspection.

As reported in the November 1945 issue, Vol. 7, No. 6, of "Dowflakes," Mr. Miller's tests were designed to evaluate the various freezeproofing treatments and to show how much less than the theoretical amount of chloride needed, actually is required to obtain good freezeproofing results.

In Mr. Miller's tests, 3/8" x 0" Pocahontas slack was carefully mixed with the proper amount of distilled water and then quantities of selected strength chlorides having approximately the lowest freezing point were added in quantities of ½-1-2-3 gallons per ton. Likewise a typical coal treating oil was added to other samples in quantities of 1-2-3-4-6-8 quarts per ton. These well mixed samples were then compacted in 4" x 8" split cylinder molds according to A.S.T.M. standards. The cylinders were then placed in refrigerators set at the desired temperature. After

Table 1—Effect of Temperature on Pocahontas (3/8" x 0") Coal Containing 8% H_2O and Treated with Varying Quantities of Brine Concentrates

Temp. °F.	*% H_2O*	*G.P.T.*	*Lbs./Sq. In. 32% $CaCl_2$*	*Lbs./Sq. In. 23% NaCl*	*Lbs./Sq. In. No Treatment*
+20	8	½	0	17.4	
+20	8	1	0	14.0	70
+20	8	2	0	6.2	
+20	8	3	0	4.5	
+10	8	½	7.3	19.0	
+10	8	1	5.6	16.3	79
+10	8	2	5.6	5.1	
+10	8	3	5.1	4.5	
0	8	½	17.9	25.3	
0	8	1	14.0	17.4	87
0	8	2	12.0	16.0	
0	8	3	9.0	12.0	
—20	8	½	26.4	93.6	
—20	8	1	20.2	81.5	91.4
—20	8	2	17.0	76.0	
—20	8	3	11.0	67.0	

Table 2—Effect of Temperature on 3/8" x 0" Coal Containing 8% to 12% Moisture and Treated with Varying Quantities of Oil per Ton

Moisture in Coal—%	*Quarts* Oil per ton*	*Oil Mixed Lbs. per Sq. In.*		
		+10°F.	*0°F.*	*—20°F.*
8	0	75	72	87
	1	65	70	75
	2	59	62	70
	3	53	59	65
	4	41	47	55
	6	39	42	56
	8	34	37	47
12	0	117	120	122
	1	114	117	121
	2	110	111	118
	3	110	114	117
	4	96	100	117
	6	80	90	113
	8	58	87	115

*Oil same as being used by several coal companies.

Table 3—Solution Diluted in Ratio Comparable to 8% Moisture in Coal and Frozen

			Chloride Solution	Equivalent Water-Chloride		Lbs. per Sq. In. Resistance		
No.	Temp. °F.	% Water	Ratio Gal./Ton	Ratio cc's	cc's	32% $CaCl_2$	23% NaCl	Water
1	0	100	0					236
2	0	8	½	100	2.37	145	305	......
3	0	8	1	100	4.74	138	267	......
4	0	8	2	100	9.48	114	220	......
5	0	8	3	100	14.22	50	161	......
6	—20	100	0					325
7	—20	8	½	100	2.37	205	412	......
8	—20	8	1	100	4.74	153	367	......
9	—20	8	2	100	9.48	129	540	......
10	—20	8	3	100	14.22	80	585	......

48 hours the cylinders were removed from the freezing chamber one at a time, molds were stripped and the specimens placed on an Elms hydraulic press where pressure was exerted at the rate of .05 inches per minute until broken. The maximum pressure was recorded from which the pounds per square inch required to break the specimen were calculated.

Results of the chloride admixtures are given in Table 1 and oil treatment in Table 2. Specimens showing resistance in excess of 15 lbs. per sq. in. are considered frozen and coal in a car under these conditions would cause unloading difficulties. The specimens breaking above 15 p.s.i. were definitely rigid and broke in a definite plane rather than in a slump break.

Further freezeproofing tests were run by filling wax impregnated cardboard containers with water and calcium and sodium chloride solutions diluted with water in accordance with the brine water ratios in coal containing 8% moisture. These 1½″ x 3″ and 3″ x 6″ cylindrical containers were filled level full then allowed to freeze for 48 hours, after which the specimens were removed, stripped, top leveled and replaced in the freezing chamber for 1 hour, then the specimens were tested in the same manner as the coal cylinders. These results are shown in Table 3.

From these results we may note that water at 0°F. showed a strength of 236 p.s.i. while moist coal yielded at 87 p.s.i. It is also interesting to note that in most cases dilute sodium chloride solutions showed greater resistance to crushing than did plain water frozen at the same temperature.

Further conclusions from Mr. Miller's test results are that fine ⅜″ x 0″ coal containing up to 8% moisture can be satisfactorily freezeproofed at 0°F. with 1 gallon of 32% $CaCl_2$ solution per ton (4.50 lb.

calcium chloride flake equivalent) or three gallons of 23% sodium chloride solution (6.99 lbs.) per ton. With 8% moisture coal at —20°F., 3 gallons of 32% calcium chloride solution (13.5 lbs.) are required to keep the coal in a workable condition while sodium chloride is valueless at these low temperatures. Likewise the quantity of oil ordinarily used on coal does not materially reduce the freezing point of the coal at the temperature conditions tested.

Conclusions

From the test results obtained from these two sources coupled with some knowledge of actual trial field tests the following conclusions are drawn as to freezeproofing treatment of coal:

Coal can be satisfactorily freezeproofed at —20°F. and lower with calcium chloride.

Sodium chloride will not freezeproof below —6°F.

Oil is a negligible factor in freezeproofing.

Coal loaded in a relatively dry state or with surface moisture low enough so there is no drainage from the car should be freezeproofed using calcium chloride in solution and this should be applied uniformly. (A 32% solution is recommended.)

Flake calcium chloride may be used to advantage when enough surface moisture is present so that the coal will drain for a short period of time, and this flake should be applied uniformly throughout the car.

Any benefits in the use of extra amounts of flake calcium chloride in the hoppers and on the bottom of the coal cars are open to question unless the coal is loaded with a large excess of water. Remember that unless the calcium chloride is in solution we get very little freezeproofing. Undissolved calcium chloride does not freezeproof.

Seven War Years in Coal Mining

(Reprinted from Coal Age, September, 1945)

1939

May 13 — "Exclusive-bargaining" right won by miners in new Appalachian agreement signed after federal intervention halting stoppage that began April 1.

May 27 — New anthracite agreement signed without stoppage; old pact was extended from April 30.

Sept. 1—Germany attacks Poland.

Sept. 3—France and Great Britain declare war.

★

1940

Jan. 23—"Voluntary" anthracite production-control and allocation plan approved by State governor, effective week ended Feb. 3; confirmed by legislation signed July 7, 1941.

May 20—Supreme Court holds Bituminous Coal Act of 1937 constitutional.

Sept. 16—Selective Service Act signed; registration Oct. 16.

Oct. 1—Bituminous minimum prices become effective.

★

1941

April 4—Bituminous Coal Act continued two years from April 26.

March 10—Lend-Lease Act signed.

April 28—Southern operators give in to end stoppage over Appalachian contract; wages raised $1 per day; southern operators bow to National Defense Mediation Board and sacrifice 40c. differential June 9, signing contract July 6.

May 19—Anthracite agreement reached after 1-day stoppgae; wages increased 10 percent.

May 27—State of unlimited emergency.

June 30—Coal mining given priority status.

Sept. 15—"Captive-mine" strike begins; after several stoppages, special commission awards union exclusive bargaining right Dec. 7 after Lewis breaks National Defense Mediation Board.

Nov. 5—Secretary Ickes named "Solid Fuels Coordinator for Defense"; "Solid Fuels Coordinator for War" May 25, 1942.

Dec. 7—Pearl Harbor.

★

1942

Jan. 8—Stockpiling campaign starts.

Jan. 12—National War Labor Board succeeds NDMB.

Feb. 15—Use of natural and mixed gas restricted in 17 northeastern states.

March 14—Fuel-oil delivery regulations adopted in 17 East coast states; campaign to convert to coal started.

April 1—MPR 112, fixing anthracite ceilings, effective.

April 13—Top preference ratings granted mining machinery.

May 6—Occupational deferment of critical workers in coal and railroad industries permitted.

May 16—Deliveries of light fuel oil cut 50 percent in East; oil for coal spraying banned.

May 18—MPR 120, fixing bituminous price ceilings, becomes effective along with

MPR 121 (miscellaneous solid fuels) and MPR 122, wholesale and retail solid fuels prices.

June 16—Orders placed for pipe for "Big Inch" line; extension to Atlantic Coast announced Oct. 28.

June 17—NLRB declares foremen's groups to be appropriate bargaining units and orders election July 17 at mines of the Union Colliery Co.; decision reaffirmed Sept. 19.

Sept. 1—Natural-gas deliveries restricted; restrictions on manufactured, natural and mixed gas made nationwide Nov. 13.

Sept. 29—Ickes asks longer work week —a request made some time previously by a number of operators.

Sept. 30—Manufacture and assembly of small stokers ended.

Oct. 27—Appalachian operators hold first meeting on lengthening work week; already authorized in Far West; captive operators complete arrangements Nov. 18.

Dec. 10—Anthracite agreement on longer work week completed; first meeting held Oct. 28.

★

1943

Jan. 24—Anthracite requested to suspend shipments to Canada and west of Erie, Pa.

Jan. 26—Construction of "Little Inch" line authorized.

Jan. 30—Oil and gasoline further restricted.

Feb. 14—Most bituminous districts signed up for longer work week.

April 19—"Solid Fuels Administration for War" established.

April 30—WPB limits receipts of bituminous coal and anthracite (May 1).

May 1—Seizure of anthracite and bituminous mines by government after failure to agree on new contracts brings complete work stoppage in both industries.

May 4—SFA issues Reg. 1, the first of a series of regulations, orders and directives restricting and controlling coal distribution to the present time.

July 20—After abortive attempt by central Pennsylvania, Illinois operators sign portal-to-portal contract; WLB rejects it Aug. 13.

July 31—Jewell Ridge Coal Corp. files portal-to-portal suit.

Aug. 16—WLB authorizes 8-hour day and 48-hour week; coal immediately moves to put it into effect.

Aug. 23—Bituminous Coal Act allowed to expire after two extensions from April 26.

Sept. 21—Texas-West Virginia gas line authorized by FPC.

Oct. 8—Fuel-conservation campaign launched.

Oct. 12—All remaining mines returned; wildcat strikes start.

Oct. 26—Second Illinois agreement rejected by WLB, which says it could approve one with rate of $8.12½ instead of $8.50.

Oct. 28—WLB awards anthracite increase of 32c. plus remission of certain charges.

Nov. 1—Mines seized second time after all industry is shut down fourth time; Ickes authorized to offer contracts based on Illinois decision.

Nov. 3—Ickes signs anthracite and bituminous agreements; approved by WLB Nov. 5; provide for 8¾-hour day with 45 minutes' travel time and 15 minutes for lunch.

Nov. 17—Bituminous wage conferences resumed; 43 mines returned.

Dec. 17—Bituminous operators representing 65 percent of tonnage sign new agreement based on Ickes contract; southern operators abstain.

★

1944

March 9—New anthracite agreement submitted to WLB; approved April 7.

March 28—Congress passes synthetic liquid-fuel act.

May 19—WLB approves new bituminous contract; southern operators accept it June 16.

June 21—All anthracite and bituminous mines except Jewell Ridge returned.

Aug. 23—Philadelphia & Reading mines seized after dispute over method of making wage payments.

Aug. 31—Organization campaign of United Clerical, Technical and Supervisory Employees' Union of the Mining Industry, District 50, which had been turned down by NLRB in June, precipitates seizure of several score metallurgical properties.

Oct. 7—WPB authorizes applications to produce 37,500 domestic-type stokers.

Oct. 24—OPA allows reconversion to fuel oil in East and Middle West.

★

1945

Feb. 24—72 mines in Pennsylvania, West Virginia and Kentucky returned.

April 1—Further steps taken to protect key men under 30 in coal and other vital industries.

April 10—235 mines seized in seven states as a result of work stoppages.

April 11—New bituminous wage contract signed providing increases in portal-to-portal and other fringe rates; WLB approves April 23.

April 29—Philadelphia & Reading mines returned after seven months.

May 1—Anthracite stoppage closes mines for two weeks; all operations seized May 3; new agreement providing "fringe" increases of $1.37½ per day signed May 19; WLB approves June 2; mines returned June 22.

May 7—Supreme Court approves portal-to-portal pay; rehearing denied June 18.

May 8—V-E day.

July 1—Simplified priorities system goes into effect.

July 14—Further limitations on coal distribution announced.

July 17—Drive for release of men, more food, price relief and other assistance culminates in offering of Congressional resolution.

July 20—Shipment of 6,000,000 tons to Europe urged by Ickes.

July 21—Production of mining equipment put on urgency list.

Aug. 14—Japs admit defeat.

Ventilation

Measurements of Air Volume — Air Pressure Surveys — Air Velocity Surveys—Apportioning Airways—Effect of Leaky Stoppings—Splitting the Air—Location of Split Regulators and Booster Fans—Effectiveness of a Field Air Shaft —Size of Air Shafts—Flow on Fan Stoppage — Air Conditioning — Auxiliary Ventilation with Tubing and Blowers—Exhaust vs Pressure Systems—Selection of Primary Mine Fan — Underground Location of Replacement Fans.

Reprinted From Mechannual—1945
Courtesy of
MECHANIZATION, INC.

VENTILATION

Measurements of Air Volume. The time is propitious for exercise of greater care in measurement of underground air volumes at various stations along the air circuit. These readings are customarily obtained by means of an uncalibrated rotating-vane anemometer held in the hand of the observer for one minute at the center of the air course. Sometimes in an attempt at improved precision the instrument operator will try to traverse the entire section during the minute interval by moving the anemometer back and forth and up and down over the plane of the measuring station but some observers will actually seek out the point at which the anemometer rotates fastest and will use that point as a measure of the average velocity passing the station.

The likelihood of obtaining air volume measurements which are even approximately accurate by these methods is remote. It would appear desirable to adopt a standard method of air measurement which would insure a high degree of accuracy and which would require no more time, provided that such a method is available. The following is a discussion of a simple procedure which can be easily followed by any mining company employe who is at all familiar with air volume measurements.

Having selected the station for air volume measurement and having accurately established the true cross-sectional area at the station, the instrument operator should stand in the center of the air course at a distance slightly less than arms' length down stream from the measuring plane. A calibrated anemometer should be attached to the end of a stick or rod of sufficient length to permit the observer to reach both ribs while standing in one place. This stick or rod can be made in short sections which can be easily carried underground. During the traverse the instrument should be held in each of twelve positions for a period of five seconds per position. These twelve instrument positions should correspond to the centers of twelve rectangles which would be obtained by stretching two strings horizontally across the air course spaced between top and bottom at the one quarter and the three quarter points, and three strings stretched vertically from top to bottom spaced at the one quarter, one half, and three quarter points between ribs. Actually, it is not necessary to install the strings, since with a little practice one can judge the approximate location for each anemometer position with sufficient accuracy by eye.

At the start of the traverse the operator should stand in a position from which he can reach the anemometer with his hand and thereby start the registration of the instrument. Immediately following the start of registration the observer should take his position in the center of the air course down stream from the measuring plane and permit the anemometer to run in the center of each rectangle for five seconds as timed by a stop watch held in the hand. The instrument should be permitted to register continuously thruout the traverse without interruption. When the time of operation in the last rectangle approaches five seconds the operator should move sufficiently close to the instrument that he can reach over and turn it off at the prescribed time. In this manner the influence of the observer's body upon the air flow past the measuring station remains unchanged thru practically the entire time of measurement so that a fairly accurate average velocity is obtained. It is important that the instrument correction be applied as indicated by the calibraton chart.

By following this recommended procedure the customary inaccuracies are either eliminated or reduced to a minimum. Such inaccuracies include errors resulting from:

1 a 1-position reading

2 improperly timed traverse rate

3 holding the instrument close to the body thruout the traverse in higher than average air velocities.

4 changing the flow pattern past the measuring plane during the time of traverse by changing the location of the observer's body.

5 neglecting the anemometer calibration.

When measuring air flow at a section that is obstructed by one or more roof props located away from the rib, the question is often raised as to the advisability of deducting for the projected area of the obstructions. A simple rule to follow is that no deduction should be made unless the width of the obstruction is equal to, or greater than the horizontal distance between anemometer positions.

Air Pressure Surveys; Purpose. The purpose of an accurate underground survey of air pressure at a mine is to obtain a pressure gradient along the circuit being investigated which will show the pressure drop between various observation points along the route. This makes it possible to locate regions of excessive resistance and to determine the economic feasibility of correcting such conditions by cleaning existing airways or driving additional passages.

A pressure gradient alone is useful for predicting the effect upon the remainder of the circuit of increasing or decreasing air regulation on any split or of applying a booster fan on a high resistance split. When contemplating sinking a field airshaft or driving a drift to the outcrop, a pressure gradient is required to predict results. Often a single-compartment field airshaft gives disappointing results in reducing water gage because it relieves a portion of the circuit that is a minor contributor to the overall mine pressure. It is therefore of value to know how the circuit pressure drop is distributed, which is best accomplished with a pressure gradient.

The underground pressure survey can be used to determine friction coefficient for various types of airway. This requires high precision work to establish useful data for prediction of mine pressure-volume characteristics for use in projecting new mine developments.

Air Pressure Surveys; Methods. Regardless of the type of instrument used to conduct a circuit pressure survey, the work should preferably be performed at a time when the mine is idle to avoid error introduced by moving trips, cages and opening and closing doors, etc. It is also preferable to select a period when the barometer is comparatively steady to restrict variation in the specific weight of the air at each observation station during the time of the circuit traverse.

The two most commonly used instruments for underground pressure surveys are the altimeter and the inclined manometer with hose extensions. The altimeter is sufficiently accurate for establishment of an underground pressure gradient and it is preferable to the manometer for such work because it has greater flexibility and a shorter time required for a traverse. With the altimeter it is possible to select more widely separated observation stations than is practical with the manometer due to restricted practical lengths of hose extensions. Also, use of the altimeter makes it possible to travel along the haulage road between airway observation stations which is easier than traveling a badly obstructed airway.

On the other hand, the inclined manometer is preferable to the altimeter for establishing friction coefficients for mine airways. The manometer readings are unaffected by differences in elevations between stations which introduce a correction that must be applied to altimeter data. Also, the manometer reading needs no correction for temperatures which may or may not be the case with the altimeter, depending upon the make of the instrument used. Elimination of correction factors combined with instantaneous, simultaneous and direct reading of the air-flow pressure drop between two successive stations gives a higher degree of accuracy with the inclined manometer than is possible with the altimeter. This is highly desirable for friction coefficient determination.

Altimeters are at best, imperfect instruments whose accuracy depends on mechanical fidelity or continued adherence to the calibration scale. The manometer, on the other hand, indicates pressure directly in terms of the height water column that the pressure will support. Altimeters are subject to some lag or creep during a traverse. This means that an instrument will not return exactly to the original reading when returned to the starting station even if the pressure at the starting station remains constant thruout the traverse. The degree of this discrepancy depends upon the quality of the instrument used but it can be kept within acceptable working tolerances by careful selection. Altimeters are available that are supposedly compensated for effects of temperature on the accuracy of the instrument. However, an instrument furnished with a temperature correction chart is likely to give more accurate results than a supposedly correct instrument without a temperature calibration chart.

Technical Publication 1827, American Institute of Mining and Metallurgical Engineers, titled "Surveys of Underground Mine Pressure", presents a detailed explanation of the proper use of altimeters and the inclined manometer for making underground pressure surveys.

Air Velocity Surveys. At any particular mine there is an approximate value for the maximum allowable underground air velocities. This depends upon various local conditions such as power consumption, roof conditions and air volume requirements. Air courses can be easily policed with a deflecting vane anemometer known as the velometer, an instrument that indicates air velocity instantaneously. By its use, regions of unusually high air velocity can be quickly determined and the seriousness of excessively high velocities can be evaluated by using an inclined manometer equipped with rubber tubing, before correcting the condition by cleaning the air course. An underground velocity survey with the velometer is a quick and fairly reliable means of ferreting out trouble, which should be generally used.

Apportioning Airways. When projecting new development at an existing mine, or development of a proposed mine, the question arises as to the most economical number of intakes and returns which should be driven. Obviously, an insufficient number of air courses is costly because of excessive power requirements for ventilation. On the other hand, an excessive number of air courses becomes costly due to the difference in profit derived from development coal on the one hand and room coal on the other. A formula for the most economical number of air courses is

$$N = 9.25\sqrt[3]{\frac{KQ^3OC}{EA^4wta}}$$

In which K is the friction coefficient suitable to the local conditions (such as 150×10^{-10}); Q is the volume of air handled by all entries, in cubic feet per minute; O is the perimeter of each air course, in feet; C is the cost of electrical energy, in cents per kilowatt hour; E is overall unit efficiency of ventilating equipment from electricity to air, in percent; A is cross-sectional area per entry, in square feet; w is the specific weight of coal, in pounds per cubic foot; t is the difference in profit per ton of entry coal and room coal, in dollars; and a is the amortization rate including depreciation and interest on investment, in dollars annually per dollar invested.

This formula is obtained by setting up an expression for the cost per foot of entry system in terms of the cost of power annually per foot of entry system, plus the annual cost of carrying charges per foot of entry system. These expressions involve the terms just defined. The first derivative of this cost taken with respect to the number of entries and equated to zero, permits solution for the optimum number of entries as set forth.

The formula can be a useful guide as illustrated by the following example:

Suppose it is desired to drive entries 12 feet wide in coal four feet thick to handle 100,000 cubic feet of air per minute. The cost of power is one cent per kwh and the overall unit efficiency of the ventilating equipment is 60 percent. Assume further that the sum of interest on investment plus depreciation is 12 cents annually per dollar invested, and that room coal nets a profit of \$1.00 more per ton than does development coal. The nature of the coal and roof condition is such that an average rubbing coefficient of 70×10^{-10} is applicable. The formula gives 3.95 air courses as the most economical number under the prevailing conditions. Therefore, four air courses would be driven. This example serves to illustrate the usefulness of the formula in projecting mine development.

Effect of Leaky Stoppings. One effect of leaky stoppings is to increase the pressure and power requirements for ventilating a particular area with a specified amount of air. It can be shown theoretically and proved experimentally that the pressure increase that results from presence of leaky stopping is approximately directly proportional to the total leakage air thru the stoppings expressed as a percent of the air volume delivered to the area to be ventilated.

For example, assume a condition in which it is necessary to deliver 100,000 cubic feet of air to the inby end of an entry along which the stopping leakage amounts to 25,000 cfm. A volume of 125,000 cfm must enter the entry. From the above stated relationship, the pressure across the entry will be 25 percent higher than it would be when delivering 100,000 cfm at the far end of the entry without stopping leakage. Since the pressure across the entry and the volume delivered to the entry are increased 25 percent, it follows that the power for ventilating the section in question will be 56 percent (1.25x1.25 = 1.5625) higher than without leakage. This illustrates the desirability of maintaining stopping leakage at as low a level as is economically justifiable.

The theoretical analysis of the above mentioned relationship is discussed in Technical Publication 1243, AIME, 1940.

Splitting the Air. The most effective and economical splitting of underground air circuits is accomplished by splitting the intake as close as possible to the point at which the air enters the mine and by reuniting the return air currents as close as possible to the point at which the air leaves the mine. This type of splitting permits air control on an individual split, within the limits of its regulator or booster, without affecting the remaining splits beyond the degree to which the pressure created by the fan is reduced or increased by the change in total fan volume. Consequently, the long splits permit greater power savings with installation of boosters and elimination of regulators than are possible when the splits start and terminate far within the mine.

In the case of short splits which start and end well inside the mine, the control of flow thru an individual split will influence the ventilation of the remaining splits due to the increase or decrease in pressure losses on the intakes and returns outby all the splits, which is occasioned by changes in total mine volume. A system of short splitting is therefore more sensitive to adjustment of flow in individual split than is a system of long splits. In addition the short split system offers less possibility of power savings in replacing regulators with boosters.

Location of Split Regulators and Booster Fans. The purpose of regulation of a split is two-fold. In the name of economy it is desirable to introduce artificial resistance on a split in the form of a regulator to prevent passage of an excessive air current on the split when it is subjected to the pressure differential required to ventilate the free split. In the name of safety, regulation is desirable on a split so that the current can be varied within limits to control the contamination resulting from varying rates of gas emission. Location of the regulators on the split should be such as to maintain the lowest posible pressure differentials across the stoppings along the split. Consequently, the regulators should be completely outby on the split, either on the intake or the return, depending upon convenience and system of mining. In case of an exhaust ventilation system in which the haulage road is on intake air it is usually desirable to locate the split regulators completely outby on the return of the split, whereas, in the case of a pressure system the reverse is true. Occasionally location of the regulator will be influenced by the fact that the split parallels the main intakes or returns being separated from one or the other by doors or stoppings. In such a case the split regulator should be located to maintain the minimum pressure difference between the inby portion and the main air course.

It is sometimes desirable to locate a booster fan on one or more splits. For example, instead of placing regulators upon the splits easy to ventilate, booster fans driven by variable speed motors can be installed on splits that are hard to ventilate. Flexibility of this system with respect to control of gas contamination equals that with use of regulators. On the other hand it is sometimes desirable to place a booster upon the free split only, especially when its resistance is such that the pressure required for its ventilation greatly exceeds the pressure required to ventilate the next easier split. Benefits of split boosters are manifold. Among them are reduced power requirements resulting from imposing the free split pressure upon the free split volume only, instead of upon the total mine air. Also, the booster fan lowers the pressure differential across stoppings outby the booster, thereby reducing the stopping leakage and the total volume of air which must be handled by the primary mine fan.

When installing a booster fan on a secondary split there are two precautions which must be rigidly observed. First the booster fan must be operated so that the pressure immediately outby the booster is greater on the intake air course than on the adjacent return air course to eliminate possibility of recirculation. Secondly, in operating a booster fan if the speed of the surface fan is to be lowered, precaution should be taken against robbing splits outby the booster. This can be done by properly adjusting the speed of the surface fan, or by opening regulators on outby splits.

In the simple case of two inside splits ventilated with a regulator on the low resistance split, the proper location of the booster fan on the free split is at a point at which the pressure between the intake and return on the free split is equal to the pressure drop across the regulator in the restricted split. The surface fan should then be operated at a speed which will pass the original volume at a pressure lower than the original pressure by an amount equal to the pressure across the regulator, which will be removed. When thus operating the actual volume will be slightly greater than the former volume on both splits due to benefits derived from reduced stopping leakages outby the booster.

Effectiveness of a Field Air Shaft. Location of a field air shaft is usually based on location of an already developed mine section which is hard to ventilate, or by a proposed development area too remotely situated for ventilation with the existing system. Frequently, the field air shaft is sunk with the idea of permitting it to serve as an additional intake or exhaust opening, depending upon whether the mine is on an exhaust or pressure system, respectively. When used in this manner the field air shaft relieves the intake arteries in the case of an exhaust system, or the return arteries in the case of a pressure system. Since haulage roads must be kept open and cleaned, it follows that the haulage road is usually equivalent to at least two air courses of doubtful maintenance. As a result it is customary to find that at least 75 percent of the total mine pressure is attributable to the air courses. A field air shaft applied in the manner previously described fails to effect the relief anticipated or desired, since it relieves a portion of the circuit which is responsible for but a small part of the resistance.

A single-compartment field air shaft can be most effectively used when it is equipped with a fan. When so used the field air shaft gives relief where most needed and it will usually effect a reduction in total mine pressure of approximately 50 percent while maintaining equivalent mine ventilation.

The most effective type of field air shaft as far as reduction of mine pressure is concerned, is a 2-compartment shaft used for both intake and return. A shaft of this kind usually relieves intakes and returns and it may reduce the total mine pressure as much as 75 or 80 percent and yet maintain equivalent mine ventilation. Great care, however, should be exercised in selection and construction of the curtain wall otherwise it will serve as a constant source of leakage and waste. Two separate airshafts are preferable to a large single shaft with a curtain wall because of lower cost, freedom from air recirculation and improbability of complete air stoppage from cave in. This conclusion is in accord with recommendations of state and federal mining departments.

Size of Air Shafts. The size of an air shaft of any desired shape for a particular air volume should be selected so that the sum of annual power cost and amortization charges is minimal. The optimum size is primarily influenced by presence or absence of shaft lining and secondarily by the cross-sectional shape of the shaft. It is risky to use arbitrary limits on the air speed as a yard stick for determining air shaft size. Regardless of shape, unlined shafts should be larger than lined or partly lined air shafts, but they are cheaper in spite of the larger size. Regardless of the amount of lining, circular air shafts are cheaper than elliptical shafts which in turn are cheaper than rectangular shafts. For a detailed analysis of the problem of optimum size of air shafts reference is made to a paper titled "Determination of Most Economical Air Shaft Size" which is being submitted to the American Institute of Mining and Metallurgical Engineers for publication.

Flow on Fan Stoppage. When the fan is stopped at a mine equipped with a single fan the direction of flow of air thru the fan reverses and the flow soon ceases. The reversal is more pronounced at mines ventilated at high pressure and at mines from which a large tonnage has been extracted and in which old workings have been left standing open.

The air reverses motion thru the fan when it is stopped because the pressure differential between the mine and the atmosphere sets up a flow of air into the mine thru an exhausting fan or out of the mine thru a blowing fan which continues until the mine air reaches atmospheric pressure. A quantitative analysis of a closely related phenomenon can be made by assuming that the mine intake is completely sealed in case of an exhausting fan or that the mine outlet is sealed in case of a blowing fan and that the fan is placed in operation at a speed which will maintain a given depression or pressure when the air has stopped flowing from or into the mine. The volume of air which the fan must handle to create the depression or pressure thruout the mine is proportional to the product of the stipulated difference between atmospheric and mine pressures and the volume of the mine opening, the latter being closely related to the tonnage of coal that has been removed from the mine. The relation may be formulated:

$$V = \frac{kit}{a}$$

where V is the volume of air, in cubic feet, to be passed by the fan to build up the specified pressure differential i, in inches of water, below or above atmospheric; a is atmospheric pressure in inches of water, t is the displacement of the tonnage removed in cubic feet and k is a constant of proportionality. To solve for k we may take a as 400 and the volume of coal in place as 25 cubic feet per ton. The equation then becomes

$$V = \frac{25\,it}{400} = 0.06125\,it$$

which may be rounded to $0.06\,it$. Thus the volume to be moved by the fan under the postulated circumstances is six percent of the product of the water gage and the tonnage. For a 5-in water gage this means that the air volume to be moved is nearly a third of the tonnage removed so that a fan at a mine from which three million tons of coal had been extracted would have to pass nearly a million cubic feet of air to build up a 5-in water gage thruout the mine with the other end of the mine sealed.

Air Conditioning. The term "air conditioning" as applied to the ventilation of coal mines usually suggests the practice of precooling intake air in hot weather to reduce roof and rib deterioration during the early stages of air passage thru the mine. In some extreme conditions it is desired to increase the moisture content of air entering the mine during the winter to reduce creation of dust hazards by absorption of moisture within the mine. Also it is occasionally desired to preheat the air in cold weather so that freezing in the intake air shaft will be reduced or eliminated.

Returning to the major objective of coal-mine air conditioning, that of roof control, it may be explained that roof difficulties in some localities are aggravated during the summer when warm humid air comes in contact with cooler coal and rock surfaces below ground. The effect upon the roof and ribs is two-fold (1) deposition of moisture whenever the dew point temperature of the air entering the mine is higher than the underground rock temperature and (2) expansion of strata caused by warm air coming in contact with cold underground surfaces. Much argument has ensued as to which condition is responsible for scaling that is produced in many localities. Some attribute the scaling to moisture deposition, whereas others attribute it to temperature difference. It is probable that sometimes one factor is responsible, at other times the other factor and usually a combination of both factors. The remedy is the same in any case, that is to precool the air entering the mine until its dew point is equal to or lower than the temperature of the roof and ribs.

There are three methods of accomplishing the desired cooling:

(A) use of spring water when it is available at sufficiently low temperature and in sufficient quantity.

(B) cooling the air with an artificial refrigeration plant

(C) utilizing the return mine air as a source of refrigeration.*

As an example, the problem will be considered of conditioning 100,000 cubic feet per minute of intake air which has a dry bulb temperature of 90 F and 50 percent relative humidity. It is desired to cool this air to a dry bulb temperature of 60 F and 100 percent relative humidity, which corresponds approximately to the condition of return mine air normally encountered. The problem becomes one of extracting 108,000 Btu per minute from the intake air.

(*A*) *Cooling with Spring Water.* Let it be assumed that there is adequate spring water available at a temperature of 55 F. By using a dehumidifier consisting of water sprays, pumps, etc., it is theoretically possible to obtain the desired cooling by circulating 528 gallons of cooling water per minute, using a 2-stage counterflow humidifier requiring two 600-gpm pumps to work at a pressure of approximately 30 pounds per square inch. It is obvious that the difficulty with this system is availability of 528 gpm of cooling water at 55 F. While such a supply of water is available in some localities, this is not usually the case.

(*B*) *Cooling with Artificial Refrigeration.* Where a natural supply of cooling water is not available, it is possible to use an artificial refrigerating unit or ice machine in addition to the equipment previously listed. The desired cooling will theoretically require a refrigeration machine capable of producing the equivalent of 539 tons of melting ice per 24 hours. In practice, a 600-ton unit would be selected, which in itself might cost in the neighborhood of a half million dollars, and its operation would approximate a 1000 horsepower of connected load in addition to the power required for operating the two 600-gpm pumps of the dehumidifier.

(*C*) *Cooling by Return Mine Air.* Where natural spring water is unavailable but where a 2-compartment air shaft is available in which all of the intake air for conditioning enters the mine, it is possible to effect the desired cooling by using a humidifier in conjunction with the dehumidifier described under

*For description of a similar application see "Air Cooling Reduces Falls of Roof", MECHANIZATION, Vol. VI, No. 12, December 1942, pp. 40-44.

(A) above and thereby use the cooling effect of the return mine air as a source of refrigeration.

In principle, the humidifier is a replica of the dehumidifier, consisting of cooling sprays and pumps. The function of the humidifier is to cool water discharged from the dehumidifier by spraying it into the return mine air and recirculating it to the dehumidifier. The humidifier thus provides the cooling water required by the dehumidifier at 60 F.

The desired cooling is theoretically available by pumping 667 gpm of 60° water to the dehumidifier sprays with two 700-gpm pumps. Two pumps are used in each case, assuming use of 2-stage units or what might be described as 2-cell dehumidifiers and 2-cell humidifiers. Theoretically, it is necessary to supply 7 gpm of 60° makeup water of which approximately 3 gpm are drained away from the high temperature accumulator to effect the proper heat balance. A flow of approximately 4 gpm supplies the excess water which the return air picks up in the humidifier over and above the water that is deposited by the intake air in the dehumidifier.

It will be seen that system (C) requires approximately twice the equipment of system (A). However, the pumps must be of 700- instead of 600-gpm capacity as a result of the difference between the temperature of the 60° return air on the one hand and the 55° temperature of the spring water on the other.

A unique way of refrigerating intake air was devised by A. S. Richardson, ventilation engineer, Anaconda Copper Mining Company at Butte, Montana. Mr. Richardson was faced with the problem of having to cool air entering the lower levels of Anaconda mines. These mines are in an ore body which is still in the process of cooling and rock temperatures reach approximately 130 F. Fortunately the summer psychometric conditions at Butte are such that the outside air maintains a comparatively low dew point temperature. This made it possible to apply the cooling tower principle and to obtain a large supply of refrigerant in the form of brine at a temperature approximately half way between the outdoor dew point and the outdoor wet bulb temperatures. Unfortunately this solution would not be applicable in the eastern part of the United States due to the prevailing high dew point temperatures of outside air.

Auxiliary Ventilation with Tubing and Blowers. The use of blower fans and tubing for face ventilation is a controversial subject. Most authorities agree upon the advantage of this system over the maintenance of line brattice for dead end ventilation but they also recognize the system's disadvantages and the fact that there is considerable disagreement as to the proper relation of advantages to disadvantages. The main justification for the use of tubing and blowers for ventilating dead ends is that the installation and maintenance of line brattice is rendered impractical because of long distances desired between crosscuts or because operation of mining equipment limits the space available. It is generally agreed that when blowers and tubing are used the blowers should be powered with permissible motors and that proper ground connection should be maintained. Furthermore, the blowers should be operated continuously to avoid possibility of high gas concentration during shut down intervals. It is also important that the blowers be placed on fresh air in such a manner as to exclude possibility of recirculation of contaminated air.

For a detailed discussion of this subject reference is made to a paper titled, "Use of Tubing and Blowers for Auxiliary Face Ventilation", Transactions of Coal Division, AIME, Vol. 157, 1944.

Exhaust vs Pressure Systems. This subject also is controversial, each system having advantages and disadvantages. On the basis of explosion hazard it can be argued that the exhaust system is preferable because mine gas liberated at the working faces are returned along air courses which are free of open electrical circuits and sparking electric motors. Of course any properly ventilated coal mine would be supplied with sufficient air to dilute the gas below the limits of an explosive mixture. However, this precaution is not always observed and possible existence of local gas pockets argues for the exhaust system.

In case of fan stoppage, the absolute pressure thruout the mine increases slightly with an exhaust system and lowers slightly with a pressure system. A case can thus be made in favor of the exhaust system on the grounds that an increase in absolute mine pressure tends to hold the gas back in the worked-out places during fan stoppage, whereas, the reverse condition prevails for a pressure system. This conclusion is qualitatively correct but it might not hold when analyzed quantitatively. In any event it ceases to be a point at mines where old workings are properly sealed.

Mines fires are most likely to occur on haulage roads or at working places, due to exposed trolley wires being wrecked by roof falls, or coming in contact with wooden doors, etc., and due to locomotive and machine cables being cut. In events of such a fire, the exhaust system takes the smoke and fumes into the mine and out the air courses thru which men must travel for escape so, it may become necessary to reverse the action of the mine fan before the men leave the mine, but this may cause confusion and loss of life. The pressure system, on the other hand, takes the smoke out along the haulage road and leaves the air course on fresh air, permitting safe travel by the escaping miners. After all the men are out of the mine, the fan can safely be reversed to permit men and fire fighting equipment to reach the fire.

In cold weather the exhaust system presents the disadvantages of freezing water in the hoisting shaft and causing discomfort for the cage men and other bottom workers. The pressure system conversely, will form ice in the air shafts but will leave the hoisting shaft free of ice and maintain comfortable working temperature at the mine bottom. At some mines, breaks to the surface near a burning refuse dump eliminate consideration of the exhaust system due to the fact that smoke contaminated air would be drawn into the mine at some point on the intake circuit. In such cases a pressure system with the fan properly located eliminates possibility of contamination.

When it is desirable to condition the intake air for summer roof control purposes, or winter heating, the pressure system is preferable to the exhaust system because the air conditioning unit can be installed adjacent to the mine fan, thereby passing all of the intake air thru the conditioning unit. This is practically impossible when all of the intake air is drawn thru a hoisting shaft or slope under the exhaust system.

It is possible with a pressure system to place the haulage road on fresh air with the aid of automatic haulage-road doors or a skip hoist, thereby combining some of the desirable features of each system but it is usually felt that the advantages gained do not justify the disadvantages of the automatic doors on the main haulage artery.

Selection of Mine Fan. The problem of choosing the primary fan for a coal mine is one of selecting a fan of the proper size and operating characteristics to efficiently perform the entire range of ventilation duties that will be required during life of the fan. Sometimes it is possible to select one fan to suffice for the life of the mine, especially now that the axial-flow type of mine fan equipped with adjustable blades is available. This type of fan has rendered the older centrifugal type of fan practically obsolete for coal mine ventilation.

Figure VII-1 shows comparative efficiency ranges of the axial flow and centrifugal fans operating over a range of mine resistance. The comparison is between a standard commercial axial-

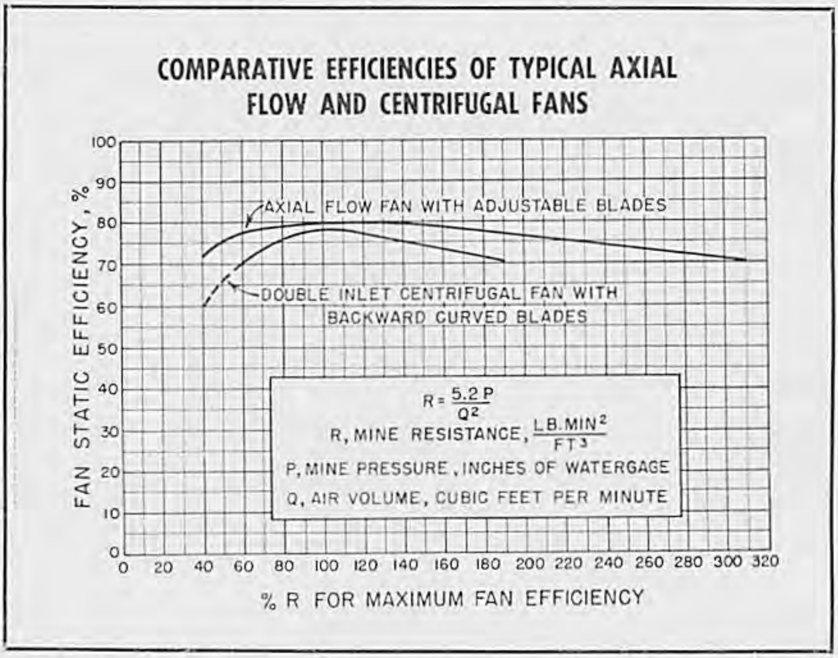


Figure VII-1—Comparative efficiencies of typical axial flow and centrifugal fans.

flow mine fan with adjustable blades and fixed straightener vanes, and the most optimistically rated centrifugal fan with backward curved blades that is available. It should be noted that the operating range for the centrifugal fan that permits fan static efficiencies above 70 percent is but 48.2 percent of the corresponding range for the axial flow fan.

It is obvious that the average operating efficiency of the axial flow fan generally exceeds the average efficiency of the centrifugal fan. As the average fan efficiency during the operating life of the fan determines the power cost of mine ventilation, it is apparent why the axial flow fan has superseded the centrifugal fan for coal mine ventilation.

Having selected the primary mine fan for either exhausting or blowing duty, the fan should be installed on the surface with a distance of not less than 25 feet between the fan rotor and the near side of the air shaft, slope or drift. The fan can be direct connected or driven by belt or gear connection to the prime mover such as electric motor, steam or internal combustion engine. It is always a good precaution to provide a standby drive unit to insure continued fan operation.

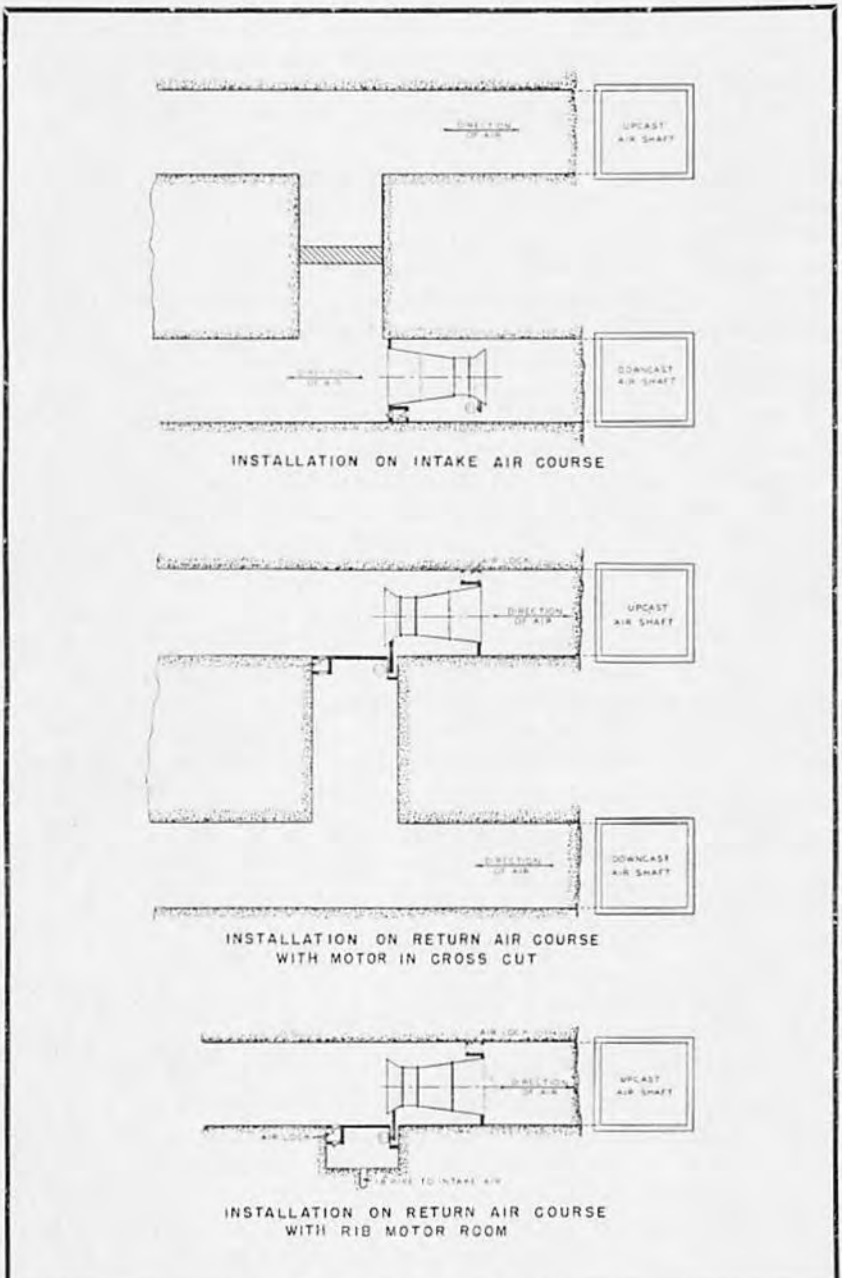


Figure VII-2—Methods of installing underground fans with drive motor on intake air.

Fan bearings should be equipped with thermal relays designed to stop the fan in event of excessive bearing temperature. A visual or audible signal to indicate continued fan operation is an additional safety feature favored by some state mining departments.

Underground Location of Replacement Fans. Advent of the compact high-pressure efficient axial-flow mine fan further emphasizes the desirability of locating replacement fans at or near the bottom of the air shaft or slope or just inside the drift mouth at mines already equipped with an outside fan which is maintained in operating condition for emergency use.

Figure VII - 2 shows satisfactory methods of underground fan installations that insure ventilation of the fan drive motor by fresh intake air. There are several such installations in this country, altho some state mining laws arbitrarily prohibit the practice of putting a main fan underground. England and Continental Europe have granted the practice statutory approval, recognizing the following safety and economical advantages of such installations:

1 two independent means of mine ventilation instead of one
2 possibility of rapid scavenging following an inside explosion by simultaneous operation of surface and inside fans
3 increased protection against damage by lightning and outside forces by virtue of sheltered location of inside fan
4 instant availability of surface fan virtually assured following the worst possible mine explosion
5 power reduction possibilities at mines equipped with a multicompartment air shaft with leaking curtain wall
6 power reduction possibilities at mines employing major split regulators
7 elimination of objectionable fan noise
8 reduced installation costs
9 uninterrupted mine operation during fan installation
10 operating and installation economies encourage improved ventilation at mines difficult to ventilate.

Objection to inside fans based upon possible air way blockage by the wrecked fan following an explosion can be eliminated by installing the underground fan in a run around parallel to the air way, with a weak stopping erected in the main air way. Objection on the grounds of air recirculation thru leaking curtain walls disappears when the problem is subjected to quantitative analysis. The principle of inside location for replacement fans is covered by paper presented before the National Safety Council at the October 1938 meeting held in Chicago, Illinois.

In Loving Remembrance

WILLIAM ORTMAN, Feb. 22, 1931
S. W. FARNHAM, March 12, 1931
H. C. PERRY, April 13, 1931
A. J. SAYERS, Oct. 11, 1931
C. E. KARSTROM, March 24, 1932
JOSEPH D. ZOOK, May 28, 1932
EDWARD CAHILL, Aug. 4, 1932
JOSEPH VIANO, Dec. 12, 1932
JOHN ROLLO, Feb. 6, 1933
DAVID I. ROCK, Aug. 2, 1933
WM. HUTTON, Aug. 18, 1934
FRED K. CLARK, Oct. 24, 1934
ERWIN CHINN, April 16, 1935
ADAM CURRIE, June 12, 1935
W. H. SLINGLUFF, Sept. 10, 1935
CHAS. B. SPICER, Oct. 26, 1935
NELSON P. MORRIS, Sept. 3, 1936
DON WILLS, Dec. 9, 1936
T. E. COULEHAN, Jan. 11, 1937
ALBERT WEBB, March 5, 1937
H. B. COOLEY, March 23, 1937
C. W. SWANSON, July, 1937
JOSEPH McFADDEN, Sept. 15, 1937
E. G. LEWIS, Sept. 21, 1937
E. L. STEVENS, Sept. 28, 1937
W. C. ARGUST, Dec. 17, 1937
H. H. TAYLOR, SR., Dec. 28, 1937
E. L. BERGER, May 27, 1938
J. I. THOMPSON, June 24, 1938
P. W. MacMURDO, July 11, 1938
J. A. EDE, July 26, 1938
M. C. MITCHELL, Sept. 11, 1938
C. F. HAMILTON, Sept. 22, 1938
H. C. LONGSTAFF, Oct. 12, 1938
JOHN JOHNSON, Jan. 2, 1939
C. A. BLOMQUIST, Jan. 9, 1939
JOHN WHITE, April 15, 1939
CHARLES HAFFTER, May 21, 1939
BRUNO F. MEYER, July 21, 1939
JOHN A. GARCIA, Aug. 11, 1939
A. J. MOORSHEAD, Oct. 16, 1939
HARVEY E. SMITH, Nov. 6, 1939
C. W. McREAKEN, Nov. 30, 1939
C. C. HUBBART, March 4, 1940
SAMUEL HANTMAN, Sept. 13, 1940
SIMON A. BOEDEKER, Oct. 12, 1940
JOHN H. DAVIS, Oct. 21, 1940
S. J. WILLS, Oct. 22, 1940
HARRY HANTMAN, Nov. 5, 1940
J. W. GLENWRIGHT, Nov. 27, 1940
J. C. WILSON, Dec. 18, 1940
NICHOLAS CHRISTENSEN, Dec. 26, 1940
JOHN W. POLING, Jan. 31, 1941
JOHN T. RYAN, Feb. 20, 1941
M. F. PELTIER, April 2, 1941
F. M. BEAN, April 30, 1941
F. M. SCHULL, Aug. 20, 1941
C. J. SANDOE, Aug. 29, 1941
F. F. SCHLINK, March 15, 1942
FRED F. GERMANN, March 31, 1942
JOHN MENTLER, April 28, 1942
HUGH MURRAY, June 5, 1942
G. D. COWIN, June 14, 1942
JAMES M. ROLLO, June 15, 1942
SYDNEY A. HALE, Aug. 12, 1942
BYRON BROWN, Sept. 17, 1942
J. E. SEYMOUR, Nov. 21, 1942
OTTO AWE, December 6, 1942
A. F. ALLARD, Dec. 29, 1942
THOMAS R. STOCKETT, Feb. 15, 1943
A. R. JOYCE, April 7, 1943
W. S. BURRIS, April 9, 1943
A. H. MALSBERGER, May 7, 1943
J. B. FLEMING, May 19, 1943
H. T. MORGAN, May 29, 1943
E. W. HASENJAEGER, July 29, 1943
C. W. WATERMAN, August 7, 1943
J. R. HURLBURT, Sept. 6, 1943
JAMES S. ANDERSON, Sept. 1943
F. F. JORGENSEN, Nov. 1943
E. W. BEARD, Jan. 5, 1944
W. M. ELDERS, Jan. 22, 1944
THOMAS ENGLISH, April 3, 1944
FRANK TIRRE, May 22, 1944
*J. K. CHILDS, June 10, 1944
W. S. STINTON, Dec. 6, 1944
E. W. HAWLEY, Jan. 29, 1945
J. C. ANDERSON, July 7, 1945
F. A. FLASKAMP, Aug. 12, 1945
JOHN M. DILLAVOU, Aug. 19, 1945

* Killed in Action.

BUY MORE BONDS

Reprinted from "Coal Mining Looks Ahead," May 1945, by permission of Mining Congress Journal.

MACHINE MINING

New ideas, new machine designs and new materials will result in improved standards of management, engineering, operation and safety.

EDWIN H. JOHNSON
Chief Engineer of Mines, Republic Steel Corporation
Cleveland, Ohio

Under pressure of war needs, machine methods of mining have been adopted very rapidly, having been limited only by the manufacturing capacity of machine builders. Emphasis has been focussed on tonnage and no effort has been spared by management to produce an extra ton. Much of this production has been inefficient by our standards of comparison before the war. During this war period mine management has been badgered by demand for ever increasing production, by difficulty of getting supplies and repair parts, by loss of the cream of the workmen to the Armed Services, by inefficient and inadequate maintenance, by strikes and by endless regulation. But this period of stress has high lighted the needs of the industry and at the same time aroused the ingenuity of management and manufacturers.

Management Must Meet Market Competition

Perhaps it may not be unfair to say that cost consciousness has been a war casualty in mines, at least for the time being. High production of itself tends to obscure some of the inefficiencies that otherwise would demand attention. But management knows that these exist and plans to attack them as soon as the urge for output slackens off. It knows that the mines that survive in competition for markets that will inevitably be restricted, will be those with high man tonnage and high quality of output. No one expects wages to return to prewar levels and no one expects high prices to carry the load under restricted output. Therefore there is considerable uneasiness about the future of mining and a determination to look for better answers in methods, equipment and routine.

The manufacturers have been pressed to keep up with supply parts and new equipment demand, while being burdened with shortages of material and manpower. But they, too, have been looking toward the future. Perhaps very soon the demand for extra production will recede and with it the volume that has sustained the backlog of supply and equipment orders. This presents the challenge they have seen in the future for the development of new machines, sufficiently ahead of their own earlier manufacture, to render the old machines obsolete. And the end of the war will find them ready with ideas that have been in the development mill, unable to get out because of war-time restrictions on new types of equipment.

So long as a very substantial percentage of underground output in any field was loaded by hand, the price of coal in that market was determined by the price that would support a well-run mine that was not mechanized. So the mechanical mine with a higher man tonnage obtained an economic advantage with even a fair degree of operating efficiency. In a great many cases this natural advantage has caused the management of these properties to become too easily satisfied with a performance far below the capacity of their men and their machines.

Such managements are due for a rude awakening. After the war it is not going to be possible for sunshine superintendents and sandbox foremen to depend upon machinery to replace lack of skill in management and overcome laxity in engineering. When the miners that are now on the other side of the world return to reclaim their jobs many of them are going to bring back a new perspective which will put new life and energy into their work and develop a new intolerance of worn out traditions and make-shift practices. Thus the future of mining will find itself dominated by forward looking management, revitalized miners and a manufacturing industry equally alert and prepared.

Comfort and Safety for Machine Operators

We see for the future the improvement of standards of safety, of organization, of engineering, of maintenance, of routine, of quality and of cost. We also see new standards of machinery design and manufacture, and the emergence of the machine to do a complete job of mining. In the perennial problem of making mining a more desirable job it is certain that future machines must be designed to operate more easily, particularly with less physical effort for the machine operator. The easy operation of controls and the ready response of a machine to the will of the operator is one of the best means to promote safety. Some machines tire out an operator physically or mentally or both. The exasperation of mule-like response in a machine is an invitation to an accident.

Track mounted mechanical loader working under ideal seam conditions.

Some machines seem to invite short cuts, such as sumping a shortwall at high speed, using the controller instead of the brake, nipping instead of using the trolley pole; and the like. It should be the aim of manufacturer and of management to develop machines that operate most easily the right and safe way instead of inviting the dangerous short cuts. It must be remembered that more tons can be expected, not from faster or harder effort by the operator, but by making the operator's work easier, more comfortable and more attractive. The miners' distrust of automatic controls in many cases stems from the fact that there is too much "gingerbread" in them, by which he means that they were probably designed for stationary operation and not for the shocks and vibration of mining service. If a chunk of sponge rubber is useful on a draftsman's stool, why should a motorman or shuttle car operator sit all day on an oak plank or its equivalent? Some shuttle car operators are now suffering from jeepitis.

Machines Designed for Easy Maintenance

One certain future trend of mining methods will be to supply something close to rated voltage to the motor terminals. For many mines which now have adequate power, it would be unfair to state this as a future trend, but a surprising percentage of otherwise well run mines check their voltage when there is no load on the section and operate machinery at snail's pace under load. Copper for feeders and bonds will not be so hard to get after a while and this will be true of sub-stations, too.

In this war mining situation perhaps the saddest letdown is in maintenance. Nowadays a spare machine is not an operating accessory but surplus. That means that we run the spare machine too until it stops, then patch it up to run a while longer. No one now will argue against the desirability of spare machines which can be overhauled in turn, so that all machines can be kept in shape to give dependable service. Most men who have had experience in mechanization agree with this principle

Low coal is mined efficiently with tractor loading machine.

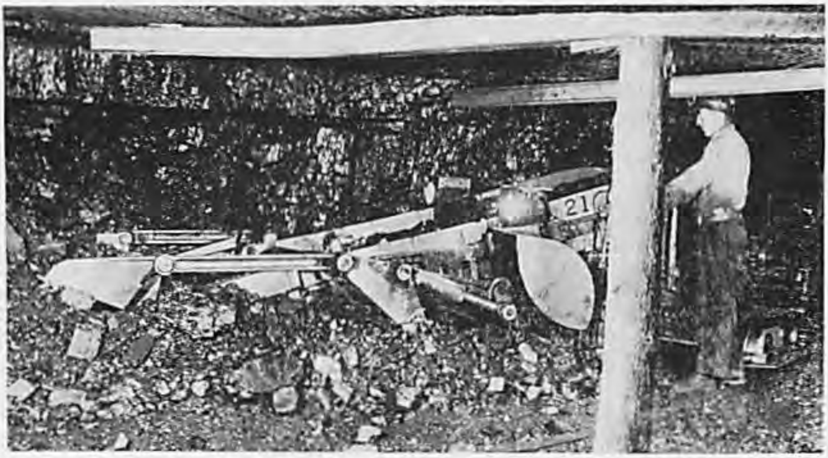
and have well considered plans developed for organization of maintenance. Just now we are all troubled for lack of spares and lack of adequate maintenance crews, but we can take care of that with a breathing spell when we get some good men back.

We shall find another shortage then. Most of us do not have proper shop facilities near enough to the working area, and most of our care of replacement parts in underground shops is rather negligent. Here is one place the manufacturer is ready to cooperate in modern machinery design. He is building machinery now in group assemblies. Instead of tearing out a set of gearing piece by piece to replace a bearing or a shaft we can take out a unit assembly and substitute one that is new or rebuilt, in far shorter time. Then we can take the other to a clean, well lighted bench and rebuild it without mixing the grease with sand and coal dust.

Before the war the use of alloy steels for working parts and corrosion resisting plates, and even the use of light alloys, had already become commonplace in mining practice. Substitutes for rubber and copper and light alloys have in some cases forced the development of new answers which were an improvement over original design. At any rate the post war machinery will have available not only the use of such materials as are required but also the benefit of tremendous technical improvements in hydraulics and electronics that are now employed in the airplane industry. Hydraulic control and hydraulic motors have a wide application to mining machinery.

Haulage With Truck and Conveyors

More specifically, we believe that underground main line haulage is going to be improved in road bed, cars and locomotives, to support safe speeds of twenty miles per hour. For main line service and even for face operation in high seam mines we see the wider use of cars with double trucks having capacities above ten tons of pay load per car. The



This loading machine operator works in safety and comfort.

higher speed will require better road bed drainage and a better ballast than mine refuse. Further improvement is necessary in couplings to handle these heavier loads faster.

Conveyors will come in for many new refinements, particularly belt conveyors used for gathering in low seam mines. These belts are going to run faster when they serve shuttle car sections where the flow to the belt now has to be choked to prevent overloading and spillage. More thought will be given to design for ease of handling of belt conveyor intermediate sections and to making provision for training of belt in either direction. Particularly in very low coal it should not be necessary to brush a roadway to get timber back to the room neck because the belt will train in only one direction. Many belts now are handling supplies on regular schedule. Many experiments are now proceeding in low coal mines to find a better answer than high brushing at belt transfer points. This deserves a lot of study.

Rubber Tires for All Machines

Shuttle cars have proved to be of great value under favorable conditions of grade and floor. Even in soft bottom when adequate power is available they have shown much promise. The strip pits have already proved what soon must be realized by underground mines that haulage on rubber can be cheap only if it is done on real road and some of the high maintenance of shuttle cars can quite profitably be transferred from the cars to the pavement.

Practically all types of modern mounted cutters have been successfully put on rubber wheels. We shall also see the rubber mounted carrying truck for short wall machines, drills and other utility service for use in trackless sections. We also shall see the rubber wheel mounted loading machine. It is much more difficult to provide proper rubber tire support for an arcwall type of cutter than for a loader, and under certain bottom conditions the rubber wheel mounting for a loader will develop some advantages over other methods of mounting. Other refinements in track mounted and caterpillar mounted loaders will include further use of unit assemblies for aid in maintenance and improved flexibility of control.

One Machine for Complete Mining

For many years the goal of forward looking engineers has been the development of machines to do a complete mining job. The drilling and blasting of the material between the cutting and the loading operations has been and still is a difficult hurdle to cross. At least five types of digging and loading machines have been tried with varying degrees of promise and there still appears to be a long period of development and experiment in this direction. It is possible in many cases to combine two, at least, of the four major jobs of cutting, drilling, loading and conveying. As illustration we have the self-loading conveyors like the duck bill which loads and conveys the coal, the use of mounted drills on the mining machine to cut and drill with the same crew and the short wall loader that cuts and loads in a simultaneous operation. The effect of such combination is an increase of man tonnage which is one of the yardsticks of efficiency.

The most interesting period in the history of coal mining should be the one that follows the war end, because the flood of new ideas and machines that will be released will find a more sympathetic reception by mine operators than ever before.

HOW TO WEIGH
For Accuracy in Mine-Scale Operation*

HARRY M. ROESER
Manager, Sales and Service, Streeter-Amet Co., Chicago, Ill.
Secretary, National Scale Men's Association

The trouble which besets the measurement of coal originated, no doubt, when the first coal mine was no more than a foot deep. During the 30 years which corresponds to my professional experience with it, the aspects have changed from time to time with the development of mining methods, but the grief remains.

At once my relation to mine scales and weighing methods may be identified. It is different from most of those interested. I have never dug coal or had any coal of my own to weigh. My experience has been with weighing machinery, its functions, maintenance and operation. In short, my business is making weighing machinery and making it work—and it is a business. And in this paper, I am limiting myself to mine scales and weighing methods used in determining the quantity of coal produced and from which cash income is derived. Scales and weighing methods involved in the processing of coal within a plant will not be touched upon; first, because of the proprietary nature of some of them; and second, there are those who can handle better that phase of the subject.

Two radically different weighing devices are used at coal mines: namely, (a) hopper scales and (b) track scales. The track scale, the primary subject of this paper, is adaptable to a wide variety of circumstances of use, is readily procurable, is economical in cost and maintenance and is distinguished by accuracy in service.

Scale Requirements

General—When purchasing a scale, a sound principle for a coal operator to keep in mind is that, except for a few specialists in the business, the man who comes carrying a scale manufacturer's catalog knows no more about the practical conditions of handling coal in mining operations than the operator knows about manufacturing scales. In many instances it may safely be said he does not even know as much about scales as the operator. This is not an indictment of the scale business. The circumstances are the same in any merchandising operation. It is a fact, however. As a manufacturer of weighing machinery and a salesman, I lay it down and emphasize it unabashed, and justify doing so with the statement the circumstances are as great a source of discomfort to me as they are to coal-mine operators.

---

* Abstract of an article entitled "Mine Scales and Weighing Methods," presented at the December, 1944, meeting of the Kentucky Mining Institute.

A scale must not only weigh something. Its features must be such as to convey confidence that the weighing results are correct. From this derives an axiom common among scale men: 'An honest scale is no good if nobody believes it is honest.'' Some of them point to the coal-mining industry as an apt illustration of the cogency of the utterance. The situation is the result of operators having poor technical advice, or ignoring it if they have had good advice.

Capacity—One outstanding deficiency of coal-mine weighing layouts is lack of strength of scale parts. The fact grows out of a common situation in which the operator estimates the size of loads expected to be weighed, and a catalog carrier in the scale business points to a picture in the book whose title indicates the subject will handle that much load. The customer signs an order and is delivered not only a scale, but a lot of grief for the life of the mine.

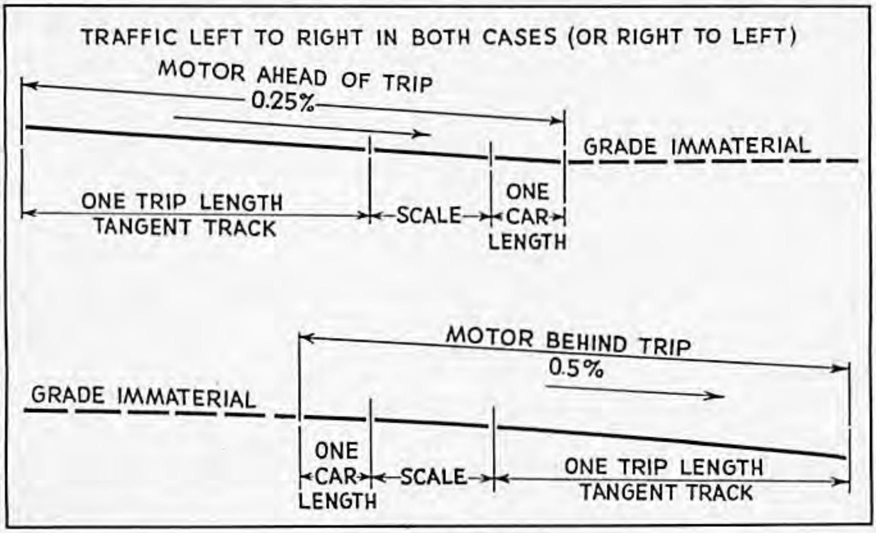
That circumstance may properly be regarded as the fault of the scale business, which catalogs its articles without giving due consideration to the fact that the load sustaining capacity of a scale has not much to do with its serviceability at a coal mine. Salesmen of experience working the coal-mine trade, however, do give it consideration and largely disregard the catalog pages in recommending equipment. The need is judged in terms of the practical operating conditions, and no such man takes them sight unseen. He cannot do his job confidently without studying the layout with his own eyes, and usually his recommendations are for twice to three times the capacity of scale offered by the catalog carriers. The economy is sound both from first cost and service expense.

The object is to get sufficient mass into the scale parts to prevent derangement under the normal traffic. Track conditions are not always the best, and the hired help cannot be expected to be constantly alert to the fact that some delicate machinery is under the deck and must be babied along to avert misperformance as the result of derangement under the handling of cars. As the practical scale man puts it, ''Make the scale heavy enough so that whatever hits it will bounce instead of the scale.'' To impart confidence that the scale is suitable for the purpose, it must have the appearance.

Weighrail Length

The length of the scale rails has an important bearing on scale performance. The circumstances, which differ according to the method of weighing, may be briefly outlined as follows:

Stationary Weighing—At rotary dump operations and some others, cars are weighed while standing still on the scale, uncoupled or coupled to other cars. In such instances, the scale rails need to be sufficiently longer than the car wheelbase that stopping cars on the scale for weighing can be managed without jockeying by the tipple hands. Usually 6 or 8 ft. is enough.



Grade requirements for coal-mine track scales when cars are weighed coupled and in motion under the two conditions of locomotive ahead of or behind the trip.

Motion Weighing, Gravity—At many locations cars are weighed en-route to the dump as they drift over the scale uncoupled under the influence of gravity. The scale must be sufficiently long that the car at its normal rate of speed will remain on the scale long enough for the weighing operation to be completed. Such installations usually are equipped with an automatic device that requires about 2½ seconds to finish weighing after the car is completely on the scale. To meet this condition the scale length requirements, depending upon the car wheel-base, usually are 12 to 14 ft.; rarely more.

Motion Weighing, Coupled—The practice of weighing cars coupled in trips and moving has grown with the increase in bottom-dump-car operations. If the cars are the same length, the best length for scale weighrails is the coupler-pin-to-coupler-pin distance of cars coupled in the trip. If more than one size of car is used, the weighrail length must be the coupler-to-coupler distance of the shortest car. It is best to consider no variation from what has just been said. The method is sound and, when the weighing layout is properly prepared and operated, excellent results are obtained. But the word of a scale man must be observed: liberties cannot be taken with it.

Grades

Many a weighing layout is spoiled by inadequate attention to track grade. For *stationary weighing* the requirement for a flat or very slight grade is obvious. However, when loads are weighed while moving, sharp attention to the practical features is advisable. It may be said in passing that any man who can use his eyes has found numerous examples of gravity weighing layouts made obsolete by changes in the rolling stock. Ten years or more ago, a layout with a 10-ft. weighrail and a track grade of 1½ per cent or more was thoroughly adequate for weighing the cars then used. Cars with roller bearings and the longer wheelbase common in the present era roll past such scales so fast that the weighing machinery does not finish its work before they are in the dump.

For *gravity weighing* operations, the grade should be such that a car rolling freely on the scale will not accelerate. For roller-bearing cars, 0.25 per cent is enough for the scale rails and for a car length at each end; for straight journal cars, 1.5 per cent or more, according to the condition of the rolling stock.

For *coupled motion weighing* the grade requirements are different, depending upon whether trips are brought to the scale with the locomotive in front or behind. The object is to get the cars over the scale with no reaction at the couplers. If the cars are pulled, tangent track should grade downward to the scale at 0.25 per cent for a distance at least equal to the length of the trip, over the scale, and a car length beyond. From there the grade is immaterial. If cars are pushed, the grade in the track up to a point a car length ahead of the scale is immaterial. Beginning at a car length in front of the scale, over the scale, and for at least a trip length beyond, tangent track should grade downward at 0.50 per cent. The arrangement is illustrated in the accompanying diagram. In both cases the travel must be uniform, as variations in the amount of slack in the trip may cause disturbance in the weighing.

The subject of track grades cannot be completed without a warning against attempting weighing in a track laid upgrade. Happily enough, it seems that nearly everyone has already discovered the fact, but now and then instances are found of coal operators learning an expensive lesson. The laws of nature being what they are, weighing simply cannot be done satisfactorily on a scale with cars moving upgrade.

Location

A scale is a device for measuring the force with which objects, such as carloads of coal, are pulled toward the center of the earth by the forces of gravity. The magnitude of the load is measured by the amount of the pull, so that, if the purpose is to find out how much coal is in a load, it is absolutely necessary to prevent any and all forces other than the force of gravity from acting upon it. Any unnatural restraint on the load adds to, or subtracts from, the force of gravity, and the result is erratic weighing. The principle that scales must be isolated from disturbing forces of all types often is violated as the result of poor or unfortunate judgment in the location of the scales.

Men of experience realize, of course, that coal-mine operators build tipples for handling coal and not for holding up scales, and give due consideration to the idea when offering weighing equipment. Nevertheless, there are limits beyond which such men will not go in the location of weighing machinery on coal tipples. When such a man appears to hedge and wants the equipment located on a structure built up separately from the tipple, or wants it located on the ground away from the tipple, giving him his head is not unwise. The necessity for insulation from cases where mounting a weighing outfit in the tipple structure and tipple disturbances is less than formerly, but there are still plenty of expecting satisfactory results from it is inadvisable to the point of foolhardiness.

The weight indicator must be kept close to the scale. As the result of what I am pleased to call office-boy engineering, catalog carrier salesmanship or both, instances are too common where the weigh house containing the weiht indicator is located away from the scale track, the connections being through a train of extension levers. This is an evil construction that inevitably deteriorates rapidly with time. Among scale men, the construction is looked upon with disfavor even under the best of circumstances. The disturbances that result from the extraordinary vibration and relative settlement or shifting of supports which are the nature of coal tipples inexorably manifest themselves. Instances of such construction are in service where it is a safe bet that a carload of coal cannot be weighed correctly! Two correct principles may be safely followed: (1) Locate the weight indicator as close to the scale track as the law will allow; (2) locate the weight indicator on the same structure, or part of the struture, that supports the scale track.

In respect to the second principle, vibration is not of itself a particularly disturbing factor in weighing, provided only that all parts of the weighing outfit are shaken in unison with the same amplitude and frequency. The effect can be controlled. If, however, the scale track is on one part of the structure and the weight indicator on another, or any other condition prevails that makes one element move in one direction while the other element moves another, and at different rates, freakish results can happen, and usually do.

At *rotary dumps* a common practice is to locate the scale immediately ahead of the dump. The results usually are sad. Settlement of the structure in the approach to the dump ring produces derangement of the scale parts. A common accident is the freezing of couplers so that when the dump turns over it not only empties the car in the dump but also the one on the scale track, and not infrequently causes considerable property damage in the immediate structure including the scale. A scale cannot go through many such experiences and be much good afterward.

The correct practice at rotary-dump operations is to locate the scale in relation to the dump so that the third or fourth car from the one in the dump is standing on the scale being weighed while the dump is turning over.

At *bottom dump* operations weighing is done with cars coupled in trips and moving. The scale should be located in tangent track, and the specifications previously noted for grades should be followed.

In general, for all motion weighing jobs, the scale must be located in track sufficiently free from curves adjacent to the scale that cars can straighten out to a smooth forward motion before they are weighed.

Tonnage Control

The problem of tonnage control, or maintaining a check between tipple and railroad weights, is one that makes scale men shudder. To them this universal problem is especially grievous because they know that when it becomes serious enough for a coal-mine operator to begin worrying, the shortage is so great that it is virtually impossible for the weighing equipment to be responsible. Nevertheless, because the scale is the most obvious thing on the premises to suspect, scale men find themselves in the middle and on the defensive.

This phase of the discussion may be prefaced with the statement that 30 years of experience weighing coal up and down the bituminous fields shows that a certain degree of shortage between tipple and railroad weights is normal, that it is against nature for the two weights to check and that least of all is it natural for tipple weights to run ahead of railroad weights. The normal shortage is from 0.5 to 0.75 per cent; rarely less. If more than that, one who knows his way around a coal mine can, if given the opportunity, do something about it.

Shortage figures greater than those just mentioned are common, of course; the most extreme case in my experience being 8 per cent—an instance, apparently, of a coal mine working at least two full days a month without having coal to show for it. Regarding such, no coal-mine operator has heard this from a scale man before, perhaps, but it is not original with me: If the scale is responsible for shortage of 1.5 per cent or more, the services of a scale expert are unnecessary to determine if something is wrong with it. It will be obvious to the most casual observer, for the scale literally will be falling apart.

Before going into details, it is perhaps apropos to say that the tin-ear scale men turn toward complaints of loss of coal when shortages appear is based not only on what has just been said but also on the blunt fact there is no loss of coal. For, if the tipple scale is weighing in excess, the coal said to be lost is really still in the mine, and if the tipple scale is weighing correctly when railroad weights turn up short, the coal is still on the premises between the tipple scale and the loading point. It cannot be anywhere else. What is lost, of course, is the pay-off on tipple records for the tonnage that subsequently does not appear in the invoices based on railroad weights, but the coal itself still is available. The so-called loss is nothing more nor less than the result of circumstances that have the same effect in the end as padding the tipple records.

Running down the causes of shortage between tipple and railroad weights is a not uncommon item of service furnished to the industry by men in the weighing-machinery business. We stick firmly to the principle, however, that the primary job is to weigh correctly the coal that comes to the scale, considering what happens to it afterward to be a feature of mine operation that cannot be entered into without invading the proper responsibilities of the mine operator. Some common causes of shortage may be itemized and methods of correction suggested.

Tare Weight Control—A common cause of discrepancy between tipple and railroad weights is inadequate tare weight control. The usual practice is to use one or more average tare weights, depending upon the types of cars used for hauling. Unfortunately, it usually happens that the tare weight fixed is too low. One contributing reason is inadequate sampling of cars to be weighed in establishing the tare weight. For so important a figure, it seems strange to a scale man that miners will establish it by weighing a relatively few samples usually no more than 10 per cent or less of the cars in use. The correct answer to how many cars should be weighed is: all of them. The justification for that apparently extreme number is that any figure derived from a lesser quantity has a chance to be wrong. The probability is the same, of course, that a figure derived from a small sample will be too heavy as too light, but tare weights that are too large tend to reduce the apparent shortage, and, thus, we never hear of them. In every case the forces of nature operate to make the established tare weight too light, the visible effect of which is a practical padding of the tipple sheet.

Another contributing factor which confounds scale men is the practice of cleaning out the cars slick as a whistle before they are weighed to establish the average tare. To scale men it is obvious, as it must be to anyone who gives it the slightest thought, that the tare weight so established cannot be valid any longer than is required to run the first trip out of the mine. Cars used for coal that is only moderately wet, that stands in the open or is hauled relatively long distances outside inevitably retain coal that packs in the bottom and on the sides and adds fiction to the tipple records with results as stated.

In some regions the variation in average weight is seasonal. Whether or not this is so, common sense dictates that the average tare should be checked or tested frequently. To the question, "How frequently?" do not be astonished if a scale man makes himself dogmatic that once a month is often enough. Certainly it should be the first thing tested any time an operator finds himself with a railroad shortage worth worrying about. It is about as certain as sunrise that the condition cannot be remedied by testing the scale.

Two simple remedies for the tare-weight difficulty may be suggested. The first is to weigh empty cars in their normal condition as they are used for hauling coal. For that remedy the best that can be said is that it is simple. I know and understand as well as anyone that it is not, or has not, been practical. A second remedy both practical and simple is to put a dump hand with a shovel to cleaning out each car each time as it comes from the dump. In most instances it will be the best investment a coal-mine operator can make in day labor and coal shovels. Do not, however, follow in the steps of one coal operator to whom this idea was suggested. He put a man to cleaning out the empties, sure enough, and the cleaning operation was supervised and carried out with consummate zeal. The only thing wrong was that the empty track was immediately alongside the loaded track, and the coal removed from the empties was shoveled over on top of loads coming up to the scale to be weighed. He did not come out well.

Here may be sounded a warning. The practice of marking each car with its tare weight and using individual tare weights for establishing the quantity of coal is not yet common, but it has been found in enough instances to justify anticipation of its growth. Whether the practice contributes to relief against the padding of tipple records is doubtful, but even if it does it is getting relief the hard way. The argument for it is specious, and its general use will only add to the general discontent. Mine operators will be prudent in hedging against development of the practice.

Diversion—Much apparent difference between tipple and railroad tonnage derives from loose accounting for coal and refuse taken out between the tipple scale and the loading point. Usually some attempt is made to account for the coal diverted for houses and power, and for refuse removed. In recent years, improvement in methods and equipment for the purpose is noticeable, but under the best circumstances they rarely justify complete confidence in the results.

Theft and Loss in Transit—Commonly the idea is held that much of the shortage is due to theft or loss in transit between the loading point and weighing point on the railroad, especially if the coal must be hauled a considerable distance in the railroad cars before it can be weighed. That some loss of the kind occurs is inevitable, and certainly cases of exceptional loss due to those causes have occurred, but it is equally certain that all the coal said to be lost cannot possibly be stolen or strewed along the right of way. It is more probable that the coal never got to the railroad cars in the first place.

Railroad scales are instruments of interstate commerce. Although not perfect, they nevertheless are closely supervised by trained personnel, and systematic checks between weighing points by the reweighing of cars are made by agencies established for the purpose. The agreement is close enough and universal enough to justify confidence in comparative infallibility. That is to say, reasons are ample for a bad railroad weight now and then, but that all or any considerable portion of weights over a period of time are bad is out of the question. It simply does not happen.

Loss of Moisture—Some of the apparent discrepancy between tipple and railroad tonnage undoubtedly is due to loss of moisture by evaporation or actual leakage from cars if coal is exceptionally wet. I have seen cars lose as much as 300 lb. standing on a scale while a man was trying to weigh them. This phase, I think, may be passed over lightly. The effects are obvious, the causes well known and, generally speaking, adequate provision for it is made in railroad tariffs, water allowances and otherwise.

Tracing Leaks

To scale men engaged in furnishing equipment and maintenance service to the coal-mining industry, the ubiquitous problem of maintaining agreement between tipple and railroad tonnage has a definite pattern. The user of the Diogenes Scale Mfg. Co. equipment sometimes around the tenth of the month comes up with a complaint about tonnage shortage. He never says how much shortage in how much tonnage, and seldom goes into any of the other practical circumstances, but he is sure the scale is wrong. Such complaints are not taken lightly, because we know that when the shortage becomes bad enough for the man to become articulate about it, the chances are he should have complained quite a while sooner.

I have heard the equipment of manufacturers, including our own, roundly cursed, the general idea being that before the equipment was procured there was no trouble with tonnage control, while nothing but trouble occurred after it was procured. The reason, of course, is simple. The scale man usually finds that the trouble was always there but not discovered until equipment good enough for the purpose became available.

The clear pattern of such complaints makes for a clear and usually sure pattern for handling them. Each outfit, I suppose, has its own methods, but our own private ritual is simple and, as there is no secret about it, the method may as well be outlined. Most of it can be handled as well by the coal-mine operator as by a scale man anyway. Each man is coached to develop certain inquiries and to follow certain instructions. The schedule of operations is:

1. When were cars last weighed for tare?

2. Was the tare weight increased or decreased and how much?

3. How many cars a month are weighed (calculate the deficiency per car)?

4. How much refuse thrown out, and is it docked from the tipple records (ask the superintendent)?

5. Ask the same question of the tipple boss (the superintendent and the tipple boss seldom agree, but the latter usually has the closer answer).

6. Ask the same question of the man responsible for disposal of the refuse (if the superintendent and the tipple boss agree the answer usually is correct unless both disagree with the man who disposes of the refuse, in which case the odds favor the last having the better answer).

7. Check the accounting for coal diverted for house and power use.

8. Calculate the percentage the scale has to be off to produce the alleged discrepancy.

9. With the information thus developed, if the discrepancy cannot be reconciled to closer than 0.5 per cent, examine and test the weighing outfit thoroughly.

10. In the absence of obvious evidence of physical derangement, damage or lack of repair that might cause a discrepancy of greater than 0.5 per cent, discard all the information obtained by local inquiry and go after the answers yourself.

Believe me, the routine can and does fix tonnage shortages without a hand being put to the scale.

Sources of Service

Whenever service on weighing equipment is needed, using any but the best is poor economy. I am sorry to have to say that good scale men are at a premium and those that are available are overworked. The woods are full of scissors grinders whose status on the income tax rolls is evidence of the general soundness with which scale manufacturers build weighing machinery. They prosper because the weighing machinery they get paid for fixing did not need fixing anyway and, of course, operators are left with the tonnage leaks that caused the disturbance. Everybody loses but the scissors grinders.

Variety in equipment is such that an operator requiring scale service should satisfy himself that the man hired for the job, if he is not an agent of the manufacturer, is qualified by the manufacturer to perform the service. The facts can be established with one exchange of correspondence, either by letter or telegraph, with the manufacturer; or the secretary of the National Scale Men's Association will know if an agency is one of established reputation.

Finally, scale men are of a craft apart. Association with the immutable law of gravity does things to them. Through an automatic process of elimination those that survive are hardheaded, stubborn, durable men who know no compromise between right and wrong. They may not be combative on the point; nevertheless, deep in the consciousness of each is the motivating principle: a certain amount of trouble is essential to prove that a weighing routine is properly handled and the absence of trouble proves only that the operator is being imposed upon. In the coal-mining business in particular, the absence of weight disputes proves only that a mine operator is giving away so much coal nobody will argue with him. The fact may be deplorable, but it cannot be ignored that a coal-mine operator needs a scale man worse when he thinks he is out of trouble than when he is in it.

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, shall 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, provided 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 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'S ROLL OF HONOR

★

We honor and we are proud of the following members of the Illinois Mining Institute who are in the Armed Forces of the United States. We have endeavored to keep the list correct. Should any name or names be omitted, you will please advise your Secretary at once in order that the list may be complete.

★

Major L. S. Ahlen
Major Harold C. Brown
Sgt. Bart Campbell
★ Lt. J. K. Childs
W. J. Dodd, M. M. 1/c
Lt. H. D. Freeman
Lt. (j.g.) Richard Y. Fuller
Lt. R. G. Harmon
John E. Jones, Jr., EM 2/c, USNR
Col. John L. Leidenheimer
Capt. Rolf Lindenhayn, Jr.
Lt. Thomas Linton
Cpl. Robert R. Lipe
Ensign Fred Main
Capt. John P. Marlin
Lt. (j.g.) D. B. Mikesell
Ensign Robert N. Morris
Major T. P. Ross
Lt. Theodore J. Schlitt, USNR
T/5 Robert M. Stephens

★ Killed in action.

ILLINOIS MINING INSTITUTE

LIFE MEMBERS

BALDWIN, L. W., Pres. & Chief Exec. Officer................ Missouri Pacific Lines, Mo. Pac. Bldg., St. Louis 3, Mo.

BALL, CLAYTON G................Paul Weir Co., 307 N. Michigan Ave., Chicago 1, Ill.

BARROW, W. E................Joy Manufacturing Co., Franklin, Penn.

BROOKS, C. W., Contracting Engineer................53 W. Jackson Blvd., Chicago 4, Ill.

BUCHANAN, D. W., Pres................Old Ben Coal Corp., 230 S. Clark St., Chicago 4, Ill.

BUDD, RALPH, Pres................Burlington Lines, 547 West Jackson Blvd., Chicago 6, Ill.

BUTCHER, FRED E., Pres................ War Hemp Industries, Inc., 208 S. La Salle St., Chicago 4, Ill.

CAMPBELL, GEORGE F., Vice Pres................ Old Ben Coal Corp., 230 S. Clark St., Chicago 4, Ill.

DEVONALD, D. H., Vice Pres. in Chge. of Oper................ Peabody Coal Co., 231 S. La Salle St., Chicago 4, Ill.

DUNCAN, W. M., Pres................Duncan Foundry & Machinery Co., Alton, Ill.

GARCIA, JOHN A................Allen & Garcia Co., 332 S. Michigan Ave., Chicago 4, Ill.

GEROW, T. G., V.-P................Truax-Traer Coal Co., 310 S. Michigan Ave., Chicago 4, Ill.

GREEN, ARTHUR C., Sales Mgr................ Goodman Mfg. Co., 4834 S. Halsted St., Chicago 9, Ill.

GREEN, JOS. G., Asst. Sales Mgr................ Philco Corp., Storage Battery Div., Trenton 7, N. J.

HARRINGTON, GEORGE B., Pres................ Chicago, Wilmington & Franklin Coal Co., 332 S. Michigan Ave., Chicago 4, Ill.

HARRIS, ALLYN, Pres................Cardox Corp., 307 N. Michigan Ave., Chicago 1, Ill.

HAYDEN, CARL T., Gen. Mgr................ Sahara Coal Co., 59 E. Van Buren St., Chicago 5, Ill.

HITT, JOS. E., Vice Pres................Walter Bledsoe & Co., Arcade Bldg., St. Louis, Mo.

JENKINS, G. S., Gen. Supt................ Consolidated Coal Co., Railway Exchange Bldg., St. Louis, Mo.

JENKINS, S. T................Goodman Mfg. Co., 322 Clark Ave., St. Louis, Mo.

JENKINS, W. J., Pres................ Consolidated Coal Co., Railway Exchange Bldg., St. Louis, Mo.

JENKINS, WM. J., II................Consolidated Coal Co., Lymar Hotel, Herrin, Ill.

JOHNSTON, W. A., Pres................ Illinois Central System, 135 E. Eleventh Pl., Chicago 5, Ill.

JONES, JOHN E................Old Ben Coal Corp., West Frankfort, Ill.

KEELER, E. R., Pres................ Franklin County Coal Corp., 135 S. La Salle St., Chicago 3, Ill.

KNOIZEN, A. S................Joy Manufacturing Co., Franklin, Penn.

LEACH, B. K., Pres................ Egyptian Tie & Timber Co., 1803 Railway Exchange Bldg., St. Louis, Mo.

McCOLLUM, H. C................Allen & Garcia Co., 332 S. Michigan Ave., Chicago 4, Ill.

McFADDEN, GEORGE C................408 Elmore, Park Ridge, Ill.

MORROW, J. D. A., Pres....Joy Mfg. Co., Franklin, Penn.

MOSES, HARRY M., Pres....
H. C. Frick Coal Co., 1322 Frick Bldg., Pittsburgh, Penn.

MUELLER, FRANK E., Pres....
Roberts & Schaefer Co., 307 N. Michigan Ave., Chicago 1, Ill.

MULLINS, T. C., Pres....
Northern Illinois Coal Corp., 310 S. Michigan Ave., Chicago 4, Ill.

PEABODY, STUYVESANT, Pres....
Peabody Coal Co., 231 S. La Salle St., Chicago 4, Ill.

PFAHLER, F. S., Pres....Superior Coal Co., 400 W. Madison St., Chicago 6, Ill.

POWERS, F. A....Hulburt Oil & Grease Co., Box 21, Peoria, Ill.

PRUDENT, NORMAN....Centralia Coal Co., Centralia, Ill.

ROSING, BORGE, Vice Pres....
West Va. Steel & Mfg. Co., Box 118, Huntington 6, West Virginia

RYAN, JOHN T., Gen. Mgr....
Mine Safety Appliances Co., Braddock, Thomas & Meade Sts., Pittsburgh, Penn.

SCHONTHAL, B. E., Pres....
B. E. Schonthal & Co., Inc., 28 E. Jackson Blvd., Chicago 4, Ill.

SCHONTHAL, D. C....
West Virginia Steel & Mfg. Co., Box 118, Huntington 6, West Virginia

SCHONTHAL, JOSEPH, Sec....
B. E. Schonthal & Co., Inc., 28 E. Jackson Blvd., Chicago 4, Ill.

SCHULL, B. H....Binkley Mining Co., Box 1140, Terre Haute, Indiana

STEVENS, E. F....Binkley Mining Co., Railway Exchange Bldg, St. Louis, Mo.

STOVER, HOLLY, Pres....
Chicago & Eastern Illinois RR., 332 S. Michigan Ave., Chicago 4, Ill.

TAYLOR, H. H., JR...Franklin County Coal Corp., 135 S. La Salle St., Chicago 3, Ill.

THOMAS, T. J., Pres....Valier Coal Co., 547 W. Jackson Blvd., Chicago 6, Ill.

TIGRETT, I. B., Pres...Gulf, Mobile & Ohio RR, 104 St. Francis St., Mobile 13, Ala.

TITUS, A. P., Pres....Illinois Terminal R.R. Co., 710 N. 12th Blvd., St. Louis 1, Mo.

TREADWELL, HARRY A., Vice Pres....
Chicago, Wilmington & Franklin Coal Co., 332 S. Michigan Ave., Chicago 4, Ill.

TRUAX, A. H., Pres....Truax-Traer Coal Co., 310 S. Michigan Ave., Chicago 4, Ill.

WALKER, HAROLD L., Head of Dept., Dept. Mining & Metallurgical Engineering,
Univ. of Ill., 209 Transportation Bldg., Urbana, Ill.

WANNER, E. W., Vice Pres....
Hulburt Oil & Grease Co., Erie & Trenton Ave., Philadelphia, Penn.

WARE, LOUIS, Pres....
International Agricultural Corp., 20 N. Wacker Dr., Chicago 6, Ill.

WEIR, PAUL....Paul Weir Co., 307 N. Michigan Ave., Chicago 1, Ill.

WHITE, HUGH, Pres....
Dist. 12, U.M.W.A., United Mine Workers Bldg., Springfield, Ill.

WOODS, HENRY C., Chmn. of Bd....
Sahara Coal Co., 59 E. Van Buren St., Chicago 5, Ill.

ZELLER, HARRY A....1434 Fifth Avenue, Huntington, West Virginia

HONORARY MEMBERS

GOALBY, JOHN F. .... 923 Kinsted St., Morris, Ill.

JEFFERIS, J. A...Illinois Terminal Railroad Co., 710 N. 12th Blvd., St. Louis 1, Mo.

JENKINS, W. J., Pres. ....
Consolidated Coal Co., Railway Exchange Bldg., St. Louis, Mo.

McAULIFFE, EUGENE, Chmn. of the Bd. ....
Union Pacific Coal Co., 1416 Dodge St., Omaha, Neb.

MOSES, THOMAS .... 123 North Franklin St., Danville, Ill.

WEISSENBORN, F. E., Asst. Comm. ....
Illinois Coal Oper. Assn., 4266 Arsenal St., St. Louis, Mo.

SCHOLARSHIP MEMBERS

S LIPE, ROBERT R., CPL. (Peabody Scholarship) ....
16121076, Btry. A., 53 F. A. Bn., APO 6, c/o P.M., San Francisco, Calif.

S MORRIS, ROBERT N., ENSIGN (IMI Scholarship) ....
U. S. Marine Corps, 319 West O'Gara St., Harrisburg, Ill.

S STEPHENS, ROBERT M., T/5 (Peabody Scholarship) ....
36949843, Co. A, 18th Engr., C Bn., B.A.A.F., Blythe, Calif.

ACTIVE MEMBERS

ACKERMAN, ROBT. .... Consolidated Coal Co., Staunton, Ill.

ADAMS, R. L., Gen. Supt. .... Old Ben Coal Corp., West Frankfort, Ill.

ADAMS, WALTER G., Indust. Engr. ....
Central Illinois Public Service, P. O. Box 533, Springfield, Ill.

ADAMS, W. G., Pres. .... Dooley Bros., 1201 S. Washington St., Peoria, Ill.

AGEE, ERNEST B. ....
Indiana Coal Producers Assoc., 524 Opera House Bldg., Terre Haute, Ind.

S AHLEN, L. S., MAJOR .... 27th Inf., APO 25, c/o P.M., San Francisco, Calif.

AHLGREN, GORDON S., V.-P. ....
Buettner Shelburne Machine Co., Inc., S. Third & Minshall Sts., Terre Haute, Ind.

AIKEN, J. MARSHALL, Engr. ....
Freeman Coal Mining Co., Seymour Coal Mining Co., Herrin, Ill.

AITKEN, W. I., Slsmn. .... Dooley Bros., 1201 S. Washington St., Peoria, Ill.

ALBERS, H. A., Dist. Rep. ....
Philco Corp., Storage Battery Div., 2024 Railway Exch. Bldg., St. Louis 1, Mo.

ALFORD, NEWELL G. .... 314 S. Homewood Ave., Pittsburgh 8, Penn.

ALLAN, HARRY .... Superior Coal Co., Gillespie, Ill.

ALLEN, CLARENCE, Mine Mgr. ....
Standard Coal Mng. & Converters Corp., Carlinville, Ill.

ALLEN, W. T. .... Hagerty Bros. Co., 927 S. Washington St., Peoria, Ill.

ALLING, S. J. .... Coal Age, 520 N. Michigan Ave., Chicago 11, Ill.
ALVERSON, RALPH, G. S. .... Carney Coal Co., Harrisburg, Ill.
ANDERSON, E. C., Sales Mgr. ....
Kensington Steel Co., 505 Kensington Ave., Chicago 28, Ill.
ANDERSON, L. A., Repr. ....
Goodyear Tire & Rubber Co., 350 N. Ogden Ave., Chicago, Ill.
ANDERSON, MAT. Bituminous Casualty Corp., Cleaveland Bldg., Rock Island, Ill.
ANDERSON, S. A., Field Repr. ....
Goodyear Tire & Rubber Co., 107 E. Gaskins St., Harrisburg, Ill.
ANDERSON, WALTER, Supt. .... Mine Rescue Station, 503 E. Main St., Benton, Ill.
ANSTEAD, JOE .... Templeton Coal Co., Sullivan, Ind.
APPUHN, A. J., Pres. .... The Appuhn Co., 210 E. Main, DuQuoin, Ill.
ARMSTRONG, D. A. .... Central Ill. Pub. Serv. Co., Beardstown, Ill.
ARMSTRONG, E. R. .... Equitable Powder Co., Collinsville, Ill.
ARNOLD, F. W. Broderick & Bascom Rope Co., 8909 Mority Ave., Brentwood, Mo.
ARNOLD, MARK R. ....
810 W. Washington Blvd., c/o A. Leschen & Sons Rope Co., Chicago 7, Ill.
ARONSON, A. C. ....
U. S. Sanitary Specialties Co., 435 S. Western Ave., Chicago 12, Ill.
AUSTIN, W. J., Dir. of Purchases .... Hercules Powder Co., Wilmington, Delaware
BAGWILL, GEORGE, State Mine Inspector .... 506 N. Main St., Harrisburg, Ill.
BAILEY, FRED J., Dir. of Safety ....
Cardox Corp., 307 N. Michigan Ave., Chicago 1, Ill.
BAILEY, WILLIAM H., Mine Mgr. ....
Old Ben Coal Corp., 508 S. Emma St., Christopher, Ill.
*BALDWIN, L .W., Pres. & Chief Exec. Off. ....
Missouri, Pacific Lines, Missouri Pacific Bldg., St. Louis 3, Mo.
BALDWIN, RICHARD, Pres. ....
Midwest-Radiant Corp., 220 N. Fourth Street, St. Louis 2, Missouri
*BALL, CLAYTON G. ....
c/o Paul Weir Company, 307 N. Michigan Ave., Chicago 1, Ill.
BARGMAN, WALTER .... Sahara Coal Co., Harrisburg, Ill.
BARKER, CHAS. W. .... 1113 N. State St., Marion, Ill.
BARLOW, J. E. .... Goodman Mfg. Co., 1052 Fayette St., Springfield, Ill.
BARNES, F. A., Industrial Serv. Rep. ....
Standard Oil Co., 1524 W. Wood St., Decatur, Ill.
BARNETT, W. T., Sls. Mgr. ....
Capitol Coal & Coke Co., Arcade Bldg., St. Louis 1, Mo.
BARR, ROY E., V. P. in Chge. of Traf. ....
Illinois Central R. R., 135 E. 11th Place, Chicago 5, Ill.
*BARROW, W. E. .... Joy Manufacturing Co., Franklin, Penn.
BARTLETT, A. G. .... Austin Powder Co., West Frankfort, Ill.
BARTOSCH, WM., Special Coal Agt. ....
Chicago, Milwaukee, St. Paul & Pac. RR., 2003 Ry. Exch. Bldg., St. Louis 1, Mo.
BASKIN, E. D., Dist. Sls. Mgr. ....
The Upson-Walton Co., 737 W. Jackson Blvd., Chicago 6, Ill.

BASS, A. C.......I. B. Williams & Son, 180 N. Wacker Drive, Chicago 6, Ill.

BASSLER, A. H.......Illinois Powder Mfg. Co., 730 Pierce Bldg., St. Louis, Mo.

BASTMAN, I. T., Pres.......Supplies, Inc., 564 W. Adams St., Chicago 6, Ill.

BAUER, JOHN H., A.F.T.M.......
New York Central Railroad, 408 Pine St., St. Louis, Mo.

BAUMEISTER, H. E., Comm. Agt.......
Illinois Central Railroad, 601 Spivey Bldg., East St. Louis, Ill.

BAYLESS, I. N., Pres.......Union Pacific Coal Co., Union Pacific Bldg., Omaha, Neb.

BEACHAM, ROBT. K., Gen. Supt.......
Fairview Collieries Corp., 105 S. Meridian St., Indianapolis, Ind.

BEAUMONT, G. L.......Mine Timber, Cowden, Ill.

BECK, CLARENCE V., Sec'y..Florida Coal Co., 1104 Fullerton Bldg., St. Louis, Mo.

BECKER, FRED H., Electrician.......Peabody Coal Co., Taylorville, Ill.

BECKER, LESTER O., Sales Mgr.......
Utility Mine Equipment Co., 620 Tower Grove Ave., St. Louis, Mo.

BECKMAN, FRED W., Pres...Beckman Bros., 9141 Olive St. Road, St. Louis 5, Mo.

BEDA, P. W., V. P.......Old Ben Coal Corp., 230 S. Clark St., Chicago 4, Ill.

BEDDOE, A. H., Area Distr. Mgr.......
Solid Fuels Administration for War, 910 New Federal Bldg., St. Louis 1, Mo.

BEEBE, HAMILTON K.......
Essington, McKibben, Beebe & Pratt, 231 S. La Salle St., Chicago 4, Ill.

BEEMAN, N. J., Slsman.......Dooley Bros., 1201 S. Washington St., Peoria, Ill.

BELL, J. H.......Cardox Corporation, 307 N. Michigan Ave., Chicago 1, Ill.

BENNER, DALE A.......Gilbraltar Equip. & Mfg. Co., Alton, Ill.

BENNER, MRS. DALE A.......Gibraltar Equip. & Mfg. Co., Alton, Ill.

BERGMANN, EMMETT T.......
Industrial Products, 404 Paul Brown Bldg., St. Louis 1, Mo.

BERKEY, JERRY.......Jones-Laughlin Steel Co., 916 Shell Bldg., St. Louis, Mo.

BERNEY, W. HURLBURT, Resident Mgr.......
Walter Bledsoe & Co., 1481 Northwestern Bank Bldg., Minneapolis, Minn.

BEUSHAUSEN, F. W., Sec.-Treas.......
Walter Bledsoe & Co., 700 Merchants Bank Bldg., Terre Haute, Ind.

BIELER, FRED, Supt.......
Snow Hill Coal Corp., 410 Merchants Natl. Bank Bldg, Terre Haute, Ind.

BIGLER, W. P., Sales Mgr.......
Mining Machine Parts, Inc., 5707 St. Clair Ave., Cleveland, Ohio

BIGLEY, P. W.......
Centrifugal & Mech. Industries, Inc., 146 President St., St. Louis 18, Mo.

BIRD, BYRON M., Tech. Consultant.......Jeffrey Mfg. Co., Columbus 16, Ohio

BIRD, FREDERICK H., Combustion Engr.......
Binkley Coal Co., 230 N. Michigan Ave., Chicago 1, Ill.

BLAKE, ARTHUR.......Peabody Coal Co., 231 S. La Salle St., Chicago 4, Ill.

BLAKENEY, CHARLES.......State Mine Inspector, Route No. 6, Danville, Ill.

BLANKINSHIP, G. F., Sales Engr.......Egyptian Sales Agency, Murphysboro, Ill.

BLEDSOE, CHARLES, Chief Electrician.......Little John Coal Co., Victoria, Ill.

BLEDSOE, WALTER A., Pres.......... Walter Bledsoe & Co., 709 Merchants Bank Bldg., Terre Haute, Ind.

BLUTH, MARC G., Mgr., Chicago Office.......... National Coal Association, 307 N. Michigan Ave., Chicago 1, Ill.

BOBBISH, GEORGE, Sls. Engr.......... Rite-Way Oil & Sales Co., 417 N. Fourth St., Springfield, Ill.

BOBBISH, MICHAEL, Sls. Engr.......... Rite-Way Oil & Sales Co., 417 N. Fourth St., Springfield, Ill.

BOETTA, JOSEPH .... State Miners Examining Board, 800 N. Adams St., Gillespie, Ill.

BOLEY, CHARLES C.......... Illinois State Geological Survey, 205 Natural Resources Bldg., Urbana, Ill.

BOLT, WILLIAM..........Perry Coal Co., O'Fallon, Ill.

BONNEY, J. F..........Mt. Olive & Staunton Coal Co., Staunton, Ill.

BONTEMPS, CARL W., Engineer.......... Commonwealth Edison Co., Box 7, Taylorville, Ill.

BONTJES, JOHN H., Pres.......... The Citizens' Mng. & Sales Co., Central National Bank Bldg., Peoria, Ill.

BORGMANN, HENRY J., Pres., Treas.......... Commonwealth Coal & Ice Co., Inc., 2710 Brannon Ave., St. Louis 9, Mo.

BOSTON, R. S., Vice Pres.......... Alton & Southern R. R., 320 North Fourth St., St. Louis 2, Mo.

BOTTOMLEY, J. A..........Sahara Coal Company, Harrisburg, Ill.

BRADBURY, H. W..........Sparta, Ill.

BRADBURY, WILLIAM......Mechanization, Inc., Munsey Bldg., Washington, D. C.

BRADLEY, DON B., Field Supvr.......... Bitum. Coal Prod. Bd., Dist. No. 10, 1709 Whittier, Springfield, Ill.

BREWER, JACK H., Engr. Sales & Serv.......... Streeter-Amet Co., 4101 Ravenswood Ave., Chicago 13, Ill.

BRISCOE, L. E..........Fairview Collieries, 430 Big Four Bldg., Indianapolis., Ind.

BRISTOW, JAMES W., Sec.......... Illinois Coal Strippers Assn., Rm. 2330, 230 N. Michigan Ave., Chicago 1, Ill.

BROADWAY, J. W.....Bell & Zoller Coal Co., 307 N. Michigan Ave., Chicago 1, Ill.

BRODERICK, J. R., Div. Mgr.......... Central Illinois Public Serv. Co., 202 E. Main St., Marion, Ill.

*BROOKS, C. W..........Room 601, 53 W. Jackson Blvd., Chicago 4, Ill.

BROSSEAU, C. L., Mgr. Mines & Quarries.......... Mack Trucks, Inc., 3300 Wentworth Ave., Chicago, Ill.

S BROWN, MAJOR HAROLD C.......... 6th Port QH, T/C, APO 765, c/o Postmaster, New York, N. Y.

BROWNING, J. ROY, Pres.......... Freeman Coal Mining Corp., 120 W. Adams St., Chicago 3, Ill.

BRUMBAUGH, H. C..........U. S. Bureau of Mines, 116 Lawrence St., Benton, Ill.

BRYDON, A. A.......................E. J. Wallace Coal Co., 1205 Olive St., St. Louis 1, Mo.

*BUCHANAN, D. W., Pres.......Old Ben Coal Corp., 230 S. Clark St., Chicago 4, Ill.

BUCHANAN, J. H., Res. Mgr...Atlas Powder Co., 135 S. LaSalle St., Chicago 3, Ill.

BUCK, GEO. M., Auditor..........
Western Coal & Mng. Co., 1400 Missouri Pacific Bldg., St. Louis, Mo.

*BUDD, RALPH, Pres..................Burlington Lines, 547 Jackson Blvd., Chicago 6, Ill.

BULLINGTON, JACK..................Truax-Traer Coal Co., 53 W. Spruce, Canton, Ill.

BURGENER, CARL..Peabody Coal Co., Marion, Ill.

BURKE, WAYNE F..Ohio Oil Co., Robinson, Ill.

BURKEY, W. H..........
Gould Storage Battery Co., 2185 Railway Exch. Bldg., St. Louis, Mo.

BURKHALTER, C. H...Ohio Brass Co., 231 S. La Salle St., Rm. 1580, Chicago 4, Ill.

BURNELL, E. J., V. P..............Link-Belt Co., 307 N. Michigan Ave., Chicago 1, Ill.

BURRESS, S. J., Elect. Engr..............................Franklin County Coal Co., Herrin, Ill.

BURT, LOUIS B.....Lincoln Engineering Co., 2415 S. Michigan Ave., Chicago 16, Ill.

BUSCH, A. D..........................The W. S. Tyler Co., 7540 Lovella Ave., St. Louis, Mo.

BUSWINK, WILLIAM..Peru Deep Vein Coal Co., Peru, Ill.

*BUTCHER, FRED E., Pres..........
War Hemp Industries, Inc., 208 S. La Salle St., Chicago 4, Illinois

BUTCHER, R. W..Superior Coal Co., Gillespie, Ill.

BUTTERS, H. E., Mgr.........Sullivan Machinery Co., 4120 Clayton, St. Louis 10, Mo.

BYERS, J. G...................................Peabody Coal Co., 925 W. Main St., Taylorville, Ill.

CADY, GILBERT H..State Geological Survey, Urbana, Ill.

CAINE, K. E............................Goodman Mfg. Co., 1714 Liverpool St., Pittsburgh, Pa.

CALLAHAN, J. E.................J. E. Callahan C. & C. Co., 3924 Duncan, St. Louis, Mo.

CALLEN, A. C.........Dean College of Engineering, Lehigh University, Bethlehem, Pa.

CALVERT, W. J., Engr..Sahara Coal Co., Harrisburg, Ill.

CAMMACK, KIRK V.....U. S. Geological Survey, 413 Denham Bldg., Denver, Colo.

s CAMPBELL, SGT. BART..........
Medical Section, 12th Army Group, APO 655, c/o Postmaster, New York, N. Y.

CAMPBELL, C. E..............Shell Petroleum Corp., 6928 Plateau Ave., St. Louis, Mo.

CAMPBELL, C. H., A.T.F..........
Illinois Central Railroad Co., 111 N. Fourth St., St. Louis 2, Mo.

*CAMPBELL, GEO. F.................Old Ben Coal Corp., 230 S. Clark St., Chicago 4, Ill.

CAMPBELL, H. E., P. A.........Peabody Coal Co., 231 S. La Salle St., Chicago 4, Ill.

CAMPBELL, H. G..........
The Electric Storage Battery Co., 4613 S. Western Ave. Blvd., Chicago 9, Ill.

CAMPBELL, JAMES, Investigator..........
Dept. Mines & Minerals, R.R. No. 3, Springfield, Ill.

CAPE, SAM....Sahara Coal Co., Harrisburg, Ill.

CAPPS, GEORGE A...Capitol Coal & Coke Co., 1608 Arcade Bldg., St. Louis 1, Mo.

CAPPS, ROY....U. S. Bureau of Mines, 201 Post Office Bldg., Vincennes, Ind.

CARTER, C. D....Carter Coal Co., Madisonville, Ky.

CARTER, DALE, Supt....Mine No. 2, Bell & Zoller, Zeigler, Ill.

CARTWRIGHT, HARVEY....Indiana Coal Operators Assn., Terre Haute, Ind.

CASE, H. N., Gen. Supt....Little Sister Coal Corp., Canton, Ill.

CASSADY, PETER A., Gen. Mgr....
Pac Lubricating & Service Co., 1500 S. Western Ave., Chicago 8, Ill.

CASSIDY, S. M., V. P....Consolidation Coal Co., Jenkins, Letcher Co., Ky.

CERAR, P. J....South Mine Co., Carlinville, Ill.

CHAPMAN, CLAUDE....Bituminous Casualty Corp., 720 Frye Ave., Peoria, Ill.

CHAPMAN, F. A....Lubrication Sales Dept., The Ohio Oil Co., Robinson, Ill.

CHARTRAND, J. S., Gen. Frt. Agt....
Gulf Mobile & Ohio Railroad, 721 Olive St., St. Louis 1, Mo.

CHASE, RALPH E....Chase Welding Supply Co., Benton, Ill.

CHEASLEY, THOS. C., Fuel Engr....
Sinclair Coal Co., 114 West 11th St., Kansas City, Mo.

CHEVALIER, J. H....National Elect. Coil Co., 8001 W. Main St., Belleville, Ill.

CHICK, W. R....U. S. Bureau of Mines, 422 E. Church St., Benton, Ill.

CHOLET, HAROLD F., Trfc. Mgr....
Belleville Fuels, Inc., 407 N. Eighth St., St. Louis 1, Mo.

CHOLLET, M. J., Dist. Mgr....
Mack-Int'l Motor Truck Corp., 2350 Chouteau Ave., St. Louis 3, Mo.

CHRISTIANSEN, ANDREW J., Sec....
Northern Illinois Coal Trade Assn., 310 S. Michigan Ave., Chicago 4, Ill.

CHRISTIANSON, C. ....
Sullivan Machinery Co., 860 S. MacArthur Blvd., Springfield, Ill.

CLARKE, H. W., Pres....Mealpack, Inc., 152 W. 42nd St., New York, N. Y.

CLARKSON, C. E....Clarkson Mfg. Co., Nashville, Ill.

CLARKSON, JOHN L., Pres....Clarkson Mfg. Co., Nashville, Ill.

CLAYTON, R. R....Hercules Powder Co., 332 S. Michigan Ave., Chicago 4, Ill.

CLEMENS, ROSS D., Div. Frt. Agt....
The Pennsylvania Railroad, 1010 Syndicate Trust Bldg., St. Louis 1, Mo.

COASH, CARL J., Dist. Mgr....
McGraw-Hill Publishing Co., 3615 Olive St., St. Louis 8, Mo.

COFFEY, E. J., Sls. Mgr....Binkley Coal Co., St. Louis, Mo.

COLCLESSER, R. Y....
E. I. du Pont de Nemours & Co., 3300 College Ave., R. R. No. 4, Terre Haute, Ind.

BARTOSCH, WM., Special Coal Agt....

COLLINS, J. B., Pres.................Collins Timber Co., 1218 Olive St., St. Louis 3, Mo.

COLQUHOUN, ALEX..Peabody Coal Co., Taylorville, Ill.

CONLON, J. A., Spec. Repr...
U. S. Rubber Co., 440 W. Washington St., Chicago 6, Ill.

CONWAY, C. C., Chief Elect......................................Consolidated Coal Co., Herrin, Ill.

CONWAY, LEE...Consolidated Coal Co., Staunton, Ill.

COOK, JOHN H...Union Colliery Co., Dowell, Ill.

COOK, WALTER............Central Mine Equip. Co., 4520 Enright Ave., St. Louis, Mo.

COOKE, WILLIAM H., Pres...
Little Sister Coal Corp., 310 S. Michigan Ave., Chicago 4, Ill.

COOPER, HARRY C., City Frt. Agt..
Rock Island Lines, 817 Chemical Bldg., St. Louis 1, Mo.

CORKERY, JOHN F...........Corkery Coal Co., 4640 Chippewa St., St. Louis 16, Mo.

COTTON, HOMER S.....................Midvale Coal Co., 721 Olive St., St. Louis 1, Mo.

COX, R. L..Jeffrey Mfg. Co., Columbus, Ohio

CRAIG, W. G..Joy Mfg. Co., Box 404, Centralia, Ill.

CRAWFORD, J. G., Gen. Mgr...
Valier Coal Co., 547 W. Jackson Blvd., Chicago 6, Ill.

CREWS, GARRETT B., Asst. to Supt.........................Union Colliery Co., Dowell, Ill.

CROAK, JAMES M., Coal Serv. Agt...
Illinois Central Railroad, 111 N. Fourth St., St. Louis 2, Mo.

CROSS, H. A..Box 26, Sandborn, Indiana

CROTHERS, ARTHUR.................Fraser Label Co., 732 Federal St., Chicago 5, Ill.

CROWDER, GORDON G., Asst. to V. P..
Peabody Coal Co., 231 S. La Salle St., Chicago 4, Ill.

CUNNINGHAM, M. F..............Goodman Mfg. Co., 809 S. Center, Terre Haute, Ind.

CURRAN, GEORGE W., Pres...
Curran Coal & Appliance Co., 2772 Gravois Ave., St. Louis 18, Mo.

CURTIS, G. C..Dept. Mine & Minerals, Oblong, Ill.

DAHLBERG, T. L............Hockaday Paint Co., 166 W. Jackson Blvd., Chicago 4, Ill.

DAKE, WALTER M., Pres...
Mining Machine Parts, Inc., 5707 St. Clair Ave., Cleveland 3, Ohio

DANKS, GENE H...
E. I. duPont de Nemours & Co., 1809 Casey Ave., Mt. Vernon, Ill.

DAUGHERTY, C. H., Salesman...
Linde Air Products Co., 230 N. Michigan Ave., Chicago 1, Ill.

DAVIDSON, J. S...................The Jeffrey Mfg. Co., 3015 Locust St., St. Louis 3, Mo.

DAVIES, JAMES, Pres. ....
Alton & Southern Railroad, 3105 Missouri Ave., P. O. Box 270, East St. Louis, Ill.

DAVIS, E. J., Dist. Mgr...
Gates Rubber Co., Ind. Div., 2701 Olive St., St. Louis 3, Mo.

DAVIS, IRA, Gen. Supt.
Terminal R.R. Assoc. of St. Louis, 1800 Market, St. Louis 3, Mo.

DAVIS, N. L. Link-Belt Co., 300 W. Pershing Rd., Chicago 9, Ill.

DAVIS, WM. H. Simplex Wire & Cable, 564 W. Monroe St., Chicago 6, Ill.

DAVISON, L. A. W. M. Hales Co., Benton, Ill.

DAWSON, HUGH Bethlehem Steel Co., 500 W. Monroe, Herrin, Ill.

DAY, CARL D., JR., Ch. Elect.
United Electric Coal Co's, Buckheart Mine, 308 W. Pine St., Canton, Ill.

DAY, MATTHEW, Mine Mgr. Mt. Olive & Staunton Coal Co., Staunton, Ill.

DEINES, FRED E. C. B. & Q. Railroad, 625 Frisco Bldg., St. Louis 1, Mo.

DERING, J. K., Exec. V. P. Dering Coal Co., Eldorado, Ill.

DETWILER, J. S., Dist. Engr. W. H. & L. D. Betz, 818 Olive St., St. Louis 1, Mo.

*DEVONALD, D. H., Vice Pres. in Chge. of Oper.
Peabody Coal Co., 231 S. La Salle St., Chicago 4, Ill.

DE VORE, STANLEY F., Mgr.
The White Motor Co., 4151 Forest Park Blvd., St. Louis, Mo.

DE WITT, C. S., P. A. C-W-F Coal Co., 332 S. Michigan Ave., Chicago 4, Ill.

DICKENS, GEORGE M., Mine Mgr.
United Electric Coal Co's., Box 87, Freeburg, Ill.

DICKINSON, A. W. American Mining Congress, Munsey Bldg., Washington, D. C.

DICKSON, S. A., Supvr. Fuel Economy
The Alton R.R., 609 E. Walnut, Bloomington, Ill.

DILLINGHAM, HERVIE, Ind'l.
Standard Oil Co., 1108 Lindell, West Frankfort, Ill.

DILLON, H. G., Mgr. Mng. Sec.
Westinghouse Elect. & Mfg. Co., East Pittsburgh, Pa.

DINN, T. J. Ohio Oil Co., West Frankfort, Ill.

DODD, A. F., Supt. United States Coal & Coke Co., R.F.D. No. 1, Georgetown, Ill.

S DODD, W. J., M.M. 1/c
2nd Det., 45th Bat., c/o Fleet Post Office, San Francisco, Calif.

DOLD, R. N., Slsmn.
Chicago Pneumatic Tool Co., 837 Ravenswood Ave., Evansville, Ind.

DONALDSON, R. F., Civil Engr.
United Electric Coal Co's., 230 West Lafayette St., Rushville, Illinois

DONIE, P. L. Little Betty Mining Corp., Linton, Ind.

DOOLEY, JAMES, Vice Pres. Dooley Bros., 1201 S. Washington St., Peoria, Ill.

DOWNS, FRANCIS J. Schramm, Inc., 2732 Wismer Rd., St. Louis, Mo.

DOZIER, JOS., Chief Elect. Peabody No. 58 Mine, Taylorville, Ill.

DRYSDALE, GEORGE W. Macwhyte Co., 228 South Desplaines St., Chicago 6, Ill.

DU BOIS, M. A. Post-Glover Electric Co., 221 W. Third St., Cincinnati, Ohio

DUCHECK, A. W., Salesman
Walter Bledsoe & Co., 1382 Arcade Bldg., St. Louis 1, Mo.

DUNCAN, ALEX, Asst. Supt. .... Superior Coal Co., Gillespie, Ill.

DUNCAN, A. W. .... Duncan Foundry & Machine Works, Inc., Alton, Ill.

DUNCAN, GEORGE, SR. .... Duncan Foundry & Machine Co., Alton, Ill.

DUNCAN, J. M., Vice Pres. .... Litchfield & Madison Railway, 1017 Olive St., St. Louis, Mo.

*DUNCAN, W. M. .... Duncan Fdry. & Machine Co., Alton, Ill.

DUNHAM, WM., Asst. Mines Mgr. .... Panther Creek Coal Co., 1613 E. Moffatt, Springfield, Ill.

DYER, J. L. .... Timken Roller Bearing Co., 3300 Lindell Blvd., St. Louis 3, Mo.

EADIE, GEORGE B., Supt. .... Sahara Coal Co., Harrisburg, Ill.

EADIE, JOHN, Safety Eng. .... Sahara Coal Co., Harrisburg, Ill.

EAGAN, ROD .... Goodman Mfg. Co., 4834 S. Halsted St., Chicago 9, Ill.

EDGAR, R. L. .... Watt Car & Wheel Co., Barnesville, Ohio

EDMONDS, ELMER, Inspector .... State at Large, Royalton, Ill.

EDWARDS, J. E. .... Peabody Coal Co., 218 W. Franklin, Taylorville, Ill.

EICHHORN, FRANK L., Secy.-Treas. .... DuQuoin Iron & Supply Co., Inc., DuQuoin, Ill.

ELDERS, C. F. .... Broderick & Bascom Rope Co., 4203 N. Union Blvd., St. Louis 15, Mo.

ELLIOTT, L. W. .... Broderick & Bascom Rope Co., 4203 N. Union Blvd., St. Louis, Mo.

ELLIS, H. J., Dist. Slsmgr. .... Franklin County Coal Corp., 317 N. 11th St., St. Louis 1, Mo.

ELLIS, HOWARD R., Slsmn. & Engr. .... Cardox Corporation, 316 N. Main St., Benton, Ill.

ELLWOOD, E. E., Asst. Dist. Sls. Mgr. .... Youngstown Steel Products Co., 432 Fairview Ave., Webster Groves, Mo.

ELSHOFF, CARL H., Pres. .... Mine B. Coal Co., 1301 Bates Ave., Springfield, Ill.

ELY, HOWARD L. .... Superior Coal Co., Gillespie, Ill.

EMRICK, J. A. .... Rail to Water Transfer, 7627 Cornell Ave., Chicago, Ill.

EQUITABLE POWDER MFG. CO. .... East Alton, Ill.

ERB, HENRY O. .... Coal Trade Assn. of Indiana, 632 Cherry St., Terre Haute, Ind.

ERBACHER, C. H. .... The Whitney Chain & Mfg. Co., 325 W. Huron St., Chicago, Ill.

ERIXSON, HARRY .... American Chain & Cable Co., 400 W. Madison St., Chicago 6, Ill.

ESSINGTON, T. G., Chief Counsel .... Illinois Coal Operators Assn., 231 S. La Salle St., Chicago 4, Ill.

EUBANKS, FRANK .... Old Ben Coal Corp., West Frankfort, Ill.

EVANS, CADWALLADER, JR., Gen. Mgr. .... Hudson Coal Co., Scranton, Pa.

EVANS, J. A., Mgr. .... Old Ben Coal Corp., 3615 Olive St., St. Louis 8, Mo.

EVANS, JOHN H., Supt. .... Wasson Coal Co., Harrisburg, Ill.

EVANS, O. M., V. P. .... Midwest-Radiant Corp, 220 N. Fourth St., St. Louis 2, Mo.

EXLINE, HAROLD, Engineer .... Little John Coal Co., Victoria, Ill.

FABER, PHIL .... Electric Coal Mining Mach. Co., 11 Franklin St., Danville, Ill.

FALCETTI, OSCAR, Supt. .... The Mine "B" Coal Co., Springfield, Ill.

FARRAR, E. C., Dist. Mgr. ....
American Cyanamid & Chemical Co., 20 N. Wacker Dr., Chicago 6, Ill.

FARRIMOND, JACK .... Peabody Coal Co., No. 58, Taylorville, Ill.

FERRELL, J. L. ....
Crescent Lubricating Co., 406 First National Bank Bldg., Huntington, W. Va.

FIELDS, RAY E. ....
Evansville Electric & Mfg. Co., 600 W. Eichel Ave., Evansville, Ind.

FIELDS, W. G. .... U. S. Bureau of Mines, 114 La Salle St., Peoria, Ill.

FINCH, F. E. ....
Centrifugal & Mech. Industries, Inc., 146 President St., St. Louis 18, Mo.

FIRMIN, W. H. .... Wyoming Tie & Timber Co., Metropolis, Ill.

FIRTH, B. H., Supt. .... Lumaghi Coal Co., Collinsville, Ill.

FISHER, PETER, Supt. .... Mine Rescue Station, Dept. Mines & Minerals, Benld, Ill.

FISHER, S. M. .... Superior Coal Co., Gillespie, Ill.

FITHIAN, G. W., Trans. Foreman ....
United Elect. Coal Co., 307 N. Michigan Ave., Chicago 1, Ill.

FITZGERALD, P. H. .... Allen & Garcia Co., 204 S. Grand Ave., East, Springfield, Ill.

FITZPATRICK, J. C., Area Distr. Mgr., S.F.A.W. ....
U. S. Dept. of the Interior, 1161 Merchandise Mart, Chicago 54, Ill.

FLEMING, JAMES R. ....
Mine Safety Appliances Co., 1012 W. Stoughton St., Urbana, Ill.

FLETCHER, J. H., Consulting Engr. .... 332 S. Michigan Ave., Chicago 4, Ill.

FLETCHER, J. R. .... J. H. Fletcher & Co., 332 S. Michigan Ave., Chicago 4, Ill.

FLETCHER, WILLIAM .... J. H. Fletcher & Co., 332 S. Michigan Ave., Chicago, Ill.

FLOOD, C. S. J., Trfc. Mgr. ....
Anheuser-Busch, Inc., 721 Pestalozzi St., St. Louis 18, Mo.

FOLLY, C. L. .... Cent. Ill. Pub. Serv. Co., Mattoon, Ill.

FORBES, CHARLES J. .... Frank Prox Co., 1201 S. First St., Terre Haute, Ind.

FORBES, W. H. .... National Safety Council, 20 N. Wacker Dr., Chicago, Ill.

FORD, CLEM C. .... Jeffrey Mfg. Co., 307 N. Michigan Ave., Chicago 1, Ill.

FORMAN, J. S. ....
Mt. Olive & Staunton Coal Co., 806 Laclede Gas Bldg., St. Louis, Mo.

FORSYTH, JAMES G., Pres. ....
Forsyth-Carterville Coal Co., 20 South Central, Clayton 5, Mo.

FORSYTH, WALTER R. .... Forsyth-Carterville Coal Co., Carterville, Ill.

FOSTER, JOHN R., Supt. Chicago, Wilmington & Franklin Coal Co., West Frankfort, Ill.

FRANKLIN, GORDON........Aikman Bldg., Marion, Ill.

FREEMAN, H. D........c/o Peabody Coal Company, Taylorville, Ill.

FREW, JOSEPH, Asst. Mine Mgr........Superior Coal Co., Gillespie, Ill.

FRIES, FRANK W., Arbitrator........Illinois Coal Operators Assn. & District 12 U.M.W.A., Gillespie, Ill.

FULKE, FRANK L........c/o Frank Prox Co., Terre Haute, Ind.

s FULLER, RICHARD Y., LT. (j.g.)........401640, Adv. Base Personnel Administration, Navy 128 F.P.O., San Francisco, Calif.

GALEENER, PERCY, Mng. Engr........Dering Coal Co., Eldorado, Ill.

GALLAGHER, W. A........U. S. Bureau of Mines, Vincennes, Ind.

GALLAND, J. H........American Steel & Wire Co., 208 S. La Salle St., Chicago 4, Ill.

GALT, MARTIN E., JR........The Howard Corp., Clayton, Mo.

GAMMETER, E........Paul Weir Co., 307 North Michigan Ave., Chicago 1, Ill.

*GARCIA, JOHN A........Allen & Garcia Co., 332 S. Michigan Ave., Chicago 4, Ill.

GARWOOD, THOMAS L........Chicago, Wilmington & Franklin Coal Co., West Frankfort, Ill.

GATELY, ALBERT..Republic Coal Co., Fullerton & Southport Ave., Chicago 14, Ill.

GAUEN, C. F...Egyptian Tie & Timber Co., Railway Exchange Bldg., St. Louis, Mo.

GEBHART, B. R., Vice Pres........Chicago, Wilmington & Franklin Coal Co., 332 S. Michigan Ave., Chicago 4, Ill.

GEHLSEN, R. G., Sales Engr........Mines Equipment Co., 4215 Clayton Ave., St. Louis 10, Mo.

GENTER, A. H........Duquesne Mine Supply Co., Pittsburgh, Pa.

*GEROW, T. G., Vice-Pres........Truax-Traer Coal Co., 310 S. Michigan Ave., Chicago 4, Ill.

GHARST, C. F., Mgr........C. F. Gharst Supply Co., P. O. Box 62, Terre Haute, Ind.

GIACHETTO, PETE........Superior Coal Co., Gillespie, Ill.

GIBSON, D. G., JR., Asst. Mgr........Crystal Fluorspar Co., Elizabethtown, Ill.

GILES, WM. S........Giles Armature & Electric Works, Marion, Ill.

GILGIS, W. L., Pur. Agent........Superior Coal Co., 1417 Daily News Bldg., Chicago 6, Ill.

GILL, WALTER C........Coal Producers Assn. of Ill., 129 Edgehill Court, Peoria, Ill.

GILLESPIE, EDWARD........Peabody Coal Co., Taylorville, Ill.

GIVEN, IVAN A., Editor........Coal Age, 330 W. 42nd St., New York 18, N. Y.

GLATTE, E. I........Gates Rubber Co., 2701 Olive St., St. Louis 3, Mo.

GLAZEBROOK, J. U........Peabody-Carter Processing Plant, Kincaid, Ill.

GLIDDEN, G. M........E. D. Bullard Co., 133 N. Sacramento Ave., Chicago 12, Ill.

†GOALBY, JOHN F........923 Kinsted St., Morris, Ill.

GODBY, J. K. ... American Brake Shoe & Foundry Co., P. O. Box 943, Huntington, W. Va.

GOLDMAN, WILLIAM ... Peabody Coal Co., Taylorville, Ill.

GOLLOGHER, C. J., Field Repr. ... Bitum. Coal Prod. Bd., Dist. No. 10, 904 W. Vine Street, Taylorville, Ill.

GOODWIN, C. L., Mine Supt. ... Sahara Coal Co., Harrisburg, Ill.

GORDON, G. B., P. A. ... Ingalls Iron Works, Birmingham, Alabama

GOURLEY, S. R., Sec. ... Mine "B" Coal Co., Box 311, Springfield, Ill.

GRAHAM, DON ... Socony-Vacuum Oil Co., Inc., P. O. Box 746, Trenton, Mich.

GRAHAM, K. W., Chief Clerk ... Freeman Coal Mining Corp., Herrin, Ill.

*GREEN, ARTHUR C. ... Goodman Mfg. Co., 4834 S. Halsted St., Chicago 9, Ill.

GREEN, HOWARD, Engineer ... Northern Illinois Coal Corp., 310 S. Michigan Ave., Chicago 4, Ill.

*GREEN, J. G., Asst. Sales Mgr. ... Philco Corporation, Storage Battery Div., Trenton 7, N. J.

GREEN, KENNETH ... 1301 Saw Mill Run Blvd., Pittsburgh, Pa.

GREEN, W. A., Electrician ... Sahara Coal Co., Harrisburg, Ill.

GREENAN, T. J., Gen. Supt. ... Panther Creek Mines, Inc., 1116 Ridgley Bldg., Springfield, Ill.

GREENE, D. W., Master Mech. ... Superior Coal Co., Gillespie, Ill.

GRIESEDIECK, HENRY, Gen. Mgr. ... American Pulverizer Co., 1249 Macklind Ave., St. Louis 10, Mo.

GRIEVE, J. A., Industl. Serv. Rep. ... Standard Oil Co., 11 S. 51st St., Belleville, Ill.

GRIFFEN, JOHN, Sales Engr. ... The McNally-Pittsburg Mfg. Corp., 1017 Bessemer Bldg., Pittsburgh 22, Penn.

GRIGGS, E. G., Sales Dept. ... The McNally-Pittsburg Mfg. Co., 307 N. Michigan Ave., Chicago 1, Ill.

GRIMES, J. R., Gen. Agent ... Fuel Traffic Dept., C. B. & Q. Railroad, 547 W. Jackson Blvd., Chicago, Ill.

GRIMMETT, O. C. ... c/o C-W-F Coal Co., Benton, Ill.

GROAT, E. T., Dist. Mng. Specialist ... General Elect. Co., 840 S. Canal St., Chicago 80, Ill.

GRONE, S. F. ... Consolidated Coal Co., Staunton, Ill.

GUDAUSKAS, TOM ... Mine Investigating Commission, 415 Stone St., Georgetown, Ill.

GUINEY, JAMES G., Supt. ... Franklin Cty. Coal Co. No. 5, Herrin, Ill.

GUST, M. J., Sales Dept. ... Mines Equipment Co., 4215 Clayton Ave., St. Louis 10, Mo.

HABERLEN, C. F. ... Bell & Zoller C. & M. Co., Zeigler, Ill.

HAIG, DONALD D., Sales ... Old Ben Coal Corp., 3615 Olive St., St. Louis 8, Mo.

HAIGH, H. W. ... Chicago Tube & Iron Co., 2531 W. 48th St., Chicago 32, Ill.

HALBERSLEBEN, PAUL, G. S. ... Sahara Coal Co., Harrisburg, Ill.

HALE, GEORGE A., Consulting Chemical Engineer ... 116-20 N. Fourth St., St. Louis 2, Mo.

HALES, W. M., Pres. ... W. M. Hales Co., 605 W. 116th St., Chicago 28, Ill.

HALL, GEORGE ... State Mine Inspector, 1809 S. Lincoln Ave., Springfield, Ill.

HALL, R. DAWSON....340 Burns St., Forest Hills, Long Island, N. Y.
HALLENBECK, C. F., V. P....
Southwest Supply Co., B-21 Railway Exchange Bldg., St. Louis 1, Mo.
HAMAN, MILES, Mgr....Crystal Fluorspar Co., Elizabethtown, Ill.
HANNA, C. W., Mgr....
Central Storage Battery Div., Philco Corp., 175 W. Jackson Blvd., Chicago 4, Ill.
HANNAFORD, FOSTER, Coal Officer....
Commonwealth Edison Co., 72 W. Adams St., Rm. 1628, Chicago 90, Ill.
HANSELMAN, J. A....Goodyear Tire Co., Springfield, Ill.
HARDSOCG, LESTER C....Hardsocg Mfg. Co., Ottumwa, Iowa
HARDY, JOHN W., Supt....Peabody Mine No. 9, 1220 W. Main St., Taylorville, Ill.
HARDY, WM....Peabody Coal Co., Taylorville, Ill.
S HARMON, RALPH G., LT....610 H. St., N. E., Washington, D. C.
HARRELL, C. L., V. P....Sterling Steel Casting Co., P. O. Box 66, East St. Louis, Ill.
HARRIMAN, G. W....Valier Coal Co., Valier, Ill.
*HARRINGTON, GEO. B., Pres....
Chicago, Wilmington & Franklin C. Co., 332 S. Michigan Ave., Chicago 4, Ill.
*HARRIS, ALLYN, Pres....Cardox Corporation, 307 N. Michigan Ave., Chicago 1, Ill.
HARRIS, JOE, Inspect. at Large....
Dept. Mines & Minerals, 811 S. Ledford St., Harrisburg, Ill.
HARRIS, JOHN A., Publisher....
Coal Trade Review & Solid Fuel Engr., Columbia, Mo.
HARRIS, JOSEPH....Russell Fork Coal Co. Inc., P. O. Box 173, Praise, Kentucky
HARRISON, BRAD, Sales Mgr....
Electric Supply Corp., 705 W. Jackson Blvd., Chicago 6, Ill.
HARVEY, HADLEY....Ohio Brass Co., 1414 S. E. First St., Evansville, Ind.
HASKELL, J. B....West Va. Steel & Mfg. Co., Huntington 6, West Va.
HASKINS, LEE....10 S. 29th St., Belleville, Ill.
HATLEY, BEN....Austin Powder Co., Box 177, Evansville, Ind.
HAYDEN, ANDREW F., Gen. Supt....
Standard Mining & Converters Corp., Box 152, Carlinville, Ill.
*HAYDEN, CARL T., Gen. Mgr....
Sahara Coal Co., 59 E. Van Buren St., Chicago 5, Ill.
HAYDEN, F. R....
E. I. du Pont de Nemours & Co., Inc., 1222 S. Sixth St., Springfield, Ill.
HAYWARD, T. Z....Jos. T. Ryerson & Son, Inc., 2558 W. 16th St., Chicago 80, Ill.
HAZEN, L. G....Socony-Vacuum Oil Co., Pinckneyville, Ill.
HEAP, PAT....General Electric Co., 112 N. Fourth St., St. Louis, Mo.
HEATH, R. R....Northern Illinois Coal Corp, 310 S. Michigan Ave., Chicago 4, Ill.
HECKWOLF, A. J., Slsmn....
Capitol Coal & Coke Co., 1608 Arcade Bldg., St. Louis 1, Mo.
HEINECKE, W. F., Pres....
Heinecke Coal & Material Co., 1940 S. Kingshighway, St. Louis 10, Mo.
HEISE, E. A....Union Wire Rope Corp., 111 N. Canal St., Chicago 6, Ill.
HELFINSTINE, R. J....
100 Natural Resources Bldg., Ill. Geological Survey, Urbana, Ill.

HENDERSON, J. R., Chairman........
Bituminous Coal Producers Bd. for Dist. No. 10, 105 W. Monroe St., Chicago 3, Ill.

HENDERSON, PHILUS C., Mine Mgr.........Truax-Traer Coal Co., Elkville, Ill.

HENDERSON, R. E., Gen. Supt.........Binkley Coal Co., Box 278, Bicknell, Ind.

HENSGEN, J. F.........U. S. Rubber Co., 2801 Locust St., St. Louis, Mo.

HEPBURN, R. J., P. A........
United Electric Coal Co., 307 N. Michigan Ave., Chicago 1, Ill.

HERBERT, C. A., Superv. Engr.........Bureau of Mines, Vincennes, Ind.

HERBERT, C. F.........Bituminous Casualty Co., Cleaveland Bldg., Rock Island, Ill.

HERMAN, JOHN.........Superior Coal Co., Gillespie, Ill.

HERRINGTON, M. K.........310½ West Amelia Ave., Tampa 3, Fla.

HERT, A. K...Snow Hill Coal Corp., Merchants Nat'l Bank Bldg., Terre Haute, Ind.

HEYD, W. J.........Hagerty Bros. Co., 927 S. Washington St., Peoria, Ill.

HICKS, H. N.......Truax-Traer Coal Co., No. 7 Signal Hill Blvd., East St. Louis, Ill.

HIGGINS, T. C., Assoc. Mine Insptr........
Bureau of Mines, 2316 Lowell Ave., Springfield, Ill.

HIPPLER, F. R.........Ohio Carbon Co., 12508 Berea Rd., Cleveland, Ohio

*HITT, JOS. E., V. P.........Walter Bledsoe & Co., Arcade Bldg., St. Louis, Mo.

HOEHN, R. A.........Superior Coal Co., Gillespie, Ill.

HOEHN, ROY O., Mng. Engr.........Superior Coal Co., Gillespie, Ill.

TOM HOGAN ....
Mill Supply & Machinery Co., 2910-12 Washington Ave., St. Louis, Mo.

HOHN, H. L., Storekeeper.........Lumaghi Coal Co., Collinsville, Ill.

HOLLIS, FRANK R., Gen. Supt.........Alton Box Board Co., Box 276, Alton, Ill.

HOLMES, ALBERT W., Engr........
Link-Belt Co., 8147 Champlain Ave., Chicago 19, Ill.

HOLMES, JOHN K., Secy........
Robert Holmes & Bros., Inc., 520 Junction Ave., Danville, Ill.

HOLMES, LESLIE A., Assoc. Prof. of Geology........
Illinois State Normal University, Normal, Ill.

HOLMES, R. G.........Whitney Chain & Mfg. Co., 325 W. Huron St., Chicago 10, Ill.

HOLTON, GEORGE ....
American Cyanamid & Chemical Corp., 30 Rockefeller Plaza, New York, N. Y.

HOOK, GEORGE H., Sls. Mgr........
Beck & Corbitt Co., 1230 N. Main St., St. Louis, Mo.

HOPGOOD, TED.........Atlas Powder Co., Belleville, Ill.

HOPPER, WALTER L., Asst. Supt.........Little Sister Coal Corp., St. David, Ill.

HOUCHARD, VIC.........Superior Coal Co., Gillespie, Ill.

HOUP, R. W.........Post-Glover Elect. Co., 221 W. Third St., Cincinnati, Ohio

HOUTS, ROBERT S., Western Mgr........
Mechanization, 1712 Board of Trade Bldg., Chicago 4, Ill.

HOWARD, HUBERT E., Pres........
Pyramid Coal Corp., 230 N. Michigan Ave., Chicago 1, Ill.

HOWE, BOB.........W. F. Hebard & Co., 2433 S. State St., Chicago 16, Ill.

HOY, C. P., Trf. Comm.
5th & 9th Dist. Coal Trfc. Bur., 407 N. Eighth St., St. Louis 1, Mo.

HUBELI, W. H., Vice Pres.
St. Louis & O'Fallon Coal Co., 2528 S. Jefferson Ave., St. Louis 4, Mo.

HUBER, LOUIS W., Dist. Mgr.
Mine Safety Appliances Co., 1404 First Natl. Bank Bldg., P. O. Drawer 120, Lexington, Ky.

HUEY, JOHN J., Elect. Engr.
The United Electric Coal Co's, 307 N. Michigan Ave., Chicago 1, Ill.

HUFF, FRED A. Truax-Traer Coal Co., Elkville, Ill.

HUGGINS, NATHANIEL
E. I. du Pont de Nemours & Co., Leland Hotel, Springfield, Ill.

HUGHES, ARTHUR M. Superior Coal Co., Gillespie, Ill.

HUGHES, J. J.
Thomas A. Edison, Inc., Edison Storage Battery Div., 1902 Continental Bldg., St. Louis, Mo.

HUGILL, E. P., Field Engr.
Gates Rubber Co., 648 John B. Rogers Bldg., Mt. Vernon, Ill.

HUMMERT, AUGUST J., V. P. & Gen. Mgr.
Breese-Trenton Mining Co., Breese, Ill.

HURST, W. C., Pres.
C&IM Railway Co., 821 Public Service Bldg., Springfield, Ill.

HUTCHINSON, GEORGE C., JR., Manufacturers' Representative
Farmers Bank Bldg., Pittsburgh 22, Pa.

JACKMAN, H. W. Ill. State Geological Survey, Urbana, Ill.

JACKSON, CHESTER H., Pres.
Southwestern Ill. Coal Corp., 675 E. Washington St., Indianapolis 4, Ind.

JACKSON, JOHN C., Repr.
Mine Safety Appliances Co., 325 S. Illinois St., Springfield, Ill.

JAMISON, A. R., V. P.
Standard Supply Co., 1549 S. Michigan Ave., Chicago 5, Ill.

JAYNE, JAMES IVOR, M. M. Sunnyside Coal Co., Box 195, Cuba, Ill.

†JEFFERIS, J. A. Illinois Terminal R.R. System, 710 N. 12th Blvd., St. Louis, Mo.

*JENKINS, G. S., Gen. Supt.
Consolidated Coal Co. of St. Louis, Railway Exchange Bldg., St. Louis, Mo.

*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.

*JENKINS, W. J., II Consolidated Coal Co., Lymar Hotel, Herrin, Ill.

JENNINGS, ARLEN "ZACK", Consulting Engr.
6728 East End Ave., Chicago 49, Ill.

JOHNSON, E. H., Chief Engr. of Mines
Republic Steel Corporation, Republic Bldg., Cleveland, Ohio

JOHNSON, FREDERICK E., Mgr.
The Appuhn Co., 46 South Main St., Canton, Ill.

JOHNSON, HARRISON H., Sales Engr.
Beck & Corbitt Co., 1230 N. Main St., St. Louis, Mo.

JOHNSON, JOE, Supt.
St. Louis & O'Fallon Coal Co., 416 Portland Ave., Belleville, Ill.

JOHNSTON, J. M., C. E. .... Bell & Zoller C. & M. Co., Zeigler, Ill.
*JOHNSTON, W. A., Pres. .... Illinois Central System, 135 E. Eleventh Pl., Chicago 5, Ill.
JONES, ARCH M. .... John A. Roebling's Sons Co., 2023 Locust St., St. Louis, Mo.
JONES, D. W., Pres. .... Simpson Creek Collieries Co., Galloway, W. Va.
JONES, EVERETT, Lubrication Engr. .... Standard Oil Co., Decatur Div., 101 W. Cerro Gordo St., Decatur, Ill.
*JONES, JOHN E. .... Old Ben Coal Corp., West Frankfort, Ill.
s JONES, JOHN E., JR., EM 2/c, USNR .... SRTU-Office, Mare Island, Calif.
JONES, L. L. .... Hoe Supply Co., 118 N. McCann St., Benton, Ill.
JONES, MARVEL L. .... Truax-Traer Coal Co., 1002 Shell Bldg., St. Louis 8, Mo.
JONES, ROBERT M. .... W. F. Hebard & Co., 2433 S. State St., Chicago 16, Ill.
JONES, WALTER M. .... Joy Manufacturing Co., Centralia, Ill.
JOY, DEWEY E. .... Cutter Bit Service Co., Christopher, Ill.
JOY, JOS. F. .... 309 Hazelwood Ave., Warren, Ohio
JOYCE, PETER, Asst. Commissioner .... Illinois Coal Operators Assn., 722 N. Grand Ave., W., Springfield, Ill.
JUNELL, ANDREW .... Truax-Traer Coal Co., Fiatt, Ill.
JUSTICE, CLYDE H., Pres. .... Du Quoin Iron & Supply Co., Inc., Du Quoin, Ill.
KAGA, R. L. .... Robt. Holmes & Bros. Inc., 510 Junction Ave., Danville, Ill.
KAVANAUGH, HARRY H., Drill Demons. .... Dooley Bros., 1201 S. Washington St., Peoria, Ill.
KEEFE, TOM, Frt. Rep. .... Baltimore & Ohio Railroad, 408 Pine St., St. Louis, Mo.
*KEELER, E. R., Pres. .... Franklin County Coal Corp., 135 S. La Salle St., Chicago 3, Ill.
KEENAN, A. F. .... U. S. Rubber Co., 440 W. Washington St., Chicago 6, Ill.
KEISER, WALTER, Res. Engr. .... Metropolitan Refining Co., 3642 Connecticut St., St. Louis 16, Mo.
KELCE, L. RUSSELL, V. P. .... Delta Coal Mining Co., 114 W. 11th St., Kansas City, Mo.
KELCE, MERL C., Gen. Supt. .... Delta Coal Mining Co., Railway Exchange Bldg., St. Louis 1, Mo.
KELLEY, CARL A. .... F. W. D. Sales & Service Corporation, Box 189, Carlinville, Ill.
KELLY, R. H. .... Ahlberg Bearing Co., 2881 Locust St., St. Louis, Mo.
KENNEDY, E. A., Treas. .... Kennedy-Webster Elect. Co., 300 W. Adams St., Chicago 6, Ill.
KENNEDY, H. M., Pres. .... Kennedy-Webster Electric Co., 300 W. Adams St., Chicago 6, Ill.
KENTFIELD, R. H. .... Superior Coal Co., 413 W. Chestnut St., Gillespie, Ill.
KESSLER, WALTER W., Inspector .... U. S. Bureau of Mines, Staunton, Ill.
KIESEL, G. F. .... G. F. Kiesel Ice & Fuel Co., 114 S. Tenth St., St. Louis 2, Mo.
KIMBALL, P. G. .... John Flocker Co., 644 Grant St., Pittsburgh, Pa.
KING, PHILIP S. .... Forsyth-Carterville Coal Co., 20 South Central, Clayton 5, Mo.
KINSMAN, H. J., Main. Engr. .... Franklin County Coal Corp., Royalton, Ill.
KISS, LAWRENCE .... Superior Coal Co., Gillespie, Ill.

KLEIN, GEO....................Klein Armature Works, Centralia, Ill.

KLOPPENBURG, H. M....................
Ideal Commutator Dresser Co., 1316 S. College St., Springfield, Ill.

*KNOIZEN, A. S....................Joy Mfg. Co., Franklin, Pa.

KOCUREK, PAUL....................Peabody Coal Co., Taylorville, Ill.

KOENIG, ROBERT P., Pres....................
Ayrshire Collieries Corp., 105 South Meridian St., Indianapolis 4, Indiana

KOLB, FRED, Dist. Mgr....................Jeffrey Mfg. Co., 3015 Locust St., St. Louis, Mo.

KOSANKE, ROBERT M., Asst. Geol...Illinois State Geological Survey, Urbana, Ill.

KOSTBADE, C. J., Pres...Berry Bearing Co., 2635 S. Michigan Ave., Chicago 16, Ill.

KOSTBADE, GEORGE, Mgr....................
Bearing Service Co., 9 N. W. First St., Evansville, Ind.

KOSTBADE, HOWARD W....................
Power Trans. Equpt. Co., 130 N. Clinton St., Chicago 6, Ill.

KRAUSE, E. J....................Columbia Quarry Co., Syndicate Trust Bldg., St. Louis, Mo.

KUECHLER, C. W....................Illinois Powder Mfg. Co., 730 Pierce Bldg., St. Louis, Mo.

KUHLS, WALTER H., Coal Trf. Mgr....................
C. M. St. P. & P. RR., 516 W. Jackson Blvd., Chicago 6, Ill.

KUMPE, EARL L....................E. J. Wallace Coal Co., 1205 Olive St., St. Louis 3, Mo.

KUNZ, BEN....................Mine Investigation Commission, Mt. Olive, Ill.

LAMBUR, CHARLES H., JR....................Coal Age., 330 W. 42nd St., New York, N. Y.

LAND, JOHN, Asst. Comm....................
Illinois Coal Operators Assn., 1203 E. St. Louis St., West Frankfort, Ill.

LANGTRY, W. D., Pres....................
Commercial Testing & Engrg. Co., 307 N. Michigan Ave., Chicago 1, Ill.

LARSEN, EDWARD H., Gen. Supt....................Florida Coal Co., Coulterville, Ill.

LARSON, E. L....................Peabody Coal Co., 231 S. La Salle St., Chicago 4, Ill.

LATIMER, T. H., Engr....................
United Electric Coal Co's., 307 N. Michigan Ave., Chicago 1, Ill.

LAUDER, F. B., Secretary-Treasurer....................Blue Hill Coal Co., Marion, Ill.

LAWRY, R. G., Contracting Engineering....................
Roberts & Schaefer Co., 307 N. Michigan Ave., Chicago 1, Ill.

LAZZELL, R. GLENN, Mng. Engr....................
Island Creek Coal Company, Box 244, Holden, West Virginia

*LEACH, B. K., Pres....................
Egyptian Tie & Timber Co., 1803 Railway Exchange Bldg., St. Louis, Mo.

LEACH, R. A....................The Bowdil Co., West Frankfort, Ill.

LEE, ALBERT J....................Cairo City Coal Co., 1914 Commercial St., Cairo, Ill.

LEE, ARTHUR F., Chief Engr....................Pyramid Coal Co., Pinckneyville, Ill.

LEE, CARL....................Peabody Coal Co., 231 S. La Salle St., Chicago 4, Ill.

LEHMAN, LEWIS H., Sales Mgr....................
Productive Equipment Corp., 2926 W. Lake St., Chicago 12, Ill.

s LEIDENHEIMER, JOHN L., COL....................
6920 New Hampshire Ave., N. E., Takoma Park, Md.

LEIGHTON, M. M....................State Geological Survey, Urbana, Ill.

LEMING, ED., Supt. Union Colliery Co., Dowell, Ill.
LEMING, HARRY B., Elect. Old Ben Coal Corp., 304 Sylvester, Christopher, Ill.
LENZINI, JOS. P. Liquid Carbonic Company, 205 Station St., Zeigler, Ill.
LESENEY, R. M., Maintenance Engr. Truax-Traer Coal Co., Fiatt, Ill.
LEUVER, J. A. U. S. Rubber Co., 440 W. Washington St., Chicago 6, Ill.
LEVIN, N. D. Jeffrey Mfg. Co., Columbus, Ohio
LEWIS, A. D., Chairman
United Constr. Workers, 15th & Eye St., N. W., Washington, D. C.
LEWIS, HOWARD Old Ben Coal Corp., 509 W. Sixth St., Benton, Ill.
LEWIS, JAMES Taylorville, Ill.
LEYHE, W. H., CAPT. Eagle Packet Co., St. Louis, Mo.
S LINDENHAYN, ROLF, JR., CAPT. c/o Tibballs, 552 Cliff St., Ridgewood, N. J.
LINDSAY, GEORGE 801 S. English, Springfield, Ill.
LINDSAY, ROBERT L., Supt. Dering Coal Co., Eldorado, Ill.
LINDSAY, W. L. Socony-Vacuum Oil Co., Benton, Ill.
LINEBARGER, ROY O. Atlas Powder Co., Box 661, Peoria, Ill.
S LINTON, THOMAS, LT.
Chicago Ordnance District, 38 S. Dearborn St., Chicago, Ill.
‡S LIPE, ROBERT R., CPL.
16121076, Btry. A—53rd F.A. Bn., APO 6, c/o Postmaster, San Francisco, Calif.
LIPPERT, FRED, State Mine Inspector 920 Centerville Ave., Belleville, Ill.
LITHGOW, C. H. Jos. T. Ryerson & Co., 16th & Rockwell Sts., Chicago 80, Ill.
LITTLE, JAMES R. Equitable Powder Mfg. Co., 505 Alby, Alton, Ill.
LOEWENHERZ, E., Pres.
K. W. Battery Co., 3705 N. Lincoln Ave., Chicago 13, Ill.
LOFQUIST, RALPH J.
Roberts & Schaefer Co., 307 N. Michigan Ave., Chicago 1, Ill.
LOHR, C. P., Repr.
Reliance Electric & Engineering Co., 5579 Pershing Ave., St. Louis 12, Mo.
LONG, GENE Truax-Traer Coal Co., Fiatt, Ill.
LOTT, GEO. M.
Mining Machinery Sales Corp., 343 S. Dearborn St., Chicago 4, Ill.
LOWE, ROBERT W., Engineer
Panther Creek Mines, Inc., 1116 Ridgely Bldg., Springfield, Ill.
LUBIN, A. Central Iron & Metal Co., Box 34, Springfield, Ill.
LUMAGHI, L. F., JR., Pres. Lumaghi Coal Co., 408 Olive St., St. Louis, Mo.
LUMSDEN, J. L., Asst. Gen. Frt. Agt.
Illinois Central System, 408 Pine St., St. Louis 2, Mo.
LYMAN, G. E. 7535 Luella Ave., Chicago 49, Ill.
LYNCH, S. F., Gen. Mgr. Ill. Central System, 135 E. 11th Pl., Chicago 5, Ill.
LYON, JOHN, Safety Engr.
Bell & Zoller Coal & Mng. Co., 111 Wilcox Ave., Zeigler, Ill.
LYONS, FAY A. Illinois Coal Oper. Assn., 1501 Knoxville Ave., Peoria, Ill.
MABRY, H. E. Equitable Powder Mfg. Co., 711 Euclid Place, Alton, Ill.
MACALISTER, J. N. Simplex Wire & Cable Co., 564 W. Monroe St., Chicago 6, Ill.

MAC INNIS, A. P., A.G.F.A. Wabash Railroad Co., 323 Pierce Bldg., St. Louis 2, Mo.

MAC MURDO, GEO. C. Peabody Coal Co., 302 W. Market St., Taylorville, Ill.

MAC VEAN, GORDON Mine Safety Appliance Co., 201 N. Braddock Ave., Pittsburgh, Pa.

MACWHYTE CO. Kenosha, Wis.

MAHOOD, G. PHILLIPS, Sls. Engr. Bethlehem Steel Co., 400 North Michigan Ave., Chicago 11, Ill.

s MAIN, FRED, ENS. VPB 71, c/o Fleet Post Office, San Francisco, Calif.

MANCHA, RAYMOND Jeffrey Manufacturing Co., Columbus, Ohio

MANTLE, L. D. Prairie State Coal Co., Marissa, Ill.

MARKS, DEWEY, Mine Mgr. Sahara Coal Co., Harrisburg, Ill.

MARLIER, F. R., Pres. Portable Products Corporation, 420 Blvd. of the Allies, Pittsburgh 19, Pa.

s MARLIN, JOHN P., CAPT. U. S. Army Air Forces, 32 Malcolm Drive, Dayton, Ohio

MARSHALL, D. W. Bemis Bro. Bag Co., 601 S. Fourth St., St. Louis, Mo.

MARTIN, ELMER, SR. Truax-Traer Coal Co., 605 N. Second, Canton, Ill.

MARTIN, PAUL, Ch. Elect. Moffatt Coal Co., Sparta, Ill.

MASELTER, J. E. General Electric Co., 737 Luckystone, Glendale, Mo.

MATTHEWS, M. A. Templeton-Matthews Corp., Terre Haute, Ind.

MAXWELL, E. L. Fairview Collieries, Fairview, Ill.

MAXWELL, J. V., Gen. Agt. C. B. & Q. R.R. Co., 625 Frisco Bldg., St. Louis 1, Mo.

McALLISTER, EUGENE, Foreman Peabody Coal Co., 128 East North St., DuQuoin, Ill.

McALLISTER, R. T. U.M.W.A., Dist. 12, Miners Examining Board, Du Quoin, Ill.

McALPIN, MARK L., V. P. McLaren Coal Co., Marion, Ill.

McARTHUR, M. C., Dist. Repr. Bear Manufacturing Co., 2707 N. Ashland Ave., Chicago 14, Ill.

†McAULIFFE, EUGENE, Chmn. of the Bd. Union Pacific Coal Co., 1416 Dodge St., Omaha, Nebr.

McBRIDE, P. A., Pres. Pittsburgh Knife & Forge Co., 1421 Reedsdale St., Pittsburgh 12, Pa.

McCABE, LOUIS C. American Gas & Electric Co., 30 Church St., New York, N. Y.

McCALL, C. O., Specialist Off the Road Tires B. F. Goodrich Co., 333 West Lake St., Chicago 6, Ill.

McCANN, KEITH Peabody Mines No. 57 and No. 59, 1805 College St., Springfield, Ill.

McCLOUD, DON B. Liquid Oxygen Explos. Mfr., 119 N. Chestnut St., Du Quoin, Ill.

McCLUSKEY, RAY, State Mine Inspector 602 E. Grand Ave., Carterville, Ill.

*McCOLLUM, H. C. Allen & Garcia Co., 332 S. Michigan Ave., Chicago 4, Ill.

McCOY, J. M., Mng. Engr. Truax-Traer Coal Co., Fiatt, Ill.

McCULLOCH, WM. C. Roberts & Schaefer Co., 307 N. Michigan Ave., Chicago 1, Ill.

McCULLOUGH, E. W.......
American Car & Foundry Co., 3095 S. Seventh St., Terre Haute, Ind.

McDERMOTT, B. W., Fuel Inspr.......
New York Central System, 612 S. Seventh St., Terre Haute, Ind.

McDIVITT, J. W.......Fairview Collieries, 430 Big Four Bldg., Indianapolis, Ind.

McDONALD, H. F., Pres.......
Bell & Zoller Coal Co., 307 N. Michigan Ave., Chicago 1, Ill.

McDOWELL, W. J.......Nail City Bronze Co., 7005 Crandon Ave., Chicago 49, Ill.

McELHATTAN, D. F., Saf. Engr.......Peabody Coal Co., Marion, Ill.

McELVAIN, RALPH C, Pres.......Morris Coal & Mining Co., Box 311, Morris, Ill.

McEVOY, F. E., P. A.......
Bell & Zoller Coal & Mng. Co., 307 N. Michigan Ave., Chicago 1, Ill.

*McFADDEN, GEORGE C.......408 Elmore, Park Ridge, Ill.

McFADDEN, NAT., Div. Engr.......Peabody Coal Co., Taylorville, Ill.

McGRAW, W. C...Westinghouse Elec. & Mfg. Co., 411 N. Seventh St., St. Louis, Mo.

McGUIRE, L. H.....U. S. Bureau of Mines, 233 Federal Office Bldg., Seattle 4, Wash.

McKAIG, C. E., Mgr., Wire Rope Sales.......
Jones & Laughlin Steel Corp., Gilmore Wire Rope Div., 105 W. Adams St., Chicago 3, Ill.

McKEE, MELBOURNE A., Chemist..Northern Illinois Coal Corp., Wilmington, Ill.

McLAREN, A. B.......McLaren Fuel Co., Marion, Ill.

McLAREN, W. S.......McLaren Coal Co., Marion, Ill.

McLEESE, R. R.......Dayton Rubber Co., 2741 Washington Blvd., St. Louis, Mo.

McMANUS, P. H., Asst. Sls. Mgr.......
Templeton, Kenly & Co., 1020 South Central Ave., Chicago 51, Ill.

McMASTER, D. H.......307 N. Michigan Ave., Chicago 1, Ill.

McMURRER, P. D.....American Mining Congress, Munsey Bldg., Washington, D. C.

McNAIL, W. M.......Bell & Zoller Coal & Mng. Co., Zeigler, Ill.

McPHAIL, ROBERT, Supt.......Peabody Mine No. 18, West Frankfort, Ill.

MEAGHER, GEORGE.......C. W. & F. Coal Co., West Frankfort, Ill.

MEAGHER, JOHN R.......John Flocker & Co., 644 Grant St., Pittsburgh 30, Pa.

MEDILL, ROBERT M., Director.......Dept. Mines & Minerals, Springfield, Ill.

MEDILL, W. L.......Dept. Mines & Minerals, Springfield, Ill.

MEISSNER, JOHN F., Dist. Mgr.......
Robins Conveyors, Inc., 37 W. Van Buren St., Chicago 5, Ill.

MEISTER, V. S.......The Jeffrey Mfg. Co., 2135 Third Ave., Terre Haute, Ind.

MELVILLE, J. B. F., Vice Pres.......
Fairview Collieries Corp., 430 Big Four Bldg., Indianapolis 5, Ind.

MERCER, HUGH, Mng. Engr...Consolidated Coal Co., 304 S. Ninth St., Herrin, Ill.

MERHOLZ, B. J.......
Mining Machine Parts, Inc., 5707 St. Clair Ave., Cleveland 3, Ohio

MERRITT, G. W., Vice Pres.......The Mining Safety Device Co., Bowerston, Ohio

MESHORER, SYLVAN A.......
Amalgamated Steel Co., 7831-35 Broadway, Cleveland, Ohio

MEYER, CHARLES, Supt.......Mine Rescue Station, DuQuoin, Ill.

MEYERS, EDMUND L., Asst. Ch. Elect................Superior Coal Co., Gillespie, Ill.

s MIKESELL, D. B., LT. (j.g.) (SC) USNR...
U.S.S. Munda (CVE 104), Fleet Post Office, San Francisco, Calif.

MILLER, A. J., City Frt. Agt...
C. B. & Q. R.R. Co., 625 Frisco Bldg., St. Louis 1, Mo.

MILLER, FRED A..........................Consolidated Coal Co., 305 S. 13th St., Herrin, Ill.

MILLER, JAMES B., Pres...Mines Equipment Co., 4215 Clayton Ave., St. Louis, Mo.

MILLER, J. D., Application Engineer...
Westinghouse Elect. Mfg. Co., 418 S. Washington St., Peoria, Ill.

MILLER, JAMES E.............Mines Equipment Co., 4215 Clayton Ave., St. Louis, Mo.

MILLER, JOHN T., Asst. to Sales Mgr...
Mines Equipment Co., 4215 Clayton Ave., St. Louis, Mo.

MILLER, J. W.....................National Electric Coil Co., 273 Cornwall Drive, Crete, Ill.

MILLER, RICE W...Nokomis Coal Co., Nokomis, Ill.

MILLER, WM. J., Pres.........Hawthorn Coal Co., 688 Arcade Bldg., St. Louis 1, Mo.

MITCHELL, A. G...
American Cyanamid & Chemical Corp., Explosives Dept., Mt. Vernon, Ill.

MITCHELL, D. R.......................................Mineral Industries Bldg., State College, Pa.

MOEHLMANN, C. T. Vice-Pres...
Central Mine Equip. Co., 4520 Enright Ave., St. Louis 8, Mo.

MOFFATT, H. A., Gen. Mgr........Dooley Bros., 1201 S. Washington St., Peoria, Ill.

MOHN, B. E..Edward Mohn & Son, Bartonville, Ill.

MONICO, J. A.....Illinois Powder Mfg. Co., 212 N. Pennsylvania Ave., Belleville, Ill.

MORAN, FRANK W., Field Repr...
Amer. Mng. Congress, 600 S. Michigan Ave., Chicago, Ill.

MORAN, PAUL W. F. J., Prep. Mgr...
Pyramid Coal Corp., Box 1140, Terre Haute, Ind.

MORGAN, W. L., State Mine Inspr..........................Chandler Apartments, Macomb, Ill.

‡s MORRIS, ROBERT N., ENS., U. S. Marine Corps.......................................
319 W. O'Gara St., Harrisburg, Ill.

MORROW, J. B., President............Pittsburgh Coal Co., Oliver Bldg., Pittsburgh, Pa.

*MORROW, J. D. A., President...........................Joy Manufacturing Co., Franklin, Pa.

MOSEBACH, K. J., Pres..
Mosebach Elec. & Supply Co., 1115 Arlington Ave., Pittsburgh, Pa.

MOSER, C. E.....................Socony-Vacuum Oil Co., 4140 Lindell Blvd., St. Louis, Mo.

*MOSES, HARRY M., Pres...H. C. Frick Coal Co., 1322 Frick Bldg., Pittsburgh, Pa.

†MOSES, THOMAS...123 N. Franklin St., Danville, Ill.

*MUELLER, FRANK E., Pres...
Roberts & Schaefer Co., 307 N. Michigan Ave., Chicago 1, Ill.

MUELLER, LESTER J.......E. J. Wallace Coal Co., 1205 Olive St., St. Louis 1, Mo.

MULCONNERY, M. J., Comm'l Agt..
Illinois Central System, 111 N. Fourth St., St. Louis 2 ,Mo.

*MULLINS, T. C., Pres..
Northern Illinois Coal Corp., 310 S. Michigan Ave., Chicago 4, Ill.

MUNRO, W. T...5047 Columbia Ave., Hammond, Ind.

MYRICK, CLINT C., Salesman
Austin Powder Co.-Diamond Mine Supply, 4071 Broadway, Evansville, Ind.

NASH, J. J.....Sligo Iron Store Co., 1301 N. Sixth St., St. Louis, Mo.

NEAL, J. D.....Consolidated Coal Co., Mt. Olive, Ill.

NEIBCH, KENNETH W.....Bell & Zoller Coal Co., Centralia, Ill.

NELSON, C. J., Fuel Traffic Mgr.
C. B. & Q. Railroad, 547 W. Jackson Blvd., Chicago 6, Ill.

NELSON, I. C.....c/o Beall Bros. Supply Co., Marion, Ill.

NESLAGE, O. J., V. P.
Sullivan Machinery Co., 333 Henry W. Oliver Bldg., Pittsburgh 22, Pa.

NEWTON, CHAS. A.....Midvale Coal Co., 721 Olive St., St. Louis 1, Mo.

NEWTON, H. W.....Barber-Greene Co., Aurora, Ill.

NICHOLSON, H. P., Pres.....Chestnut Hill Zinc Co., Galena, Ill.

NIEDRINGHAUS, R. C.
A. Leschen & Sons Rope Co., 5909 Kennerly, St. Louis, Mo.

NOEL, WILLIAM, Supt.....Cardox Corp., Benton, Ill.

NOLD, H. E., Prof. Mine Eng.....Ohio State University, Columbus 10, Ohio

NORTON, R. C., Asst. to Pres.
Southwestern Ill. Coal Corp., 675 E. Washington St., Indianapolis, Ind.

NUCKELS, C. E.....221 W. Third St., c/o Post-Glover Electric Co., Cincinnati, Ohio

OAKLAY, WALTER H., JR., Sales Engr.
Bethlehem Steel Co., 400 N. Michigan Ave., Chicago 11, Ill.

OBERJUERGE, W. W.
Oberjuerge Rubber Distributing Co., Third & Walnut Sts., St. Louis, Mo.

O'BRIEN, C. M., Mgr., Fuel Div.
Better Business Bureau, 373 Arcade Bldg., St. Louis 1, Mo.

O'BRIEN, W. L.....Illinois Power Co., Belleville, Ill.

OEHLER, HARLAN E., Production Mgr.....Bixby-Zimmer Engr. Co., Galesburg., Ill.

OEHM, KARL, Claim Adjuster.....Sahara Coal Co., Harrisburg, Ill.

OLDANI, JOHN V., Inspect.....Dept. Mines & Minerals, Oil & Gas Div., Herrin, Ill.

OLDHAM, K. W.....Standard Oil Co., Harrisburg, Ill.

O'LOUGHLIN, IVAN, Asst. Engr.
Northern Illinois Coal Corp., 310 S. Michigan Ave., Chicago 4, Ill.

O'NEAL, BYRON.....State Mining Board, 303 S. Edwardsville St., Staunton, Ill.

O'NEILL, CHARLES J.....Dupont Powder Co., McCormick Bldg., Chicago 4, Ill.

O'NEILL, T. J.....U. S. Rubber Co., 440 W. Washington St., Chicago 6, Ill.

O'ROURKE, DAN.....Sanford-Day Iron Works, Hotel Deming, Terre Haute, Ind.

O'ROURKE, JOHN.....303 W. Lindell St., West Frankfort, Ill.

O'ROURKE, PETE.....W. M. Hales Co., Danville, Ill.

ORR, WILLIAM.....Illinois Mining Commission, 911 S. Madison St., Gillespie, Ill.

OSBORNE, WM., JR.....Superior Coal Co., Gillespie, Ill.

OVERSTREET, J. W.....National Electric Coil Co., Columbus, Ohio

PAAPE, W. W.....Euclid Road Machinery Co., 1361 Sheridan Rd., Cleveland 17, Ohio

PAGE, D. C., Vice Pres.....Walter Bledsoe & Co., 603 Safety Bldg., Rock Island, Ill.

PAGE, FARRELL.....B. E. Schonthal & Co., Inc., Box 504, Sesser, Ill.

PARLIER, HENRY W., Shop Foreman....................
United Electric Coal Co's, Buckheart Mine, 407 N. Ave., Canton, Ill.

PARMLEY, S. M., Prep. Engr....................
Pittsburgh Coal Co., 1014 Oliver Bldg., Pittsburgh, Pa.

PARRISH, W. S., Div. Mgr....................
Iron Fireman Mfg. Co., 449 Paul Brown Bldg., St. Louis 1, Mo.

PATTISON, THOS T....................Hulburt Oil & Grease Co., Philadelphia, Pa.

PAUL, R. J....................Allis-Chalmers Mfg. Co., 1205 Olive St., St. Louis, Mo.

*PEABODY, STUYVESANT, Pres....................
Peabody Coal Co., 231 S. La Salle St., Chicago 4, Ill.

PEARCE, J. R....................Dept. Mines & Minerals, 11 S. La Salle St., Chicago 3, Ill.

PEARSON, T. W., Pit Supt....................Central States Collieries, Inc., Cuba, Ill.

PECHMAN, O. A...A. Leschen & Sons Rope Co., 5909 Kennerly Ave., St. Louis, Mo.

PECKHAM, O. H....................
Oberjuerge Rubber Distrib. Co., Third & Walnut Sts., St. Louis, Mo.

PERRY, R. G....................Sahara Coal Co., Harrisburg, Ill.

PERZ, FRANK, Federal Mine Inspector....................Staunton, Ill.

PETERSON, C. A....................Bethlehem Steel Co., Wrigley Bldg., Chicago 11, Ill.

*PFAHLER, F. S., Pres....................Superior Coal Co., 400 W. Madison St., Chicago 6, Ill.

PFEIFER, CLEM J....................Truax-Traer Coal Co., 1002 Shell Bldg., St. Louis, Mo.

PHEMISTER, H. I....................
American Cyanamid & Chemical Co., 2401 Koppers Bldg., Pittsburgh 19, Pa.

PHILLIPS, ARTHUR, Supt....................
Peabody Coal Co. Mine No. 59, 2710 S. Douglas Ave., Springfield, Ill.

PHILLIPS, EDGAR R....................631 McCully St., Pittsburgh, Pa.

PICKARD, A. E....................The Tamping Bag Co., Mount Vernon, Ill.

PIERCE, FRANK E., JR....................Bethlehem Steel Co., Wrigley Bldg., Chicago 11, Ill.

PIERSOL, R. J....................State Geological Survey, Urbana, Ill.

PLATT, F. J., Purch. Agent....................Little Sister Coal Corp., St. David, Ill.

PLESCHNER, O. J., Mng. Engr....................
U. S. Coal & Coke Co., P. O. Box 147, Danville, Illinois

POLING, GILBERT ....
Evansville Elec. & Mfg. Co., 600 W. Eichel Ave., Evansville, Ind.

POLLACK, HARRY....................Pollack Brothers, Herrin, Ill.

PORTER, ELMER....................F. W. D. Auto Co., 2100 S. Wabash Ave., Chicago 16, Ill.

POWELL, JAMES S....................Superior Coal Co., 701 S. Macoupin, Gillespie, Ill.

*POWERS, F. A....................Hulburt Oil & Grease Co., Box 21, Peoria, Ill.

POWIS, BERT....................Nokomis Coal Co., Nokomis, Ill.

PRATT, STEWART M....................Superior Coal Co., Gillespie, Ill.

PRICE, W. H., Supt....................Delta Coal Mining Co., Marion, Ill.

PRIEST, LLOYD M., Office Mgr....................Little John Coal Co., Victoria, Ill.

PRINS, KLAAS, Sales Engineer....................Joshua Hendy Iron Works, Sunnyvale, Calif.

PRITCHARD, W....................Goodman Mfg. Co., 1008 S. Second St., Springfield, Ill.

PROFFITT, R. P....................
Timken Roller Bearing Co., 2534 S. Michigan Ave., Chicago 16, Ill.

PROX, ROBERT F.........Frank Prox Co., Inc., 1201 S. First St., Terre Haute, Ind.
*PRUDENT, NORMAN.........Centralia Coal Co., Centralia, Ill.
PSCHIRRER, A. R., Pres.........Pschirrer & Sons Coal Co., R. R. No. 4, Canton, Ill.
PSCHIRRER, JOHN.........Pschirrer & Sons Coal Co., Canton, Ill.
PULFORD, W. J., Asst. Sls. Mgr.........
Walter Bledsoe & Co., Arcade Bldg., St. Louis 1, Mo.
PURICELLIO, CHARLES J.........Mineweld Co., 8618 Elgin Ave., St. Louis 23, Mo.
PURSGLOVE, JOSEPH, JR.........Pursglove, W. Va.
RANDALL, C. O.........
U. S. Rubber Co., Wire & Cable Dept., 440 W. Washington St., Chicago 6, Ill.
RASSIEUR, T. E., Pres.........
Central Mine Equipt. Co., 4520 Enright Ave., St. Louis, Mo.
RASMUSSEN, R. C., Sales Engr.........
Bell & Zoller Coal Co., 307 N. Michigan Ave., Chicago 1, Ill.
REAK, MURRELL, Member.........
State Mining Board, 1604 E. Oak St., West Frankfort, Ill.
REBSTOCK, JOE.........Coal Yard Supplies, 2550 W. Sullivan, St. Louis 7, Mo.
REECE, CARL.........Consolidated Coal Co., Railway Exchange Bldg., St. Louis, Mo.
REED, C. H., Serv. Engr.........The Howard Corp., 27 S. Meramec St., Clayton, Mo.
REED, FRANK H.........State Geological Survey, Urbana, Ill.
REED, J. R., Sales Engr.........
National Electric Coil Co., 201 N. El Molino Ave., Pasadena, Calif.
REED, R. E.........Hercules Powder Co., Carbondale, Ill.
REES, O. W., Chemist.........
Ill. State Geological Survey, Natural Resources Bldg., Urbana, Ill.
REESE, E. P.........The Wm. Powell Co., P. O. Box 106, Cincinnati 22, Ohio
REESE, B. F., Pres.........Coal Dealers Sales Co., 175 Salisbury St., St. Louis 7, Mo.
REESE, C. A.........General Electric Co., 607 E. Adams St., Springfield, Ill.
REIBER, J. LOUIS.........
Mt. Olive & Staunton Coal Co., 806 LaClede Bldg., St. Louis, Mo.
REICHLING, R. L., Sales Engr.........
The Tool Steel Gear & Pinion Co., Cincinnati, Ohio
REID, H. A., V. P. in Charge of Oper.........
The United Electric Coal Companies, 307 N. Michigan Ave., Chicago 1, Ill.
REITHER, E. C.........Timken Roller Bearing Co., 416 Craig St., Pittsburgh, Pa.
REUTER, WM., Constr. Engr.........Peabody Coal Co., P. O. Box 311, Marion, Ill.
REYNOLDS, HUGH M., Mgr., Mechanical Sales.........
U. S. Rubber Co., 2801 Locust St., St. Louis, Mo.
RHEIN, HERBERT E.........Grant Wilson, Inc., 4120 Broadway, Indianapolis 5, Ind.
RHINE, FRANK E.........623 E. Blair St., Alton, Ill.
RHOADS, M. J.........Spring Valley Coal Co., Spring Valley, Ill.
RICE, B. F., Coal Trf. Mgr.........
Wabash R.R. Co., 1462 Railway Exchange Bldg., St. Louis, Mo.
RICE, OSCAR, State Mine Inspector.........Elizabethtown, Ill.
RICE, RICHARD, Sales Repr.........Walter Bledsoe Co., Arcade Bldg., St. Louis, Mo.

RICHARDS, L. O.....Robert Holmes & Bros., Danville, Ill.
RICHART, F. W.....Coal Age, Carterville, Illinois
RICHART, RALPH R., Asst. Ed.....
Coal Age, McGraw-Hill Publishing Co., 330 W. 42nd St., New York, N. Y.
RIEDLINGER, ARTHUR P., State Mine Inspector..117 Amsler St., Bartonville, Ill.
RIEVLEY, R. L., Slsman.....Egyptian Powder Co., Box 110, East Alton, Ill.
RILEY, PHIL, Pres.....Phil Riley Fuel Co., Inc., 42 N. Market St., St. Louis 6, Mo.
ROBERTS, ARTHUR L., Gen. Supt.....
Franklin County Coal Corp., Royalton, Illinois
ROBERTS, BEN F., Area Serv. Supvsr.....
Shell Oil Co., Inc., 602 S. Court St., Marion, Ill.
ROBERTS, HOWARD .....
C. F. Gharst Supply Co., 550 N. Ninth St., Terre Haute, Ind.
ROBINSON, A. W., Mgr.....R-J Bearings Corp., 611 N. Water St., Decatur, Ill.
RODENBUSH, JAKE, Asst. Mine Mgr.....Peabody No. 24 Mine, Georgetown, Ill.
RODENBUSH, JOHN, Gen. Supt.....C.W.F. Coal Co., Benton, Illinois
ROE, WALTER B., Asst. Chief Engr.....
Truax-Traer Coal Co., 310 S. Michigan Ave., Chicago 4, Ill.
ROESSLER, CARL E., Mgr.....Hotel Jefferson, 415 N. 12th Blvd., St. Louis, Mo.
ROHRER, L. C., Sales Rep.....
Jones & Laughlin Steel Corp., 105 W. Adams St., Chicago 3, Ill.
ROLEY, ROLF W., Chief Engr.....
Mt. Olive & Staunton Coal Co., 903 S. Hackman St., Staunton, Ill.
ROLLINS, J. E., V. P.....
Bituminous Casualty Corp., Cleaveland Bldg., Rock Island, Ill.
ROMAN, F. W.....Hercules Powder Co., 332 S. Michigan Ave., Chicago 4, Ill.
ROSENBERG, NATHAN J., Sls. Repr.....
Walter Bledsoe & Co., 310 S. Michigan Ave., Chicago 4, Ill.
ROSENQUIST, G. C.....
Wood Preserving Division, Koppers Co., Railway Exchange Bldg., Chicago 4, Ill.
*ROSING, BORGE, Gen. Sls. Mgr...West Va. Steel & Mfg. Co., Huntington 6, W. Va.
S ROSS, T. P., MAJOR....Headquarters AAFGTC, Fresno Fairgrounds, Fresno, Calif.
ROZANSKI, M., Mine Mgr.....Peabody Mine No. 8, 524 S. Cherokee, Taylorville, Ill.
RUHL, R. J.....Mines Equipment Co., 4215 Clayton Ave., St. Louis 10, Mo.
RUSHING, JOHN, Supt.....Mine Rescue Station, Herrin, Ill.
RUSSELL, FRANK.....Russell & Son, 100 W. St. Louis St., West Frankfort, Ill.
RUTLEDGE, J. J., Chief Mng. Engr.....State Office Building, Annapolis, Md.
*RYAN, JOHN T., JR., Gen. Mgr.....
Mine Safety Appliances Co., Braddock, Thomas & Meade Sts, Pittsburgh, Pa.
RYAN, J. P.....Northern Illinois Coal Corp., 310 S. Michigan Ave., Chicago 4, Ill.
SACKBAUER, L. A., Coal Traf. Mgr.....
Missouri Pacific Railroad Co., St. Louis, Mo.
SACKETT, H. C., V. P.....Alton Box Board Co., Box 276, Alton, Ill.
SADLER, WALTER, Supt.....Sahara Coal Co., Harrisburg, Ill.
SALMONS, J. D.....Peabody Coal Co., Kincaid, Ill.
SALSICH, NEIL E.....Jeffrey Mfg. Co., Columbus, Ohio

SANDERS, GENE W., Elecl. Engr. Insulation & Wires, Inc., 2127 Pine St., St. Louis 3, Mo.

SANDOE, R. D. Pittsburgh Coal Co., Oliver Bldg., Room 1014, Pittsburgh 30, Pa.

SANFORD, J. H., Mgr. Mining Division, Ohio Brass Co., Mansfield, Ohio

SAURS, FRED C. 408 S. Washington St., Duquoin, Ill.

SAUSSER, C. D. Ohio Oil Co., 927 S. Grand Ave., E., Springfield, Ill.

SAYLES, C. J., Gen. Ft. Trf. Mgr. Wabash R.R. Co., 1450 Railway Exchange Bldg., St. Louis, Mo.

SAYLOR, H. N., Pres. H. N. Saylor Co., 2908-2910 Brannon Ave., St. Louis 9, Mo.

SCANLAN, DRISCOLL O., State Mine Inspector P. O. Box 85, Nashville, Ill.

SCHRIBER, R. R., State Mine Inspector Glen Carbon, Ill.

SCHLAPP, C. H., JR. Perry Coal Co., O'Fallon, Ill.

SCHLEGEL, WM. P., Gen. Mgr. West Div., Truax-Traer Coal Co., 1002 Shell Bldg., St. Louis 3, Mo.

SCHLEPER, G. J. Union Colliery Co., Dowell, Ill.

SCHLITT, FRANKLIN C. Schlitt Hardware Co., Springfield, Ill.

S SCHLITT, THEODORE J., LT., USNR—S.C. 829 Pismo Court, Mission Beach, San Diego, Calif.

SCHMIDT, W. E. Mining & Investigating Commission, 107½ S. Macoupin, Gillespie, Ill.

*SCHONTHAL, B. E., Pres. B. E. Schonthal & Co., Inc., 28 E. Jackson Blvd., Chicago 4, Ill.

*SCHONTHAL, D. C. West Va. Steel & Mfg. Co., Huntington 6, West Va.

*SCHONTHAL, JOSEPH, Sec. B. E. Schonthal & Co., Inc., 28 E. Jackson Blvd., Chicago 4, Ill.

SCHOOLER, D. R., PROF. Missouri School of Mines, Rolla, Missouri

SCHROETER, W. A., Pres. Schroeter Coal Co., 2300 Miami St., St. Louis 18, Mo.

SCHOPF, JAMES M., Paleobotanist Origin & Constitution Coal, U. S. Bur. of Mines, 4800 Forbes St., Pittsburgh 13, Pa.

SCHREIER, MARIE Schreier Electric Co., 1508 E. Main St., W. Frankfort, Ill.

SCHUBERT, R. R., V. P. and Gen. Mgr. Greensburg Mach. Co., Greensburg, Pa.

SCHULER, HARRY A., Engr. Robins Conveyors, Inc., 37 W. Van Buren St., Chicago 5, Ill.

*SCHULL, B. H., Gen. Mgr. Binkley Mining Co., P. O. Box 1140, Terre Haute, Ind.

SCHWALB, F. E., Dist. Mgr. Webster Mfg. Co., 343 S. Dearborn St., Chicago 4, Ill

SCHWARTZ, H. L. W. M. Hales Co., Hillsboro, Ill

SCHWEICKHARDT, W. K. Walsh Refractories Corp., 176 W. Adams St., Chicago 3, Ill

SCULLY, T. ALVIN U. S. Bureau of Mines, 625 E. C. St., Belleville, Ill

SEE, FRED O., Dir. of Sales Mining Div. Cardox Corp., 307 N. Michigan Ave., Chicago 1, Ill.

SEEKAMP, HERMAN L. Superior Coal Co., Gillespie, Ill

SEHNERT, JOHN A. Jones & Laughlin Steel Corp., 916 Shell Bldg., St. Louis, Mo.

SEIDEL, JEROME J., V. P. and Slsmgr. Seidel Coal & Coke Co., 3915 Duncan Ave., St. Louis, Mo.

SEIDEL, MAURICE E., Pres.........
Seidel Coal & Coke Co., 3915 Duncan Ave., St. Louis 10, Mo.

SELLEG, L. A., Mgr.........
Petroleum, Chem. & Mng. Sec., Westinghouse Elect. & Mfg. Co., 20 N. Wacker Dr., Chicago 6, Ill.

SENSENICH, CHESTER G., Chairman of the Board.........
Irwin Foundry & Mine Car Co., Irwin, Pa.

SEXTON, ESTEL, Face Boss.........
Peabody Coal Co., 118½ East Main St., Taylorville, Ill.

SEYMOUR, F. H., Gen. Supt.........Freeman Coal Mining Co., Herrin, Ill.

SHAFER, GLENN A., Pres.........Pana Coal Co., Pana, Ill.

SHEPARD, M. M., P. A.........
Franklin County Coal Corp., 135 S. La Salle St., Chicago 3, Ill.

SHEPARD, PAUL B., Sales Engr.........
Stephens-Adamson Mfg. Co., 20 N. Wacker Dr., Chicago 6, Ill.

SHERWOOD, L. H., Supt.........Little John Coal Co., Victoria, Ill.

SHIELDS, JAMES.........Panther Creek Mines, Inc., Ridgely Bldg., Springfield, Ill.

SHIVE, R. O., Pres.........Sterling Steel Casting Co., P. O. Box 66, East St. Louis, Ill.

SIDENER, L. E., Sales Engineer.........
Walsh Refractories Corp., 4070 N. First St., St. Louis, Mo.

SIEVING, A. H., Sales Engr.........
Productive Equipment Corp., 2010 Olive St., St. Louis, Mo.

SIMON, JACK A., Asst. Geol.........
Illinois State Geological Survey, Natural Resources Bldg., Urbana, Illinois

SIMONSEN, C. S.........
American Cyanamid & Chem. Co., 2401 Koppers Bldg., Pittsburgh 19, Pa.

SIMPSON, DAVID.........Panther Creek Mines, Inc., Ridgely Bldg., Springfield, Ill.

SIMPSON, J. H.........Mines Equipment Co., 4215 Clayton Ave., St. Louis 10, Mo.

SINDERSON, L. O.........General Electric Co., 840 S. Canal St., Chicago 80, Ill.

SINGHURSE, J. E., Mine Foreman.........
Truax-Traer Coal Co., 801 N. Washington St., DuQuoin, Ill.

SKELTON, ALEX, Supt.........
Division of Mine Rescue, Department of Mines & Minerals, Peru, Ill.

SKILLINGS, DAVID N., Bus. Mgr.........
Skillings Mining Review, 501 Builders Exchange Bldg., Duluth, Minn.

SLOAN, WM., JR., Serv. Dept.........
Mine Safety Appliance Co., 317 W. Raymond St., Harrisburg, Ill.

SLOMER, J. J., Eng. Dept.........Goodman Mfg. Co., 4834 S. Halsted St., Chicago 9, Ill.

SMILEY, E. B.........Illinois Gear & Machine Co., 2108 N. Natchez Ave., Chicago 35, Ill.

SMITH, C. M.........Mechanization, Munsey Building, Washington, D. C.

SMITH, GEORGE E.........Smith Coal Co., Marissa, Ill.

SMITH, G. H.........
E. I. du Pont de Nemours & Co., Rm. 1814—McCormick Bldg., Chicago 4, Ill.

SMITH, GEO. M., Mine Supt.........
Peabody Coal Co., 1800 Whittier Ave., Springfield, Ill.

SMITH, R. B., Coal Traf. Mgr.........Illinois Central R. R., 135 E. 11th Pl., Chicago 5, Ill.

SMITH, SIDNEY.........Mt. Olive & Staunton Coal Co., Staunton, Ill.

SNARR, F. E. .... Orient No. 1, C.W.F. Coal Co., West Frankfort, Illinois

SNARR, GEORGE W. .... Geo. W. Snarr & Co., 110 S. Ninth St., St. Louis, Mo.

SNEDDEN, GEORGE, Cty. Mine Inspect. .... 416 Adelia St., Springfield, Ill.

SNEDDON, JAMES .... Dept. Mines & Minerals, Valier, Ill.

SNYDER, W. D., Sales Engr. .... Lehigh Safety Shoe Co., 607 Tenbroeck St., Paris, Ill.

SOMERS, BYRON, Supt. .... Truax-Traer Coal Co., Fiatt, Ill.

SOMERS, HOWARD .... Truax-Traer Coal Co., Fiatt, Ill.

SONDAG, RAY J. .... Mineweld Co., 200 S. Theresa Ave., St. Louis 3, Mo.

SONTAG, R. E. .... The Okonite Co., Hazard Insulated Wire Works Div., 1410 Shell Bldg., St. Louis, Mo.

SOPER, ROY .... Goodman Mfg. Co., 825 Providence, Webster Groves 19, Mo.

SOULE, M. M., Vice Pres. .... United Electric Coal Co's, 307 N. Michigan Ave., Chicago 1, Ill.

SOUTHARD, J. L. .... Carter Processing Plant, Peabody Coal Co., Kincaid, Ill.

SOUTHWARD, G. B., Mng. Engr. .... American Mining Congress, 439 Munsey Bldg., Washington, D. C.

SPENCER, KENNETH A., Pres. .... The Pittsburg & Midway Coal Mng. Co., 610 Dwight Bldg., Kansas City, Mo.

SPIEGELBERG, P. A., A.T.F. Mgr. .... Wabash R.R. Co., 1450 Railway Exchange Bldg., St. Louis, Mo.

STANK, FRANK, State Mine Inspector .... Box 202, Taylor Springs, Ill.

STAREK, R. B. .... Old Ben Coal Corp., 230 S. Clark St., Chicago 4, Ill.

STARKS, J. W., Div. Supt. .... Peabody Coal Co., Taylorville, Ill.

STARKS, LLOYD G. .... Peabody Coal Co., No. 7, Kincaid, Ill.

STARKS, ROY .... Equitable Powder Mfg. Co., Taylorville, Ill.

STEARNS, EARL D., Gen. Sales Mgr. .... Barber-Greene Co., Aurora, Ill.

STEKER, EDGAR A., Salesman .... Helwig Company, 2544 North 30th St., Milwaukee 10, Wis.

STELLING, H. C. .... Union Carbide Co., 30 East 42nd St., New York, N. Y.

STELZRIEDE, HOWARD R., Washery Foreman .... C. W. & F. Coal Co., Orient No. 1, West Frankfort, Ill.

‡S STEPHENS, ROBERT M., T/5 .... 36949843, Co. A., 18th Engr. C. Bn., B.A.A.F., Blythe, Calif.

STEPPAN, ERNEST L. .... Insulation & Wires, Inc., 2127 Pine St., St. Louis, Mo.

STERBA, E. J., Engr. .... Webster Mfg. Co., Inc., 343 S. Dearborn St., Chicago 4, Ill.

*STEVENS, E. F. .... Binkley Mining Co., Railway Exchange Bldg., St. Louis, Mo.

STEVENS, ROSS .... Truax-Traer Coal Co., Liverpool, Ill.

STEWART, E. W. .... Freeman Coal Mining Corp., Box 269, Herrin, Ill.

STEWART, J. W. .... Dept. Mining & Metal. Engrg., University of Illinois, Urbana, Ill.

STEWART, WM. M., Service Man .... Jeffrey Mfg. Co., 3015 Locust St., St. Louis, Mo.

STIEHL, C. G. .... Belle Valley, Belleville, Ill.

STILLE, HERMAN, Safety Man .... Mt. Olive & Staunton Coal Co., Staunton, Ill.

STOCKS, FRANK C., Dist. Sls. Mgr.........
Bell & Zoller Coal Co., 1803 Boatmens Bank Bldg., St. Louis 2, Mo.

STOLZ, JOHN J...Tool Steel Gear & Pinion, 211 Township Ave., Cincinnati 16, Ohio

STONE, A. M..........Sahara Coal Co., Harrisburg, Ill.

STONE, E. D., Pres.........
Western Fuel & Supply Co., 602 Midland Bldg., Kansas City 6, Mo.

STOTLAR, J. C..........Mechanization, 516 Oliver Bldg., Pittsburgh 22, Pa.

*STOVER, HOLLY, Pres.........
Chicago & Eastern Ill. Railroad, 332 S. Michigan Ave., Chicago 4, Ill.

STRAWN, W. L., Sls. Mgr.....United Iron Works, 521 Ridge Bldg., Kansas City, Mo.

STRUTHERS, JOHN, Asst. Mine Mgr..........Superior Coal Co., Gillespie, Ill.

SULLIVAN, G. DON, Asst. to Pres.........
Fairview Collieries Corp., 105 S. Meridian St., Indianapolis, Ind.

SUTHERLAND, HARRY T..........Standard Oil Co., Marion, Ill.

SUTOR, DON M., Vice Pres.........
Mines Equipment Co., 4215 Clayton Ave., St. Louis 10, Mo.

SWALLOW, R. H., Chief Engr.........
Fairview Collieries Corp., 430 Big Four Bldg., Indianapolis 5, Ind.

SWEENEY, W. J..........Mt. Olive & Staunton Coal Co., Staunton, Ill.

TAGGART, ROBERT, State Mine Inspector..........Farmington, Ill.

TAYLOR, C. F..........Goodyear Tire & Rubber Co., 7324 Goff Ave., St. Louis 8, Mo.

*TAYLOR, H. H., JR.........
Franklin County Coal Corp., 135 S. La Salle St., Chicago 3, Ill.

TAYLOR, JOHN..........Dept. Mines & Minerals, 2055 N. State St., Eldorado, Ill.

TAYLOR, W. C., Pres..........Midvale Coal Co., 721 Olive St., St. Louis 1, Mo.

TEMPLETON KENLY & CO..........1020 S. Central Ave., Chicago 44, Ill.

THOMAS, CLIFFORD, Mine Mgr..........Moffat Coal Co., 112 W. Mound, Sparta, Ill.

*THOMAS, T. J., Pres..........Valier Coal Co., 547 W. Jackson Blvd., Chicago 6, Ill.

THOMPSON, ERNEST, Elecl. Engr.........
Clark Controller Co., 807 Shell Bldg., St. Louis 3, Mo.

THOMPSON, JOHN, Supt..........The Black Mountain Corporation, Kenvir, Ky.

THOMPSON, R. A.........
Hercules Powder Co., B-20, Railway Exchange Bldg., St. Louis, Mo.

TIBBETTS, R. K., Sales.........
Central Diesel Engine Co., 3311 Washington, St. Louis 3, Mo.

*TIGRETT, I. B., Pres.........
Gulf, Mobile & Ohio R. R., 104 St. Francis St., Mobile 13, Ala.

TIMMERMAN, GEORGE..........Mt. Olive & Staunton Coal Co., Staunton, Ill.

TINEY, B. C., Sls. Engr.........
Michigan Chemical Corp., 500 Bankson St., St. Louis, Mich.

*TITUS, A. P., Pres.........
Illinois Terminal Railroad Co., 710 North 12th Blvd., St. Louis 1, Mo.

TODD, EMERSON H., Dist. Sls. Mgr.........
American Cable Division of American Chain & Cable Co., Inc., 400 W. Madison St., Chicago 6, Ill.

TOVEY, STEVE, Mine Mgr..........Peabody Mine No. 24, Westville, Ill.

TOWN, GLENN E..........Deer Creek Mine, Lincoln, Ill.

*TREADWELL, H. A., V. P.
C.W.F. Coal Co., 332 S. Michigan Ave., Chicago 4, Ill.

TREBILCOCK, R. A. 216 Clark St., Houghton, Mich.

TROGOLO, E. D. Hoe Supply Co., 106 N. Thomas, Christopher, Ill.

TROVILLION, L. A., Secy. to Div. Supt. Peabody Coal Co., Taylorville, Ill.

*TRUAX, A. H., Pres. Truax-Traer Coal Co., 310 S. Michigan Ave., Chicago 4, Ill.

ULRICH, J. RAY Bethlehem Steel Co., Bethlehem, Pa.

UPP, JACK Dayton Rubber Co., 2741 Washington Blvd., St. Louis, Mo.

VALLIER, J. D. General Electric Co., 112 N. Fourth St., St. Louis, Mo.

VAN DOREN, HAROLD, Engr. Standard Oil Co. (Ind.), Evansville, Ind.

VAN HORN, JACK R-J Bearings Corp., 3152 Locust at Compton, St. Louis, Mo.

VAN SCHAICK, CHARLES, State Mine Inspector
207 W. Cleveland St., Spring Valley, Ill.

VAN SLYCK, CLIFFORD E., Chief Elect.
Old Ben Coal Corp., 508 N. Emma St., Christopher, Ill.

VANSTON, J. M. Electric Storage Battery Co., 1218 Olive St., St. Louis, Mo.

VATTER, ALBERT E., Combustion Engr.
Walter Bledsoe & Co., 310 S. Michigan Ave., Chicago 4, Ill.

VERNON, DOUGLAS W., Gen. Mgr. of Sales
A. Leschen & Sons Rope Co., 5909 Kennerly Ave., St. Louis 12, Mo.

VOGEL, A. G., Mgr.
Coal Traffic Dept., Chicago, Rock Island & Pacific R.R., 139 W. Van Buren St., Chicago 5, Ill.

VOGELPOHL, HARRY, Purchasing Agent Clarkson Mfg. Co., Nashville, Ill.

VOIGHT, A. L., Supt. Trotter Water Co., Uniontown, Penn.

VOLTZ, GEO. P., Engr. Peabody Coal Co., 2025 S. Sixth St., Springfield, Ill.

VOLTZ, LESLIE S., Mining Engr.
Peabody Coal Co., 231 S. La Salle St., Chicago 4, Ill.

VON MEDING, WILLIAM
Allen & Garcia Co., 332 S. Michigan Ave., Chicago 4, Ill.

VON PERBANDT, L. Allen & Garcia Co., 332 S. Michigan Ave., Chicago 4, Ill.

VROMAN, J. B. Mines Equipment Co., 4215 Clayton, St. Louis, Mo.

WADDELL, J. N. Henry H. Cross Co., 122 S. Michigan Ave., Chicago 3, Ill.

WALDRON, LEWIS Citizen's Mining Sales Co., 1505 S. Fifth St., Springfield, Ill.

*WALKER, PROF HAROLD L.
Dept. Mining & Metallurgical Engrg., 209 Transportation Bldg., Urbana, Ill.

WALKER, ROY E. Cardox Corp., 610 W. Washington Ave., Benton, Ill.

WALLACE, E. J. E. J. Wallace Coal Co., 1205 Olive St., St. Louis, Mo.

WALLS, MARION B. Miami Copper Co., Miami, Arizona

WALSH, J. D., Dist. Mgr. Link-Belt Co., 317 N. 11th St., St. Louis, Mo.

WALTER, LOUIS E., Exec. Secy.
Coal Exchange of St. Louis, 122 N. Seventh St., St. Louis, Mo.

WALTERS, HOWARD A., Serv. Engr.
Sullivan Machinery Co., 409 McFall, Benton, Ill.

*WANNER, E. W., Vice Pres.
Hulburt Oil & Grease Co., Erie & Trenton Aves., Philadelphia, Pa.

*WARE, LOUIS, Pres...
International Agricultural Corp., 20 N. Wacker Dr., Chicago 6, Ill.

WARNER, E. E..........Euclid Road Machinery Co., 1361 Chardon, Cleveland 17, Ohio

WARREN, JOHN A...
Lincoln Engineering Co., 2415 S. Michigan Ave., Chicago 16, Ill.

WARREN, WILLIAM, Asst. Supt.......................Prairie State Coal Co., Marissa, Ill.

WASSON, L. A., Pres. & Gen. Mgr..........................Wasson Coal Co., Harrisburg, Ill.

WATERMAN, C. W., JR...
McNally-Pittsburg Mfg. Corp., 307 N. Michigan Ave., Chicago 1, Ill.

WATSON, D. O.........................Standard Oil Co., 314 S. Grant West, Springfield, Ill.

WATSON, WILLIAM, Ch. Engr...
Rock Island Improvement Co., 228½ Court St., Pekin, Ill.

WEART, EVERETT T...
John A. Roebling's Sons Co., 600 W. Jackson Blvd., Chicago 6, Ill.

WEBSTER, R. W., P. A...........Sahara Coal Co., 59 E. Van Buren St., Chicago 5, Ill.

WEBSTER, W. S., V. P. & Gen. Mgr...
Walter Bledsoe & Co., 700 Merchants Bank Bldg., Terre Haute, Ind.

WEIGHILL, WILLIAM...Superior Coal Co., Gillespie, Ill.

*WEIR, PAUL....................Paul Weir Company, 307 N. Michigan Ave., Chicago 1, Ill.

WEIR, ROBERT, Asst. Director...
Dept. Mines & Minerals, Room 219, State House, Springfield, Ill.

†WEISSENBORN, F. E., Asst. Comm...
Illinois Coal Operators Assn., 4266 Arsenal St., St. Louis, Mo.

WENDELL, E. A..........................Link-Belt Co., 300 W. Pershing Rd., Chicago 9, Ill.

WENTE, I. H., A.T.M...
Gulf, Mobile & Ohio Railroad, 105 W. Adams St., Chicago 3, Ill.

WENTWORTH, B. K., Asst. to Supt...
Chicago, Wilmington & Franklin Coal Co., West Frankfort, Ill.

WEST, ALBERT R..Bertrand P. Tracy Co., Du Quoin, Ill.

WEST, JETT J., Trav. Auditor................................Peabody Coal Co., Taylorville, Ill.

WEST, LEONARD, Pit Supt..........................Little Sister Coal Corp., St. David, Ill.

WESTERLAND, H. G...................................C. W. F. Coal Co., West Frankfort, Ill.

WEYSSER, JOHN L. G..Route 2, Box 60, Pikeville, Ky.

WHENNEN, W. K..............McLaughlin Mfg. Co., 3650 Park Ave., Springfield, Ill.

WHITAKER, D. C...
Oberjuerge Rubber Distrib. Co., Third & Walnut Sts, St. Louis 2, Mo.

WHITE, FRANK L., Asst. Chief Engr...
Peabody Coal Co., 231 S. La Salle St., Chicago 4, Ill.

*WHITE, HUGH, Pres., Dist. 12...
United Mine Workers of America, United Mine Workers Bldg., Springfield, Ill.

WHITE, JAMES..Franklin County Coal Corp., Herrin, Ill.

WHITESIDE, FRED W., Secy.-Treas...
Rocky Mountain Coal Mining Inst., Suite 804, Equitable Bldg., Denver 2, Colo.

WHITLOW, COIL, Mine Com...
Peabody Coal Co., 416 Wyandotte St., Taylorville, Ill.

WHITNEY, J. P..Peabody Coal Co., Taylorville, Ill.

WHYERS, EDWARD E........................Wyoming Tie & Timber Co., Metropolis, Ill.

WIEDERANDERS, E. O.............Jeffrey Mfg. Co., 3015 Locust St., St. Louis, Mo.
WILCOX, D. D., G. S..........Superior Coal Co., Gillespie, Ill.
WILCOX, RICHARD..........Superior Coal Co., Gillespie, Ill.
WILEY, C. F.............American Steel & Wire Co., 208 S. La Salle St., Chicago 4, Ill.
WILKEY, FRED S., Secy..........
Illinois Coal Operators Assn., 307 N. Michigan Ave., Chicago 1, Ill.
WILKINS, GENE, Supt..........Wilkins & Biggs Co., 105 East Blvd., Marion, Ill.
WILKISON, T. A..........Hulburt Oil & Grease Co., Harrisburg, Ill.
WILLIAMS, CLIFFORD T., Sales Mgr..........
The American Crucible Products Co., Lorain, Ohio
WILLIAMS, T. H. J.....Universal Lubricating Co., Schofield Bldg., Cleveland, Ohio
WILLIAMS, W. J., Mine Rescue Supt.........Dept. Mines & Minerals, Springfield, Ill.
WILLIS, W. E., Chief Engr..........Lumaghi Coal Co., Collinsville, Ill.
WILLS, D. V..........Standard Oil Co., 14 W. Walnut St., Harrisburg, Ill.
WILLS, GERALD..........Peabody Coal Co., Taylorville, Ill.
WILLS, SAM, JR..........Peabody Coal Co., Mine No. 57, Springfield, Ill.
WILSON, A. L., Gen. Frt. Agt..........
Illinois Central Railroad, 111 N. Fourth St., St. Louis 2, Mo.
WILSON, GEORGE M..........
State Geological Survey, 100 Natural Resources Bldg., Urbana, Ill.
WILSON, JAMES R., State Mine Inspector.....107 W. Lindell, West Frankfort, Ill.
WINN, ISAIAH..........Valier Coal Co., Valier, Ill.
WINNING, W. T..........Bituminous Casualty Corp., 704 N. Eighth St., Herrin, Ill.
WINTER, OSCAR, Gen. Mgr..........
Southwest Bolt & Nut Co., 1228 Hadley St., St. Louis 6, Mo.
WOLFE, F. J..........Coal Mine Equipt. Sales Co., Beasley Bldg., Terre Haute, Ind.
WOLFE, SHELDON J..........
Coal Mine Equip. Sales Co., Beasley Bldg., Terre Haute, Ind.
WOMMACK, AL. J..........R. J. Bearings Corp., 3152 Locust, St. Louis, Mo.
WOOD, CHAS. H., Asst. Gen. Supt. of Trans..........
Missouri Pacific Railroad Co., Missouri Pacific Bldg., St. Louis, Mo.
WOOD, RICHARD F..........Belleville Fuels, Inc., 407 N. Eighth St., St. Louis, Mo.
*WOODS, HENRY C., Chmn. of the Board..........
Sahara Coal Co., 59 E. Van Buren St., Chicago 5, Ill.
WOODWARD, C. J., Dist. Mgr..........
Rome Cable Co., 208 S. Jefferson St., Chicago 6, Ill.
WOOSLEY, CLYDE W., Gen. Supt..........Pyramid Coal Corp., Pinckneyville, Ill.
WORSHAM, JAMES A., Exec. Sec..........
St. Louis Coal Merchants Assn., 418 Olive St., St. Louis, Mo.
WRIGHT, D. D..........Central Ill. Public Serv. Co., Marion, Ill.
WRIGHT, EDWARD S., Supt..........
Mine Rescue Station, 330 W. Main St., Belleville, Ill.
WRIGHT, H. D., Pres..........
Republic Coal & Coke Co., 8 S. Michigan Ave., Chicago 3, Ill.
WRIGHT, JOHN, Supt. Inspection & Delivery..........
Koppers Co., Wood Preserving Div., 416 W. Main St., Carbondale, Ill.

YERKES, J. H.............Jos. H. Yerkes & Co., 3715 Washington Ave., St. Louis 8, Mo.

YOHE, G. R., Chemist..
State Geological Survey, Natural Resources Bldg., Urbana, Ill.

YOUNG, A. M......................Sales Analysis Institute, 230 S. Clark St., Chicago 4, Ill.

YOUNG, CHARLES C., Chief Engr............Franklin County Coal Corp., Herrin, Ill.

YOUNG, L. E...Box 146, Pittsburgh, Pa.

YOUNG, W. P., Pres...
Bell & Zoller Coal & Mining Co., 307 N. Michigan Ave., Chicago 1, Ill.

*ZELLER, HARRY A...1434 Fifth Ave., Huntington, West Va.

ZEPPENFELD, H. B., Sales Mgr...
Mines Equipment Co., 4215 Clayton Ave., St. Louis 10, Mo.

ZIMMER, WALTER ....
Bixby-Zimmer Engineering Co., 961 Abingdon St., Galesburg, Ill.

ZINKGRAF, J. W. Dist. Mgr...
Chicago Pneumatic Tool Co., 1931 Washington Ave., St. Louis, Mo.

ZIV, HARRY M., Vice Pres...
Walter Bledsoe & Co., 310 S. Michigan Ave., Chicago 4, Ill.

ZOLMAN, G. W., Mech. Goods Repr..
Goodyear Tire & Rubber Co., 350 N. Ogden Ave., Chicago 7, Ill.

---

* Life Members.

† Honorary Members.

‡ Scholarship Members.

‡S Scholarship Members now in service.

S Serving in the armed forces of the United States Government. Carried as members in good standing without payment of dues for the duration.

Members, Meet Your Friends

Much of the success of our Institute is due to the support we have had from our friends. We want to continue meriting it.

We urge our membership to consult the Advertising Section in this and other issues of our Proceedings when in need of equipment.

Many of our friends — the advertisers — have carried copy with us in each issue. They have expressed satisfaction with the results obtained through their support.

This is the seventeenth consecutive yearbook we have published.


7687

CLARKSON *DIGS* those Tight Corner Shots out PERFECTLY!

When undermining standing coal, the CLARKSON LOADER really proves its outstanding superiority on "tight corner shots". That's just one of its many exclusive features that appeals to coal mining engineers.

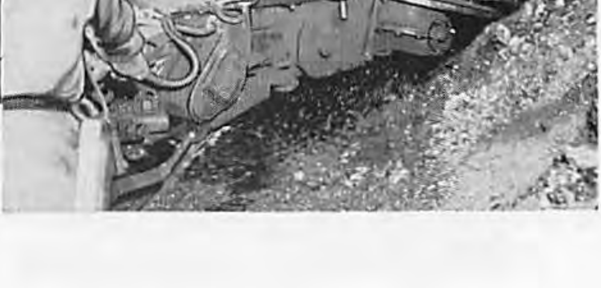
Added to this "corner shot" feature is the advantage of one operator handling all controls from one central point—the entire operation being powered with one (50 h. p.) Motor.

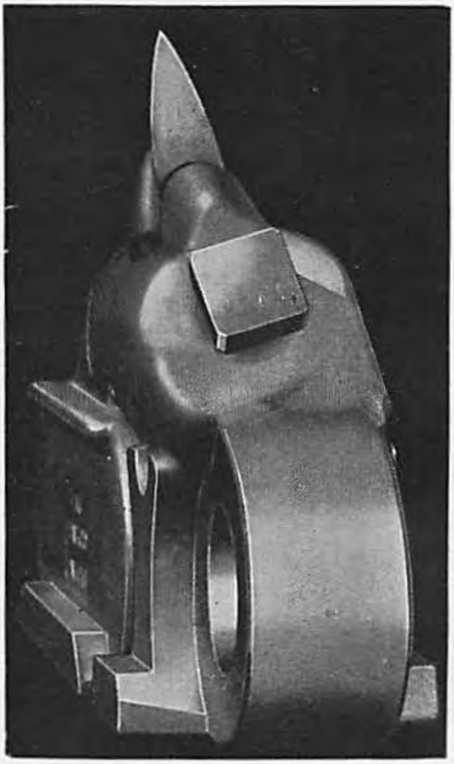
Yes, you'll find it well worth your time to get *all the facts* before you order any Loader.

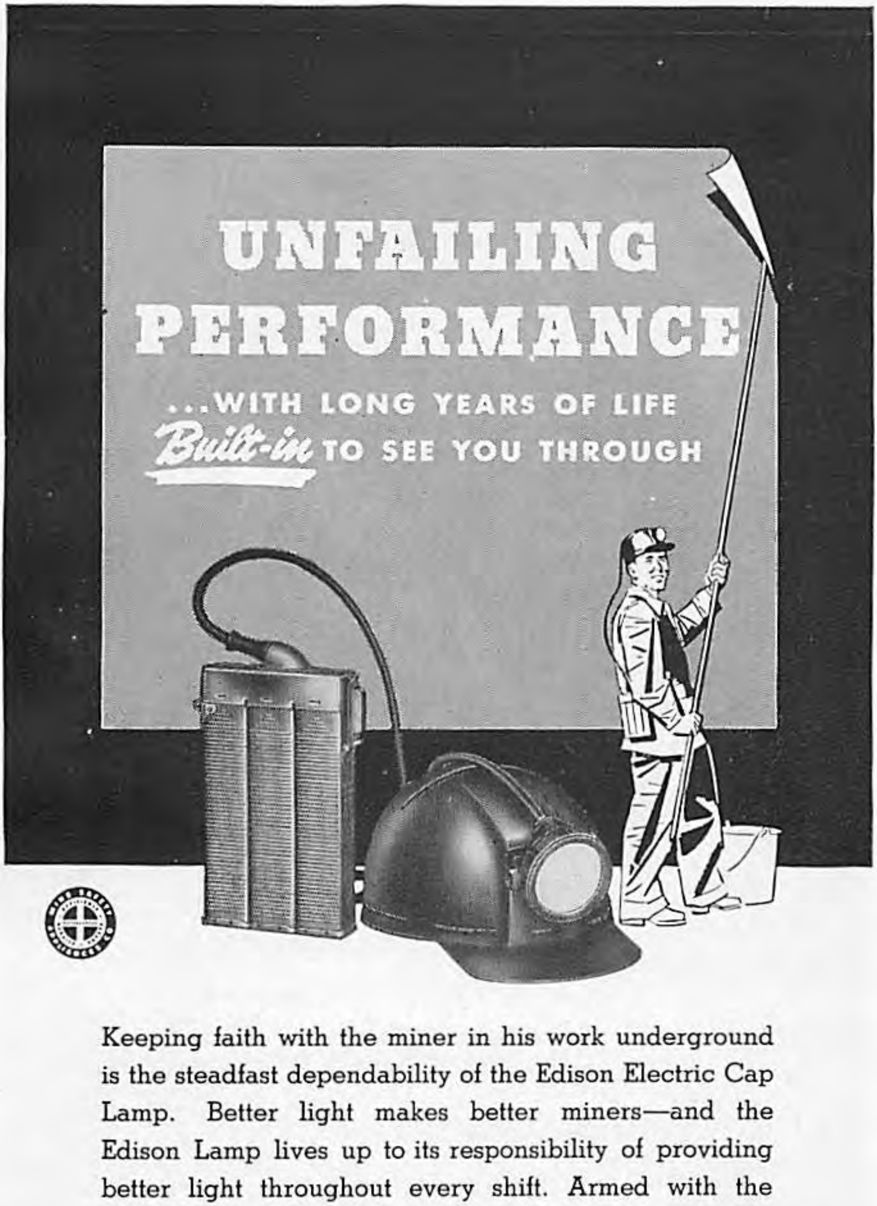
The CLARKSON MANUFACTURING CO.
NASHVILLE, ILLINOIS

CLARKSON
UNIVERSAL 24BB
LOADER

LOWEST 50 H. P.
LOADER MADE
(PATENTED)






UNFAILING
PERFORMANCE
...WITH LONG YEARS OF LIFE
Built-in TO SEE YOU THROUGH

BETHLEHEM PRODUCTS for the Mining Industry

Prefabricated Track

Every item for a complete mine-track set-up. After studying a blueprint or sketch of your layout, Bethlehem will figure the trackwork, cut the rails to length and precurve them in its own plant, and ship the entire outfit ready to assemble—rails, steel ties, switches, switch stands, turnouts, frogs, guard rails, joints, bolts, etc. A prefabricated track job saves installation time, cuts maintenance costs, reduces derailments.

Steel Ties

Bethlehem ties are made in a wide range of sizes and weights to suit individual conditions. Slip them under the rails, tap the clips into place with a hammer . . . that's all there is to it. No gaging, no spiking. Removal is just as easy. Install them for long-range economy; they outlast several sets of wooden ties and save maintenance too.

Wire Rope

For shafts, slope operations, incline planes, machine feeds, slusher hoists, conveyors, dragline excavators, power shovels. Bethlehem wire rope is available in all standard grades, sizes, and constructions, either preformed (Form-Set) or non-preformed.

Also recommended is the Bethlehem Lay-Lock Safety Clamp for shaft hoists. This device is bolted to the hoist rope several feet above the cage. Heavy chains connect the clamp to the cage so that, in case of rope failure at the socket, the cage is prevented from dropping.

Hollow Drill Steel

Fatigue-resisting drill steel—equally suitable for forged-on bits or threaded rods used with detachable bits. Easy to make up and heat-treat. The smooth, round, well-centered hole speeds up drilling by providing easy passage for air or water. Standard lengths, 17 to 25 feet.

Solid Drill Steel

An all-purpose carbon tool steel for general blacksmithing tools, chisels, drills, pinch bars, etc.

★ ★ BETHLEHEM STEEL ★ ★

OTHER BETHLEHEM PRODUCTS FOR MINES

MINE CARS • WHEELS AND AXLES • TOOL STEELS • BOLTS, NUTS, RIVETS, AND SPIKES • WIRE NAILS • HOT-ROLLED SHEETS • GALVANIZED STEEL ROOFING AND SIDING • PIPE • FABRICATED STRUCTURES • PLATES • MAYARI R (HIGH-STRENGTH, LOW-ALLOY STEEL)

SPEED

S-A

ACCURACY

STREETER-AMET COMPANY

4105 NORTH RAVENSWOOD AVENUE • CHICAGO, ILLINOIS

Print the weight—weigh cars in motion—for speed and accuracy **Automatic Weighers by the originators of Weight Recorders** **Visual Weight print—last three weights always visible**

Automatic weighing, recorded weights, and notion weighing provide the fastest, most accu-rate, least costly weighing method for mines. Our Recorders have been used by industry hroughout the world to provide an efficient veighing service since 1888. Our line includes 16 models. Streeter-Amet's mine line of Record-ers can be easily attached to existing scales or installed complete with scale levers. By a simple maneuver these machines can be converted into hand weighers instantaneously—an advantage in testing the weighing mechanism against the Recorder. . . . an advantage in labor or pro-duction control when authenticating the weigh-ng performance becomes necessary. The sav-ngs effected by printed weights and automatic veighing more than pays for this equipment in weight accuracy, speed and decreased work.

AUTOMATIC RECORDER FOR SHAFT MINES

TYPE MT-14. In the tipple or at the bottom of the mine shaft, Type MT-14 can be attached o the weigh hopper under a rotary or cross-over dump. On a mine track scale it weighs moving cars coupled in train or singly at prac-tical speeds. Motion weighing not only increases weighing speed many times but saves wear and maintenance of rolling stock and weighing equipment. Vibration of a tipple does not affect he accuracy of this machine.

Printing Mechanism: Can take abuse, is sim-ple to maintain, and the mechanism is readily accessible through front or rear doors.

Type MT-14
Automatic Recorder

Printed Record: Eliminates guess work and human errors. The record can be on either tape or tickets available for filing. On tipple machines, the weights of the last three loads are both visible and accessible for additional notations. The printing function is automatically actuated.

Beam: A beam with graduated bar, slide and counter-poise weights is connected directly to the scale levers. By its movement the type-wheel and indicator are positioned.

Tamper-Proof: This is a special feature used by operators who have uniform tare weights. After the tare has been set off, the Tamper-Proof housing is locked and sealed. The net weight is automatically printed.

MINE TRACK AND MOTOR TRUCK WEIGHER

TYPE W. This sturdy scale is ideal for mine use. Combined with Type MT-14 the best possible motion weighing results will be obtained because proper concentration of mass has been

considered in the design for this purpose. With Type B, it asusres a fast, accurate motor truck weigher. Sustained accuracy is assured by its special 3-point design—pivots at right angles to traffic; no weighbridge overhang; and a long "fulcrum distance". Each scale is assembled and tested at the factory. It can be furnished with weigh beam.

FIELD ENGINEERING SERVICE

Take advantage of our free Field Engineer Service. Let these experienced engineers tell you how you can save time and money with Automatic Recorders. Call on us for estimate repairing or survey of weighing operations.

WASHING UNITS

SCREENS—ALL TYPES

PICKING TABLES

CAR DUMPERS AND HAULS

BELT CONVEYORS

LOADING BOOMS

AS SPECIALISTS in the design, manufacture and application of conveying, cleaning, crushing, sizing, drying, and blending equipment and power transmission machinery, Link-Belt engineers have acquired and learned how to apply an extensive knowledge and experience, effectively, to the solution of materials handling, preparation and power transmitting problems of all kinds. While we have designed and built many of the country's largest coal preparation plants, as well as metallic and non-metallic ore handling systems, we have also designed hundreds of the smaller ones and revamped many others by the installation of individual units or the modification of existing equipment.

ENGINEERING SERVICE

Submit your problems to Link-Belt. Our experienced engineers will analyze your requirements and make impartial, constructive recommendations. Write today!

LINK-BELT COMPANY

Chicago 9, Philadelphia 40, Pittsburgh 19, Wilkes-Barre, Huntington, W. Va., Denver 2, Kansas City 6, Mo., Cleveland 13, Indianapolis 6, Detroit 4, St. Louis 1, Seattle 4, Toronto 8.

HEAT DRYERS

COAL SIZER-CRUSHERS

CONVEYORS—ALL TYPES

MALLEABLE, PROMAL & STEEL CHAINS

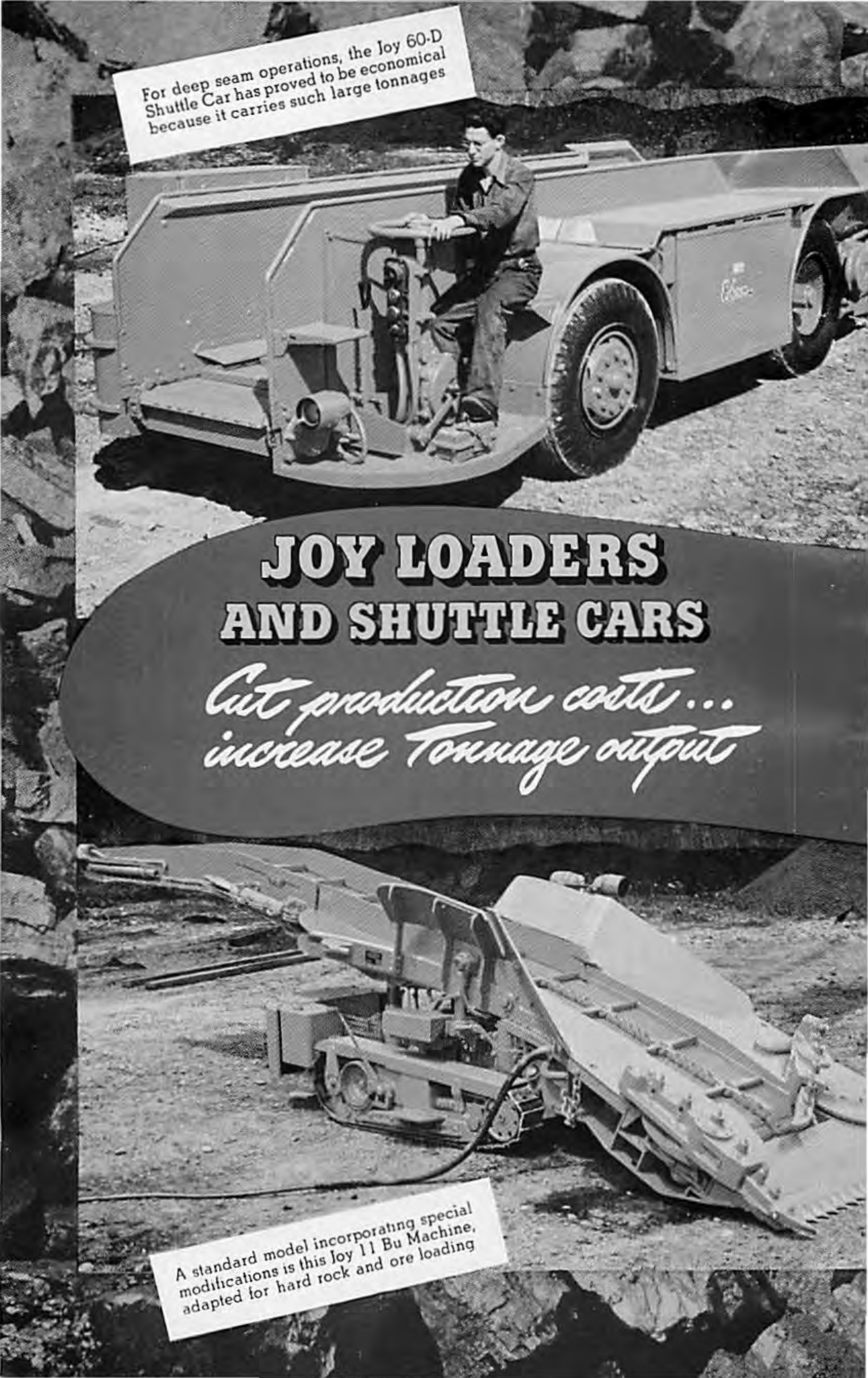
SPEED REDUCERS AND VARIATORS

BALL & ROLLER BEARINGS

COAL PREPARATION AND HANDLING EQUIPMENT

Engineered, Built and Backed by LINK-BELT

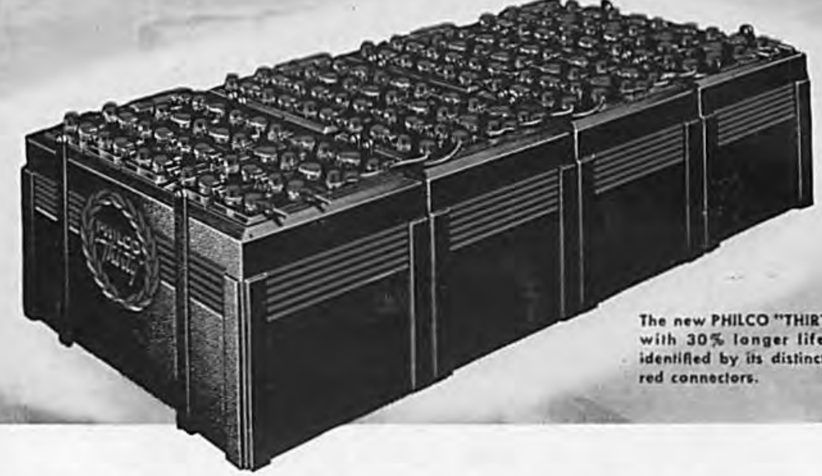

Even distribution and fast unloading of coal is effected in the Joy 32" Shuttle Car by means of the conveyor bottom.
3 BIG FEATURES
of all JOY mining equipment
Inherent Ruggedness...
Economy of Operation...
Simplicity in Handling...


For deep seam operations, the Joy 60-D Shuttle Car has proved to be economical because it carries such large tonnages
JOY LOADERS
AND SHUTTLE CARS
Cut production costs... increase Tonnage output
A standard model incorporating special modifications is this Joy 11 Bu Machine, adapted for hard rock and ore loading


Use the service
of a Joy Engineer
There's no
obligation
Thorough factory testing is mandatory
with all Joy equipment. Here a high-
pan mining machine truck is checked
JOY
MANUFACTURING
COMPANY
FRANKLIN, PA.

FOR THE LATEST IN MODERN MINE BATTERY ENGINEERING...

Specify PHILCO



The new PHILCO "THIRTY" with 30% longer life is identified by its distinctive red connectors.

MORE THAN EVER, today, Philco stands out as the leader in the development of modern high capacity, long-life storage batteries for mine haulage. Well known to mine operators is the pioneering work of Philco with its famous extra capacity XL and XVL type Batteries. And now, in addition, the great new Philco "Thirty" with 30% longer life, is available in increasing quantities for current deliveries. Powered by modern Philco Batteries, your locomotives and shuttle cars haul more tons. Philco dependability and longer life save you money. Write today for new descriptive catalogs. PHILCO CORPORATION, *Storage Battery Division,* Trenton 7, New Jersey.

For 50 years a Leader in Industrial Storage Battery Development

The complete line of Philco Mine Storage Batteries includes high capacity types of proven long life and economy for all battery-powered locomotive and shuttle car equipment.

WHAT IS COORDINATED CONVEYOR ENGINEERING?

Simply this: three separate engineering staffs working as a team to provide a system of low cost haulage of coal, ore, sand, gravel and other bulk materials. These three are engineers

representing: mine or plant operators, conveyor equipment manufacturers and United States Rubber Company.

Such three-way teamwork results in a belt conveyor which carries materials fficiently, handles output at minimum cost.

Thousands of U. S. Rubber Coneyor Belts, designed and installed through coordinated engineering, are ontributing to low cost conveying.

SERVING THROUGH SCIENCE

UNITED STATES RUBBER COMPANY

1230 SIXTH AVENUE • ROCKEFELLER CENTER • NEW YORK 20, N. Y.

LISTEN *to "Science Looks Forward"—new series of talks by the great scientists of America—on the Philharmonic-Symphony Program. CBS network, Sunday afternoon, 3:00 to 4:30, E. W. T.*

CARDOX

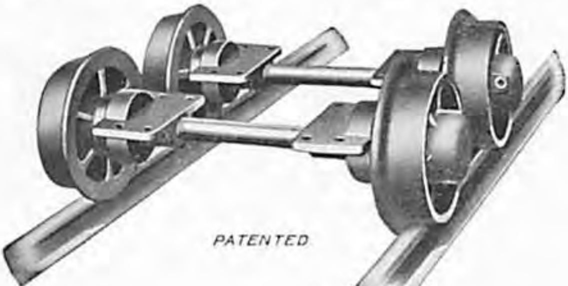
"THE NON-EXPLOSIVE MINING METHOD"

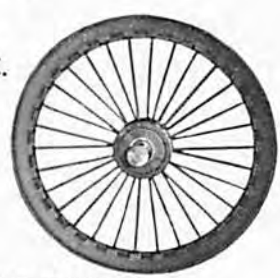
HELPS YOU TAKE *Full Advantage* OF MECHANIZATION

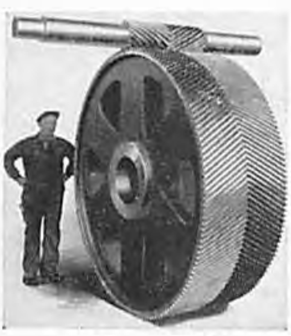
For example, CARDOX rolls the coal forward in a loose pile of coarse sizes. This permits the use of longer cutter bars—gives more coal per face—speeds up loading—reduces wear and tear on mechanical loaders.

Equally important, the gentle heaving action of CARDOX minimizes shattercracks...increases realization...reduces cleaning costs. Protection against overshooting is positive. Roof troubles are reduced. Because crews can enter the working face immediately after the fall, non-productive time of men and machines is greatly reduced.

CARDOX CORPORATION BELL BUILDING, CHICAGO 1, ILL.


PATENTED





NOW OUR PRODUCTS ARE AGAIN AVAILABLE TO OUR FRIENDS

The 150,000 square feet of floor space shown above can now be devoted entirely to the manufacture of Molded Rubber Cable Connectors, Vulcanizers, Electric Switchman, Cutter Bit Heaters and other products to aid in efficient mine operation.

Our job for the Armed Forces has been done—four times the Army—Navy "E" was awarded the men and women of Mines Equipment Company for a great production record.

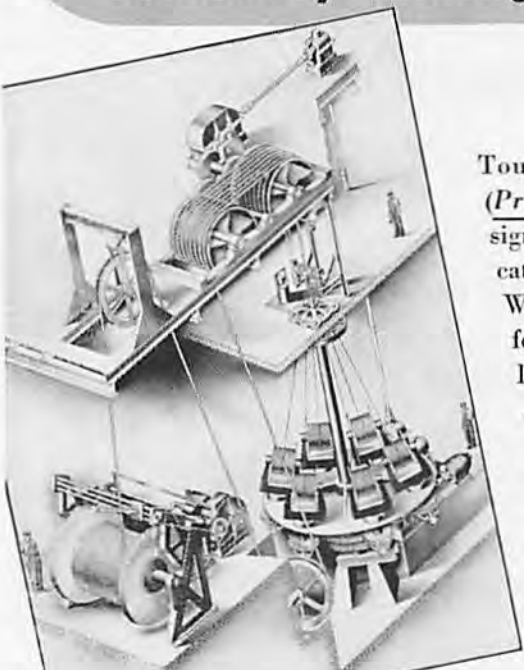
That's all over—again we hope to get around to see you more frequently. You will find the welcome mat out at our plant too. We are glad to have our friends come in any time.

MINES EQUIPMENT COMPANY

4215 Clayton Ave.
St. Louis, 10, Missouri

Wire Rope

for Every Mining Purpose



Tough, durable Union-formed (*Pre*formed) Wire Rope, designed for every mining application is a specialty with Union Wire Rope. In service and performance it is the ultimate in low cost.

This Union Wire Rope four-story giant closing machine has a capacity of 27 tons of continuous Wire Rope, ranging in size from ¾ inch to 4 inch diameter. Wire Rope for stripper shovels is one of its products.

Tuffy Union-formed Wire Ropes for mining machines are stronger, safer, withstand abrasion, bending and crushing longer. They are easier to handle because flexibility is built into the *Pre*forming of the strands. Tuffy ends for mining machinery are Union-clipped for easier installation.

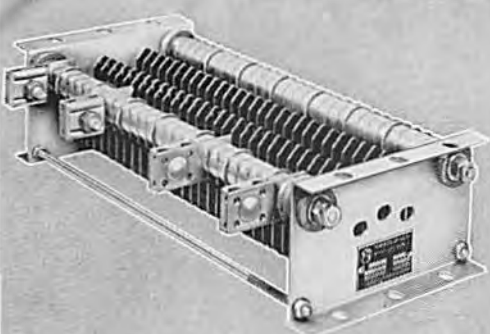
UNION WIRE ROPE CORPORATION

2178 Manchester Ave. Kansas City 3, Mo.

UNION WIRE ROPE CORP

union
Wire Rope

union-formed is Preformed

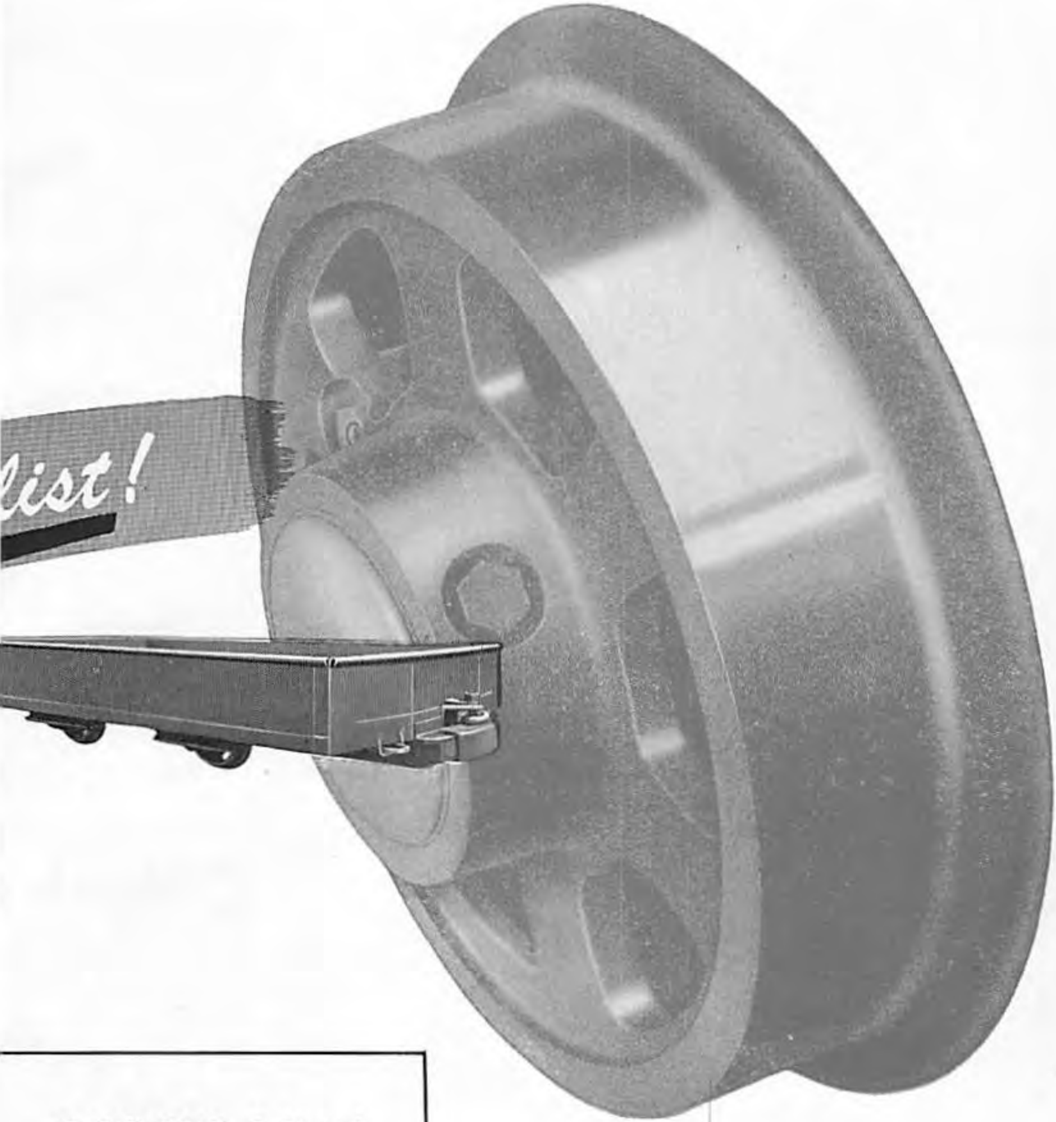


Put war-worn mine cars on your honorable discharge

With every machine or conveyance there comes a time when dollars and cents say that a new replacement is more economical to operate — and mine cars are no exception.

You know from your own operations the tremendous demands that the war has placed on your equipment. You know that in the postwar battle for business you will want the most efficient rolling stock to keep costs down.

Talk over your needs with an Q.C.f. mine car representative — early. Ask him to go over your cars, sit down with your people and make suggestions. His services will prove invaluable in helping you decide whether new cars are indicated NOW or LATER — what type the cars should be for your most profitable operation — whether parts replacement alone might be sufficient. Over the years, at mine after mine, this personalized service has helped lower production costs.


list!

Have you met "MONOBEL" AA?

A dependable, low-cost, water-resistant permissible developed for wet work and hard-shooting coal

"Monobel" AA was developed by Du Pont research for use in coal mines where the working is wet and where thick, hard-shooting coal is encountered.

It's a strong low-velocity ammonia permissible that has been proved thoroughly dependable in wet work. "Monobel" AA is waterproofed by a basically new method and costs less than the gelatinous permissibles used for similar work.

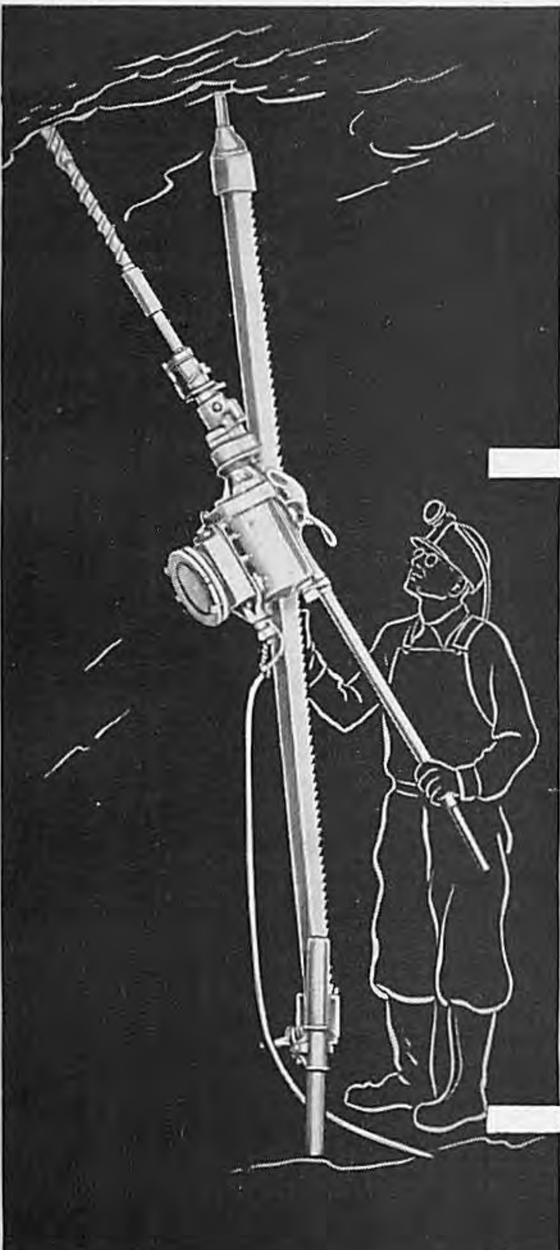
"Monobel" AA produces firm, coarse coal, yet breaks it down sufficiently to facilitate mechanical loading. Tests show that by its use a charge can be readily concentrated in the back of the hole . . . which results in more efficient shots . . . squares up the face and shears the ribs better.

Try "Monobel" AA. Operators agree that it performs well regardless of whether top or bottom cutting is practised, and that it will do ordinary rock and slate shooting in any mine. Talk with your Du Pont representative for complete information. E. I. du Pont de Nemours & Co. (Inc.), 332 South Michigan Ave., Chicago 4, Illinois.

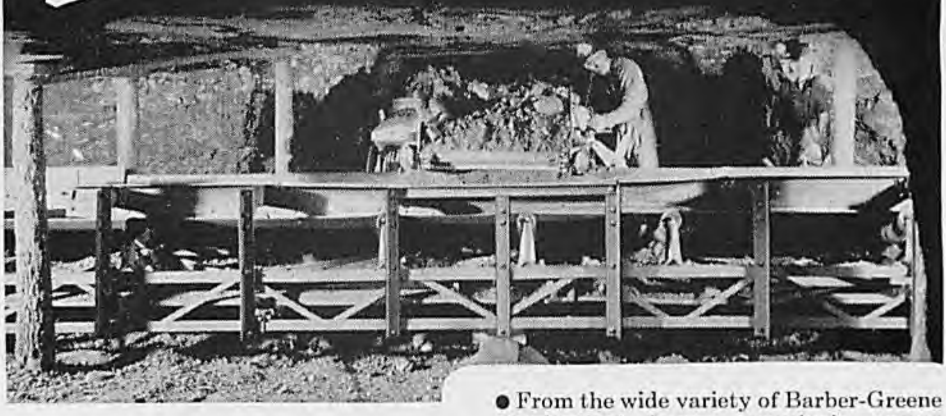
DU PONT

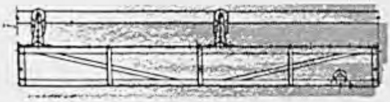
PERMISSIBLES

Blasting Supplies and Accessories

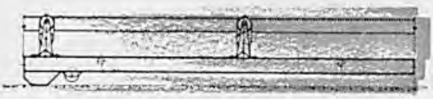


How B-G CONVEYORS MEET VARIED MINE CONDITIONS





Truss Conveyor Frame
Built for Strength and Endurance



Channel Conveyor Frame
Ideal for Low Headroom

Low Seam Conveyor Frame
Designed for Frequent Moving

● From the wide variety of Barber-Greene *standardized* frames, terminals, power drives and take-ups, you can select those units best suited to the particular requirements of an underground conveying system in your mine.

Truss frames, for instance, are designed for main-entry duty. The truss design provides extra rigidity to maintain true alignment over uneven bottom curves and for long unsupported spans.

Channel frames have sturdy skid legs for low mounting directly on the mine floor. Just bolt the sections together — each one is a self-contained unit.

And when frequent extension or moving is required, the demountable frame of the low seam conveyor will save many hours of precious time.

Barber-Greene conveying equipment can be easily adapted to your mine. Mine Catalog 66 illustrates with many drawings and installation photos how B-G mine conveyors are now meeting a variety of mine conditions. For your copy, write to Mining Department, Barber-Greene Company, Aurora, Illinois.

44-68A

Barber B-G Greene

Constant Flow Equipment

IF IT'S A CUTTER CHAIN PROBLEM WE CAN HELP YOU . . .

No, we're not magicians but we have worked closely with hundreds of mine operators over a period of twenty-five years. Such close relationship has brought us in touch with many difficult problems. Our knowledge and help is yours for the asking.

CINCINNATI DUPLEX CHAIN

Specialists in Coal Cutting Equipment for 25 Years

CINCINNATI STANDARD CHAIN

Cincinnati Standard Chain accommodates Stanex Holder and Bit or regular ½" x 1" bit. Similar in design to the famous Duplex Chain.

STANEX HOLDER AND BIT
The Stanex Holder and factory made double ended Stanex Bit fits all chains that accommodate the regular ½" x 1" bit.

YEARS ago we started out with one thought in mind . . . to build a better Cutter Chain. For twenty-five years we have devoted all our energies and engineering abilities to that one task. Today, Cincinnati Chains and reversible, double-ended Duplex Bits are acknowledged all over the world for their outstanding performance under any and all cutting conditions. Heat-treated and drop-forged, the Cincinnati Chain is engineered to give greater production at a lower cost . . . to hold shutdowns to a minimum . . . to produce larger cuttings . . . to use less power. Let one of our representatives prove to you the advantages of Cincinnati Time Tested Coal Cutting Equipment. There's no obligation.

THE CINCINNATI MINE MACHINERY CO.

2980 SPRING GROVE AVENUE • CINCINNATI, OHIO

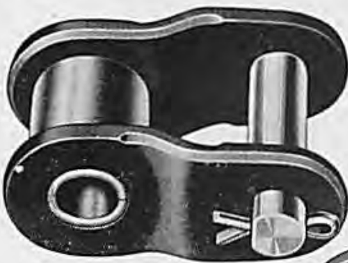
J&L PERMASET PRECISIONBILT PRE-FORMED WIRE ROPE

DISTRIBUTORS OF

Links for Diamond Roller Chains

SPRING CLIP CONNECTING LINK—Standard for 3/8" pitch, 1/2" pitch No. 66, and 5/8" pitch chains and can be supplied for 1/2" pitch No. 65. The cover plate is a loose, or slip, fit on the pins and is held in place by flat spring steel clip, split at one end and fitting in grooves in the pin ends. Specify connecting links with press-fit cover plates or master links, if chains are used for high-speed drives.

CONNECTING LINK—Cotter Pin Type—Standard for roller chains 3/4" to 2 1/2" pitch inclusive. The pins are riveted into one link plate; the "cover plate" is driven evenly into place over the drilled pin ends and is not a loose, or slip, fit. The cotters do not hold the link plate in place. The press-fit between pins and cover plate prevent the pins from turning and the plate from coming off.



OFFSET LINK—(Half Link)—Used (one per chain) when the chain length requires an odd number of pitches. The use of offset links should be avoided whenever possible and if their use is necessary the "combination" offset link is to be preferred particularly for the short pitch chains and chains run at high speeds or under heavy loads.

COMBINATION OFFSET LINK—An Offset Link and a Roller Link assembled and riveted together, the pin being a press fit in the offset link plates. Used (one per chain) when the chain link requires an odd number of pitches. An improvement over the plain offset link but should be used only when shaft centers cannot be adjusted to accommodate a chain length when an even number of pitches. This design is standard for 3/8" and 1/2" pitch No. 65 chains.

"SNAP-ON" CONNECTING LINK—Made for 1/2" pitch No. 65 chain only. Cover plate fits into grooved pin ends and is sprung into place after the link is assembled in the chain. Not suitable for high speeds.

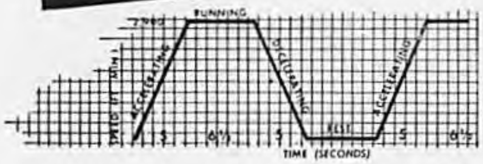
ROLLER LINK—Standard for all sizes of roller chains.

MASTER LINK—Pin Link Riveted—Standard for all sizes of roller chains. The pins are riveted into one link plate; the "cover plate" is driven over the opposite pin ends and will be held in place by the heavy press fit, although, for appearance, it is customary to rivet or spread the pin ends after the "cover plate" is in place.

NEW AMPLIDYNE-CONTROLLED MINE HOIST

makes 167 trips PER HOUR

HOISTS 750 TONS OF COAL PER HOUR UP 487-FOOT SHAFT



Mine cars don't pile up waiting for the hoist in the Pennsylvania mine where this new G-E drive is installed. Hoisting 4½-ton loads 487 feet in the almost unbelievable time of 16½ seconds, this hoist is making a truly remarkable record for tonnage handled.

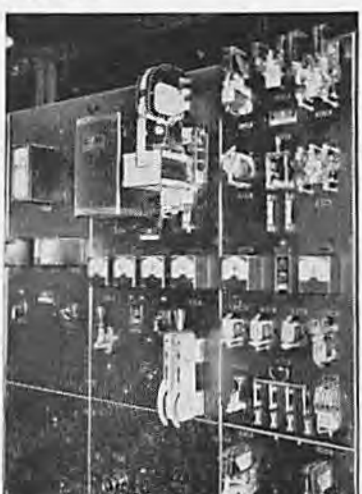
As the chart above shows, the amplidyne-controlled drive accelerates the fully loaded cage to running speed in 5 seconds, and decelerates it to a stop in the same time. In addition, the maximum running speed is 2900 feet per minute, which necessitates accurate and positive control. A complete trip is made every 21½ seconds: 10 to accelerate and decelerate; 6½ running at full speed; and 5 to dump and load. In continuous operation, the hoist thus makes 167 trips per hour; handles 750 tons of coal per hour.

If you are planning to install a new hoist, or to modernize one of your present drives, let G-E engineers give you the benefit of their practical experience with hoists of every type and size. The teamwork of amplidyne control and G-E hoist motors will give you the hoist you need to handle the tonnage you want—rapidly and safely. *General Electric Co., Chicago 7, Ill.*

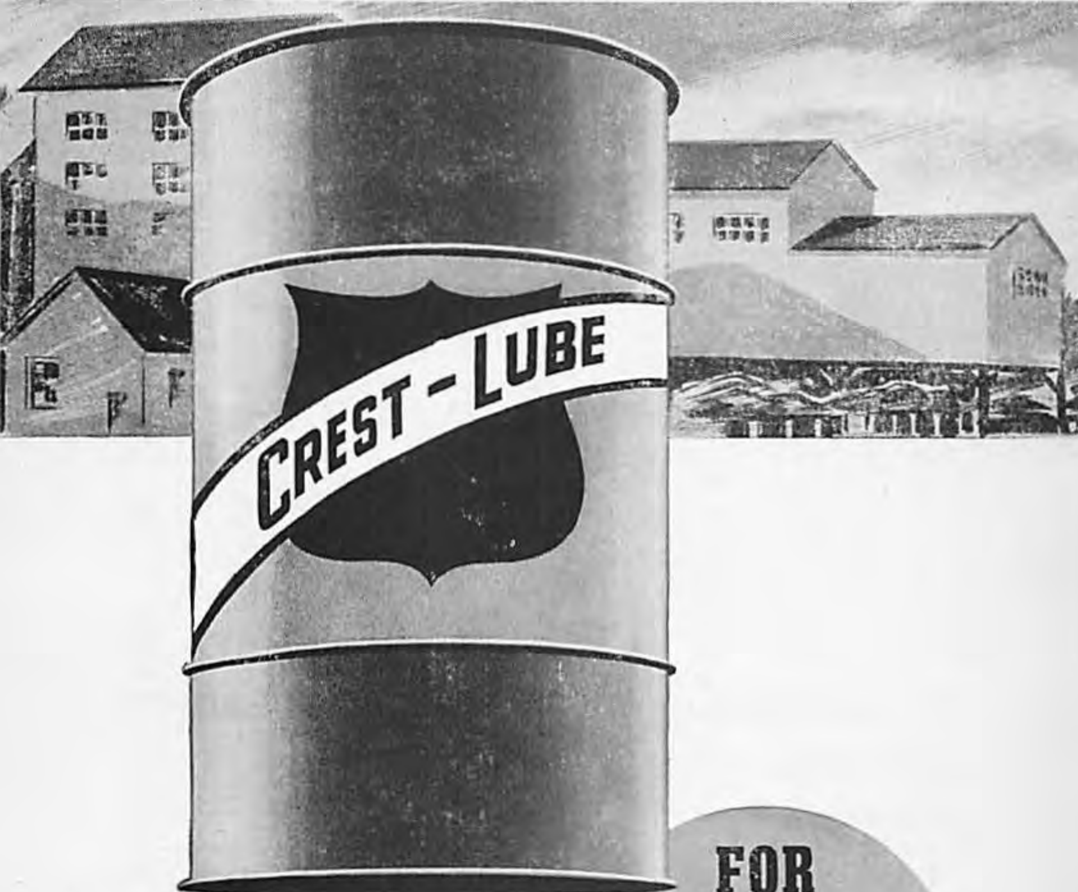
GENERAL ELECTRIC

657-42D1-497

SIMPLICITY OF CONTROL is a big feature of the G-E amplidyne. Contrast the small size and small number of the devices on the amplidyne panel (right) with the many contactors and relays that would be required with conventional control. Left-hand panel controls the dynamic-braking exciter for the motor-generator. Center panel is the main d-c line panel.



KEY TO THE SPEED with which this hoist responds is the G-E amplidyne, the new electrical tool which provides as much as 10,000 to 1 amplification. Responding instantaneously to minute currents impressed on its control field, the amplidyne furnishes the power to drive or control machines.


CREST-LUBE

For Coal Stripping - -

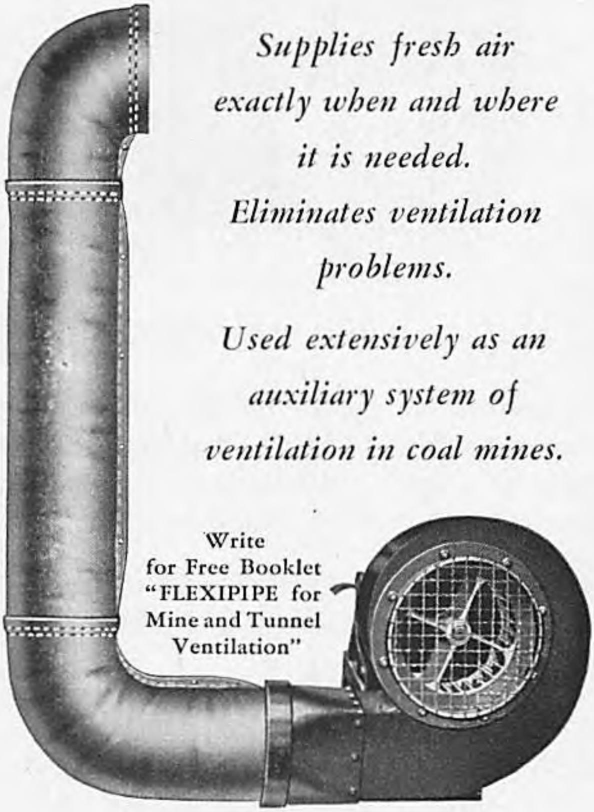
EUCLIDS are your Best Bet!

tom-Dump and Rear-Dump Euclid
l Haulers move more tons per hour
consistently lower cost because
y are designed and built through-
for off-the-highway service. Carry-
pay loads of 15 to 30 tons at top
eds from 21 to 34 m.p.h., Euclids are efficient for all lengths of haul.
v operating costs plus trouble-free performance have made Euclid
outstanding hauling equipment for coal, overburden and gob.

will be glad to supply helpful facts and figures without obligation.
o new pictorial booklets showing Euclids at work on various
ning and construction jobs are yours for the asking.

e EUCLID ROAD MACHINERY Co. · · · Cleveland 17, Ohio

FLEXIPIPE



Supplies fresh air exactly when and where it is needed.

Eliminates ventilation problems.

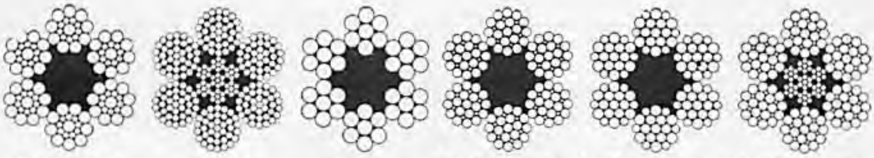
Used extensively as an auxiliary system of ventilation in coal mines.

Write for Free Booklet "FLEXIPIPE for Mine and Tunnel Ventilation"

The Original makers of FLEXIBLE Air Tubing

BEMIS BRO. BAG CO.

ST. LOUIS 2, MO.



6 x 19 Seale Hemp Center	6 x 37 IWRC	6 x 7 Hemp Center	6 x 19 Filler Wire Hemp Center	6 x 19 Warrington Hemp Center	6 x 19 Filler Wire IWRC

Recommended Constructions of Wire Rope for Use in Coal and Metal Mining

VERTICAL SHAFT HOIST ROPES (Single Layer on Drum)

⅞" to 2" Dia. 6 x 19 Filler Plow or Perfection Hemp Center "LAY-RITE" (Sometimes Lang Lay)

VERTICAL SHAFT HOIST ROPES (Multiple Layers on Drum)

⅞" to 1⅛" Dia. 6 x 19 Seale Plow or Perfection Hemp Center "LAY-RITE"

MINING MACHINE ROPES (For Jeffrey, Goodman, Sullivan, Motherwell, etc.)

Pull Rope—⅝" or ¾" Dia. 6 x 37 Plow or Perfection IWRC "LAY-RITE"

Tail Rope—½" Dia. 6 x 19 Filler Plow or Perfection IWRC "LAY-RITE"

HAULAGES

½" to 1⅜" Dia. 6 x 7 Plow or Perfection Hemp Center Lang Lay "LAYRITE"

CAR RETARDERS

⅝" and ¾" Dia. 6 x 19 Filler Plow or Perfection IWRC "LAYRITE"

CAR PULLERS OR CAR SPOTTERS

½" to ¾" Dia. 6 x 19 Seale Plow IWRC "LAYRITE"

PORTABLE DRILLING MACHINES

⅝" to ⅞" 6 x 19 Warrington Mild Plow Hemp Center Left Lay or Right Lay

SCRAPERS OR SLUSHERS

⅜" to ⅝" Dia. 6 x 19 Seale Plow Hemp Center or IWRC "LAY-RITE"

¾" to 1⅛" Dia. 6 x 19 Seale Plow IWRC "LAYRITE"

CONVEYORS—DISC OR BUTTON (As Jeffrey, Roberts & Schaefer, etc.)

⅝" to 1¼" Dia. 6 x 19 Seale Plow or Perfection IWRC—Strands Alternate Right Lay and Left Lay "LAYRITE"

CRAB WINCH HOIST

5/16" to ½" Dia. 6 x 19 Filler Plow Hemp Center "LAYRITE"

ROOM HOISTS

¼" to ½" Dia. 6 x 19 Seale Plow Hemp Center "LAYRITE"

ROCK DUMP HAULAGES

⅝" to ⅞" Dia. 6 x 19 Seale Plow Hemp Center "LAYRITE"

Established 1871

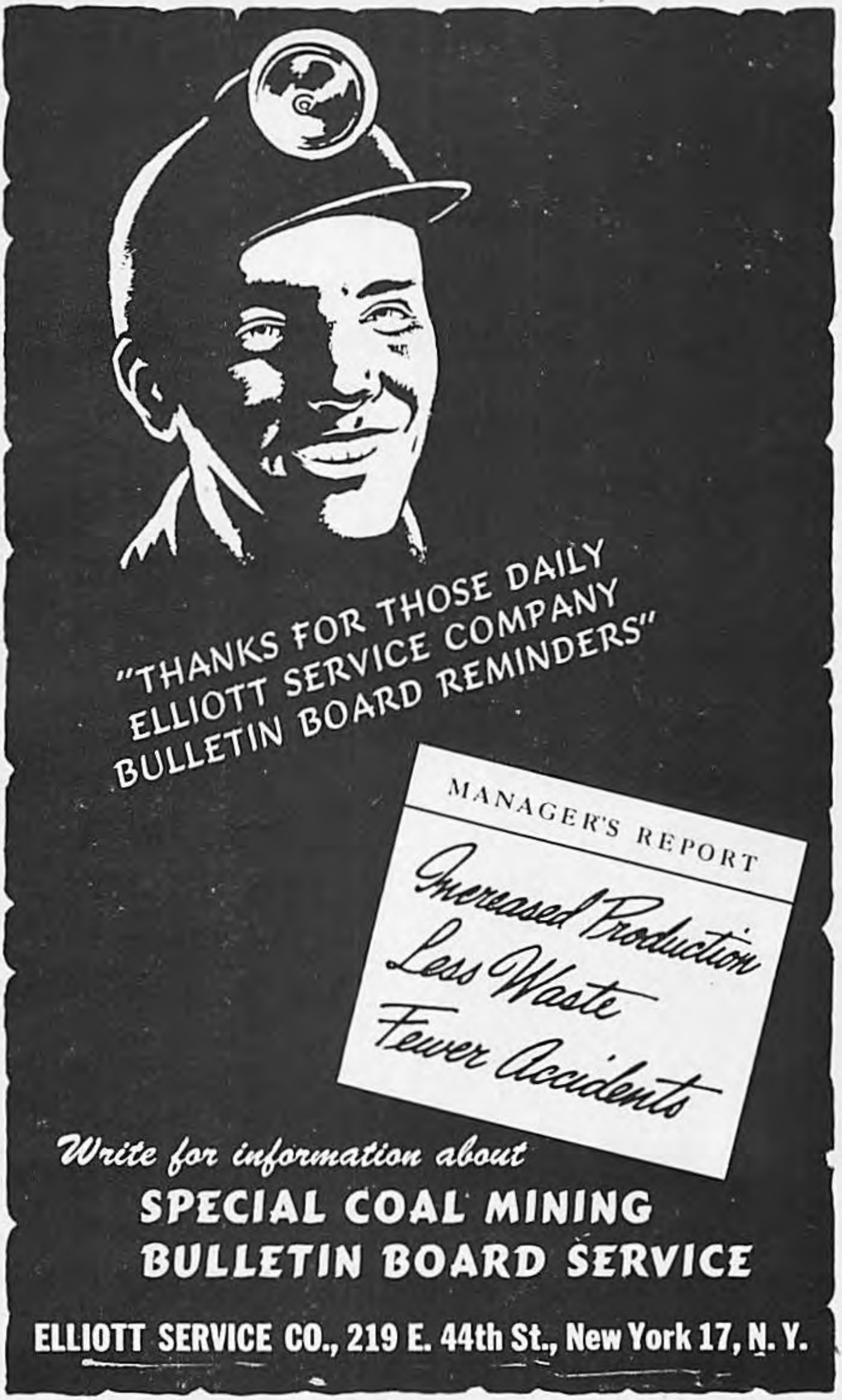
Upson-Walton also manufactures the most complete line of BRATTICE

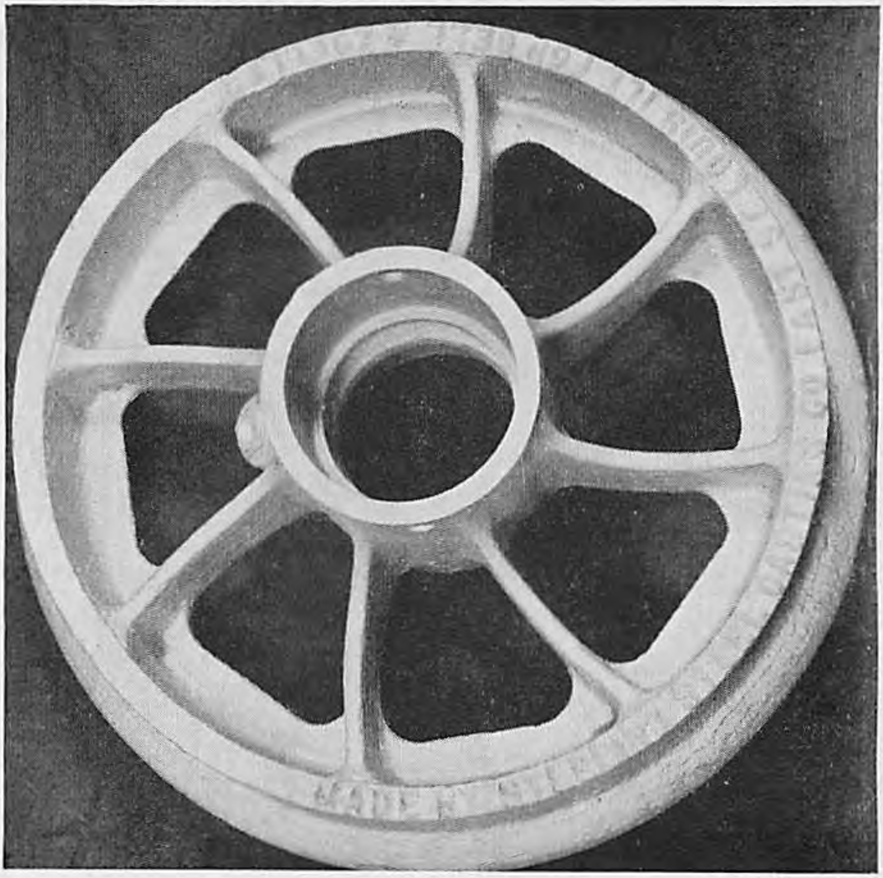
THE UPSON-WALTON COMPANY

Manufacturers of Wire Rope, Wire Rope Fittings, Tackle Blocks

MAIN OFFICES AND FACTORY: CLEVELAND 13, OHIO

114 Broad Street, New York 4 — 737 W. Van Buren Street, Chicago 7 — 241 Oliver Building, Pittsburgh 22


"THANKS FOR THOSE DAILY
ELLIOTT SERVICE COMPANY
BULLETIN BOARD REMINDERS"
MANAGER'S REPORT
Increased Production
Less Waste
Fewer Accidents
Write for information about
SPECIAL COAL MINING
BULLETIN BOARD SERVICE
ELLIOTT SERVICE CO., 219 E. 44th St., New York 17, N. Y.



Sterling Mine Car Wheels

Sterling's cast steel mine car wheels are rapidly becoming more popular in the coal fields. Our customers are daily becoming more conscious of the superiority of the Sterling wheel over the chilled grey iron wheel offered by our competition. Our wheels eliminate five difficulties common to other type wheels:

1. Broken flanges
2. Broken treads
3. Broken spokes
4. Flats
5. Broken hubs.

By eliminating these difficulties, the Sterling Wheel prevents many serious wrecks. This greatly reduces operating expenses and gives greater insurance against injury or death to the workers. In one mine alone our wheels have transported better than 13,000,000 tons of coal over a period of ten years.

STERLING STEEL CASTING CO.

EAST ST. LOUIS, ILLINOIS

★

Remember our Friends

THE

ADVERTISERS

★

The Sincere

Thanks

of the

Officers and Members of the

ILLINOIS MINING INSTITUTE

goes to the Advertising Committee:

M. M. SHEPARD, *Chairman*

P. W. BEDA

ARTHUR T. BLAKE

H. E. CAMPBELL

J. G. CRAWFORD

C. S. DE WITT

R. J. HEPBURN

W. L. GILGIS

G. S. JENKINS

F. E. McEVOY

R. W. WEBSTER

Their willingness and efficient cooperation have helped make this yearbook possible.

INDEX TO ADVERTISERS

Ahlberg Bearing Co. 171
W. D. Allen Mfg. Co. 152-B
Allen & Garcia Co. 100
American Brattice Cloth Corp. 49
American Cable Division 37
American Car & Foundry Co. 70-71
The American Crucible Products Co. 125
American Cyanamid & Chemical Corp. 127
American Pulverizer Co. 143
American Steel & Wire Co. 55
Anaconda Wire & Cable Co. 159
Antiseptol Co., Inc. 144-A
Atlas Powder Co. 106
Austin Powder Co. 154
Austin-Western Co. 47
The Autocar Co. 153

Barber-Greene Co. 98
Beall Bros. Supply Co. 118-B
Bearings Service Co. 99
Beck & Corbitt Co. 142
Bemis Bro. Bag Co. 135
Berry Bearing Co. 32
Bethlehem Steel Corp. 26
Bituminous Casualty Corp. 16
Bixby-Zimmer Engineering Co. 158-A
Broderick & Bascom Rope Co. 76
Bucyrus-Erie Co. 87
Buettner Shelburn Machine Co., Inc. 63
E. D. Bullard Co. 14-B

Cardox Corp. 53
Central Iron & Metal Co. 48-B
Central Mine Equipment Co. 6
Centrifugal & Mechanical Industries, Inc. 52-A
Charles Products Co. 161
Chicago Perforating Co. 40-B
Chicago Pneumatic Tool Co. 93
Chicago Tube & Iron Co. 13
Cincinnati Mine Machinery Co. 103
Clarkson Mfg. Co. 8

Coal Age 5
Coal Mine Equipment Sales Co. 147
Columbia Quarry Co. 122
Commercial Testing & Engineering Co. 62-B
Consolidated FWD Sales & Service Corp. 113
Crescent Lubricating Co. 131
Henry H. Cross Co. 109
Cummins Diesel Sales Corp. of Ill. 51
Cutter Bit Service Co. 166-B

The Davies Supply Co. 163
Diamond Chain Co. 114
Dooley Bros. 130
Duncan Foundry & Machine Works, Inc. 105
E. I. du Pont de Nemours & Co. 88
Duquesne Mine Supply Co. 61
Du Quoin Iron & Supply Co., Inc. 83
Dustlix Corp. 158-B

Eagle Boat Store Co. 144-B
Eagle Iron Works 52-B
Egyptian Powder Co. 48-A
Egyptian Sales Agency 46-A
Egyptian Tie & Timber Co. 77
Electric Coal Mining Machinery Co. 167
The Electric Storage Battery Co. 172
Elliott Service Co. 151
Ensign Electric & Mfg. Co. 74-A
The Equitable Powder Mfg. Co. 50-B
The Euclid Road Machinery Co. 133
Evansville Electric & Mfg. Co. 115

The Fafnir Bearing Co. 72
John Flocker & Co. 121
The Flori Pipe Co. 138-B
L. B. Foster Co. 112-B
Fraser Label Co. 140-B
Fulton Bag & Cotton Mills 82-A
Funk Forging Co. 152-A

The Garlock Packing Co. 74-B
General Electric Co. 123
Gibraltar Equipment & Mfg. Co. 160
Goodman Mfg. Co. 66
Gould Storage Battery Corp. 138-A
Graybar Electric Co., Inc. 89

Great Lakes Supply Corp. 90
Greensburg Machine Co. 68-A
Grinnell Co. 170-A

W. M. Hales Co. 149
H. H. Halliday Sand Co. 68-B
Hawkins Electric Co. 50-A
Hazard Wire Rope Div. 29
Helwig Co. 102-B
Hendrick Mfg. Co. 84
Hercules Powder Co. 173
Hockaday Paint Co. 24-A
Robert Holmes & Bros., Inc. 43
Hotel Abraham Lincoln 45
Hulburt Oil & Grease Co. 1

O. Iber Co. 155
Ideal Commutator Dresser Co. 82-B
Illinois Bearing Co. 60
Illinois Gear & Machine Co. 110
Illinois Powder Mfg. Co. 108-A
Insulation & Wires, Inc. 116-117
International Shoe Co. 54
Irwin Foundry & Mine Car Co. 146-B
I-T-E Circuit Breaker Co. 15

The Jeffrey Mfg. Co. 79
Charles Eneu Johnson & Co. 128-B
The Johnson-March Corp. 78
Jones & Laughlin Steel Corp. 104
Joy Mfg. Co. 33-36

Kanawha Mfg. Co. 168-A
Kennedy-Webster Electric Co. 40-A
Kensington Steel Co. 162
Klein Armature Works 118-A
Koehler Mfg. Co., Inc. 17
Koppers Co., Inc., Wood Preserving Div. 23

Leetonia Tool Co. 145
A. Leschen & Sons Rope Co. 136
Link-Belt Company 31
Ly-Mar Hotel 148-A

Macwhyte Co. 56
The Manhattan Rubber Mfg. Div. of Raybestos-Manhattan, Inc. 10

The Marion Steam Shovel Co. 75
The Martindale Electric Co. 4
McMaster Carr Supply Co. 148-B
McNally Pittsburg Mfg. Corp. 11
Mechanization 3
Michigan Chemical Corp. 132-A
Mine Safety Appliances Co. 19
W. H. Miner, Inc. 24-B
Mines Equipment Co. 59
Mineweld Co. 168-B
Mining Machine Parts, Inc. 20
Mississippi Lime Co. 44-B
Mosebach Electric & Supply Co. 46-B

National Electric Coil Co. 119

Oberjuerge Rubber Distributing Co. 134
Ohio Brass Co. 156
Ohio Oil Co. 95
Ottumwa Iron Works 57

Pac Lubricating & Service Co. 102-A
Peoria Tractor & Equipment Co. 9
Philco Corporation, Storage Battery Div. 38
Phillips Mine & Mill Supply Co. 91
Pittsburgh Knife & Forge Co. 111
Portable Safety Div., Portable Products Corp. 140-A
The Post-Glover Electric Co. 65
Power Transmission Equipment Co. 126
Productive Equipment Corp. 30
Frank Prox Co., Inc. 18

Revere Electric Supply Co. 62-A
R-J Bearings Co. 14-A
R-J Bearings Corp. 73
Roberts & Schaefer Co. 67
Robins Conveyors, Inc. 86
John A. Roebling's Sons Co. 25
Rome Cable Corp. 139
Joseph T. Ryerson & Son, Inc. 69

The Salem Tool Co. 146-A
Seibel-Suessdorf Copper & Iron Mfg. Co. 120-B
Simplex Wire & Cable Co. 137
SKF Industries 107
Sligo Iron Store Co. 85

INDEX TO ADVERTISERS

Ahlberg Bearing Co. 171
W. D. Allen Mfg. Co. 152-B
Allen & Garcia Co. 100
American Brattice Cloth Corp. 49
American Cable Division 37
American Car & Foundry Co. 70-71
The American Crucible Products Co. 125
American Cyanamid & Chemical Corp. 127
American Pulverizer Co. 143
American Steel & Wire Co. 55
Anaconda Wire & Cable Co. 159
Antiseptol Co., Inc. 144-A
Atlas Powder Co. 106
Austin Powder Co. 154
Austin-Western Co. 47
The Autocar Co. 153

Barber-Greene Co. 98
Beall Bros. Supply Co. 118-B
Bearings Service Co. 99
Beck & Corbitt Co. 142
Bemis Bro. Bag Co. 135
Berry Bearing Co. 32
Bethlehem Steel Corp. 26
Bituminous Casualty Corp. 16
Bixby-Zimmer Engineering Co. 158-A
Broderick & Bascom Rope Co. 76
Bucyrus-Erie Co. 87
Buettner Shelburn Machine Co., Inc. 63
E. D. Bullard Co. 14-B

Cardox Corp. 53
Central Iron & Metal Co. 48-B
Central Mine Equipment Co. 6
Centrifugal & Mechanical Industries, Inc. 52-A
Charles Products Co. 161
Chicago Perforating Co. 40-B
Chicago Pneumatic Tool Co. 93
Chicago Tube & Iron Co. 13
Cincinnati Mine Machinery Co. 103
Clarkson Mfg. Co. 8

Coal Age ... 5
Coal Mine Equipment Sales Co. ... 147
Columbia Quarry Co. ... 122
Commercial Testing & Engineering Co. ... 62-B
Consolidated FWD Sales & Service Corp. ... 113
Crescent Lubricating Co. ... 131
Henry H. Cross Co. ... 109
Cummins Diesel Sales Corp. of Ill. ... 51
Cutter Bit Service Co. ... 166-B

The Davies Supply Co. ... 163
Diamond Chain Co. ... 114
Dooley Bros. ... 130
Duncan Foundry & Machine Works, Inc. ... 105
E. I. du Pont de Nemours & Co. ... 88
Duquesne Mine Supply Co. ... 61
Du Quoin Iron & Supply Co., Inc. ... 83
Dustlix Corp. ... 158-B

Eagle Boat Store Co. ... 144-B
Eagle Iron Works ... 52-B
Egyptian Powder Co. ... 48-A
Egyptian Sales Agency ... 46-A
Egyptian Tie & Timber Co. ... 77
Electric Coal Mining Machinery Co. ... 167
The Electric Storage Battery Co. ... 172
Elliott Service Co. ... 151
Ensign Electric & Mfg. Co. ... 74-A
The Equitable Powder Mfg. Co. ... 50-B
The Euclid Road Machinery Co. ... 133
Evansville Electric & Mfg. Co. ... 115

The Fafnir Bearing Co. ... 72
John Flocker & Co. ... 121
The Flori Pipe Co. ... 138-B
L. B. Foster Co. ... 112-B
Fraser Label Co. ... 140-B
Fulton Bag & Cotton Mills ... 82-A
Funk Forging Co. ... 152-A

The Garlock Packing Co. ... 74-B
General Electric Co. ... 123
Gibraltar Equipment & Mfg. Co. ... 160
Goodman Mfg. Co. ... 66
Gould Storage Battery Corp. ... 138-A
Graybar Electric Co., Inc. ... 89

Great Lakes Supply Corp. 90
Greensburg Machine Co. 68-A
Grinnell Co. 170-A

W. M. Hales Co. 149
H. H. Halliday Sand Co. 68-B
Hawkins Electric Co. 50-A
Hazard Wire Rope Div. 29
Helwig Co. 102-B
Hendrick Mfg. Co. 84
Hercules Powder Co. 173
Hockaday Paint Co. 24-A
Robert Holmes & Bros., Inc. 43
Hotel Abraham Lincoln 45
Hulburt Oil & Grease Co. 1

O. Iber Co. 155
Ideal Commutator Dresser Co. 82-B
Illinois Bearing Co. 60
Illinois Gear & Machine Co. 110
Illinois Powder Mfg. Co. 108-A
Insulation & Wires, Inc. 116-117
International Shoe Co. 54
Irwin Foundry & Mine Car Co. 146-B
I-T-E Circuit Breaker Co. 15

The Jeffrey Mfg. Co. 79
Charles Eneu Johnson & Co. 128-B
The Johnson-March Corp. 78
Jones & Laughlin Steel Corp. 104
Joy Mfg. Co. 33-36

Kanawha Mfg. Co. 168-A
Kennedy-Webster Electric Co. 40-A
Kensington Steel Co. 162
Klein Armature Works 118-A
Koehler Mfg. Co., Inc. 17
Koppers Co., Inc., Wood Preserving Div. 23

Leetonia Tool Co. 145
A. Leschen & Sons Rope Co. 136
Link-Belt Company 31
Ly-Mar Hotel 148-A

Macwhyte Co. 56
The Manhattan Rubber Mfg. Div. of Raybestos-Manhattan, Inc. 10

The Marion Steam Shovel Co. 75
The Martindale Electric Co. 4
McMaster Carr Supply Co. 148-B
McNally Pittsburg Mfg. Corp. 11
Mechanization 3
Michigan Chemical Corp. 132-A
Mine Safety Appliances Co. 19
W. H. Miner, Inc. 24-B
Mines Equipment Co. 59
Mineweld Co. 168-B
Mining Machine Parts, Inc. 20
Mississippi Lime Co. 44-B
Mosebach Electric & Supply Co. 46-B

National Electric Coil Co. 119

Oberjuerge Rubber Distributing Co. 134
Ohio Brass Co. 156
Ohio Oil Co. 95
Ottumwa Iron Works 57

Pac Lubricating & Service Co. 102-A
Peoria Tractor & Equipment Co. 9
Philco Corporation, Storage Battery Div. 38
Phillips Mine & Mill Supply Co. 91
Pittsburgh Knife & Forge Co. 111
Portable Safety Div., Portable Products Corp. 140-A
The Post-Glover Electric Co. 65
Power Transmission Equipment Co. 126
Productive Equipment Corp. 30
Frank Prox Co., Inc. 18

Revere Electric Supply Co. 62-A
R-J Bearings Co. 14-A
R-J Bearings Corp. 73
Roberts & Schaefer Co. 67
Robins Conveyors, Inc. 86
John A. Roebling's Sons Co. 25
Rome Cable Corp. 139
Joseph T. Ryerson & Son, Inc. 69

The Salem Tool Co. 146-A
Seibel-Suessdorf Copper & Iron Mfg. Co. 120-B
Simplex Wire & Cable Co. 137
SKF Industries 107
Sligo Iron Store Co. 85

Geo. W. Snarr & Co., Inc. 129
Socony-Vacuum Oil Co. 81
Solvay Sales Corporation 92
Southern Electric Inc. 96
Southwest Bolt & Nut Co. 108-B
Standard Oil Co. (Indiana) 101
Standard Stamping & Perforating Co. 124
Stephens-Adamson Mfg. Co. 7
Sterling Steel Casting Co. 164
Streeter-Amet Co. 27
Sullivan Machinery Co. 94
Supplies, Inc. 128-A

The Tamping Bag Co. 42
Templeton, Kenly & Co. –
Timken Roller Bearing Co. 22
Tools & Supplies, Inc. 12
Bertrand P. Tracy Co. 41
The W. S. Tyler Co. 58
80

Union Wire Rope Corp. 64
United States Rubber Co. 39
The Universal Lubricating Co. 120-A
The Upson-Walton Company 141
U. S. Sanitary Specialties Corp. 44-A
Utility Mine Equipment Co. 97

Viking Machinery Sales Corp. 169

Walter Motor Truck Co. 150
The Watt Car & Wheel Co. 21
West Virginia Steel & Mfg. Co. 2
Western Powder Mfg. Co. 112-A
Westinghouse Electric & Mfg. Co. 165
H. Kirk White & Co. 28
I. B. Williams & Sons 166-A
Wyoming Tie & Timber Co. 157

Jos. H. Yerkes & Co. 132-B