COAL AGE

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Devoted to the Operating, Technical and Business Problems of the Coal Mining Industry

JOHN M. CARMODY
Editor

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STATESMANSHIP

ENLIGHTENED self-interest seems for the moment to be guiding the planning of bituminous coal operators. Responsible leaders are beginning to take a long-range view of their industry. Policies based on the fallacy that the follies of today will leave tomorrow's actions unscarred are giving way to the conviction that the only solid foundation for the future is intelligent building now. Nowhere is there a greater need for this enlightened self-interest than in merchandising. Nowhere, perhaps, has this new spirit been more strikingly illustrated than in the symposia on coal's outstanding problems in the two preceding issues of *Coal Age*.

FOR long years bituminous coal operators have indulged an individualism in selling that has led to ruinous competition. Fearful that a rival would get an order they sought, prices have been slashed without regard to the bare costs of production. Coal has been mined before it was sold and sold to save demurrage. A common practice in industry generally? How many cars of steel rails are rolled before there is a customer for them? None. How many cars of cement lie on railroad sidings awaiting a customer? Again the same answer—none.

THE fact is modern industry is learning how to control production and how to co-ordinate that controlled production with consumer requirements. The coal industry is learning too, but so long as there are thousands of small units working within a narrow shell control will be only a gesture—and that largely futile. Whether that co-ordination may be best accelerated in individual cases through consolidation of physical properties, common financial control or district selling units are matters of detail. In every case the real test will be such thorough-going efficiency in operation and distribution that no critic can find avoidable waste.

BUT there is still another step necessary if the movement is to attain the full measure of success. Co-ordination of production and consumption demands the co-operation of the large buyer as completely as it demands the unreserved support of the large seller. It demands a partnership in interest that transcends the daily bartering because the interdependence of coal and general industry is too basic, too vital to be ignored by either the coal producer or the coal consumer. There is too much to be gained by a common attack on the broader problems to risk any other approach.

EXTERNAL developments in the past decade have bred misunderstanding upon both sides. There is every reason to believe, however, that there is a real willingness and a readiness upon the part of both the coal producer and the large coal consumer to endeavor patiently and sympathetically to pierce the fog which has enveloped "the coal problem" in an effort to reach common ground and common understanding. The coal business too long has been considered a thing apart from business generally. The time seems ripe to effect that integration of coal with industry at large which will make for the profit and security of all.

Courtesy Hayden Coal Co.

A Study in Black Art

A·I·M·E

Contributes Its Annual Harvest of Ideas To the Extractive Industries

A VENTILATING CODE with teeth seems likely to be adopted by the ventilation committee of the American Institute of Mining and Metallurgical Engineers as a result of a decision to prepare a model code at the 136th meeting of the Institute, held Feb. 20-23 in New York City. Some light was thrown on the barrier-pillar question regarding which legislation in Pennsylvania doubtless will be passed before long.

Auxiliary fans were shown to give safe ventilation provided the air delivered to the fan was pure, was adequate in quantity and if gas was not allowed to accumulate by the shutting down of the fan. War was declared by the paleobotanists on the chemists at the classification meeting and both for a time seemed likely to fare badly at the hands of the practical men—all of which is not news. It is sure to be thus to the end of time.

So many items were on the program that the excellent coal sessions could be discerned only by deliberate reading. Yet those who attended the coal meetings, of whom there were 100 to 150, found excellent material for consideration.

Especially attractive were the general session on Coal and Coal Products, the session on the stabilization of the industry and that on engineering education. But to all who attended, coal men and others, the crowning feature was the address by the Secretary of Commerce, Herbert Hoover, the recipient of the William Laurence Saunders medal.

In all 1,445 registered and perhaps 2,000 attended. At the dinner about 700 were expected and 1,200 came, straining the capacity of the banquet hall of the Waldorf-Astoria to provide for so many persons. In all there were 71 separate events, including the annual meeting, the Rocky Mountain Club meeting, the smoker, the banquet, luncheons and dinners with or without technical features, the excursion to Perth Amboy and other like events.

There were 47 purely technical sessions. These features kept the visitors and staff abundantly busy from Monday, when the meeting commenced, till Thursday, when it closed. The institute harvests yearly some of the best ideas and methods of the extractive industries and this year it certainly can record a bumper crop.

Seeking Safety and Economy in Ventilation

THAT ventilation is one of the big problems of the coal operator was the theme of the opening address of George S. Rice, chief mining engineer, U. S. Bureau of Mines, Washington, D. C., at the ventilation sessions of the A.I.M.E. on Monday, Feb. 20, over which he presided during the morning. He said that in Illinois it had been ascertained that five to ten times as much air as coal was removed from the mines and that in 40 mines the power costs of ventilation were 22.45 per cent of all such costs.

It was interesting, he said, to note that Prof. Henry Briggs, professor of mining, University of Edinburgh, stated that in Great Britain the average ratio of air to coal on the weight basis was about 6 to 1. In some collieries this ratio was 10 or even 12 to 1. Some 80 million cu.ft. of air per minute was in continuous movement in British mines, and the annual bill for ventilation was but little short of $10,000,000 per annum or 4c. per ton.

Mr. Rice pointed out that the power increased so rapidly with increased volume of air where the airway was not augmented that to put any more than a certain quantity of air in a mine might not be impossible but was clearly impracticable. The importance of efficient ventilation in reducing mine costs was but little appreciated by the mine operator.

W. S. Weeks

Dan Harrington's report on "Metal Mine Ventilation" followed. Only one other subcommittee chairman had prepared a report. This was Dr. R. R. Sayers, chief surgeon, U. S. Bureau of Mines. This was read in part by Mr. Harrington. Dr. Sayers declared that some of the inert dust used for rock dusting was dangerous. Oxygen, 95 per cent pure, could be breathed by guinea pigs for 50 days, 16 hours a day, without harm. On the other hand, straight oxygen breathed steadily for four or five days caused death.

The paper on "Air-Current Regulators," prepared by W. S. Weeks,

H. P. Greenwald

University of California, Berkeley, Calif., was presented by A. C. Callen, head of the mining department, University of Illinois, Urbana, Ill. Mr. Weeks assumed that the drop in pressure through an orifice was with air as with water $\frac{Kv^2}{2g}$ where $\frac{v^2}{2g}$ is the velocity head in the duct and K is a factor that depends only on the ratio of the area of the duct to the area of the orifice.

TABLE I.—COEFFICIENTS (K) FOR GIVEN ORIFICIAL RATIOS

Ratio	Coefficient	Ratio	Coefficient
10	0.645	2	0.694
5	0.646	1.75	0.709
4	0.651	1.5	0.729
3	0.663	1.25	0.774

When duct and orifice are equal—that is, if the regulator is omitted—the ratio and the coefficient are both unity.

Mr. Callen said that he had found that these results, so far as he had checked them in the laboratory, were correct, and H. P. Greenwald, supervising engineer, Experimental Mine, U. S. Bureau of Mines, Pittsburgh, Pa., said that the observations of G. E. McElroy, mining engineer, associated with him, also checked with those of Mr. Weeks. Answering Cadwallader Evans, general manager, Hudson Coal Co., Scranton, Pa., Mr. Callen said that the duct and the orifice were placed symmetrically and were of the same shape.

G. E. McElroy

The paper by F. E. Brackett, mining engineer, Cumberland, Md., on "Propeller Fan Calculations," was presented. In this paper Mr. Brackett uses results obtained by three manufacturers of propeller-type fans, obtaining several empirical formulas and ascertaining formulas for the required size of fan under certain conditions.

In the afternoon, A. C. Callen occupied the chair and H. P. Greenwald described his interesting work with H. C. Howarth, superintendent, Experimental Mine, U. S. Bureau of Mines, Pittsburgh, Pa., in testing the recirculation of air and mine gas by auxiliary fans. He showed that when a certain quantity of air per minute is passed up a straight airway and an auxiliary fan is placed to divert all that air into an entry at right angles to the first, recirculation is practically inevitable, no matter how far the fan is from the side entry.

That is a most important observation, even though one not entirely surprising. Although his fans were placed one at the mouth of the side entry and on the intake side, one 8 ft. back on the flank of the main entry away from the side entry, one 8 ft. back on the same side as the side entry and one 16 ft. back on the opposing side, in all cases where the auxiliary fan attempted to absorb the whole main current it drew quite important percentages of gas into recirculation.

Vitiated air was found going back near the roof along the main entry toward the intake for a distance of 50 to 75 ft. Somewhere it fell toward the floor and was drawn into the fan for recirculation. That undesirable condition was corrected where the quantity of air supplied was 2.5 times the quantity of air circulated by the auxiliary fan, and that in every case regardless of the location of the fan.

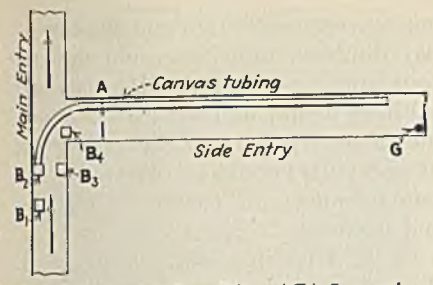
Similar results were obtained when auxiliary fans were used to ventilate the dead-end extensions of the straight entry. Check brattices near the fan were not found helpful in reducing recirculation. It appeared

F. Ernest Brackett

dangerous to use any more than 40 per cent of the main air current in places ventilated by an auxiliary fan. Moreover, it was proved that in all cases the gas percentage in the return air with a given emission of gas reached a certain definite figure which was never exceeded, no matter how long the test was extended.

It must be recognized, R. D. Hall said, that rarely indeed in any properly conducted mine are the main currents in any split as meager as 1,000 cu.ft. per minute or even 2,000 or 3,000, for in one with 75 men with an allowance of 200 cu.ft. per minute per man there would be 15,000 cu.ft. provided. Somebody remarked that at the end of the split it would be different, but Mr. Hall declared that then the air used would, in a gassy section, be full of gas and the practice fraught with danger unless permissible motors were used to drive the fan. A. W. Hesse, chief coal min-

H. C. Howarth



Fan (B's) and Gas Pipe (G) Locations

TABLE II.—RESULTS OF TESTS WITH SINGLE FAN AT A SIDE ENTRY

Air Delivered By Fan, Cu.Ft. per Min.	Air in Main Current, Cu.Ft. per Min.	Air Delivered Main Current, Cu.Ft. per Min.	Gas Liberated At Face	Gas in Air, Per Cent — At Fan Inlet	Gas in Air, Per Cent — In Return of Side Entry	Gas in Air, Per Cent — In Main Return
Fan in main entry 16 ft. from outbye edge of side entry on opposite side of main entry (B_1)						
1,020	1,020	1.00	10.6	0.2	1.5	0.9
1,020	1,420	0.72	9.2	0.0	1.3	0.7
1,020	2,160	0.47	10.3	0.0	1.1	0.5
Fan in main entry 8 ft. from outbye edge of side entry on opposite side of main entry (B_2)						
1,030	1,000	1.03	9.8	0.8	1.7	0.7
1,030	1,880	0.55	10.3	0.1	1.3	0.7
1,020	2,530	0.40	9.0	0.0	0.9	0.4
1,030	3,020	0.34	10.0	0.0	1.2	0.5
2,020	1,960	1.03	17.3	0.6	1.3	1.0
2,020	3,030	0.67	18.8	0.2	1.0	0.5
2,020	4,040	0.50	19.5	0.1	1.0	0.5
2,010	5,000	0.40	23.0	0.0	0.9	0.5
Fan in main entry 8 ft. from outbye edge of side entry on same side of main entry (B_3)						
980	1,020	0.96	9.9	0.8	1.6	0.8
980	1,940	0.50	9.7	0.1	1.4	0.6
980	2,470	0.40	10.0	0.0	1.2	0.6
Fan at outbye end of side entry near outbye rib of that entry (B_4)						
1,050	1,020	1.03	9.9	1.2	2.1	1.3
1,050	1,990	0.53	10.0	0.1	1.5	0.7
1,050	2,460	0.43	10.2	0.0	1.4	0.5

ing engineer, Buckeye Coal Co., Nemacolin, Pa., stated that at the Nemacolin mine the splits usually carried 20,000 to 30,000 cu.ft. of air.

George S. Rice's paper on "Controlling Factors in Formulating a Coal-Mine Ventilation Code" was then presented by the author. It contained 31 questions as to desirable practice, such as the degree of separation of intake and return, the fireproofing of main intake, the location of the main fan, its reversibility, the incombustibility of its housing and drift approaches, the use of booster and auxiliary fans, the chemical limits of air vitiation, the quantity of air required per man, the air current in each non-working or unsealed place, where these quantities should be measured, the number of men allowed in a split, the definitions for non-gassy, slightly gassy and gassy mines and similar questions.

H. N. Eavenson said auxiliary fans could hardly be dispensed with. In driving drainage tunnels advances of 1,400 ft. or more were made per month owing to the assistance rendered by auxiliary fans.

H. I. Smith proposed, and Eugene McAuliffe seconded the proposal, that a committee of nine be appointed by the chairman of the ventilation committee for 1928 to write and submit such a code. The motion was carried.

Is Profit or Production Industry's Aim?

AT THE CONFERENCE on problems of overproduction in industry many were the opinions given as to means by which industry's great capacity might be adjusted to today's limits of normal trade. E. De Golyer, outgoing president, presided.

Some urged that working time in plants be curtailed systematically to level off the peaks of production. The case of the bituminous industry was presented by E. C. Mahan, president, National Coal Association, who said:

"When coal operators think and talk about overproduction what they really have in mind is day-by-day performance in the mining of coal which has not been ordered and in the shipment of coal upon open consignment. It is that continuing small per cent of production in excess of orders and the shipment of unconsigned coal which makes it possible for the buyer rather than the seller to name the price, and which results in the sellers actually buying the orders for their own products. The decrease in the cost of production accruing from full-time operation provides a constant temptation to the coal operator to take chances on a portion of his unsold output.

E. C. Mahan

"This brings us squarely up to the outstanding economic problem in the bituminous mining industry. There has been altogether too much shadow boxing in forums of discussions on this subject, with the result that the vital issue has been obscured. I am convinced that the only sensible approach is by way of improved marketing methods. Rumors of mergers are now thick and I am hopeful that every prospective consolidation will materialize. Control of capacity in fewer hands should simplify the task of introducing sound marketing and distribution practices.

"I am heartily in sympathy with all movements which make for increased operating efficiency, but I stress the point that intensified production, through mechanization and otherwise, does not strike at the root of the problem. Volume often is gained by price recession which usually more than offsets the savings effected through decrease in unit costs."

S. A. Taylor, consulting engineer, Pittsburgh, Pa., gave the results of an investigation he made in 1926 as to the factors entering into the decline in the rate of increasing consumption. From 1840 until 1910 consumption increased 10 per cent annually, but from 1910 to 1925 the rate of increase was only about 2 per cent a year. He found by using the efficiencies of 1910 as a base that improved methods of generating power in central stations in 1926 dispensed with the need for 100,000,000 tons; use of byproduct gases displaced 35,000,000 tons; burning of tars, 15,000,000 tons; improved combustion on railroads, 45,000,000 tons, and

oil, 200,000,000 tons of coal. The energy equivalent of the total of these figures check with the increase in the use of power.

A. C. Lane, speaking for New England, suggested that seasonal freight rates be made effective during a portion of each year, after the storms in winter and before the movement of crops in summer.

John Janney, of Nevada, declared that accurate information is needed for solution of the problems of overproduction, for the study of which a committee from the institute should be named. He does not feel that the government would look with disfavor upon *reasonable* measures for correcting overproduction. He also invited inquiry into the matter of shortening the working hours as a corrective influence toward overproduction, which might at the same time effect a lower operating cost. Mr. Janney said that at one mine in the West laying off one of the working days in the week actually served to reduce costs. P. B. Butler, Joplin, Mo., added that reduction in the number of hours worked in the Joplin district has created a more healthy condition.

Stephen Tuthill, secretary of the American Zinc Institute, said he would not be surprised if the present Congress reviewed the Sherman Act and recommended its further consideration in the next Congress. In this connection he suggested that industry follow the example of labor. "When labor wants something," he said, "it makes up its mind what it wants, then gets it."

Harrington Emerson, of New York, expressed the belief that if equipment were replaced every 10 years instead of every 20 years, $150,000,000 worth of it would produce twice as much as $250,000,000 worth of it; further, that if working hours were cut in two and the rate of pay doubled, industry could produce four times as much. Materials and supplies would be used up faster and the labor freed from the production of necessities could be diverted to the establishment of further necessities and luxuries.

O. E. Kiessling, statistician, U. S. Bureau of Mines, stated that the principle of supply and demand is not a law and consequently cannot be applied to the complex society of America today, even though it might function in the simpler society of England. Early economists did not term this principle a law; rather they looked upon it as a formula not necessarily correct. It is an error in economic reasoning to think that free competition sets production or that low costs in mining will wipe out competition. Mr. Kiessling declared that much of present-day economics is "bunk."

Lump Coal—How to Get It

At the main session of the coal and coal-products committee, over which H. N. Eavenson presided, a paper by L. E. Tiffany and S. S. Lubelsky, U. S. Bureau of Mines, Pittsburgh, Pa., was presented by George B. Harrington, a summary of which follows:

To determine the effect of using explosives with varying rates of detonation, quantitative tests were made in a Pennsylvania mine where the Pittsburgh bed was being extracted. In these tests five different permissible explosives were tried.

Where the coal was blasted with an explosive having an intermediate rate of detonation 4.7 per cent more lump was obtained than when the explosive was used that had the lowest rate. Although similar tests were not made in other mines, we are of the opinion that there is at every mine a rate of detonation which will produce a maximum quantity of lump. Under a given condition, however, this critical rate will vary with the coal.

In many mines of southern Illinois which work the No. 6 bed the approximate angle between the direction of the working places and the face cleat planes is 45 deg., the working places usually being driven either north and south or east and west and the direction of the face cleats in general running about N. 45 deg. W. In such places the working faces tend to overhang, particularly if the holes are not drilled deep enough.

In a Pennsylvania mine additional tests, similar to those already described for the same mine, were made to ascertain the relative effect of driving on face and butt, the coal being drilled and blasted in each instance in a similar manner. It was found that in a butt entry 10 ft. wide and with the coal slightly more than 7 ft. thick 54 per cent of the coal screened on the tipple was 1¼-in. lump coal. Trials were then made in places 18 ft. wide driven on the butt. Under this changed condition the lump-coal percentage was increased to 56.8.

On the other hand, when the working place was only 10 ft. wide and driven on the face, a 57.7 per cent yield of 1¼-in. lump coal was obtained. In rooms 18 ft. wide driven on the face the percentage of lump coal was 59.1.

Where the holes are drilled nearly flat, or almost parallel to the bedding planes, 5.1 per cent more lump is produced than where the holes have a steep inclination. By flat holes 64.2 per cent of 1¼-in. lump coal was obtained.

The importance of loading out all coal loosened by a shot before firing the next one was exemplified by two tests. In the first all the coal brought down or loosened (about 30 tons) by the rib shot, which was fired first, was loaded out before the second hole was fired. This method resulted in the production, by actual screen test at the tipple, of 59.1 per cent of 1¼-in. lump coal from the entire cut.

In the second test the quantity of coal loaded out before firing the second shot was only 8 tons. This was the minimum quantity that had to be removed in order that the miner could shear in along the rib to the back of the cut on the side where the first shot was fired. By this latter method there was only 56.5 per cent of 1¼-in. lump coal produced from the entire cut, or 2.6 per cent less than by the first method.

The shotholes should be drilled after the working place has been cut, otherwise their placement may not bear the proper relation to the cut.

Tests made in a mine working the Pittsburgh bed showed that each rib-hole should be placed 12 in. from the rib and the same distance below the roof, also that the hole should be almost flat and parallel to the line of sights. However, in the tougher coal beds of southern Illinois, as represented by the No. 6 bed of the series, it is found necessary to increase the distance between the rib

S. S. Lubelsky

J. E. Tiffany

and hole to as much as 2 or even 3 ft.

During a recent investigation in a southern Illinois mine a determination was made of the most desirable location for placing the holes in both rooms and entries. For hand loading in rooms the placement of holes is as shown in Figs. 3 and 4. Figs. 1 to 4, inclusive, refer to methods employed in mines working the No. 6 bed of southern Illinois.

In these mines 14 to 24 in. of coal is left in place to support the roof, and there is a persistent mother-coal parting on the underside of the roof coal. In the upper third of the bed there are several other partings of mother coal. In Figs. 1 to 3, inclusive, the holes are placed 12 in. below the roof parting. They are nearly flat and in their entire length do not rise more than 4 in.

There is a tendency to incline the holes so much that they pass through the parting and into the roof coal. This practice is bad and increases the dangers of mining. When the roof coal of the No. 6 bed in southern Illinois is drilled, the explosives break it and allow the shale above the coal to fall in large quantities. The operations involved in cleaning up a fall and timbering the broken roof make additional costs and hazard.

In some sections of a Pennsylvania mine where the coal would not separate readily from a slate roof it was found advisable to incline the holes so that they would just touch the roof at the back of the hole.

Overhanging faces and ribs are caused principally by poorly placed or shallow holes. When holes are drilled only 6 ft. deep for a 7-ft. undercut the overhang tends to increase about 1 ft. after each cut has been cleaned up. Only that portion of the hole which is vertically above the undercut can be considered effective (see Fig. 5).

In one southern Illinois mine thirteen rooms were visited at random and measurements made of the three holes in each room. The average depth of hole was 76 in. with an average overhang of 25 in. Fig. 5 shows a section in one of these rooms where there was an overhang of 36 in. One of the holes was drilled to a depth of 78 in., as shown. This would have been the proper depth for one drilled in a vertical face from *b* to *d*, but with the overhanging face the depth of the hole should be increased 36 in. or by as much as the coal overhangs at the mouth of the hole.

THE FIRING of a charge of explosive in a shallow hole *abc* will tend to shatter that portion of the coal represented by *efgh*, while that in the portion *cgi* is broken only to a slight extent and can be brought down only by an excessive amount of pick work. The portion *hji* is not affected by the blast. The overhang at *h* has been increased by 6 in. For the most efficient blasting the quantity of coal in the portion *efgh* should be as large as possible and that from *cji* as small as possible.

Percentage Savings in Lump Coal Produced

By blasting with correct explosive	4.7
By widening place 80 per cent	1.4 to 2.8
By driving toward cleats of coal	2.3 to 3.7
By drilling horizontal shot-holes	5.1
By completely loading out coal from one shot before firing another	2.6
By air-spacing cartridges of explosive	2.0

The hole should be drilled so that a vertical line when projected from the back end of a hole will intersect the undercut at a point 6 in. short of its end.

Shorter holes than these cause the face to overhang. Faces out of plumb 3 or 4 ft. frequently were observed. The excuse made for gripping a cut at the ribs has been that the face or ribs overhung so much that the undercutting machine could not be properly operated.

Explosive charges should never be reduced to such an extent as to make the bringing down of the coal uncertain. The shattering effect of permissible explosives can be reduced by the use of air-spaced shots. There are a number of ways of doing this, but the best results are obtained by reducing the diameter of the explosive cartridge, the diameter of the drillhole remaining the same.

IN AN investigation in southern Illinois the size of cartridge was changed from 1¾ x 6½ in. to 1¼ x 8 in. By this and other changes the quantity of explosive used was reduced by 10 per cent and there was an increase of 2 per cent in the quantity of 6-in. lump coal produced.

However, in other mines where tests were made, air-spacing did not always permit the charges to be reduced. In these instances the advantages of the practice were confined to improvements in the firmness and size of lump produced.

William German, technical representative, E. I. du Pont de Nemours & Co., Inc., suggested that miners be equipped with suitable scraper rods for the removal of cuttings from drillholes, if blownout shots are to be avoided. Drilling before cutting is a bad practice, as also is the charging of the second of two holes before the first is detonated. Both practices are likely to cause blownout shots.

No hard and fast rule can be established as to the effect of the rate of detonation of an explosive on the quantity of lump coal produced, declared Mr. German. In a mine in West Virginia a permissible explosive with a detonating speed of 15,000 ft. per minute was found to produce much better lump coal than one with a speed approximately half as great. He said the use of ordinary

blasting cables was uncertain, that the Paragon Electric Co., of Chicago, offers a high-grade rubber-covered cable for this purpose.

He asked if anyone in the audience had good reasons why explosives other than those of the permissible type should not be excluded from coal mines. One operator replied that by experience he found the shattering effect of permissible so great that tender roof was broken, resulting in increased danger from falls of roof. The difficulty was remedied by use of pellet powder, which he does not consider dangerous in non-gassy mines. The change was not made with a view of increasing the lump coal produced, as the product is crushed anyway.

Josiah Keely, president, Cabin Creek Consolidated Coal Co., West Virginia, said the substitution of pellet powder for permissible resulted in an increase of 9 per cent in lump coal. He added that many miners are inclined to pulverize pellet powder in the hole in an attempt to get a quicker acting explosive.

A paper on the valuation of coal properties was presented in brief by John B. Dilworth, of the Edward V. d'Invilliers Engineering Co., Philadelphia, Pa. In commenting on this paper Eli Conner, consulting engineer, Scranton, Pa., took issue with Mr. Dilworth on the use of a base line of actual earnings in appraisal calculations. The method, he said, is reasonably satisfactory, but it is not always equitable. He said he knew of one enterprise appraised in this manner on the basis of earnings in four good years which today is in bankruptcy. Mr. Dilworth remarked that no safer measuring stick can be found than that of bargaining between owner and lessee. S. A. Taylor said that when a lessee desires to sublease a property, one-fifth of the value of that property to him as an operator is an equitable appraisal.

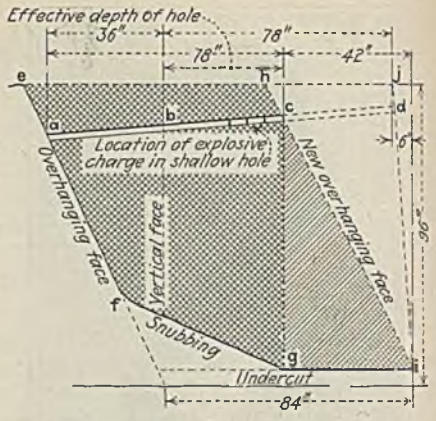
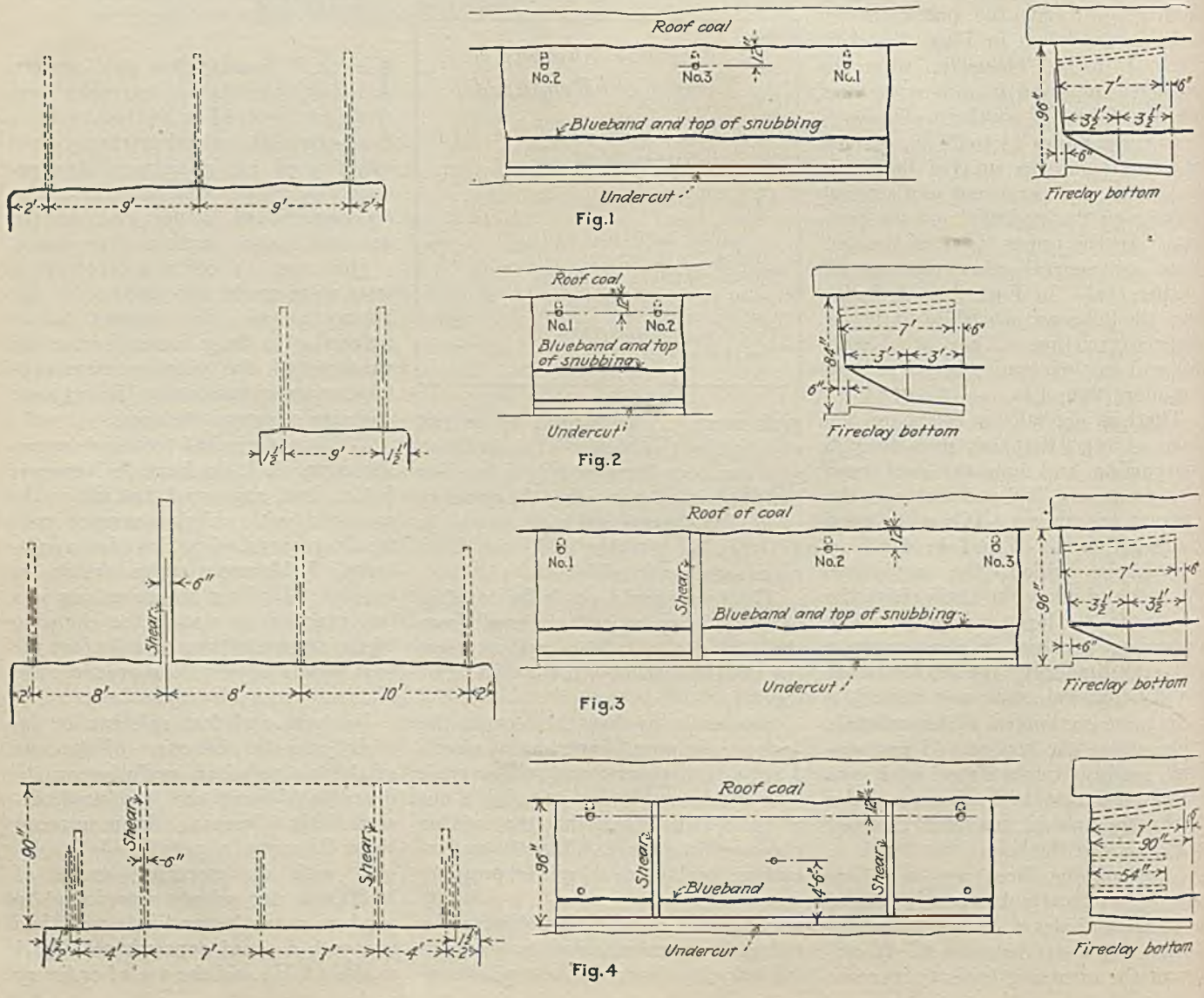


Fig. 5—Illustrating Cause of Overhang

The coal-mining industry and general conditions in Russia were described in a travelog by John A. Garcia and illustrated with motion pictures and accompanying comments by Charles E. Stuart, of Stuart, James & Cook, engineers, New York City.

Figs. 1, 2, 3 and 4—Methods of Shooting Adopted in Southern Illinois



What Size of Pillar to Leave and Where

THAT it is a folly to leave pillars under roads and buildings, that it wrecks them more certainly than if the coal were removed from under them in a methodical manner, was the contention of R. V. Norris, consulting engineer, Wilkes-Barre, Pa., who presided at the morning meeting of the ground movement and subsidence committee of the A.I.M.E. on Wednesday, Feb. 22.

These pillars by holding up part of the roof and letting down the rest prevent the healing of fractures and cause permanent breaks of the ground that do much more damage than is caused when the coal is entirely extracted.

It is not necessary said Mr. Norris, to fill all the spaces excavated. To protect the surface it will suffice to fill the extracted areas in the beds nearest the surface. In the anthracite region as many as fourteen beds may be mined, and the action of the mining of one bed on that beneath is one of the most vital of problems.

H. W. Montz, chief mining engineer, Lehigh Valley Coal Co., described a subsidence caused by pillaring. Along one side was a railroad and some houses. To protect these a big block of coal was left, but the effect of the subsidence on the houses was nevertheless quite evident. One monument in the unmined area is slightly higher than when originally located. Over the solid measures were about 90 ft. of unconsolidated glacial drift.

Eli. T. Conner, consulting engineer, Scranton, Pa., said that when blocks of coal were left to protect buildings more damage was done than if they had not been left.

R. D. Hall said that consideration should be given the structural forces at work. The roof might break vertically if weak, especially in those parts of the anthracite region where there were large deposits of unconsolidated sand. Collapses from shear, however, usually were limited to shallow workings or those heavily burdened by loose measures. Such collapses took place suddenly.

The roof in general might be regarded as a deep beam but more properly as a thick plate. It was this consideration that made Mr. Hall conclude in 1910 that the roof would break at the surface over the supporting pillar, and in this he was confirmed in England by Dickinson, whose experience had been such as to afford proof of this fact.

However, when the roof has been torn over the pillar and in the excavated space, it tries to lower itself into the opening and, being thick, it finds, like a fat man, that though bending is in itself easy it brings discomforting compressions. These compressions stop the bending and cause arch stresses and these stresses horizontal stress, and this again tears part of the roof loose from the rest. The fat man has lost a layer of flesh.

George H. Ashley

Therefore he bends more easily. The arch becomes a beam once more and so it continues. Now, this is a serious operation and it takes time. It has often been noted that collapse is slow, and it is in this way that this fact can be explained.

As for the lower measures above the drawslate that are rent by the horizontal shear described, these become isolated beams that might be termed cantilevers were it not for the fact that they are loaded over the pillar by a nipping weight of some hundreds of feet of strata. They are, therefore, not cantilevers but *encastré,* or built-in beams freed by fracture at one end and held tightly at the other.

These fracture in a direction leaning back into the excavated area. They do not necessarily have any linear connection with the fundamental fractures which may have barely formed at the time when these subsidiary fractures occur. The fundamental fractures over the coal may themselves be stepped.

At the afternoon meeting H. G. Moulton, consulting engineer, New York City, presided. George H. Ashley, state geologist of Pennsylvania, Harrisburg, Pa., addressed the committee on "Barrier Pillars" on behalf of a commission—of which he was secretary—appointed by the Governor of Pennsylvania to determine what barrier pillars should be left between properties and against flooding.

A pillar only 5 ft. thick, he said, would hold a considerable head of water, for its powers of resistance were based on the hold it had on the roof and floor and not on its weight. The method of basing the resistance of a dam on its weight might serve well on the surface where there was nothing but friction to prevent movement, but it was not satisfactory where the structure was under vertical pressure.

The problem, then, was to find a minimum safe thickness that would enable the pillar to retain its integrity under the superincumbent weight. Tests had been made on the 10,000,000-lb. testing machine, but it is not clear that tests on cubes, however big, are expressive of mining conditions.

Naturally the shape of pillar fracture is important. If the unbroken roof stretches out over the pillar edge so that the weight of roof on the pillar exceeds the weight of the rock within the vertical projection of the pillar from its top to the surface of the ground, then the pillar left will have to be larger than it would be if the roof had a truly vertical fracture and more than would be necessary if the roof broke back over the pillar.

A. B. Jessup, vice-president and general manager, Jeddo - Highland Coal Co., Jeddo, Pa., said that the coal might hold water only to have it come through the roof, and added that, with a pillar 200 ft. wide under a head of 125 ft. of water, leakage was considerable. Mr. Ashley said that water would travel 1,000 to 2,000 ft. in some seams. The fact that where the seams dip, coal outcrops are wet, shows that the water travels through the coal seam. Mr. Rice said that possibly wide barriers would serve merely to prevent big rushes of water and not percolations and seepages.

Mr. Rice declared that small cubes give a false impression, as clay bands tend to drag the coal off the sides. Furthermore, the coal spalls but that

spalling on a big pillar may not be important, for the falls may prevent the extension of the spalling. The Sankey commission of Great Britain said that in the British coal fields 3,500 to 4,000 million tons was tied up in barrier pillars to isolate workings against water, gas and underground fires and to surround the properties. These pillars, Sir Richard Redmayne said, ran from 22 to 60 yd. thick.

Charles Enzian, mining engineer, Berwind-White Coal Mining Co., Windber, Pa., said that in one place where a pillar was 1,000 ft. wide and the water head was 60 ft., so much water percolated through the coal that the water had to be drained by driving a place through the pillar. There are many subterranean channels that make it impossible to entirely impound water. When grout was injected at a pressure of 400 lb. per square inch the water in a spring was badly discolored though the spring was 1,800 ft. away from the grouting operations.

Legislation should provide against only the catastrophic hazard. It should not attempt to give protection against the gentle feeding of water through barriers. To show how small a pillar will keep back water, in one instance a 6-ft. pillar withstood a pressure of 56 ft. of water. That the pillar was no larger was discovered only after a squeeze had crushed the coal.

What Industry Seeks in College Graduate

EDUCATIONAL institutions have done well, all things considered, in the teaching of engineering students; yet it is felt there is room for much improvement, influenced by the national bodies of practicing engineers. Whatever inadequacy exists is in large measure due to the failure of engineers' societies to guide and promote the expansion of college training. Industry and society both demand of the engineer qualities which he does not possess or has failed in general to display. Much of this is due to gaps in the program for the training of engineers.

Encouragement has not been given to the development of qualities of leadership; an appreciation of social responsibilities and an understanding of economic phases have not been impressed upon the younger engineers. The Society for the Promotion of Engineering Education is seeking a solution of the problem. At the session of the institute on engineering education an analysis of the report on the problem by this society was presented by W. E. Wickenden, director of investigation of that organization. W. B. Plank, head of the department of mining, Lafayette College, presided.

"What Industry Wants the Graduate to Know" was discussed by C. R. Mann. He emphasized that those intrusted with the guidance of technical education may profit from the changes in general education in the last ten years. An analysis of the teaching of modern foreign languages in some 600 schools showed that one group learned more of the vocabulary in two years than another group in four years. When words were arranged in order of frequency of use it was found that a better command of the language followed. Analysis of use is a principle which might be applied to advantage in engineering education, he said.

Job specifications are growing in use. These specifications should not embrace qualifications for the job but rather clearly define what are the duties. Men on the job may profit much by writing and analyzing such specifications for their own activities.

Cadwallader Evans

Student-training courses in anthracite mining for the purpose of appointing men for responsible jobs in his company were outlined by Cadwallader Evans, general manager of the Hudson Coal Co. As this company operates 22 collieries and employs some 18,000 men, a demand for engineering, operating and managerial talent constantly exists and is met to an extent by graduates of these practical courses conducted by the company in its own plants. Two different courses are offered; one is a two-year course for which only engineering graduates are eligible; the other is a 30-weeks course offered to men already in the employment of the company who have had no less than two years of experience as a miner or a miner's laborer and who have demonstrated their energy and ambition.

For the selection of candidates for the two-year course various colleges are visited and graduating students interviewed. Those displaying possibilities of greatest development are invited to Scranton, at the expense of the company, where a final selection is made. Six to ten students are chosen from a group of about twenty-five. Each student is required to submit a report covering each division of the course.

Experience in the training of these men has led the company to change the course considerably. The table below compares the initial with the latest schedule:

Activity	1915-1917	1925-1927
Mining Engineering Department	6 months	4 months
Inside Mine Work	6 months	6 months
Mechanical and Electrical Departments	4 months	3 months
Preparation	5 months	2 months
Statistics	2 months	1 month
Transportation and Safety	1 month	1 month
Loading Coal	None	7 months

The most notable change is that which compels the student to spend seven months loading coal, whereas this experience was not required in the initial schedule. The students are in charge of a supervisor. They are assigned to various collieries and serve as helpers to men on the job who are specially selected for their willingness and ability to act as leaders.

Each student is required to submit a report covering each activity in the course. They are trained to observe,

think and to report accurately and specifically only such information as is vital to successful operation.

Students for the 30-weeks course are chosen from the company's forces only. Due to the fact that the experience of these men varies in wide degree an individual schedule is prepared for each. Each prospect is required to write several pages on a mining subject familiar to him before selection, so as to demonstrate his ability to write the English language with reasonable clarity. Following is a typical schedule: Transportation (3 weeks); safety (2); engineering (2); labor department (1); robbing, timbering and use of explosives (7); preparation (1); ventilation (1); with section foreman (4); pumping (1); with yardage checkers (2); classroom work (6). In the classroom they are taught the fundamentals of elementary mathematics and mining; they also are given a course of drill in the use of statistics as to company operations.

A course in student training conducted by the Bethlehem Steel Co. was described by H. T. Morris. It is more strictly known as a probational observation circuit, of ten weeks' duration, through which 60 to 70 college men are put each year. They go through all plants, see all operations and are closely interviewed.

The purpose of the circuit primarily is to enable the students to determine whether they are satisfied to join the company as a life pursuit and what line they would like to follow. The circuit enables the company to observe these men at close range. Those who finish the circuit and express a desire to stay are asked to start at the bottom. It is felt that these men should know the workmen and operations, no matter what position is their goal.

Professor Plank stated that L. E. Young, operating vice-president of the Pittsburgh Coal Co., is planning a course of this kind. That young engineers should not expect to enter industry on preferred terms was emphasized by Mr. Wickenden. J. M. Carmody, editor of *Coal Age,* said that technical schools have not sought the aid of the technical press in putting across to industry its responsibility for assisting in the training of engineers. He made particular reference to those schools offering mining courses.

When asked how many men taking the training course of the Bethlehem Steel Co. continued in its employ, Mr. Morris said 60 per cent of those trained in the last six years. The general opinion was that this percentage is gratifyingly high. Mr. Morris offered the information that those graduated from the course five years ago are now earning an average of $305 a month.

Classifying Coal by Its Nature and Uses

THE battle of coal classification is still being waged without any evidence whatsoever as to what the outcome will be, and the meeting on that subject held Feb. 23 under the auspices of the coal and coal-products committee of the A.I.M.E. was merely one of a series of such minor actions in the long struggle.

A. C. Fieldner, U. S. Bureau of Mines, stated the problem, declaring that two classifications were being prepared, one having to do with the true nature of the coal and the other with its uses.

Howard N. Eavenson read the paper prepared by Clarence A. Seyler, of Swansea, Wales, who wrote: "There can be little doubt that the ultimate or elementary composition of the 'pure coal' is the best basis of classification. One still hears statements that the determination of this ultimate analysis is like crushing a work of art in a mortar and analyzing the powder or like counting the number of times a given letter occurs in a sentence. Such comparisons are misleading, and the criticism might be applied to organic chemistry as a whole.

"The graphic investigation of the composition and properties of coal showed already in 1900 that at least two independent variables were required to define the position of a coal in the natural series. This accounts for the failure of the older attempts at classification. Coal differing as much as cannel and lignite may have the same volatile matter, and cannel and anthracite may have the same calorific value."

A. C. Fieldner

All this, however, leads Mr. Seyler into a complicated classification in which appear anthracite, carbonaceous, semibituminous, metabituminous, orthobituminous, parabituminous, perbituminous, metalignitious and ortholignitious coal and lignite.

W. H. Thom, U. S. Geological Survey, said that the definitions of coal should show the interplay of two variables, composition and calorific value. Moisture must not be overlooked, because it is not extraneous but an essential of vegetable life. Both Mr. Thom and W. Francis, research chemist, Safety in Mines Research Board, Great Britain, agreed that the stage in its development at which the coal was subjected to pressure had an important effect on the nature of its metamorphic changes.

Marius R. Campbell, senior geologist, U. S. Geological Survey, said that the chemical composition of vegetation was much the same no matter in what age it was formed. To this Reinhardt Thiessen, U. S. Bureau of Mines, took much exception. Though the chemical composition of the various parts of a plant growing in one period might resemble the same parts in another plant growing in another period, the relative proportions of those parts would differ.

H. J. Rose, research chemist, Koppers Co., Pittsburgh, Pa., was not disposed to take an average cross-section of the coal but preferred rather to put in separate classes the various parts of the coal bed, the anthraxylon, the fusain (mineral charcoal) and the splint coal when the latter two appeared. Each had its

own peculiar chemical composition and qualities. The anthraxylon made a good coke, whereas the fusain and the splint were inimical to coking.

When it was said that the coal man would resent a classification that would make him go over the coal, layer by layer, selling these layers in different markets, Mr. Rose said that it was easy to sell splint to the gas market at a high figure and that the coke man did not want it. The fusain was so friable that it could largely be separated by sizing.

Mr. Thiessen remarked that in ligno-cellulose the cellulose disappears, turning to water and carbon dioxide. Lignin alone remains. It is the important part in coal.

Some say, "What does it matter what genera are found in any given age, chemically speaking—vegetation is vegetation?" But, looking at the peat bogs today, we find an immense difference betwen them. In a black ash bog the material is macerated readily. A cedar bog, on the other hand, resists maceration by reason of its resinous material and preservative acids. Such bogs are woody. Mr. Thiessen believes that we shall follow the Germans in their practice of classifying lignite according to its vegetable origin.

W. Francis presented a paper on oxidation of coal. He had dissolved parts of certain coal samples with pyridine and chloroform in an inert atmosphere. He had dried and ground the residues and then exposed the powder to oxidation at 150 deg. C. From this it appeared that just as the rank of the coal increased—that is, as its quantity of carbon augmented or as its hydrogen decreased—so did the oxygen absorbed by the coal in a given time decrease. Mr. Francis used nitric acid to speed up the oxidization of the residue. He advocated the use of oxidizability instead of rank as a basis for classification.

Mr. Fieldner briefed the paper of F. V. Tideswell and R. V. Wheeler, of Sheffield, England, on "Pure Coal as a Basis for Classification." They held that "the presence of inorganic materials introduces errors into the composition as found by analyses for which corrections are not adequately made in the usual calculation to an ash-free basis. The magnitude of the errors involved is greater than is perhaps generally realized." There is more associated inorganic matter, say the authors, than is shown by the derived ash, particularly in the case of the shaley and pyritic constituents,

J. R. Campbell

the two main inorganic impurities in coal.

At the afternoon session Mr. Campbell said that the natural acids protect the cellulose. That is evident, for quite hard logs are found in the Dismal Swamp and in lignite. Replying, Mr. Thiessen said that air fungi are principally responsible for the destruction of cellulose, which the Forest Products Laboratory had found occurred in about three years.

True, these fungi cannot always work on the timber, for some of it falls into the bog and some, still growing, lies down and is partly covered by the bog material. But in all peat bogs fungi lie dormant. If inoculations of peat from any part of a bog are made, the bacteria generate rapidly. The fungi are there, hungry for nitrogen and for heat. Give them their ration of that gas which they find anything but inert, warm them to 30 deg. C. and watch them grow.

Discussing the Tideswell and Wheeler paper, Mr. Thiessen said that the authors seemed to believe that very little of the ash was inherent but that he believed that a large percentage was of that character. Most coals carried 4 per cent of plant ash.

Mr. St. Perrott said he had never ground coal in a colloid mill but grinding it for the Trent process and floating it he had never been able to get less than one per cent of that impurity. George H. Ashley said that extremely fine grinding appeared to oxidize coal. He had found 20 per cent of volatile matter in fine anthracite, and he could only explain it by postulating its oxidation.

F. R. Wadleigh, consulting engineer, New York City, opening the discussion of the "Use Classification," said that producers and consumers believed that a new classification of coal was needed, as was evidenced by the replies to a questionnaire.

Eugene McAuliffe declared that commercial considerations are more potent than the thermal qualities of the coal in determining the kind of fuel the railroads will buy.

W. H. Fulweiler, chemical engineer, United Gas Improvement Co., said that the German method of rating coals for gas-making purposes was on the number of thermal units obtainable from the gas that could be made from the fuel.

W. H. Blauvelt, consulting engineer, New York City, said that combustibility was what was needed in coke. Unfortunately, this elusive quality was not clearly understood. Frequently the coke has the correct chemical analysis and yet has a low order of reactivity.

The paper of S. B. Flagg, fuel expert, Electric Bond & Share Co., was read by M. D. Cooper. The article stated that the necessities of the utilities corporations had made them prepare themselves to burn any kind of coal which might be most economical in view of the location of their plants. Some were burning coal having from 25 to 30 per cent of ash.

F. G. Tryon, coal statistician, U. S. Bureau of Mines, declared that the statistician desired a classification that was definite, simple and understandable. Mr. Tryon had tried to obtain a tabulation of production on the basis of coal rank but as he had left it to each operator to designate the type of coal he produced, he had received figures which he knew to be misleading.

Weighed Our Coal Cleaning Practices

At the meeting on blast-furnace practices, on Wednesday, Feb. 22, J. R. Campbell, bituminous representative, American Rheolaveur Corporation, presented a paper on the cleaning of bituminous coal, which outlines fundamental procedure in arriving at conclusions determining the washability of a given coal and measuring the performance of coal washers. These preliminary studies are absolutely essential, says Mr. Campbell, as practical tests do not always provide all facts on washability of a coal and frequently lead to faulty conclusions. He has used both methods. The paper also describes and gives the limitations of each of the coal-cleaning processes in current use.

THE FUTURE *of* COAL—

Will It Win a Market As a Chemical Base?

By R. S. McBride

Assistant Editor, Chemical and Metallurgical Engineering
Washington, D. C.

OUR SUPPLIES of coal greatly exceed in probable life our stores of natural gas and crude petroleum. Naturally, therefore, all parts of the fuel industries are more and more looking upon coal as the material from which all varieties of fuel must ultimately be made. Moreover, bituminous coal is a logical starting material from which to make all carbon compounds that are needed industrially upon a large scale because it furnishes industry with the cheapest form of carbon and hydrocarbon products.

Having up to the present time regarded coal only as a fuel, the coal man probably has not realized that even today about 20 per cent of the bituminous coal production of the country is used in chemical engineering plants as a raw material. Nor has the average coal man made any effort to anticipate or provide for the time when coal instead of petroleum and natural gas will be the raw material from which to make all of our liquid and gaseous fuel supplies.

The production of coal is valued at the mine at approximately $2,000,000,000 per year. At the producing well petroleum is valued at about $1,000,000,000 per year. Recent chemical research and chemical engineering development indicate that coal can be converted into petroleum substitutes. Thus there opens up for the coal man a potential market for another $1,000,000,000 of annual output.

APPROPRIATION of this market for coal, however, will not be easy. It is still a long road from the experimental work of Bergius, Fischer and Patart, who tell us that liquid fuel can be made from coal, to that goal so anxiously sought by the coal industry, the actual making of these products as a substitute which can commercially compete with petroleum. Nevertheless, this is a most promising course for exploration and further active industrial development. He who leads the way along this technologic road may often find himself astray, but he certainly is also the one most likely to find the pot of gold.

The Vision of Coal As a Chemical

Bituminous coal is to be the ultimate raw material for all fuels, whether used as solid, liquid or gas—and a raw material for many chemical and metallurgical industries.

Many have assumed that as soon as petroleum supplies became sufficiently scarce or costly it was inevitable that oil shale should be mined and distilled in order to produce petroleum substitutes. This assumption is perhaps in some measure correct, but there are two important factors commonly neglected by those who make it:

(1) The undesirable geographic location of shale deposits.

(2) The disposition of shale residue.

At present and for some generations to come it is likely that the great fuel-consuming centers of the country will lie in the Mississippi River Valley or farther east. Practically all of our oil-shale deposits lie in the heart of the Rocky Mountain country, from which point it will be necessary to move the oil by rail or pipe line long distances to reach consuming centers.

On the other hand, coal is located over much of the Mid-Continent and Eastern industrial areas and is generously distributed over those states where fuel consumption is likely to be greatest for some time to come. If we can use coal instead of shale for making oil the geographic location of coal occurrences will afford great economic advantage to both producer and user of the liquid fuel.

THERE is nothing to indicate that it will cost much more to mine a ton of coal than a ton of shale, and the least efficient processes which need be considered for liquid-fuel manufacture produce about the same volume of liquid fuel from a ton of coal as it is possible to make from a ton of shale. In the case of coal there remains a residue from half to three-fourths of the original weight which is a splendid useful fuel, namely coke. On the other hand, after retorting the shale or extraction of the oil there remains at least two-thirds, and more commonly three-quarters, of a ton of residue for which there is little or no market.

Some of the residue is sure to find a market and perhaps be profitably used—for example, in cement making. But development of hundreds of millions of tons of shale per year, which would be commensurate in magnitude with our liquid-fuel demand, would certainly create a problem of disposal of shale residue that cannot be ignored. It is more than likely that the disposal of this residue would impose a burden of expense upon the industry rather than afford a profitable byproduct. And if this is true certainly oil shale will be at a serious disadvantage as compared with coal for the raw material.

The geographic location of deposits, the relative value of solid residue, and the investment and operating expense for processing will all affect the cost of shale oil and of liquefied coal, and, therefore, largely affect their commercial prospects. But these two liquid raw materials for fuel and chemical making must also be compared as to their usefulness. Unfortunately we do not yet have sufficient knowledge to determine which

of them is the better starting material from which to make motor fuel, gas, and other products which are now made exclusively from petroleum.

Automotive fuel probably will be the principal and first objective of shale or coal processing, just as it is today the principal factor determining price and processing of petroleum. The motor fuel of the future may or may not closely resemble the present-day gasoline. There are numerous groups of compounds which give promise of being quite as useful for internal-combustion engines as the paraffin hydrocarbons which have always made up gasoline. Indeed there is some evidence to show that certain unsaturated hydrocarbons previously eliminated during petroleum refining give a superior engine performance. And, fortunately, some of these very valuable compounds probably will be available in larger percentages if liquefied bituminous coal is substituted for petroleum as our raw materials for motor-fuel making.

It is well known that certain oils are good lubricants and others useless for that purpose. There are scores, if not hundreds, of claimed explanations, but most of these are merely a restatement of observed facts and not at all an explanation why. It remains for the future, therefore, to determine whether our lubricating oil demand can be met as well from shale oil or from bituminous oil as it is today by petroleum fractions.

Fortunately the volume of lubricating oil required is small relative to the fuel-oil requirements of the country. Hence it may well be that for many years after petroleum ceases to serve as a fuel raw material adequate for the industrial demands it can still furnish enough lubricant for the wheels of industry. In any event, during the transition period from petroleum to coal and shale the physicists and chemists of the country undoubtedly will discover some fundamental facts regarding the phenomenon of lubrication. Then there should be no difficulty in synthesizing, first in the laboratory and then on plant scale, compounds with the requisite physical and chemical properties certainly to equal and perhaps to surpass in performance the best lubricating oils which ordinary refinery methods now make available from petroleum.

For manufacture of many chemicals of large industrial requirements cheap sources of carbon and hydrogen are needed. Hitherto such compounds commonly have been made from organic raw materials—for example, alcohol by grain fermentation and methanol (wood alcohol) by wood distillation. But before many years pass it undoubtedly will be true that carbon and hydrogen in grain or wood will cost more than the same elements in coal. Hence the chemical engineer has been active recently in adapting to commercial operation some processes that have long been known only on a laboratory scale. By these processes it is hoped to make from coal as a raw material many organic chemicals which today come only from vegetable or animal sources.

TO MAKE these materials the coal is first processed or gasified to obtain a simple compound such as carbon monoxide, ethylene or even elementary hydrogen. These compounds are then easily converted into the alcohols and other organic compounds which have large industrial demand.

Even though the consumption of these compounds seems large they will require but a relatively small tonnage of coal for their production as compared with the coal requirements of the coke and metallurgical industries, the gas works and the steam-electric plant. But their actual importance to industry is much greater than in proportion to the tonnage of coal required. This importance results largely because attempts to make these chemicals are bringing into the coal-processing industries large numbers of scientific investigators and chemical engineers whose influence upon the future of the business is certain to be large. It is this class of men who take a laboratory idea and convert it into a profit-making business.

The course through which such a chemical conception passes to become a profit-making industry should be carefully considered today by the coal producer. This succession is perhaps most commonly as follows: a dream, a "guess-timate," an experiment, an estimate, a large-scale trial, and finally profit or abandonment of the process.

Usually the dream originates in the mind of some academic or "pure-science" investigator. It was men of this type who saw in coal tar the beautiful dye, the healing drug and the multitude of organic chemicals. As soon as such a worker has first conceived such an idea he is likely to sit down with pencil and paper and dream a few chemical and financial dreams. Perhaps the laboratory man calls this estimating, but the precision is rarely such that it deserves a higher classification than a "guess-timate."

The purpose of study at this point is twofold: First, to determine if the transition is chemically possible, and, second, to determine whether yields and relative costs of raw material and finished product could possibly make experiments worth while. More often than not the dream passes because the investigator awakes to the fact that other raw materials than the one he is considering would insure much greater efficiency in the manufacture of the end product sought. Or he by careful chemical consideration may conclude that the conversion first conceived is a scientific impossibility.

But from such dreaming there frequently do come sufficiently promising suggestions to justify laboratory trial. By such tests the theory of the classroom is checked and it is determined, to cite a recent example, that in fact hydrogen and carbon monoxide may under certain conditions of temperature and pressure be caused to combine directly to make wood alcohol. And at this stage the laboratory man

THE petroleum industry has already learned how to "crack" a wide variety of paraffin-base, asphalt-base and mixed-base crude oils and to make from them very satisfactory gasolines. It seems likely, therefore, that if coal can be converted to a liquid form there will be little difficulty in making the next step—that is, to the stage of motor fuel. The fact that shale oil more nearly resembles crude petroleum is not in itself any proof that it will be superior to bituminous oil made by liquefying coal.

can also determine about what temperature and pressures would be needed, about what per cent of the gases would combine and about what is the probable purity of the product made.

AT THIS stage the chemist, if he be wise, calls in a chemical engineer for assistance and advice. The function of this engineer is to convert the test-tube experiment into a blueprint process which can be expected to work upon a sufficient scale to be called commercial. This means that instead of grams and cubic centimeters the chemical engineer plans to handle tons and millions of cubic feet. He works out in a preliminary fashion the interrelation of mechanical handling devices, processing equipment and heat-transfer problems. He takes the conventional apparatus available to industry and adapts it upon the blueprint to a co-ordinated succession of unit operations which it is hoped will actually work.

Then comes the stage of careful engineering estimate. The chemical engineer, assisted by the mechanical engineer and executive, decides just what efficiencies and what scale of operations can be expected at each stage of his blueprint process. Careful calculation is carried out to forecast as closely as may be the requirements for labor, the overhead charges, the investment costs, etc. Thus there results from this period of estimating a hypothetical balance sheet for five or ten years' operation of a plant upon such scale as appears to be most practical. Incidentally, the wise chemical engineer never fails to make a careful study of the potential market for the products which he proposes to produce. And selling costs must be considered just as carefully as items of plant labor, power or dividends.

IF THE ESTIMATE indicates a fair promise of profit to the backers a large-scale experiment is then in order. For this "development" stage units typical of those which will form the permanent and complete plant should be utilized wherever practicable.

Thus the functioning is converted from pounds to tons and it is soon determined whether the estimate has been sound. Moreover this small-scale plant usually becomes a logical first unit for the complete development. Second, third and many more "unit" machines are added; and what was but a short time ago a blueprint plant becomes a full-scale factory.

The coal man must interest himself in projects dealing with coal processing along lines just described, even though this is going to require a radical change in industrial outlook for many, even of the most progressive men in the coal business. And as this change comes about the coal management is going to find that a man who is a good mine manager or superintendent is motivated by quite a different psychology than the one who is well prepared by nature and training to plan and make a success of coal-processing plants. Not only is the operating technique quite different; the habits of thought and the angle of approach are quite diverse.

Operating a coal mine requires primarily skill in managing men and machinery, working each efficiently and without undue friction. Running a coal-processing plant involves on the part of the operating foremen and superintendents much of the same type of skill. But back of these men there must be one or more individuals who are capable of dreaming dreams worthy of conversion into plants, and such men must be supported financially and administratively on quite a different basis than is the works superintendent or the mine manager. They are men who must be gamblers against nature. They must take long financial chances. In no other field is it more true than in chemical engineering that "nothing ventured, nothing gained."

In order to realize upon such developments the coal producer must study coal users' needs. If he does not, the user on discovering loose industrial linkage between his business and the coal-producing unit will simply buy a mine and hire a manager to run it to suit him. Already the steel industry, many public utilities and numerous railroads have done this. And wherever the coal-processing industries see good prospects which cannot be realized because of lack of co-operation on the part of the coal producer they, too, will join the ranks of coal-mine owners. Thus may be removed from the market another large block of potential coal buyers.

Undoubtedly by 1940 the electric public utilities will have grown to two or three times their present proportion in the whole. Their power plants, with those of industry, mine and metallurgical plant, will undoubtedly consume about a third of the coal production. Much of this, and probably much of the railroad and bunker fuel used will be burned as powdered coal.

THERE will remain, therefore, as the only users who will burn lump coal otherwise unprepared the household group. And by 1940 it seems certain that the gas man and the coke producer will have so far appropriated the household heating field that even less bituminous coal will be burned in the homes than is today so used.

Certainly the coal producers of the country do not wish to look forward to any such industrial future and see most of their product used by those who are in just as good a position as themselves to own and operate a mine. If they do not prepare to come into the coal-processing business, either alone or in co-operation with other industry, they may soon find themselves without markets.

This is an unlikely result, for the coal business is not going to be so stupid. It will affiliate much more closely with the coal-processing business. It thus can have an active share in the management and the profits of those great chemical-engineering units which will make coal the greatest industrial raw material of the nation.

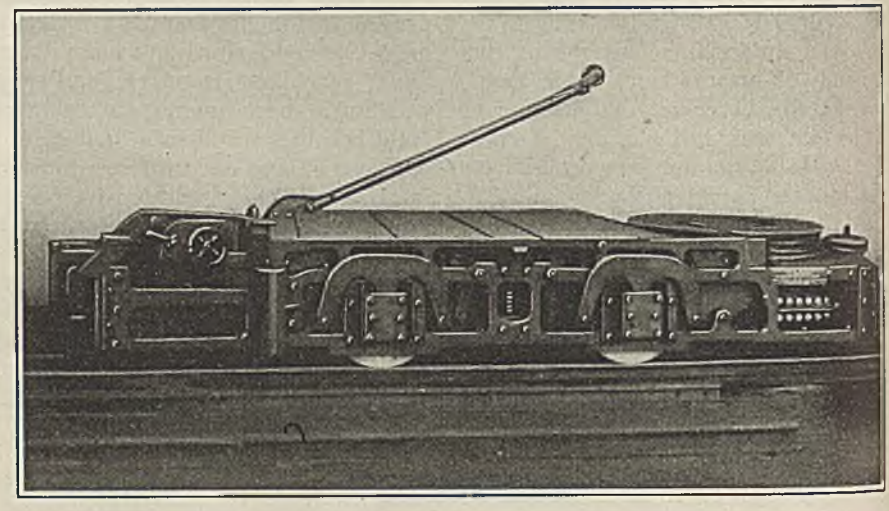
ULTIMATELY from 70 to 90 per cent of the coal mined in the United States is going to be powdered, gasified or processed. No man can forecast just how this will be brought about nor exactly what proportion of the coal production of 1940 will be used in any particular branch of industry. Certain trends already evident are, however, quite definite. These show that probably 40 per cent of the coal mined in that year will be processed for manufacture of coke, gas or bituminous oil.

SLOW SPEED

By Combining Transfer With Series-and-Parallel Switch

By W. A. Clark

General Engineering Department
Westinghouse Electric & Manufacturing Co.



Controller Placed Horizontal on 23-In. Locomotive

SLOW-SPEED locomotives for room gathering service with a rated speed of approximately 4 miles per hour at rated drawbar pull are made by all of the large manufacturers of mine locomotives.

The reasons for using slow-speed gathering locomotives and their advantages may be summarized briefly as follows:

It was found that storage-battery locomotives with a rated speed of 3½ miles per hour when used in mines with nearly level rooms and short entry hauls could gather as many cars as trolley gathering locomotives having a rated speed of from 6 to 7 miles per hour. Since all locomotives are equipped with series motors, the speeds when hauling one car, as in gathering, are much higher than the rated speeds when the locomotive has reached a balanced speed. The speed of the storage-battery locomotive when hauling one car on the level is from 6 to 8 miles per hour and of a standard trolley gathering locomotive, 10 to 14 miles per hour.

The condition of the tracks in rooms ordinarily prohibits, from the standpoint of safety, speeds of over 6 miles per hour, and the length of the run in the rooms prevents a locomotive from attaining much higher speed before it is necessary to shut off power to stop. This means that the storage-battery locomotive may be operated in the rooms with all resistance cut out, but that the higher speed trolley gathering locomotive must operate with resistance in the circuit most or all of the time when in the rooms, which is wasteful of power.

TESTS conducted independently by several companies show that slow-speed gathering locomotives, in the same service as the standard speed gathering locomotives, will gather practically the same number of cars in the same time and that the power consumption is from 30 to 50 per cent less.

Another advantage of slow-speed gathering locomotives is longer life of the conductor cable. Due to the slower speed there is less likelihood of running over the cable, and the amount of current carried by the cable is much less, thus reducing the heating of the cable and consequent depreciation of the insulation.

The only disadvantage of the slow-speed gathering locomotive is its slow speed when hauling the trips on the entry from the rooms to the parting, where they are picked up by the haulage locomotives. The advantages of the slow-speed locomotive could be obtained, without the disadvantage of slow-speed operation on the entries, by using a standard speed locomotive and operating with motors in series when in the rooms and in parallel when on the entries. But it is very difficult to get the motormen to operate in this way, because with a series and parallel controller, most motormen forget that there is any series position. That this is only natural is indicated by the tendency of automobile drivers to operate in high gear whenever possible.

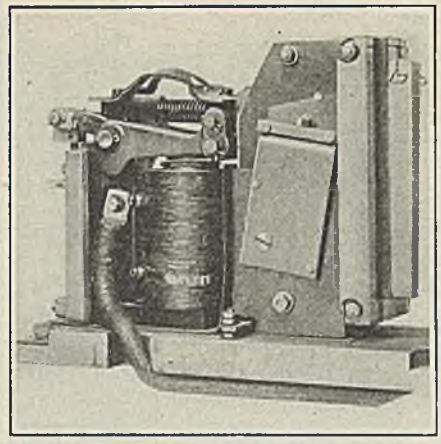
To make it necessary for the motorman to operate with motors in series when on the cable reel and permit operation in parallel when operating from trolley some manufacturers have developed a control which permits only series operation when operating from the cable reel and only parallel operation when operating from the trolley.

THE control is of the semi-magnetic type—that is, the reverse drum carries the main circuit current but the accelerating or speed drum carries only the control current for the coils of the magnetic contactors which are used to complete the circuit to the motors and vary the amount of resistance in circuit.

As shown in the accompanying diagram, the trolley reel transfer switch is combined with the reverse drum of the controller so that when the reverse drum is in the series position, power is taken from the reel cable and when the reverse drum is

in the parallel position power is taken from the trolley. This arrangement removes power from the trolley pole when the reverse drum is in the series position and removes power from the cable hook when the reverse drum is in the parallel position, and permits operation of the locomotive only with motor in series when the locomotive is receiving power from the reel cable and only with motors in parallel when the locomotive is receiving power from the trolley.

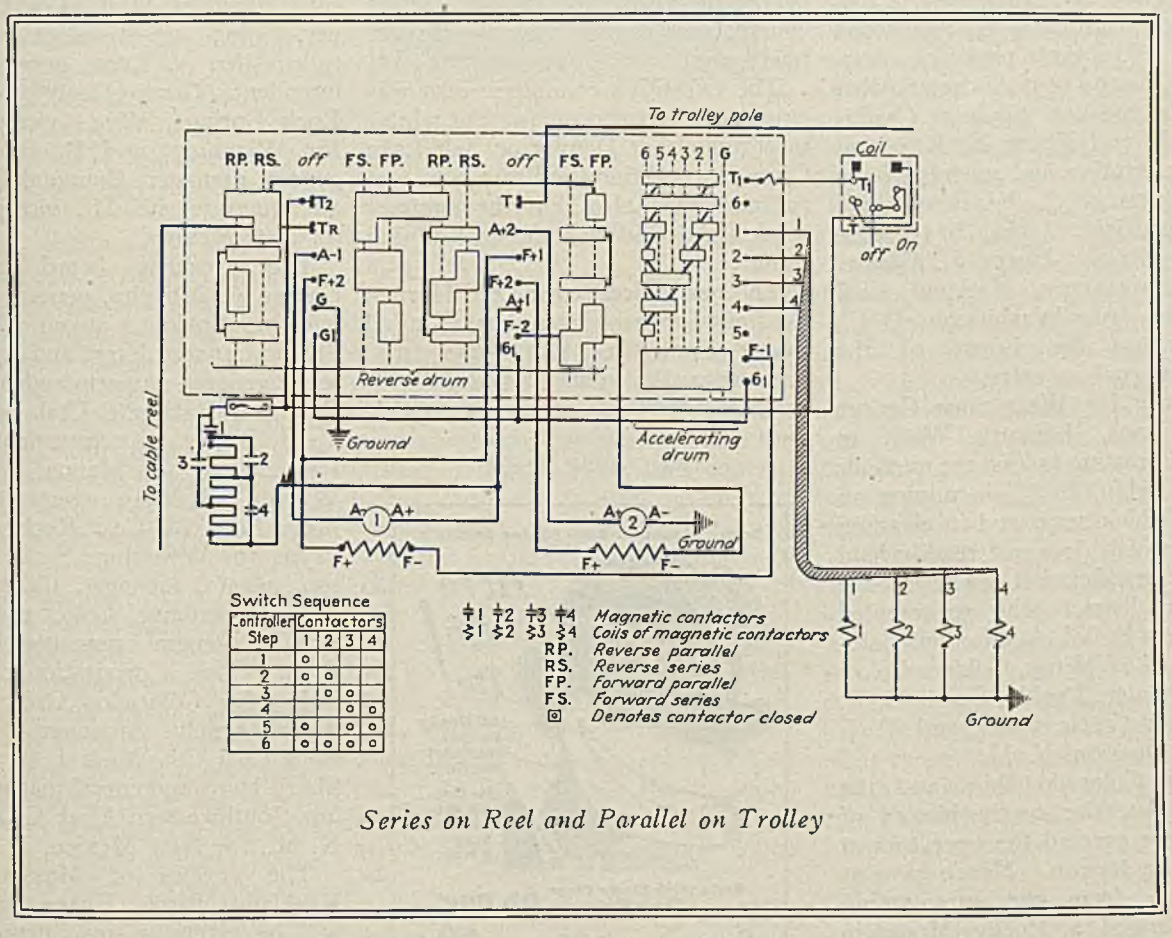
The reverse and accelerating drums of the master controller are interlocked in the usual manner so that it is impossible to break the circuit on the reverse drum until after it has been broken at the contactors by returning the accelerating drum to the "off" position. Two heavy fingers at the bottom of the accelating drum open and close the motor circuit. As shown on the diagram, these fingers make contact with the segments on the drum before the control circuit is established to the contactors in accelerating, and the fingers do not leave the segments when power is being cut off until after the contactors have all been opened by opening the control circuit. The motor break-up type of circuit is used to prevent burning of the fingers on the reverse drum. This arrangement prevents opening a heavy circulating current which otherwise could be set up by throwing the reverse drum to the parallel-reverse position while the locomotive was in motion.



Type of Magnetic Contactor Used

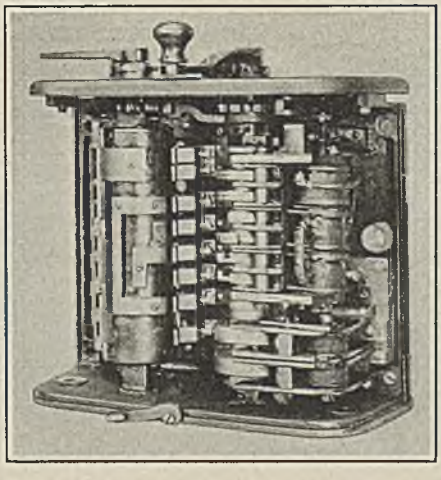
SINCE the interlocking and the motor break-up circuit prevent moving the reverse drum while the current is flowing through the fingers and segments, there is no possibility of burning the fingers or segments, thus insuring long life of these parts. The only circuits broken at the controller are the control circuits, by which only small currents are carried. Magnetic blowouts prevent burning of the control fingers and segments.

The contacts of the magnetic contactors make and break the main circuit. They are provided with blowouts which quickly rupture the arcs and the contacts have a wiping fit which prevents pitting. The contacts are much easier to replace than the segments of a drum controller and have longer life. The contactors are specially designed for mining service and are suitable for use in mines where there is considerable voltage drop, as they will operate at half voltage and will hold in at even still lower voltages. The use of semi-magnetic control greatly reduces the controller maintenance.



Series on Reel and Parallel on Trolley

Reverse and Accelerating Drums



Rocky Mountain Engineers

Enterprising as Ever

EAST MET WEST at the winter meeting of the Rocky Mountain Coal Mining Institute, which assembled for a three-day session on Feb. 27 in Denver, Colo. From Pittsburgh came G. Mac Vean to read J. T. Ryan's paper on rock-dusting; Chicago sent Andrews Allen to describe the new tipple at Castlegate, Utah, and Frank H. Kneeland with a description and models of the Cardox cartridge; L. W. Birch came from Mansfield, Ohio, to discuss the mine circuit; Harry L. Gandy, executive secretary, National Coal Association, from Washington, D. C., to speak on the future of the bituminous coal industry.

From the far West came George Watkin Evans, of Seattle, Wash., to give an interesting talk on the methods used at Corbin, B. C., in mining an unusually thick seam and in cleaning the coal, which does not readily lend itself to beneficiation. The Rocky Mountain district was represented with papers by W. A. Manuel, Colorado School of Mines, Golden, Colo.; W. J. Schenler, Pueblo, Colo.; G. D. Jones, Oak Creek, Colo., and T. J. Waddell, Dawson, N. M.

Smiling Colorado skies and the largest registration in the history of the institute greeted the operators at the opening session. Never have as many men from the surrounding states attended a Rocky Mountain Coal Mining Institute meeting. The smiling skies, however, soon turned gray and snow fell to reconcile the hearts of the delegates to a performance of the business of the meeting.

Pursuant to a motion made at the summer meeting at Trinidad, the institute acted favorably on the report of the committee which recommended that a cup be offered as a prize to any coal-mining team from the Rocky Mountain district regularly entered in the International First Aid and Mine Rescue Meet—whether representing a mining company, a miners' organization or group of individual miners—which would make the highest score in first aid. The cup will be held by the winning team till the next annual contest. Wrist watches will be awarded also to every member of the winning team. These, of course, will be for their permanent possession.

The executive committee also was empowered to choose for the winter meetings either Denver or Salt Lake City, as conditions indicate. It was recommended also that the summer sessions be held at some coal-mining center.

The new officers are: Otto Herres, assistant general manager, United States Fuel Co., Salt Lake City, president; Benedict Shubart, Lindrooth, Shubart & Co., Denver, Colo., secretary (re-elected); H. L. Pascoe, general manager, Blue Blaze Coal Co., Salt Lake City, Utah, vice-president for Utah; R. M. Perry, general superintendent, Moffat Coal Co., Denver, Colo., vice-president for Colorado; Glen A. Knox, general superintendent, Gunn-Quealy Coal Co., Rock Springs, Wyo., vice-president for Wyoming, and B. B. Hanger, general manager, Diamond Coal Co., Albuquerque, N. M., vice-president for New Mexico.

The executive board comprises George A. Murphy, general superintendent, Spring Canyon Coal Co., Spring Canyon, Utah, and I. N. Bayless, general superintendent, Utah Fuel Co., Castlegate, Utah, for Utah; T. H. Butler, superintendent, Union Pacific Coal Co., Hanna, Wyo., and William Redshaw, superintendent, Megeath Coal Co., Rock Springs, Wyo., for Wyoming; S. M. Thompson, general manager, Caliente Coal Co., Walsenburg, Colo., and C. W. Brown, general manager, Hayden Bros. Coal Corporation, Denver, Colo., for Colorado; Oscar Huber, superintendent, Albuquerque & Cerrillos Coal Co., Madrid, N. M., and Sharp Hanson, general manager, Gallup Southwestern Coal Co., Gallup, N. M., for New Mexico.

The articles of Messrs. Allen, Kneeland, Birch, Evans and Jones will be given in some detail in the pages that follow and it remains in this article to refer briefly to those delivered by Messrs. Gandy, Manuel, Carpenter, Schenler and Wardell.

Regardless of temporary clouds, asserted Harry L. Gandy, executive secretary of the National Coal Association, who addressed the Institute on the opening day, "the outlook as a whole is more assuring than it has been for some time past. It would seem as if the industry has accepted definitely certain principles of sound business — having ascertained, after much bitterness, that the law of the jungle, in which co-operation is an unknown factor, leads only to chaos."

Among favorable indications the

Who Could Resist?

speaker mentioned the growing interest in consolidations of existing properties in the East, the advances in mechanization and the increasing study of fuel research and effective utilization of coal. Mr. Gandy drew attention to the figures compiled by the U. S. Bureau of Mines on machine mining, mechanical loading and underground haulage to emphasize his tribute to the engineering skill employed in the industry.

The number of undercutting machines, he pointed out, had increased from 3,907 in 1900 to 17,551 in 1925 and the average output per machine had grown. The figures for 1926 showed a further increase in the percentage of coal undercut. Between 1923 and 1925 the percentage of coal loaded by machines jumped from slightly over 0.33 to 1.20 per cent and further increases were made in 1926 and 1927.

"Mining engineers," said Mr. Gandy, "have more than an academic interest in the economic affairs of the industry. Their interests are inseparably connected, of course, with the strength of the financial structure of the business which engineering genius is developing. Not until sound economic practices are followed, however,, will the fruits of engineering skill be fully realized by coal operators.

"The significance of this statement can be appreciated in the light of the fact that increased mechanization leads to intensified production. This means that unless the industry functions properly from an economic basis whatever gains may accrue through reduced operating costs are not retained by the operator but are swallowed up in a competitive system in which price is sacrificed on the altar of volume. It can readily be seen that the interests of the operator and the engineer are mutual, that the progress and prosperity of the industry are of common concern."

Describing developments in the practice of rock-dusting John T. Ryan, general manager of the Mine Safety Appliances Co., said that while only 7 per cent of the bituminous mines are rock-dusting, they produce about 24 per cent of the total annual output. This indicates that the larger mines are most appreciative of the merits of this treatment.

The fact that the number of explosions of a major character declined in 1927 over 1926 may be attributed in degree to the growth of rock-dusting. Mr. Ryan said the cause for

Otto Herres

greatest gratification is the growing realization that efforts expended in rock-dusting only parts of a mine are largely wasted.

Sprinkling, except at working faces, where it is employed for settling coal dust rather than for rendering it non-flammable, is slowly dying out. He points to the fact that many companies continue to make the mistake of not applying rock dust up to the faces or at least to the last breakthrough. If rock-dusting is not extended to the last breakthrough in rooms the lives of men working in these places are imperiled.

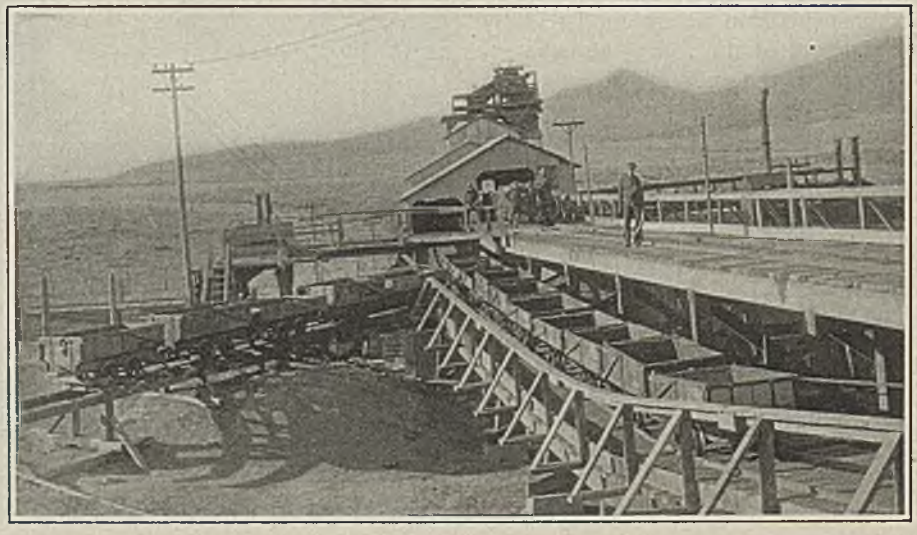
Rock-dust barriers are being less and less used owing to their impracticability as a general proposition. They are costly to install and in many instances fail to work. The rock dust placed in or on them will absorb moisture and fail to rise in a cloud in the event of an explosion. When wet, rock dust placed on the roof, ribs and floor of entries and rooms holds down coal dust, which of itself displays little affinity for water.

That the Colorado School of Mines is busy already with research work on the coal of the state and is desirous of receiving samples of coals from all parts for analysis and report was the gist of the address by W. A. Manuel, of Golden, Colo. Mr. Manuel briefly reviewed what had and what could be done to get worthwhile products from raw coal. He said that "some Colorado cokes have an ash content as high as 20 per cent, which materially increases the difficulties encountered in metallurgical operations." He added that a study should be made to find a way to produce "a good metallurgical coal from the low-ash coals of Colorado," now not considered to be coking coals.

An address presented by Clark B. Carpenter, Colorado School of Mines, Golden, Colo., summed up "The Fuel Resources of the United States." "Superpower developments," declared Mr. Carpenter, "contemplate the use of coal-burning steam plants. The development of water power is so hampered by politics that it will be many years before our potential water power resources will be half developed.

"Oil shale," he said, "has been mentioned as a possible future source of our oil supply, but the engineering problems confronting its economic recovery have not been solved and are not likely to be solved for some time to come. The supply of fuel oil is more likely to decrease than to increase, whereupon many domestic and industrial users of fuel oil will turn their attention to coal for fuel."

Tipple Described by W. J. Schenler



During the past year the Colorado Fuel & Iron Co. has been engaged in an extensive program for the modernization of its coal tipples so as to improve the quality of its product. W. J. Schenler, chief draftsman of the company, Pueblo, Colo., described the changes made in one of these tipples, which from operation and appearance standpoints became wholly new, every vestige of the old structure having disappeared.

In the old tipple no provision had been made for cleaning the lump or nut sizes and the coal had been loaded into the cars through chutes. The principal features of the new structure are a crossover tipple dump, shaker feed, shaker screens, nut and lump picking and loading booms with shuttle conveyor and a box-car loader for putting lump into railroad cars, also boiler-coal and waste-disposal systems.

A paper based on studies made into the economics of mine-car lubrication at the Stag Canyon mines of the Phelps Dodge Corporation, Dawson, N. M., was read by Thomas G. Wardell, of that company. The cars are used under conditions more severe than at most coal mines. Much water and dust is encountered by rolling stock and consequently wheels of the open type are harmfully affected.

The company felt that big savings might be made in the lubrication of mine cars by the use of inclosed anti-friction bearing wheels. A number of cars thus equipped were put into service and have given the results anticipated. The accompanying table, presented by Mr. Wardell, compares the cost of lubricating mine cars when equipped with bearings of any one of three types. The costs of supplies and labor are both covered in these figures.

COSTS OF OPERATING VARIOUS TYPES OF BEARINGS

Bearings	Per Mile Run	Per Ton Hauled	Per Ton Mile
Plain (Oiled)..	$0.0011	$0.0046	$0.0014
Timken	0.00029	0.00073	0.000223
Plain Roller...	0.00075	0.0023	0.00101

West Develops New Type Conveyor

By G. D. Jones

Victor-American Fuel Co., Oak Creek, Colo.

A PAN CONVEYOR of the shaking type which is both flexible and sectional, consisting of pans hung from chains and driven by a steel cable, is now in use in the Pinnacle mine of the Victor-American Fuel Co., Oak Creek, Routt County, Colorado. As made clear by Fig. 2, the pans or troughs, are each pressed from one piece of 12-gage sheet iron. Each is 23 in. wide and of any convenient length, this last measurement preferably being equal to the depth of an undercut.

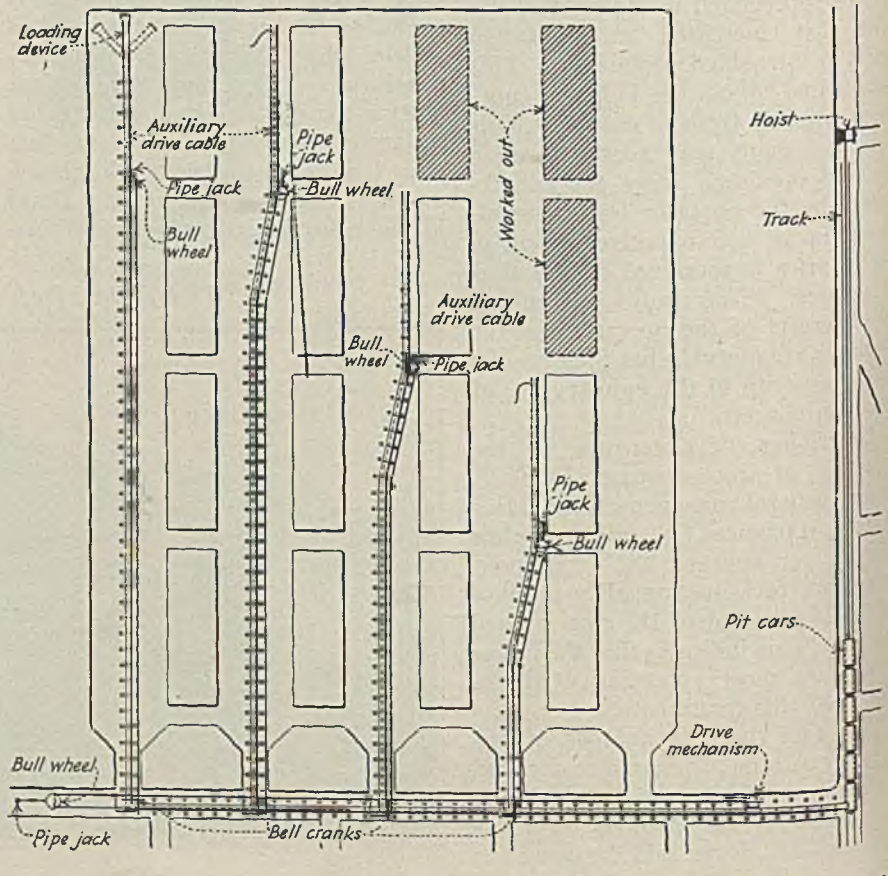
On one end of each pan is mounted a 1⅛-in. square axle, the extremities of which are tooled around. From one to ten or fifteen pans at the far or face end of the conveyor move over the mine floor on rollers placed on this axle. All other pans are hung from the roof or timbers by chains. This change from bottom support to aerial suspension is accomplished by the removal of the rollers and the attachment to the ends of the axle of a sleeve-fit pipe extension to which the chains are fastened. A cotter pin holds either the roller or the axle extension in place.

On the remaining end of each pan is welded a clamp for independent fastening of each pan to the drive cable. This clamp is located on the lateral axis of the pan and 4 in. from the end. It serves the additional purpose of preventing buckling of the conveyor sections, which are overlapped but not directly fastened together.

Motion is imparted through the cable and to the conveyor by a differential drive mechanism with a quick jerk stroke in the direction of coal travel and a slow return pull in the opposite direction. Reversal is readily accomplished for the carrying of supplies. One drive will actuate as a unit one entry conveyor and four tributary or room conveyors, as indicated in Fig. 1.

Any of the room conveyors may be stopped while the others continue to operate merely by loosening or tightening a turnbuckle by which the bull-wheel is anchored to a jack pipe. The tributary conveyors are driven by

Fig. 1—Four Rooms Worked with a Single Drive, Pinnacle Mine.



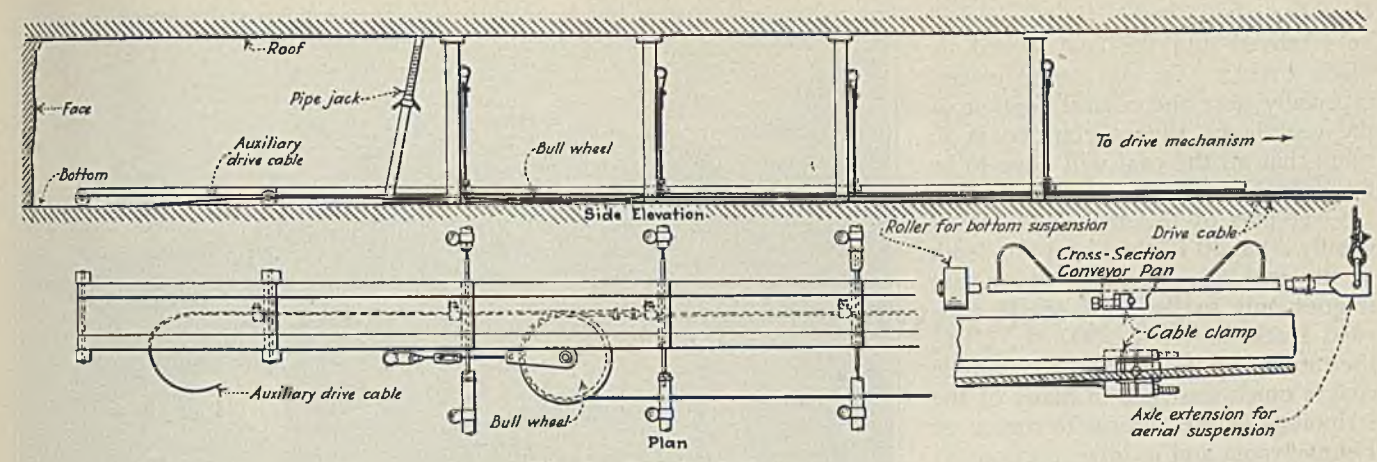


Fig. 2—Detail of Conveyor

the main drive cable through a bell crank. A 7½-hp. motor will drive a system of 1,500 ft. of conveyor.

A section can be added to the conveyor in two minutes. The pan is laid in place and then the rope is inserted in the clamp and secured by tightening two setscrews. The sections, being light, are easily transported; one man can raise one end and wheel the section along on its two rollers.

By reason of its great flexibility this conveyor may be curved vertically or horizontally to a fairly wide degree. The bull-wheels need be moved no oftener than once a week, for sections may be added ahead of it, extending it as much as 70 ft. The units located ahead of the bull-wheel are clamped to an auxiliary-drive cable which in turn is clamped to the primary drive cable, as indicated in Fig. 2. Any section may be removed independently of others for the passage of a cutting machine across the line. A duckbill loading device may be attached to the end of the conveyor.

The installation in the Pinnacle mine is shown in Fig. 1. By this system five rooms and as many pillars, 300 ft. long, were mined out in four months—a record better than at first appreciated considering that a strike interrupted the continuity of operation and the use of the conveyors was experimental. The conveyor is known as the Jones flexible conveyor and on it patent rights are pending.

Mining World's Thickest Coal and Cleaning It

By George Watkin Evans

Consulting Engineer, Seattle, Wash.

AN OUTLYING body of coal about 600 ft. thick in places though only 25 ft. thick in others is being mined by Corbin Coals, Ltd., of Spokane, Wash., the larger sizes being washed by jigs.

A portion of the property of this company is known as Coal Mountain and lies between the headwaters of Michel and Corbin creeks. There is a series of close folds, the axes of which run north and south. This close folding has concentrated large bodies of coal along the axes of the folds. Erosion has removed most of the coal in the anticlines.

No. 4 Mine, East Side of Coal Mountain

There are three principal coal bodies within the property. That in No. 4 zone, near the center of Coal Mountain, is from 25 to 250 ft. thick. The coal is high grade, but severely crushed and mixed with impurities. No. 3, on the west flank of the mountain, is 300 ft. wide between walls and about a mile long. It is mined by steam shovels.

On the east slope of Coal Mountain is No. 6. Where the coal has been crosscut by tunnels it is found from 450 ft. to about 600 ft. thick, the coal at the inclosing walls for a considerable thickness being reasonably clean and quite strong. The coal along the west wall, with a loss of 20 per cent in the washery, gave a product with 12 per cent ash.

This No. 6 body of coal can be mined by a combination of stripping and underground caving. In some places where the surface is shallow the coal will be stripped and the blocks of coal will be broken and passed down mill holes into chutes.

In other places the surface soil will be removed and the coal mined by block caving. In still other places, especially near the central portion of the coal body, the overburden is so thick that all the coal will have to be removed by underground mining.

Over part of the deposit the cover is only 20 to 30 ft. thick and the depth of the coal below this, assuming that it goes only to the level of the railroad track, is 400 or 500 ft. Thus the ratio of overburden to recoverable coal is much less than in many of the strippings in the anthracite region of Pennsylvania and in other portions of the United States.

Steam shoveling is made difficult in winter by the accumulation of snow, which falls to a depth on the level of 6 to 8 ft. Temperatures as low as minus 45 deg. F. have been recorded. The low temperatures made washing difficult, but, as the product was not uniform and hand picking was impracticable, especially for the small sizes, and as the coal had a free moisture content of from 1 to 6 per cent, washing was introduced.

A trial plant was constructed four years ago using an Elmore jig. It cleaned sizes ranging from $\frac{3}{4}$ to 3 in., the smaller sizes being bypassed. During the milder weather the $\frac{3}{8}$- to $\frac{3}{4}$-in. coal was also washed in the jig.

Two Wilmot jigs were introduced to wash the larger sizes and a Ruggles-Coles revolving heat drier was installed to dry some of the smaller sizes that were cleaned in the Elmore jig. Thus the plant washes all the coal between $\frac{1}{4}$ and 6 in. One Wilmot jig takes care of all the coal between 3 and 6 in., another all the coal between 1 and 3 in. and the Elmore jig the coal between $\frac{1}{4}$ and 1 in. The sizing is done by a Marcus screen and two Arms vibrating screens.

Corbin, B. C., Showing Coal Mountain

The coal from all three jigs passes to a sizing and dewatering screen with two decks, of which the lower has $\frac{1}{8}$-in. and the upper 1-in. round holes. The clinging moisture in the larger coal (1 to 6 in.) by the time it reaches the mixing bin, via a shaking chute, a washed-coal elevator and a sizing screen, is less than 2 per cent.

The undersize ranging from $\frac{1}{8}$ to 1 in. goes to an elevator and, falling into a 50-ton bin, is fed to a Ruggles-Coles drier having a capacity of 20 tons hourly. The material passing from the bin to the drier has a clinging moisture of from 10 to 12 per cent, depending on the length of time it remains in the bin. The drier reduces the moisture to about 1 per cent.

No. 3 Mine, West Side of Coal Mountain

From the drier it is fed to the dry-coal elevator to be raised to the sizing screen, where it is mixed with the larger sizes from the Wilmot jigs, and passes to the mixing bin. A separation is made on this screen, if desired, into washed steam and furnace coal. The moisture in the coal under $\frac{1}{4}$ in. is dried out in a Ruggles-Coles drier with a capacity of 30 tons an hour through a range of 5 per cent. The coal as received has 5 or 6 per cent of moisture, which the drier reduces to less than 1 per cent.

Several types of vibrating screens have been tried, and more or less difficulty has been experienced in separating the minus $\frac{1}{4}$-in. coal wherever the coal contains an average of 5 or 6 per cent of surface moisture. Difficulty was found with two types of screens in which the deck is inclined at an angle of approximately 30 deg.

When an attempt was made to handle a capacity such as 25 tons an hour through a $\frac{1}{4}$-in. screen difficulty was experienced due to the masking of the screen cloth. The Arms screens vibrating at about 450 r.p.m. cleared themselves very well, and the wear and tear on the screens was considerably less than it was when the vibrations per minute were 520.

Claim is made that vibrating screens will size damp coal, but my experience has been that they will handle dry coal or coal that is dripping with water, but they have great difficulty in making a satisfactory separation of certain coals that contain 5 or 6 per cent moisture.

At the time a study was made of the best way to clean Corbin coal

careful consideration was given to the use of air, but when the coal and its impurities were taken into account, especially the fact that the coal was damp and intermixed with graphitic slate and other foreign matter, I became convinced that to use air in cleaning this coal would present greater difficulties than using water. I also realized from my study of Eastern air-cleaning plants that the loss of coal in the refuse is much greater than where wet washing is used.

I decided, however, that if it were possible I would keep water away from the extreme smaller sizes, say from $\frac{1}{8}$ to 0 in. H. B. Carpenter is able with his centrifugal driers to dry conveniently to 5 or 6 per cent moisture, but during the winter months this would not be low enough to make the shipment of coal in western Canada feasible.

Invest in Line Loss or Equipment?

By L. W. Birch

Assistant Manager, Railway Sales Division
Ohio Brass Co., Mansfield, Ohio

BONDS in mine tracks should be sufficiently heavy to carry the return current economically. In fact the most economical bond to use should be carefully determined in every instance. Correct overhead construction is another measure of economy. The chart herewith is predicated on a section of track 1,000 ft. long having 66 bonds, the rail weighing 40 lb. per yard.

In the first column are the bond numbers and in the second the cost of 66 installed bonds. The third gives the power loss per 1,000 ft. of track with a 1,000-amp. load when the track is equipped with these bonds, under the assumption that the entry works 300 days in the year, each of 8 hours, and has a power cost of 3c. per kilowatt-hour. The fourth column shows the saving in dollars over the No. 1 bond for various bonds of greater capacity when consideration is given to the additional investment.*

Bond No. 5 shows the greatest saving. Bond No. 6 drops below No. 5, even though No. 6 has a larger capacity. This is because it was necessary to make No. 6 bond somewhat longer than No. 5, thus increasing the resistance of the joint.

In column 5 will be found the power loss per year per 1,000 ft. for a circuit carrying 500 amp. and in the sixth column the saving in power over the No. 1 bond. Bonds Nos. 2, 3, 4 and 5 show approximately the same saving, whereas the larger bonds, Nos. 6, 7 and 8, show a loss over the No. 1 type, because the larger diameter of the cable makes a longer bond necessary as does also the protection of the bond against high-frequency vibrations which moving trips set up. By this is not meant the movements of the rail ends resulting from the passage of the wheels over the joints.

Bonds usually are fully able to carry the current in the sense that they will not heat unduly from resistance. A fused bond is almost unknown. When a bond gets hot it is from a poor weld or connection. A 4/0 bond will carry 1,000 amp. without undue heating or danger of starting a fire.

In many outside installations catenary construction with pole spacings of 150 ft. is being used to advantage with low operating costs. Even though speeds are low, with the standard inside suspension having a rigid hanger and clamp, there is pounding and burning at the suspension points. It may be necessary in some cases to use this construction outside as well as inside because of the shortness of the outside track, but whenever possible the rigidity of the contact should be overcome.

Where the overhead construction is irregular a strong spring tension is needed to keep the wheel in place. This wears out the trolley wheel. If a lesser spring tension is used the contact is imperfect and copper from the contact wire may be deposited on the groove of the wheel, so much in fact as to make the groove build up noticeably. With good overhead construction a lesser spring tension can be used with improved results, and if the tension is greater it is less harmful than with an ill-hung trolley wire. Naturally, excessive current causes troubles that a good overhead construction cannot remedy.

Roof seepage deposits minerals on insulators, causing burns or punctures. Probably the cheapest and easiest way to eliminate the trouble due to droppers is to over-insulate. Inasmuch as seepage water leaves a deposit there is a better opportunity to clean an insulator when double insulation or larger insulation is used. It might be good policy to use porcelain where the roof seeps badly, as it is easily cleaned and not so likely to carry a power arc and burn down, once leakage is started.

Every operating man should decide whether he will spend his money for proper and adequate equipment or for lost energy and decreased production.

Losses from Bond Resistance and Savings from Large Bonds

Size Bond	Cost of Bonds	1,000-Amp. Load: Power Loss Per Year	1,000-Amp. Load: Saving Over No. 1 Size	500-Amp. Load: Power Loss Per Year	500-Amp. Load: Saving Over No. 1 Size
1	33.00	68.91		17.25	
2	39.60	53.46	13.34	13.36	1.78
3	46.20	45.14	19.55	11.28	1.75
4	52.80	34.45	28.12	8.61	2.30
5	59.40	29.70	30.76	7.42	1.39
6	72.60	35.64	20.60	8.91	4.34 Loss
7	79.20	32.67	21.46	8.17	5.69 Loss
8	85.80	23.76	28.25	5.94	5.59 Loss

*In this calculation apparently Mr. Birch assumed that the interest, depreciation and obsolescence aggregated 32 per cent per annum.—EDITOR.

Belts Lead Coal from Dumps to Tipple

By Andrews Allen

Allen & Garcia, Consulting Engineers, Chicago, Ill.

CASTLEGATE TIPPLE is the first step of the program of T. C. Keller, president, Utah Fuel Co., Salt Lake City, Utah, toward the modernization of the equipment at that company's plants. His plans involve complete mechanization of all operations. This has materially affected the design of the tipple, for it has been necessary to anticipate a daily output of 4,000 tons and to provide a preparation that will meet the needs of a highly competitive market.

The tipple takes coal from two mines on opposite sides of a wide and rugged canyon. The coal is clean but has occasional streaks penetrating in every direction running from 8 per cent to over 20 per cent ash. This is picked and crushed to be returned to the coal screens. As the coal bed is 28 ft. thick and as there is no cleavage, lumps weighing as much as 500 lb. and 5 ft. long are common. The coal is wet from sprinkling, thus making the separation of the finer sizes difficult. The streaky coal was sold at an extremely low price, being regarded as a rejected domestic fuel, but it will now be crushed and sold as a steam coal, for which it is well suited, as it has a high fuel value.

The picking facilities are sufficient to permit of the most careful cleaning of the coal. Arrangements are made for many sizes of coal, for the competitive market demands approximately thirteen different sizes and combinations of sizes. The tipple is designed to handle the 3,000-lb. capacity cars at present in use, but plans have been laid for the introduction in the future of 5-ton mine wagons.

The coal from each mine is dumped on its own side of the canyon and is conveyed to the screening plant by belt conveyors. A Link-Belt rotary dump with chain car feeders is used on one side of the canyon and a similar dump with rope and gravity feed on the other side. Each dump receives only one car at a time, which, however, may not be separated from the trip when swivel couplings are provided to make this arrangement possible.

The coal is carried to the screens over a 48-in. rubber belt troughing conveyor with Timken roller bearings. Because of the heavy lumps, the screens are made unusually heavy.

Bringing Down Coal Without Powder

By Frank H. Kneeland

Safety Mining Co., Chicago, Ill.

MECHANICAL loaders of all kinds and types represent a heavy investment on which interest and fixed charges must be paid. Keeping a machine continuously employed therefore is the biggest problem that confronts the coal producer. By using the Cardox cartridge this continuity of operation can be obtained, as the coal can be shot with safety when men are in the mine and they can safely return to work as soon as the shot is fired. There also is no smoke to be removed.

Cardox Fall on Long Face

Liquid carbon dioxide remains a liquid only under a heavy pressure and at temperatures below the critical—that is, below 88.7 deg. F. If the temperature rises above that point the gas evaporates regardless of pressure, and the remainder, because of the loss of heat in evaporation, becomes solid.

"The heating element is a paper tube containing chemicals capable of reacting with each other and producing the heat necessary to vaporize the contents of the shell. In composition and behavior these chemicals resemble thermit rather than powder. Through the center of the heater element, and forming an electrical connection between the valve stem and the disk, extends a steel wire. This is of such cross-sectional area that it is instantly vaporized by the passage of the firing current. Any current passing in either direction between the shell terminals must traverse the firing wire within the heater element. The charging current is 100 amp. at 180 volts."

NOTE—A description of Cardox by Mr. Kneeland was published in *Coal Age*, May 12, 1927. For this reason only supplementary statements can appear here.—EDITOR.

The pressure of the gas within the shell up to the time of discharge seldom exceeds 2,000 lb. per square inch. When contact with the power line is made the steel wire within the heater element starts a reaction between the chemicals which gasifies the liquid carbon dioxide so that the pressure rises in about one-twentieth of a second from 2,000 to 25,000 or 30,000 lb. per square inch.

Cartridge Ready to Be Pushed in Hole

WHERE ILLINOIS COAL GOES

A Study of Distribution Trends Since 1915

By Sydney A. Hale
Managing Editor, Coal Age

ILLINOIS coal finds a commercial sale in sixteen to twenty states. It moves northwest as far as North Dakota, southwest to Louisiana and Texas, southeast to Tennessee and Alabama and east to Indiana and Michigan. In times of national stress it has moved to Ohio and New York. Canada, too, has been a customer under exceptional circumstances and there are records of shipment via the Gulf ports to the West Indies.

Normally, however, between 95 and 99 per cent of the commercial rail shipments reach a dozen states and by far the greater part of this movement is confined to half that number. Illinois itself is the largest consumer of coal mined in the state, although the percentage of the commercial output loaded for intrastate shipment has been declining in recent years.

Illinois was a pioneer in large-scale refinement in sizing. Exclusive of mine-run and screenings, there are seven standard sizes of coal offered for shipment. These sizes are 6-in. lump, 6x3-in. furnace, 3x2-in. nut or small egg, 2x1¼-in. stove or No. 2 nut, 1¼x1¼-in. chestnut or No. 3 nut, 1¼x¾-in. pea and ¼-in. duff or carbon. Mixtures of some of the smaller sizes and variations in lump and egg sizes to meet special requirements of individual consumers add to the number. Standard screenings are offered as 2-in. and 1¼-in.

The multiplicity of sizing in the Illinois field has grown to such an extent that its wisdom is seriously questioned by many producers. There is no question that it complicates the marketing problem because, with demand for the different sizes seldom in balance, the producer is faced constantly with the accumulation of unbilled loads or the disposition of slow-moving sizes at sacrifice prices.

On the other hand, the refinement in sizing, together with certain natural advantages in structure and free-burning qualities, has given the Illinois producers a domestic market relatively larger than that of other bituminous fields. A liberal estimate of the percentage of coal from other districts sold for domestic purposes would not exceed 16; the proportion of Illinois coal so sold approximates 33 per cent.

Accurate data upon shipments by sizes have been available only since 1923. The figures for the years ended June 30, 1923, and Dec. 31, 1926, in net tons, are as follows:

	1923	1926
Lump	18,011,528	16,328,216
Furnace	11,069,423	10,484,665
Small egg	2,928,470	3,747,495
Stove	1,628,252	2,662,038
Chestnut	933,865	1,373,088
Pea	643,203	680,363
Carbon	1,434,822	1,695,947
Screenings	17,566,716	16,788,634
Mine-run	18,510,420	13,433,033

Another factor in building up the domestic market for Illinois coal has been vigorous advertising. In this southern Illinois has long taken the lead. Ever since the days when Joseph Leiter was a factor in that field the southern Illinois producers have been liberal users of the printed page. Many of the major operating interests have backed up these campaigns with elaborate dealer helps in the way of planned advertisements, booklets, folders and other forms of follow-up literature.

In the canvass for industrial business the Illinois group has called in the combustion engineer. Beginning in a small way with a few of the larger companies, this service has been expanded to meet competitive needs. More recently some of the interests in this state have carried their engineering merchandising into the field of powdered fuel. Several experimental installations have been made in greenhouses. Both high- and low-temperature carbonization processes also have attracted attention in the campaign to hold present markets and widen the use of Illinois coal. Under the lead of the Engineering Experiment Station of the University of Illinois tests have been made on the use of Illinois coal for gas making. Sizing in relation to combustion efficiency in specific types of equipment also has been studied.

Railroads offer the largest single market for Illinois coal that the producers enjoy. In 1915 the carriers took 18,928,022 tons, or approximately 33 per cent of the total output for the year, In 1917 railroad fuel tonnage approximated 35,500,000 tons, or 41 per cent of the output. In 1918 the total was 32,370,362 tons, or 36 per cent. In 1926, the most recent year for which figures are available, shipments to railroads and coal supplied to locomotives at the mines totaled 23,614,274 tons, or 34 per cent. These figures, of course, include the tonnage raised by captive mines controlled by the railroads.

Despite the manifold activities in merchandising, the sale of Illinois

TABLE I—DISTRIBUTION OF ILLINOIS COMMERCIAL SHIPMENTS

(In Net Tons)

To	1915	1917	1918	1923	1926
Arkansas	128,950	96,000	267,628	58,679	39,082
Illinois	22,778,530	25,780,675	31,405,464	26,731,154	22,702,898
Indiana	825,601	2,255,000	2,410,432	2,826,440	801,850
Iowa	3,053,413	4,026,000	3,597,048	4,005,273	3,318,756
Kansas	414,467	107,000	46,767	81,943	82,993
Louisiana	67,338	18,000	86,112	12,250	75,670
Michigan	83,256	706,000	983,572	503,205	344,413
Minnesota	1,334,330	1,801,000	1,967,926	2,398,256	971,328
Mississippi	96,557	55,000	22,954	6,162	13,713
Missouri	4,391,723	6,806,000	6,830,419	8,476,907	8,766,655
Nebraska	938,905	661,000	185,946	842,514	775,204
North Dakota	106,674	43,000	7,820	25,765	6,675
South Dakota	319,370	231,000	228,160	254,455	226,431
Tennessee	68,559	50,000	210,128	26,351	47,506
Wisconsin	1,260,188	1,936,000	2,486,254	2,099,093	1,245,978
Other states	30,491	154,000	51,347	52,623	38,740
Total	35,898,371	44,799,675	50,787,977	48,401,157	39,457,892

Note: In the allocation of tonnage to individual states coal shipped to certain Mississippi and Missouri River crossings has been arbitrarily assigned where original data show group destinations instead of individual receiving point. These allocations, as well as the allocation of Indiana tonnage within the Chicago Switching District to Illinois are shown in the footnotes accompanying the detailed analysis of Illinois distribution for 1923-26 (Table II).

coal has become increasingly difficult in the past ten years. Commercial shipments in 1926 (data for 1927 have been eliminated from this review because of the strike last year) show little gain over 1915 and are less than the totals for 1923 and 1924. In view of the contention of the operators that 1926 demand was bolstered up by the anthracite strike and the export flurry—to say nothing of the beginning of the industrial stock accumulations in anticipation of the 1927 suspension—this failure to keep pace is considered significant.

Illinois used less coal from the mines of that state in 1926 than it did in 1915. Declines also were registered in shipments to Arkansas, Indiana, Iowa, Kansas, Minnesota, Mississippi, Nebraska, the Dakotas, Tennessee and Wisconsin. Louisiana and Michigan showed gains, but shipments to the last-named state were below the totals for 1917, 1918 and 1923. Distribution for the state as a whole for selected years beginning with 1915 is shown in Table I. A detailed study of commercial shipments (including revenue railroad fuel) by producing districts for the four years ended Dec. 31, 1926, is shown in Table II.

Year-to-year fluctuations in demand, of course, explain some of the minor variations in the figures. But competition with the coals from other districts—particularly the non-union areas—is believed to be chiefly re-

TABLE II—ANALYSIS OF DISTRIBUTION O

To	Year	Southern Illinois			Central Illinois			Belleville			Fulton-Peoria		
		Coarse	Fine*	Total	Coarse	Fine*	Total	Coarse	Fine*	Total	Coarse	Fine*	Total
Arkansas	1923	37,630	2,362	39,992	91	.....	91	18,495	191	18,686	.....	.....	.....
	1924	52,241	4,012	56,253	78	.....	78	9,442	.....	9,442	.....	.....	.....
	1925	33,555	1,767	35,322	53	.....	53	2,014	.....	2,014	.....	.....	.....
	1926	35,534	430	35,964	.....	.....	.....	2,968	150	3,118	.....	.....	.....
Illinois[1]	1923	8,186,032	4,027,232	12,213,264	5,953,471	3,174,026	9,127,497	1,345,366	702,172	2,047,538	873,250	293,706	1,166,956
	1924	7,965,931	4,049,858	12,015,789	5,259,877	2,767,656	8,027,533	741,786	803,170	1,544,956	681,966	199,918	881,884
	1925	7,713,684	3,919,656	11,633,340	4,935,128	2,648,679	7,583,807	478,911	640,961	1,119,872	920,715	422,771	1,343,486
	1926	8,448,426	4,135,799	12,584,225	4,230,156	2,770,593	7,000,749	527,103	650,241	1,177,344	718,724	438,111	1,156,835
Indiana[2]	1923	1,237,498	317,562	1,555,060	744,167	57,538	801,705	12,439	6,427	18,866	3,482	106	3,588
	1924	675,244	223,179	898,423	286,374	14,214	300,588	487	94	581	2,703	112	2,815
	1925	299,283	57,667	356,940	121,126	2,783	123,909	13,410	201	13,611	1,210	.....	1,210
	1926	306,331	50,919	357,250	159,545	3,453	162,998	97,742	15,345	113,087	1,148	74	1,222
Iowa[3]	1923	1,624,942	944,380	2,569,322	365,311	175,505	540,816	490,616	72,519	563,135	103,284	182,730	286,014
	1924	2,054,067	915,112	2,969,179	220,110	180,267	400,377	121,346	14,715	136,061	73,716	98,215	171,931
	1925	1,990,649	796,423	2,787,072	113,497	135,878	249,375	34,703	3,867	38,590	56,456	51,485	107,941
	1926	2,080,174	855,751	2,935,925	88,704	138,044	226,748	66,758	4,504	71,262	45,045	31,258	76,303
Kansas[4]	1923	44,572	2,426	46,998	18,242	3,783	22,025	12,920	.....	12,920	.....	.....	.....
	1924	68,785	558	69,343	13,667	13,626	27,293	2,556	.....	2,556	.....	.....	.....
	1925	80,656	410	81,066	3,913	8,008	11,921	3,608	.....	3,608	41	.....	41
	1926	76,397	345	76,742	1,589	1,192	2,781	3,470	.....	3,470	.....	.....	.....
Louisiana	1923	11,476	297	11,773	.....	.....	.....	477	.....	477	.....	.....	.....
	1924	31,007	576	31,583	.....	.....	.....	87	.....	87	.....	.....	.....
	1925	46,708	286	46,740	.....	.....	.....	32	.....	32	.....	.....	.....
	1926	75,521	49	75,570	.....	.....	.....	.....	100	100	.....	.....	.....
Michigan	1923	308,703	19,796	328,499	140,029	1,748	141,777	18,106	182	18,288	906	.....	906
	1924	164,760	6,173	170,933	163,387	42	163,429	407	.....	407	.....	.....	.....
	1925	92,540	5,753	96,293	106,777	.....	106,777	.....	.....	.....	.....	.....	.....
	1926	180,727	36,537	217,264	121,612	2,138	123,750	3,165	54	3,219	129	.....	129
Minnesota	1923	1,098,205	694,189	1,792,394	171,285	12,092	183,377	99,340	15,252	114,592	139,225	146,767	285,992
	1924	669,230	386,996	1,056,226	40,486	6,226	46,712	16,721	191	16,912	36,754	175,840	212,594
	1925	562,921	264,732	827,653	11,009	893	11,902	5,488	.....	5,488	33,040	152,954	185,994
	1926	533,830	261,797	795,627	5,856	.....	5,856	5,622	.....	5,622	29,833	131,599	161,432
Mississippi	1923	5,850	86	5,936	89	.....	89	137	.....	137	.....	.....	.....
	1924	21,327	690	22,017	.....	.....	.....	688	.....	688	.....	.....	.....
	1925	13,320	.....	13,320	.....	.....	.....	436	.....	436	.....	.....	.....
	1926	13,713	.....	13,713	.....	.....	.....	.....	.....	.....	.....	.....	.....
Missouri[5]	1923	2,266,555	944,905	3,211,460	906,774	568,565	1,475,339	2,875,706	911,551	3,787,257	648	262	910
	1924	2,733,948	1,114,546	3,848,494	1,141,546	515,229	1,656,775	2,517,702	798,355	3,316,057	756	109	865
	1925	2,938,395	1,239,762	4,178,157	1,298,808	511,487	1,810,295	2,121,003	658,490	2,779,493	718	107	825
	1926	3,367,258	1,242,941	4,610,199	1,159,287	315,277	1,474,567	1,954,863	724,078	2,678,941	741	52	793
Nebraska[6]	1923	277,632	142,387	420,017	158,766	6,025	164,791	201,291	54,021	255,312	567	107	674
	1924	390,797	171,642	562,439	137,925	5,052	142,977	191,068	42,435	233,503	2,059	3,521	5,580
	1925	383,415	161,524	544,939	65,773	7,017	72,790	150,088	22,027	172,115	2,718	17,948	20,666
	1926	383,205	192,446	575,651	41,031	471	41,772	129,907	11,254	141,161	9,700	2,590	12,290
North Dakota	1923	20,532	2,139	22,671	1,206	.....	1,206	881	105	986	465	182	647
	1924	12,602	126	12,728	339	588	927	39	.....	39	785	169	954
	1925	11,909	86	11,995	159	.....	159	.....	.....	.....	576	.....	576
	1926	6,439	51	6,490	130	.....	130	.....	55	55	.....	.....	.....
South Dakota	1923	154,216	69,690	223,906	10,741	1,742	12,483	10,476	1,357	11,833	2,400	637	3,037
	1924	146,728	77,503	224,231	9,460	142	9,602	1,301	.....	1,301	1,105	73	1,178
	1925	130,539	91,680	222,219	2,394	.....	2,394	250	.....	250	381	73	454
	1926	111,139	112,148	223,287	1,158	392	1,150	1,499	.....	1,499	120	.....	120
Tennessee	1923	24,152	1,289	25,441	.....	.....	.....	805	.....	805	.....	.....	.....
	1924	59,977	55	60,032	40	.....	40	290	.....	290	.....	.....	.....
	1925	30,445	338	30,783	54	.....	54	.....	.....	.....	.....	.....	.....
	1926	41,953	4,853	46,806	.....	.....	.....	700	.....	700	.....	.....	.....
Wisconsin	1923	1,224,918	569,049	1,793,967	150,189	13,218	163,407	41,255	4,237	45,762	8,751	2,407	11,158
	1924	1,084,594	309,491	1,394,085	98,425	3,915	102,340	16,507	364	16,871	3,264	2,937	6,201
	1925	1,050,938	295,978	1,346,916	30,134	22,511	52,645	8,007	376	8,383	5,678	992	6,670
	1926	889,585	305,446	1,195,031	17,359	19,719	37,078	3,745	.....	3,745	4,209	89	4,298
Other States	1923	12,513	3,382	15,895	35,527	430	35,957	469	.....	469	.....	.....	.....
	1924	35,928	150	36,078	7,164	163	7,327	211	.....	211	.....	.....	.....
	1925	21,741	495	22,236	6,148	.....	6,148	50	.....	50	.....	.....	.....
	1926	23,586	179	23,765	8,196	47	8,243	314	6,418	6,732	.....	.....	.....
Totals	1923	16,535,426	7,741,171	24,276,597	8,655,888	4,014,672	12,670,560	5,129,049	1,768,014	6,897,063	1,132,978	626,904	1,759,882
	1924	16,167,166	7,260,667	23,427,833	7,378,878	3,507,170	10,885,998	3,620,638	1,659,324	5,279,962	803,108	480,894	1,284,002
	1925	15,399,698	6,836,547	22,236,245	6,694,973	3,357,256	10,032,229	2,818,000	1,325,942	4,143,942	1,021,533	646,330	1,667,863
	1926	16,573,814	7,199,691	23,773,505	5,834,623	3,251,596	9,086,219	2,797,806	1,412,199	4,210,005	809,649	603,773	1,413,422

(1) Excludes shipments to East St. Louis, but includes tonnage to Bettendorf and Davenport, Ia., and to Buffington and Gary, Ind.

(2) Exclusive of tonnage to Chicago Switching District points in Indiana.

(3) Exclusive of shipments to Bettendorf, Council Bluffs and Davenport.

sponsible for the more or less static position of the Illinois industry. This is illustrated in the development in the Chicago market—probably the greatest coal-consuming unit in the world.

In 1915 the Eastern fields shipped 7,994,018 tons of coal all-rail to Chicago and Chicago rate points; Illinois sent 8,358,838 tons to the Chicago market; Indiana, 3,496,606 tons. In 1918, when Eastern coals to a large extent were zoned out of the West except for special purposes such as byproduct coking, the East furnished 6,566,529 tons to the Chicago district; Illinois, 16,311,236 tons, and Indiana, 5,509,442 tons.

By 1923 the Eastern shipments had grown to 12,099,374 tons, Illinois had dropped to 13,358,355 tons (as against a maximum of 17,163,550 tons in 1919) and Indiana (which shipped 7,337,000 tons in 1919), to 3,621,081 tons. Western Kentucky—an unimportant factor in prewar days—shipped 519,337 tons. In 1926 the Eastern shipments rose to 16,595,224 tons; Illinois shipped only 10,737,355 tons; Indiana, 3,785,615 tons; western Kentucky, 1,880,183 tons.

Expressed in terms of proportion of the total Chicago all-rail bituminous supply, the percentage furnished by Illinois mines dropped from 57.5 in 1918 to 32.5 in 1926; the Eastern percentage rose from 23.1 to 50.3 in the same period.

ILLINOIS COMMERCIAL SHIPMENTS: 1923-26 (In Net Tons)

Danville			Northern Illinois			Centralia			Total			
Coarse	Fine*	Total	Coarse	Fine*	Total	Coarse	Fine*	Total	Coarse	Fine*	Total	
.....	.....	.....	.....	.....	.....	.....	.....	.....	56,216	2,553	58,769	
.....	.....	.....	.....	52	52	.....	.....	.....	61,761	4,064	65,825	Arkansas
.....	.....	.....	.....	.....	.....	.....	.....	.....	35,622	1,767	37,389	
.....	.....	.....	.....	.....	.....	.....	.....	.....	38,502	580	39,082	
865,793	235,655	1,101,448	654,154	40,832	694,986	222,675	156,787	379,462	18,100,741	8,630,413	26,731,154	
629,373	127,529	756,902	603,157	180,752	783,909	76,379	65,576	141,955	15,958,469	8,194,459	24,152,928	Illinois
324,108	92,854	416,962	154,338	131,731	286,069	92,158	175,680	267,858	14,619,062	8,032,332	22,651,394	
25,639	16,381	42,020	165,938	162,640	328,578	248,990	164,157	413,147	14,364,976	8,337,922	22,702,898	
377,653	67,531	445,184	302	251	553	1,299	185	1,484	2,376,840	449,600	2,826,440	
156,533	45,977	202,510	226	.....	226	.....	.....	.....	1,121,567	283,576	1,405,143	Indiana
177,220	49,895	227,115	143	500	643	143	.....	143	612,535	111,036	723,571	
108,221	56,716	166,937	.....	.....	.....	356	.....	356	673,343	128,507	801,850	
1,889	4,594	6,483	18,972	1,308	20,280	10,455	8,768	19,223	2,615,469	1,389,804	4,005,273	
204	674	878	14,431	1,856	16,287	2,641	7,719	10,360	2,486,515	1,218,558	3,705,073	Iowa
192	2,065	2,257	8,271	150	8,421	2,501	4,165	6,666	2,206,269	994,053	3,200,322	
.....	.....	.....	3,966	2,545	6,511	990	1,017	2,007	2,285,637	1,033,119	3,318,756	
.....	.....	.....	.....	.....	.....	.....	.....	.....	75,734	6,209	81,943	
.....	.....	.....	.....	.....	.....	.....	.....	.....	85,008	14,184	99,192	Kansas[4]
.....	.....	.....	.....	.....	.....	146	1,890	2,036	88,364	10,308	98,672	
.....	.....	.....	.....	.....	.....	.....	.....	.....	81,456	1,537	82,993	
.....	.....	.....	.....	.....	.....	.....	.....	.....	11,953	297	12,250	
.....	.....	.....	.....	.....	.....	.....	.....	.....	31,094	576	31,670	
.....	.....	.....	.....	.....	.....	.....	.....	.....	46,740	286	47,026	Louisiana
.....	.....	.....	.....	.....	.....	.....	.....	.....	75,521	149	75,670	
2,425	37	2,462	4,081	3,835	7,916	2,842	515	3,357	477,092	26,113	503,205	
979	.....	979	.....	.....	.....	.....	.....	.....	329,523	6,125	335,738	Michigan
47	.....	47	.....	.....	.....	.....	.....	.....	199,364	5,753	205,117	
.....	.....	.....	.....	.....	.....	51	.....	51	305,684	38,729	344,413	
1,561	889	2,450	2,267	1,194	4,261	2,501	12,689	15,190	1,514,384	883,872	2,398,256	
872	.....	872	3,051	3,484	6,535	132	312	444	767,246	573,049	1,340,295	Minnesota
180	.....	180	834	100	934	.....	.....	.....	613,472	418,679	1,032,151	
200	.....	200	1,382	785	2,167	371	53	424	577,094	394,234	971,328	
.....	.....	.....	.....	.....	.....	.....	.....	.....	6,076	86	6,162	
.....	.....	.....	.....	.....	.....	.....	.....	.....	22,015	690	22,705	Mississippi
.....	.....	.....	.....	.....	.....	.....	.....	.....	12,756	.....	12,756	
.....	.....	.....	.....	.....	.....	.....	.....	.....	13,713	.....	13,713	
122	.....	122	1,029	.....	1,029	745	45	790	6,051,579	2,425,328	8,476,907	
244	147	391	1,024	50	1,074	2,672	1,395	4,067	6,397,892	2,429,831	8,827,723	Missouri[5]
54	.....	54	.....	250	250	109	.....	109	6,359,087	2,410,096	8,769,183	
.....	.....	.....	200	1,750	1,950	53	155	208	6,482,402	2,284,253	8,766,655	
.....	.....	.....	.....	877	877	635	206	841	638,891	203,623	842,514	
.....	.....	.....	.....	.....	.....	507	776	1,283	722,356	223,426	945,782	Nebraska[6]
1,096	.....	1,096	.....	.....	.....	38	.....	38	603,128	208,516	811,644	
.....	.....	.....	.....	.....	.....	4,276	54	4,330	568,119	207,085	775,204	
.....	.....	.....	80	.....	80	175	.....	175	23,339	2,426	25,765	
.....	.....	.....	.....	.....	.....	187	37	224	13,952	920	14,872	North Dakota
.....	.....	.....	.....	.....	.....	.....	.....	.....	12,644	86	12,730	
.....	.....	.....	.....	.....	.....	.....	.....	.....	6,569	106	6,675	
863	140	1,003	1,037	32	1,069	1,124	.....	1,124	180,857	73,598	254,455	
.....	.....	.....	68	.....	68	.....	.....	.....	158,662	77,718	236,380	South Dakota
.....	.....	.....	.....	.....	.....	138	.....	138	133,702	91,753	225,455	
.....	.....	.....	25	.....	25	.....	.....	.....	113,891	112,540	226,431	
.....	.....	.....	50	.....	50	.....	55	55	25,007	1,344	26,351	
.....	.....	.....	.....	.....	.....	.....	.....	.....	60,307	55	60,362	Tennessee
.....	.....	.....	.....	.....	.....	.....	.....	.....	30,499	338	30,837	
.....	.....	.....	.....	.....	.....	.....	.....	.....	42,653	4,853	47,506	
12,512	40,646	53,158	10,830	5,840	16,670	4,878	10,093	14,971	1,453,603	645,490	2,099,093	
12,297	23,912	36,208	4,014	3,317	7,358	987	.....	987	1,220,114	343,936	1,564,050	Wisconsin
4,481	9,613	14,094	1,055	1,936	2,991	3,402	383	3,785	1,103,695	331,789	1,435,484	
241	.....	241	3,834	300	4,134	1,031	420	1,451	920,004	325,974	1,245,978	
.....	156	156	106	.....	106	40	.....	40	48,655	3,968	52,623	
.....	.....	.....	.....	.....	.....	.....	.....	.....	43,303	313	43,616	Other States
.....	.....	.....	.....	.....	.....	.....	.....	.....	27,939	495	28,434	
.....	.....	.....	.....	.....	.....	.....	.....	.....	32,096	6,644	38,740	
1,262,818	349,648	1,612,466	692,906	54,969	747,877	247,369	189,343	436,712	33,656,436	14,744,721	48,401,157	
800,501	198,339	998,740	625,998	189,511	815,509	83,505	75,815	159,320	29,479,794	13,371,570	42,851,364	Totals
507,378	154,427	661,805	164,641	134,667	299,308	98,655	182,118	260,773	26,704,878	12,617,287	39,322,165	
134,301	75,097	209,398	175,343	168,020	343,365	256,118	165,856	221,974	26,581,660	12,876,232	39,457,892	

(3) Exclusive of shipments to Atchison and Leavenworth.
(4) Includes tonnage to East St. Louis, Ill., and Atchison and Leavenworth, Kan.
(5) Includes shipments to Council Bluffs, Iowa.
* Coal passing through a 2-in. screen.

Put an End to Uncertainty with

ELECTRIFY

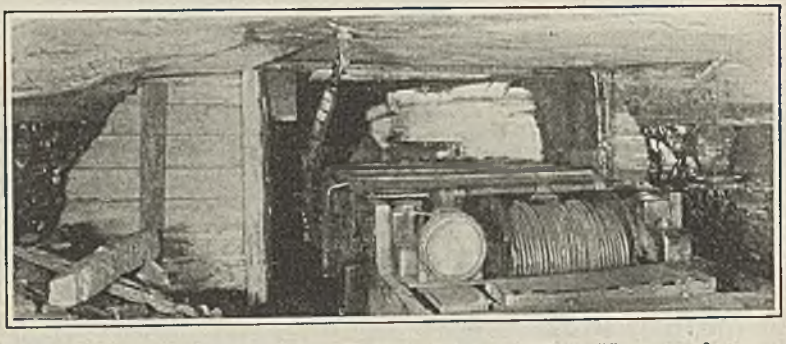
ENGINEERS and operating officials concerned with safety in gassy mines in general agree that only in one way can gas explosions be effectually prevented. That is by never allowing gas to accumulate. This, of course, necessitates an adequate and continuous supply of air. Practically all gassy mines are supplied with more than enough ventilation to afford safety, but in few, if any, is the continuity of supply to all parts of the mine absolutely assured.

The importance of uninterrupted supply is attested by the great number of instances in which auxiliary power units and even complete spare fans are installed. Rarely has expense been spared in the effort to insure both managers and men that the main supply of air will never fail, but what has been done to guarantee that every section of the mine will receive its quota of the precious supply? Where mine doors are used, what is there to insure their proper functioning, and what is there to spread an alarm if a door should fail to direct the air to the regular path?

Some will answer, "Don't use any doors"; and they may possibly cite some instance of a gassy mine without such equipment. There is no way of answering the argument that the air should be controlled by overcasts as far as is humanly possible, but most practical men recognize that in large gassy mines doors are essential, the reason being that to maintain a sufficient velocity for sweeping the gas from high points and corners in each of the many splits made needful by the elimination of doors would make it necessary to provide a prohibitively large quantity of air.

AUTHORITIES seem agreed that there is little, if any, prospect of entirely eliminating doors from all coal mines, and on the assumption that they are justified, this article is written. To me it seems absurd that mining company officials should continue to "take a chance" with their mine doors.

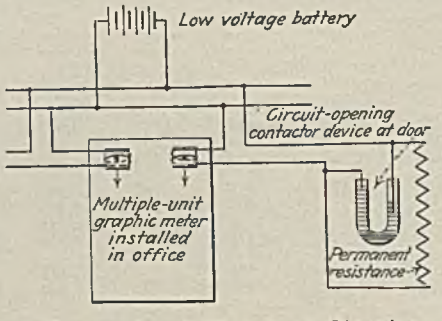
Automatic doors can be installed and maintained so that there is but little probability of their failing to close properly, but there always is a chance of a roof fall or coal spillage



Last Trip; Door May Fail to Close—What Happens?

holding the door open. This is not intended as a criticism of the automatic door, which is far more reliable than one that is hand-operated. It merely calls attention to the fact that as any door in the mine may conceivably fail to close or be closed some warning should be given whenever it is open.

When trappers are placed in attendance at all doors, reasonable safety is afforded, but only so long



Conventional Sketch of Circuit

as the former are on duty. To keep a man at each door at all hours would prove expensive indeed.

Authoritative opinion attributes a great many of our major disasters in gassy mines to open doors, and in many of these instances the door was left open during an off-shift. In recognition of this danger during the idle hours, two shifts of doormen are employed in a certain gassy steel-company-operated mine.

These doormen, who begin their duties at 4 p.m. and leave at 8 a.m., make regular rounds of all doors to see that they are closed properly. This method, although quite expensive, can be considered only fairly safe. There is little or no factor of safety in the interval between visits, which must in an extremely gassy mine be of such length that a door, if left open at the beginning of an interval, might permit of a dangerous accumulation of gas before the watchman's return. Moreover, there remains the uncertainty of the human element.

In view of the facts outlined, why is it that the large gassy mines have not been equipped with electric signal systems which will indicate the position of each door at all times and sound an alarm if any door is left open? No doubt this has been done in a limited way, but so far as I have learned while discussing this subject with many engineers during the last several years, there is no complete installation.

The natural replies to the question "Why not?" are that it would be costly and that, if it could be done by electricity, it would be nevertheless impracticable because of the great difficulty that would be experienced in installing the circuits so that they would be reliable.

As to cost, it would appear that operating companies should willingly spend the money necessary to install a signal system that would largely reduce the door hazard. Consider for a moment the thousands it

MINE DOORS

By J. H. Edwards
Associate Editor, Coal Age

takes to install a spare fan complete with drive, and to erect and maintain a steam plant or an internal-combustion power unit for a large gassy mine! The reasonable complement to this expensive equipment for insuring continuity of the primary ventilation would be an electric supervisory system at all doors to indicate at all times a continuity in the distribution of the air which these fans afford.

To the other question, "Can it be done?", is this answer: Practically anything can be accomplished electrically nowadays; it is a question merely of incentive and money.

The proposal is to install a signal system that will record automatically on a graphic chart the open and closed positions of each door separately and that will sound an alarm if any door is left open more than a predetermined time. The multiple-unit graphic indicator would be installed at a central point or points underground where someone would be in attendance at all hours, ready to act immediately in case the alarm reported an open door.

Mention of a signal system suggests a switch or contactor attached to the door, which would close a circuit when the door is opened. This, however, would not constitute a reliable system. The signal would have to be a closed-circuit system such as is used on railroad block signals and city fire-alarm boxes. Both of these have demonstrated their reliability and, moreover, in cases of a broken wire or loose contact they automatically sound an alarm or indicate danger.

A battery-and-relay system in which the continuous current in each circuit would be but a small fraction of an ampere could be used. The lines would need no larger conducting capacity than those employed for telephone circuits. In case of a mine with a bad roof the signal circuits could be incased in lead and buried in concrete ducts, as has been done with telephone circuits in some mines.

For the most part, however, the circuits could be of open-wire construction, which, of course, would mean a much smaller installation cost. Open wiring would be of particular advantage with doors that must be moved at frequent intervals. With a closed-circuit system a break in a line caused by a fall of roof or other mechanical injury would not be of serious consequence.

As to the contactor device at the door, the first thought is a switch operated by a mechanical connection. No doubt this could be made to operate satisfactorily, but instead it might be better to use some type of pressure gage which would break a contact when for any reason there might take place a large flow of air through the door, thus tending to equalize the pressure on each side. A contactor operated by such a device would take care of all conditions including the demolition of a door by a runaway car or trip.

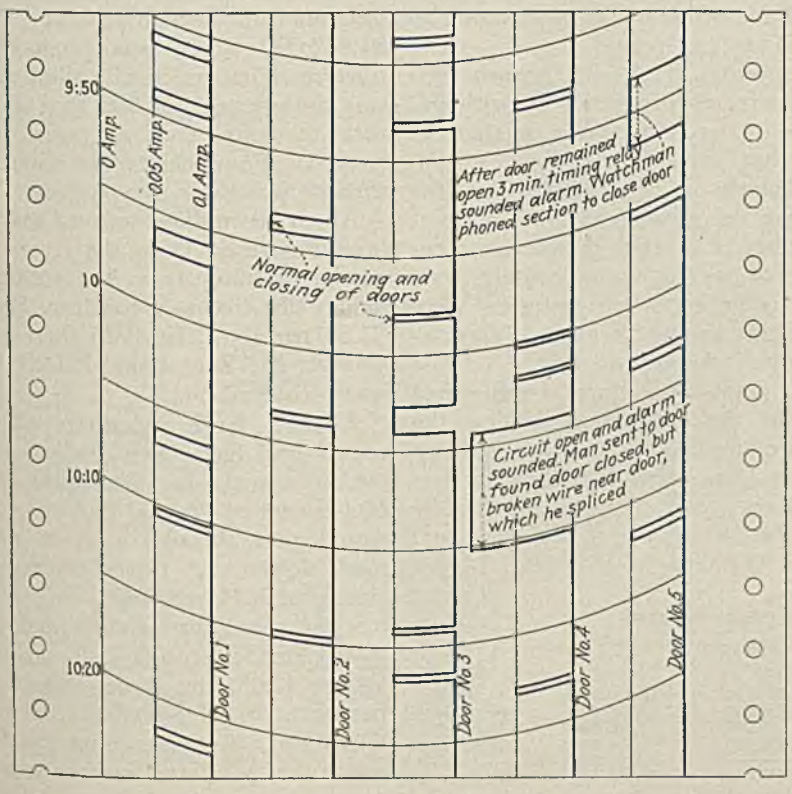
Permanent Door in Mine Planned to Be Without Doors

IT IS PROPOSED that when the contact is opened by the action of a door, this contact should not open the main circuit but instead open the circuit of a shunt across a resistance that is permanently in series across the end of the main circuit. With this arrangement the recording instruments at the "central" would differentiate between an open door and a failure of the main circuit.

Standard electrical apparatus used for other purposes is available for the job, but no doubt equipment especially designed for the purpose would be of greater value. The most difficult problem would be to obtain at a reasonable price a multiple-unit graphic instrument for continuous recording of the current value in each door circuit.

The location of the indicator and signal should be such that remedial action would not arrive too late. If placed too far from the door to be closed, almost the only recourse of the management would be to use the telephone, and if no one were at the telephone there would be no recourse except to shut off the power, thus removing the main hazard, making further work impossible and bringing the men out in protest.

Chart From Five-Door Graphic Meter



The Waste of Breakers

What It Is and Where It Goes

By J. D. Sisler

Associate Geologist
State of Pennsylvania
Harrisburg, Pa.

ABOUT 8,900,000 tons of silt is produced yearly in the anthracite field. A reasonable guess, made from estimates of some of the river deposits, would be that at least 900,000,000 tons of material, which contain enough coal to make future recovery profitable when market conditions permit, is to be found in the streams of the anthracite region. These are among the conclusions of the Topographic and Geologic Survey of Pennsylvania in Bulletin No. 92.

The "oversize" of silt includes all coal that will not pass through a $\frac{3}{32}$-in. screen. In the Northern field this runs in new banks and current silt from 1 to 16 per cent with a normal value of 4 to 6 per cent, though new collieries lose only 1 to 2 per cent of commercial-size coal. In the Southern field the silt contains more oversize except in the Panther Valley, where practically no coal above $\frac{3}{32}$ in. is lost. Where auxiliary shakers are used to rescreen the silt before it goes to the bank usually less than 2 per cent of No. 2 buckwheat is lost.

"Slime" may be defined as material that will pass through a 200-mesh screen. More of this is found in the south than in the north and more in the west than in the east. This is due primarily to the physical character of the coal and the inclination of the beds. The slime constitutes 13 to 15 per cent of the silt of the Wyoming Valley collieries and is over 30 per cent of the silt in collieries of the Southern field. The percentage of fines in silt banks depends primarily upon the method of handling silt from the washery to the bank and on the effectiveness with which the particles are settled.

The raw silt that is discharged from plants treating fresh-mined coal in the Wyoming Valley contains 20 to 25 per cent ash. In the Eastern Middle field the ash content runs from 25 to 30 per cent and in the Western Middle and Southern fields from 30 to 40 per cent, decreasing toward the west, Lykens Valley silt being unusually low in ash.

Float-and-sink tests show that throughout the anthracite fields the ash content of silt could be reduced to 10 or 12 per cent by rejecting 15 to 16 per cent of the raw material as refuse, as most of the impurity is directly mixed with the coal in mining and not inherent in the coal itself.

The calorific power of coal in silt banks deteriorates slowly with the aging of the banks and is over 4 per cent in the most extreme case. Coal that has been in a silt bank for five or ten years has 100 to 200 fewer British thermal units than fresh mined coal of the same ash content. The coal in banks that has been exposed for 40 years loses as much as 500 B.t.u. per pound.

In normal fresh silt the ash content increases progressively with decrease in size of particles, so that the dust that passes a 200-mesh screen, and which is of suitable size for burning as powdered coal without grinding, is practically worthless because of its high ash content. At most collieries where samples were taken this product contained approximately 50 per cent of ash.

At plants handling fresh-mined coal in the Wyoming Valley the silt produced has a tonnage approximately 13 per cent of that of the prepared coal. In the Eastern Middle field the ratio is about 16.5 per cent; in the Western Middle field, 14 per cent, and in the Southern field, 17.5 per cent.

At the collieries studied in the Northern field a tonnage equal to 1.6 per cent of the quantity of coal shipped is discharged in the waste water. In the Eastern Middle this ratio is 1.3 per cent; in the Western Middle, 2.7 per cent, and in the Southern field, 1.8 per cent. The total loss of fine coal discharged in the streams is about 1,150,000 tons annually. Rainy seasons and floods wash much coal into the streams from old banks. Practically all of this latter is finer than the small commercial size and has a high ash content. Silt and culm banks contain 20 to 80 per cent of combustible matter, but the rock banks of wet breakers contain less than 3 per cent.

The cost of drying and pulverizing silt and feeding it into pulverized-coal burners ranges from 50 to 90c. a ton. Where the silt is near or on the site of a boiler plant the preparation cost is as low as 30c. per ton.

Of $7,128,000 worth of fuel briquets manufactured in 1925, $1,842,000 worth was produced in Eastern states, practically all of which was anthracite; 387,000 tons of anthracite culm and silt were thus treated. Four plants are using anthracite waste for this purpose.

About ten million tons of coal has been recovered from the rivers and creeks draining from the anthracite field. The coal sold for from 50c. to $3.50 per ton. In 1925 there were 46 river-coal operations; 791,000 tons was recovered.

Though large quantities of domestic coal have been dredged from the river in the last few years, 50 to 60 per cent of the coal thus recovered would pass through a $\frac{3}{32}$-in. round mesh screen. A typical average of river coal at Harrisburg is over $\frac{3}{16}$-in., 6.5 per cent; through $\frac{3}{16}$- and over $\frac{3}{32}$-in., 25.85; through $\frac{3}{32}$-in. and over $\frac{1}{16}$ in., 42.65, and through $\frac{1}{16}$-in., 25 per cent. In all probability the river operations, particularly on the Susquehanna, will last for many years.

QUANTITY OF CULM AND SILT STORED IN BANKS

(20 to 80 per cent combustible, long tons)

Field	Culm	Silt	Mixed	Total
Southern	37,745,000	36,815,000	10,000,000	84,560,000
Western Middle	43,785,000	40,735,000	17,175,000	101,695,000
Eastern Middle	2,430,000	6,200,000	1,385,000	10,015,000
Northern	8,125,000	8,035,000	1,795,000	17,955,000
Total for all fields	92,085,000	91,785,000	30,355,000	214,225,000

NO COAL TOO LOW

For Shaking Chutes

By R. Dawson Hall

Engineering Editor, Coal Age

WHEN Cadwallader Evans, general manager of the Hudson Coal Co., invented the scoop-shovel he extended the coal areas that could be mined with profit by many thousands of acres. At least as important was the introduction of the shaking chute by Albert Jessup, vice-president and general manager of the Jeddo-Highland Coal Co., Jeddo, Pa.

The thinner the coal to be mined the more will be valued any means by which it becomes unnecessary to lift bottom or to blow down top. Where the coal is extremely thin the rock, if it has to be disturbed at all, has not only to be shot down or shot up but part of it has to be removed from the working place, perhaps all the way to the surface.

Bucking coal down a chute, which is annoying work at best, is still more distressing where the coal is thin. The shaking chute meets that condition. The backward and forward movement, even if it be as regular as the motion of a swing, gives the needed impulse even on down gradients so gentle that the coal would otherwise refuse to travel.

The coal in the shaking chute does not roll; it shuffles along, usually with its largest dimensions resting on the bed of the chute. For this reason it does not break in transit. So far the shaking chute has not yet been installed in places diagonally inclined to the pitch, for the purpose of lowering coal down steep pitches without undue degradation, but doubtless it will not be long before it will be introduced for this specific purpose.

PERHAPS no form of transportation is better suited to extremely thin coal than the shaking chute, except the suction system that has been introduced in the north of England and is designed for coal as thin as 12 in.

Though with thin coal the largest return is obtained from the use of conveyors, in thick coal also they have a definite place delivering the product to the roadway down light inclinations where it can be loaded into trips of cars.

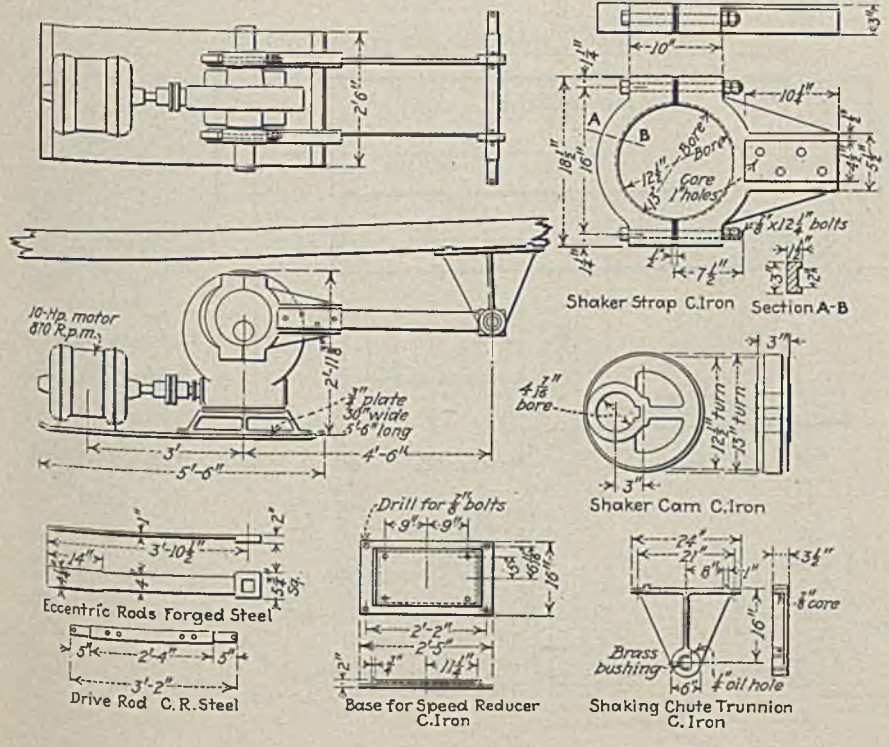
In order to find what is being done a visit was made to various parts of the coal fields and authorities were interviewed. The outcome of the trip has been noted in two previous articles in *Coal Age,* "Shaking Conveyors Banish Coal Bucking and Rock Handling," in the December issue, and "Shaking Coal From Face to Gangway," in the issue of February.

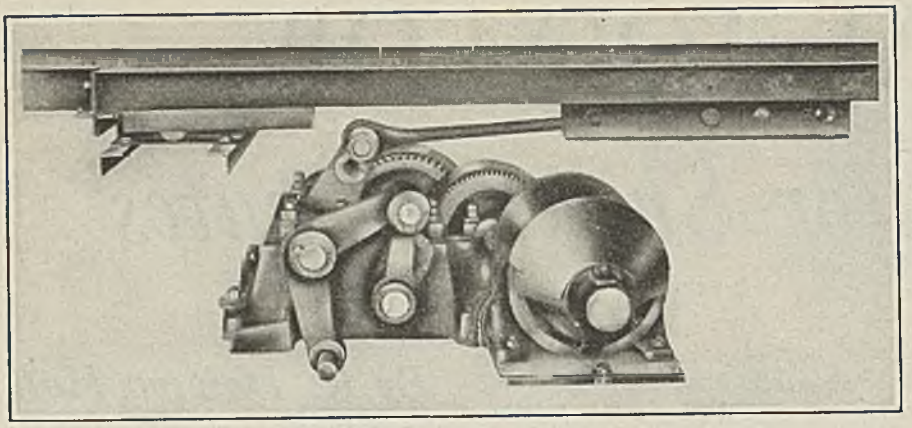
AMONG THOSE interviewed was F. L. Moore, mechanical engineer Scranton Coal Co., Scranton, Pa., who remarked: "We believe in shaking chutes as being examples of simple foolproof design such as are much needed around the mines. With complications come possibilities of trouble. Following an investigation of the methods of the Jeddo-Highland Coal Co. we put in shaking chutes hung from the roof and driven by the piston of a pump cylinder. Our coal is too low for buggies and not steep enough for chutes. We could take down top, but it seems better to use either shaking chutes or scrapers.

"The makeshift equipment has given us satisfaction. It gives better service by far than buggies. The troughs are made at a job machine shop in 4-ft. lengths. We have not attempted swivel operation. All the troughs are straight individual drives."

Oliver Davis, superintendent at the Riverside Colliery, of the same company, Winton, Pa., said that two years ago he had made a start in shaking-conveyor loading at the Blue Ridge Colliery. He had an 18-in. bed he desired to work. "On a 6- or 8-per cent grade in favor of the load," said Mr. Davis, "it pays to use these chutes, regardless of coal thickness. In my case I had such a little headroom that I decided to suspend my

Detail of Drive, Colonial Coal Co.'s Shaking Chutes





Shaking Chute and Drive, Vulcan Iron Works

chutes by chains instead of by S rods as at the Jeddo-Highland. Otherwise the 7-in. motion provided would have made the chutes collide with the roof.

"I found that the miners soon favored this method of operation and preferred it to the use of the buggy. They liked the thin coal with the shaking chute better than thicker coal with the small car. It saved the lifting of bottom. The place was driven 20 ft. without any chute; then the chute was put in and worked by hand power. When the place had been extended to 50 ft., the machine was installed.

"The chains were a great help. Had S rods been used the working of the chute would have been too laborious for hand power. We drove these places 225 ft. long. Each of the mine cars loaded took 92 cu.yd. or 2½ tons, of coal. A fair output per place with two men was 4 cars daily, or 10 tons.

"When I came to Winton I realized that I had a different proposition. The mine is on the Northern Anticline and the measures are almost level. Some action other than gravity must be provided to propel the coal along the chutes, so I arranged that the conveyor pans run on rollers. I have provided on the roller path a level spot followed by a sharpish decline that ends in a steep upward incline. This concludes with a vertical block which stops the roller and conveyor suddenly and causes the coal to be jolted forward just as the chute begins to drop on the return travel. That effectually provides for an almost continuous forward motion of the coal. I am confident that with this arrangement the coal will travel up a 4- or 5-per cent gradient. Nothing is more effective than a sudden stop."

Another company that is making use of shaking chutes is the Philadelphia & Reading Coal & Iron Co. "The shaking chutes," said John G. Reid, manager of the spacious shops of that company at Pottsville, Pa., "are made of No. 6 and No. 8 gage steel in 8-ft. lengths 23½ in. wide and 6 in. deep.

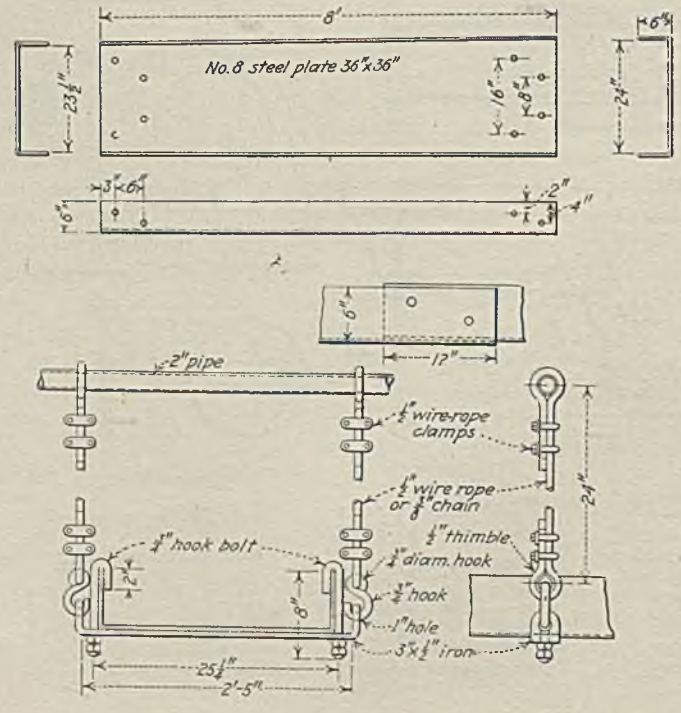
"They are of a simple pan shape with vertical sides," in contradistinction to the arc-shape which is preferred at the Jeddo-Highland Coal Co. mines. "Some, however," said Mr. Reid, "have been made slightly larger, with flared sides. These measure 2 ft. 3 in. at the bottom and 2 ft. 9 in. wide at the top, the depth of the sides being 6½ in. The same weight of metal is used in both cases. These flared sides are said to resist the progress of the coal less than the vertical sides in the more simple shape of chute.

"The pans are bolted together directly and not through flanges, and this does not seem to give any trouble. However, when the chutes are to be extended to a length of 400 ft. they should be flanged so as to eliminate the possibility of backlash.

"A ½-in. chain serves for support and an air-operated cylinder gives the chute a movement of 12 in., the speed being regulated by the degree of freedom with which air is admitted to the cylinder. This is an advantage of air operation."

The Colonial Coal Co., Natalie, Pa., also has fourteen shaking chutes operating with compressed air and fifteen operated by an electric motor. These are bolted together direct. "We have never had any trouble with this method of joining the chutes," said W. H. Lesser, the electrical engineer. The method of construction can be seen in the accompanying drawings.

New types of shaking conveyors continue to be be developed. One manufactured by the Vulcan Iron Works, Wilkes-Barre, Pa., has a drive which weighs 1,400 lb. with an over-all height, not including chute, of 21 in. A 5-hp. squirrel-cage motor actuates this drive, which will suffice for 250 to 350 ft. of chute. It is said that this conveyor will deliver 40 tons per hour, the speed at which the coal travels being 70 ft. per minute. The clearance of the chute is 11 in., so that coal can be conveyed in a place as low as 17 in. The manufacturers state that on a level the coal at every stroke is moved 1.2 to 1.5 times the length of the stroke. By a change in the point of attachment of the bell crank at the rear the direction of motion of material in the chute can be reversed.

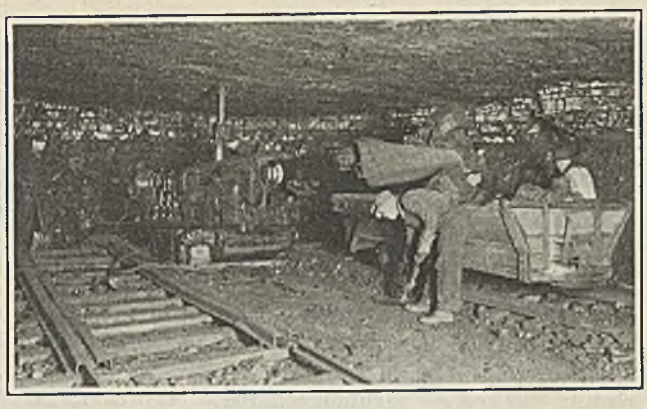


Shaking Chutes used by Colonial Coal Co. (Madeira, Hill & Co.) for Conveying Coal

DOUBLE TRACK

For Machine Loading

Eliminates Delays In Shifting Cars



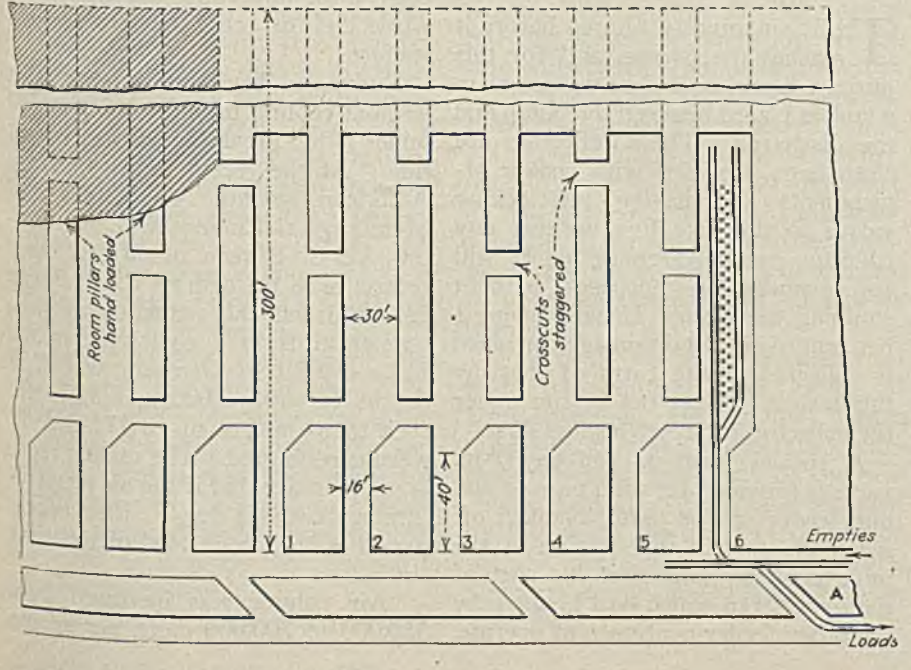
LAST JULY the Knott Coal Corporation, at Anco, Ky., in the Hazard field, took the initial step toward higher mechanization by installing a Goodman power shovel in its Knott mine. This mine is in the No. 9 seam, which affords conditions highly favorable for machine loading, in that the coal is 8 to 8½ ft. thick and the top is good. The roof is of hard slate which displays such strength that it remains in place though rooms are made wide. For the loading machine the rooms are driven 30 ft. wide on 45-ft. centers and 300 ft. long. They are necked 16 ft. wide for a distance of 40 ft.

Six such rooms, adjoining each other, are allocated to the machine. These rooms are started simultaneously and advanced at a common rate, so that the face line is constantly parallel to the room entry. The loading machine is not used in the recovery of the room pillars. This is accomplished by the usual hand-loading methods.

Delays usually incident to the changing of cars have been entirely avoided, for the rooms are double-tracked. The room tracks consist of 20-lb. rails on wooden ties, temporary extensions to the face being made by the use of Tompkins extension rails. Between the tracks are set at an interval of 5 ft. two rows of posts on 6-ft. centers.

Two teams of mules are used for shifting the cars. Empties and loads are stored in the clear of the six rooms being worked, the empties in the haulage entry and the loads in the aircourse or parallel entry. The two teams meet at the turnout leading from the haulage road to the load storage track—indicated by *A* in accompanying sketch—one team coming with a loaded car and the other leaving with an empty. Meanwhile one car is at the face in the process of being loaded. On being taken into the room an empty car is dropped at a point about 25 ft. from the end of the track and is pushed by hand within the range of the loading machine.

Wide Rooms for Machine Loading



Little time is lost by the loader in moving from room to room as it negotiates the last crosscut through each pillar. Crosscuts are driven at intervals of about 60 ft.

Delays due to machine troubles have been few. The chief source of delay has been in the preparation of or bringing down the coal for loading. The coal is cut by a top-cutting machine, of a type intended for lower coal, with the result that a top bench 1 to 1½ ft. thick is left above the kerf. Another trouble arises from the fact that the operatives round the cut, even though both tracks are utilized in the cutting. Under the circumstances much of the coal is tight or hangs unless the shooting is heavy, a practice which, of course, is discouraged.

The power shovel will loosen all the hanging or standing coal, but this necessarily wastes much time. Where loose coal is available the machine will load the 2½-ton car used with five or six scoops of the shovel, which has a capacity of ½ ton. Under these conditions the output from the machine has averaged about 175 tons, with a maximum of 243 tons, per shift.

In the crew are two shovel runners, who alternate in handling the machine and acting as helper; two car trimmers; two track and timber men; two clean-up men and one boss—a total of thirteen men. The two men who operate the cutting machine devote only 60 per cent of their time in the loading-machine section and the remainder in cutting for hand loaders. For all practical purposes, therefore, the crew consists of only twelve men for delivery of coal on the sidetrack. The loading machine operates at night since at that time a plentiful supply of cars is available and uniform voltage can be maintained at the face.

NOTES

From Across the Sea

GREAT BRITAIN has been making further experiments into the availability of the vacuum for the loading of coal—"vacuum loading," if that abbreviated expression may be pardoned. The same flexibility that makes the vacuum cleaner such a success and enables it to be thrust into corners should be noticeable in the vacuum coal loader also. It can be handled in the lowest coal and in the most irregular corners. It serves well for the gathering of coal intended for coking or pulverizing where size is not a desideratum.

It is therefore not unlikely, especially where the coal is thin, that this system will eventually find application in this country. It has been noted here, however, that where friable coal was transported by air in a mine, so much fine dust was formed that in shipping it from West Virginia to Chicago in open cars a large part of the cargo disappeared on the way, being swept into the air by the midwestern winds. Consequently where such coal has to be transported by rail, either closed or tarpaulin-covered cars of tight construction will be needed.

Toward the close of 1926—in the issue of Dec. 23 to be exact—*Coal Age* described the unusual plant at Bowburn Colliery, Coxhoe, Durham, England, by which coal was sucked from in front of the working face and drawn to a loading point still well within the inside of the mine. On Aug. 26 of that year the method by which, at the Bestwood Colliery, Nottingham, England, 40 tons of coal per hour was drawn from the screening plant by air and transported about 60 ft. in pipes also was described.

THIS method seems to have made some headway in England, especially in the County of Durham, where much of the coal that still remains, after centuries of operation, is thin, ranging from 18 to 24 in. in thickness. According to James Tonge, in a book entitled "Coal," that mineral was mined in Durham in the fourteenth century and L. F. Salzman, in his "English Industries of the Middle Ages," states that ashes and stores of unburned coal have been found in Roman ruins at Lanchester and Ebchester, Durham. This coal, however, may have been cast up by the sea and gathered on the beach and not mined by strippings or pits.

A plant for sucking coal from the face and for loading it into cars, at distances between those operations of from 75 to 450 ft. has been installed at the Pelton Colliery and one for pneumatically removing coal from the screens to the boilers at New Seaham, both in the County of Durham, have been installed according to *Colliery Engineering,* of London, England. The equipment consists of three separate machines—a suction pump, a dust collector and a discharger—interconnected by suitable piping.

The pump is of the reciprocating type and consists of three independent horizontal cylinders operated from an electrically driven crankshaft on which the cranks are set at 120 deg. to equalize the air flow and the torque on the motor. The pistons are designed to run dry, and the valves are made of a special rubber that will be uninjured by a temperature of 120 deg. F. and yet remain pliable enough to allow the valves to spring back to their seats. A vacuum of from 5 to 12 in. of mercury or 2.5 to 5.9 lb. per square inch is maintained.

THE air must be filtered before it reaches the pumps, and for this purpose a series of dust collectors in a tank is placed between the pump and the discharge. These collectors are cloth bags provided with shaker attachments and having interlocking valves to the pipe line, so that any collector can be disconnected at will for examination purposes without stopping the plant. Usually about ¼ per cent of the total tonnage conveyed is collected in the form of dust by this means. A car can be run under the collector for receiving the dust.

A special form of full-way 7-in. valve is provided for each pipe so that one feeder can be partly blanked off when the coal in that section of the mine is shot. Meantime the part of the mine from which coal is taken by the other feeder continues to operate. Cars are arranged to run continuously under the discharger, this being a cyclone in which all but the finest dust is collected. The coal is automatically fed into the cars by a patented form of revolving valve which rotates at 8 r.p.m.

It will be interesting to note the shape of the .vacuum-loader head. A recent patent of Dorman, Long & Co. shows such a device. It consists of what is termed a "shovel," a flat plate surmounted by sides and cover which slope to form a sort of mouth opened toward the coal face. On this plate operate two extremely short chain conveyors driven by bevel gearing, the axes of the conveyors paralleling the sloping sides. These conveyors have points which gather up the coal. The shovel is pushed into the pile on the floor by pressure from two hydraulic jacks. The points on the sprocket chain carry the coal to the rear of the shovel, where it is drawn by suction into the transporting pipe.

THIS is an odd but quite feasible method of transportation, but hardly more so than one anciently used at the Gwaun-Cae-Gurwen mine, an anthracite property in Glamorganshire, Wales, described in the February issue of the periodical already cited. In 1757 a dead-level tunnel was driven into a hillside through the barren rock to intersect a seam of coal at a distance of 540 ft. Here a gangway was turned right and left that followed the seam on a true level for as great a distance as practicable. Water was then admitted, canalizing the gangway and tunnel. Small flat bottomed barges were introduced to convey the miners to and from their work and to bring the coal to the surface.

Europe is beginning to find that without cooling the heat in some coal mines is too great for efficient operation. At the recent meeting of the American Institute of Mining and Metallurgical Engineers D. Harrington, U. S. Bureau of Mines, made reference to the data of R. H. Fugge de Smidt on the reduction of high temperatures in a coal mine in the Ruhr district of Germany where, at depths between 2,600 and 3,250 ft., rock temperatures up to 111 deg. F. were encountered. The mining regulations require that if the air temperature is above 82½ deg. F., the working period is but five instead of the usual six hours.

"Air volume was increased from 350,000 to 700,000 cu.ft. per minute

and, though the percentage of short or five-hour shifts has been above 80 in June, before increasing the air volume, this percentage dropped to zero by February, rising to 25 per cent in the following summer.

"To make a further reduction in underground air temperatures, a cold water 'radiator' was installed in a main intake-air crosscut 3,150 ft. below the surface, the radiator being composed of a large number of 2-, 3- and 5-in. pipes of considerable length through which cold surface water was circulated.

"The system was not wholly successful until an ammonia refrigerating plant was placed at the intake shaft collar cooling the water from about 60 to about 34 deg. F. The plant, operating with 22 cu.ft. of water per minute lowered the temperature of 250,000 cu.ft. of air from 73 deg. F. on the surface to 68 deg. F. at a point 1½ miles undergound, the cost of running the plant being $110 per shift. It is stated that the increased output averaged about $172 per shift and that the cost of the plant, approximately $17,500, was saved in about two years."

R. Dawson Hall

On the ENGINEER'S BOOK SHELF

"Gases, Dust and Heat in Mines"; 238 pp., octavo; J. B. Lippincott Co., Philadelphia, Pa.

Much progress in the improvement of mine atmospheres has been made since 1681, when J. Beaumont reported to the Royal Society that "to prevent mischief they [the colliers] keep their air very quick, and use no candles in their works, but a single wick, and those of 60 or 70 to the pound, which nevertheless gives as great a light there, as others of 10 to 12 to the pound in other places; and they always place them behind them, and never present them to the breast of the work." Evidently Mr. Beaumont believed that a small light would fire gas less readily than a big one.

Again, in this book, from the pen of John Buddle in 1835 is given the following: "They had a barbarous practice a few years ago which, I think, is now exploded; it was galloping them [asphyxiated miners] about in carts over the roughest ground that could be found; they thought that was a good mode of treatment, but I have little doubt several people have been killed by that treatment. After galloping them about over the ground as I have described, the next thing was to dig a hole in the earth and put the face into it, from an idea that there was some virtue in the smell of the soil or that some adsorption or something or other took place that tended to restore the patient."

Since then the mine atmosphere, its baleful effects and their correction have been carefully studied, and especially in the British Empire, because the great depth of the mines being operated has increased the heat and pollution of the mine air.

The author of the volume under review is K. Neville Moss, professor of mining at the University of Birmingham (England) and a member of the committee on "The Control of Atmospheric Conditions in Hot and Deep Mines." After a historical introduction from which quotations have been freely made, Professor Moss discusses mine air and its physiological effects with a chapter on firedamp. He shows, quoting Graham, that 200-mesh coal dust at 10.8 deg. C. and 30 atmospheres pressure will absorb of methane 789 cu.ft. per ton of coal, of carbon dioxide 1,966 cu.ft. and of nitrogen 329 cu.ft.

Chapters follow on carbon monoxide and other gases and on mine dust, its dangers, collection and estimation. Studies of the physics of the atmosphere follow in which a description is given of methods of measuring humidity.

The book closes with studies of high temperatures, the effect of acclimatization, salt in the human organism, dirt and temperature control. Proving that much of the heat comes from oxidation, he urges that by increasing air quantity, oxidation will be decreased, for temperature, which is an aid to oxidation, will be lowered.

"Drilling and Blasting in Some American Metal Mines," by Theodore Marvin, Managing Editor, "Explosives Engineer," 197 pp.; 6x9 in.

This publication, presented by Mr. Marvine at the recent meeting of the American Institute of Mining and Metallurgical Engineers, is an important contribution to metal mining. The metal content of the rock mined usually is low. The minerals rarely form a large portion of the whole, so the driving of drifts and cross-measure tunnels, the sinking of shafts, the excavation of raises, the extension of stopes, are practically all done in rock. Therefore there is much in this book for the coal-mining engineer, who also has his rock work problems to solve.

Mr. Marvin gives name of company, location, important mineral, nature of mine entrance, type of ore body, angle of dip, direction of strike, stoping method, type of ore or rock, manner of breaking, sectional dimensions of place driven, size of hole, type of explosive, size of cartridge, number of detonator, how charge is detonated, where detonator is placed, kind of stemming, main job of the workman who blasts the rock, time of blasting, depth of advance per round, method of handling misfires and method of loading.

At the close of the book are blasting diagrams for each of the mines in each of the five classes of work—shaft, drift, cross-tunnel (crosscut), raise and stope.

* * *

Geology and Natural Resources of Colorado; 243 pp., octavo; University of Colorado, Boulder, Col.

Colorado's mineral products are listed in order of importance by the U. S. Geological Survey as "Coal, gold, clay products and lead." The value of the coal and coke produced is about 60 per cent of that of the whole mineral production of the state. Perhaps it is not fair for the coal men to require that in a book on geology and natural resources such as this, coal and coke should have proportionate space, but here it has much less than 10 per cent. Otherwise this volume by Russell D. George, professor of geology in the University of Colorado, gives an excellent and reasonably popular conspectus of the subject of which it treats, with some basal facts regarding geology which the less well-informed reader will find helpful.

COAL AGE

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JOHN M. CARMODY, *Editor*

NEW YORK, MARCH, 1928

Politics cracks the whip

BY A VOTE of 10 to 7 the Senate committee on interstate commerce on March 6 refused to approve the nomination of John J. Esch, of Wisconsin, for reappointment as a member of the Interstate Commerce Commission. The head and front of Mr. Esch's offending is the fact that he had the temerity to change his mind on what should be the proper adjustment of rates on lake cargo coal between the time the Commission denied relief to Pittsburgh operators and their allies in 1925 and granted relief in 1927. Strip the 277-page printed record of the amazing committee hearings held last month of complexities and technicalities of legal, rate and economic controversy and that is the objection which remains.

Trickling through the record is the insinuation and the innuendo that Mr. Esch's changed viewpoint was the child of a desire to win reappointment at the hands of the President. *Pro forma* denials made by those charged with the accusation serve only to emphasize it. One hesitates to challenge the expert opinion of the Senate committee on how men seeking political preferment will surrender conviction for confirmation. But rejected it must be in this particular case on the testimony of Mr. Esch's past and present associates on the Commission and on the support volunteered by men of wide experience in rate litigation. Aside from the committee itself the only open opposition to reappointment came from a spokesman for Southern coal and commercial interests whose statement was incorporated into the record largely unread and who was not cross-examined by the committee.

The issue, however, is much broader than any question of personalities. The issue is whether the federal rate tribunal, which has held a place in public confidence akin to that enjoyed by the Supreme Court of the United States, is to be a body of independent judgment or the slave of politics. This issue was raised when Senator Reed of Pennsylvania demanded state representation on the Commission. At that time his colleagues very properly rejected the nomination of his choice for a Commissionership, not because of any question as to the personal qualifications or fitness of the individual but because of the vicious principle involved in his nomination. The action of the Senate committee in now seeking to bar Mr. Esch is nothing more than an affirmation of the vicious principle the Senate condemned in the Woods case.

It remains to be seen whether the Senate itself will be as craven as the majority of the committee on interstate commerce who voted against Mr. Esch because of his decision in the lake cargo case. It remains to be seen whether the Senate is ready to indorse the idea that the Interstate Commerce Commission must consider the political pressure which litigants may invoke as a factor in reaching a conclusion. If this is to be so, the nation has the right to expect that the Senate will have the decency to move for the complete abolition of the Commission and thereby save the taxpayers millions of dollars now annually spent in supporting an agency which no longer is in a position to exercise independent judgment.

Long-range planning for anthracite

ONE CAN EXPRESS only admiration for the efforts to maintain production that have been made during the past year by those interested in anthracite. Handicapped by a tradition that hard coal must be bought, not sold, the industry required a real jolt to appreciate the changes that have been taking place in the marketplaces of the world.

The jolt came a few years ago — substitutes pushed into normal anthracite territory. Their sponsors, skilled in merchandising and filled with enthusiasm for their new market, made rapid progress. For a time the effect was that of a fresh young athlete pitted against an old and somewhat exhausted one. Anthracite soon got its second wind, however. It is back in the field more virile than ever and better for its bitter experience.

The improvement has reached from the face to the customer's furnace and back again to the mine. Combustion engineers, working with retailer and consumer, are demonstrating how full value may be gotten from anthracite; their experience works back to the operator, influencing better preparation. This is creditable, as is also exchange inspection and the advertising campaign carried on by the operators to popularize their product. The co-operation among merchants and citizens generally in the region is commendable.

None of these is enough. If the industry is really to recover and operate on a thoroughly sound basis there must be long-range planning. A master planning board, working more intensively with wholesalers and retailers than any agency now functioning and staffed by market analysts and engineers, can unquestionably determine the total normal market for anthracite coal, making allowances for such factors as variations in weather, population shifts, etc. This means more than a discussion of immediate problems. Data now in pos-

session of the industry, plus what can be secured by a competent staff, will be invaluable for the remainder of the year.

There is ample precedent for such market planning; hundreds of corporations, and even some industries, know their market potentialities more accurately year by year. The New England Council is doing this very thing now for the industries of the New England states.

Such a survey can be undertaken best by the industry as a whole, but if this be impractical, by all means it should be initiated by as large a group as will co-operate, or even by individual companies with their retail outlets. Long-range planning, like budgeting in business, is sure to come. Why delay the start?

Was every precaution taken?

RECENT mine explosions at Kinloch and at Jenny Lind, deplorable as they are, only serve to emphasize how fortunate the coal-mining fraternity has been during this winter season. They emphasize, too, the necessity for constant vigilance at this and at all other seasons of the year.

They throw into bold relief again the part rock-dusting and other modern precautions play in preventing explosions. Only a searching examination and thoroughgoing inquest will reveal the actual causes and point remedies, but each explosion, whether major or minor, should drive home to every mine organization the ever-present danger that must be guarded against.

Property damage can be repaired, but those whose lives were snuffed out cannot be recalled. A measure of advance can be made, however, by tightening the lines everywhere so that it may not be said that lack of diligence has any part in mine safety work.

Is the ash in coal as stable as believed?

NONE of the elements in the vegetable world proves stable in the coal-making process. The carbon turns to carbon dioxide; the oxygen goes off in the same form and also as water. The formation of water is evidence likewise that the hydrogen is unstable. "But," it will be said, "the ash-making materials, surely they are unchanged from eon to eon."

If we knew that the ash percentage was unity in the original vegetation and 10 per cent in coal and that the ash contained was 100 per cent stable, then the coal must have a weight one-tenth part that of the vegetable matter from which it was formed. But is that true? Has not the wood shrunk to less than 10 per cent of its former weight in becoming coal? And was the original percentage of ash only unity?

Violette says leaves have 7.12 per cent of ash and the bark in the trunk of a tree 2.66 per cent, with the wood of the same part 0.30 per cent. Perhaps that is why the anthraxylon, which is derived from wood, is low in ash and the attritus which is derived from twigs, bark and leaves has a high ash percentage.

Berthier says that in pine, fir, lime and birch the insoluble salts run from 74 to 89 per cent, but some of these salts may, under the combined action of more powerful solvents, heat and longer time, become soluble. Their elements have all been dissolved at some time to enter the sap, but metabolism probably has changed their condition.

It seems likely that in all cases the peat has been leached of some of its salts, and the salts have been concentrated by the decomposition of the peat. The result is a composite of two opposite actions. Some coal is so pure that it would seem that leaching had been unusually active, and some is so impure that the ash would appear to be either unusually stable or adventitious or both.

This is a subject to which too little attention has been given in the past.

Making research pay its way

CONTRARY to the generally accepted belief, much research has been and is being made into coal-consuming problems, not perhaps by the coal man nor perhaps by the consumer but by governmental bodies, universities and manufacturers of coal-consuming equipment.

It has been not unnatural to leave most of this work to those who by solving the problem for many consumers could get the largest advantage from the solution. A study of most industrial products will reveal that the greatest advances in the utilization of material were made by those who used it or made equipment for using it.

The National Coal Association with its research committee will be doing something unusual when it spends money in solving problems of consumption. It will receive enthusiastic support only by limiting itself to certain eminently practical difficulties which bituminous coal men have, or may have, to meet and which are preventing, or are likely to prevent, sales of the product—the formation of smoke, clinker or fuel dust—are penalizing some part of the output, such as slack, or are crippling coal in meeting the competition of rival fuels.

It is hardly likely that new uses for coal will be discovered that will greatly add to the volume of the coal trade. Even though rubber, unbreakable dishes, dyes or drugs be made from coal, as suggested, it would do little to increase consumption. It might lead a few coal men into the chemical industry perhaps, but it would not help them as producers.

The BOSSES *Talk it Over*

How Does Power Factor Affect Cost?

"DID you read that power-factor article in the February issue of *Coal Age?*" This question from Jim, the superintendent, caused Shorty to jump part way out of a rut into which he had begun to slip soon after leaving the electrical department of a steel company. For several years after going with the coal company he had tried, without success, to persuade the officials to buy power-factor meters and watthour meters for the substations. Lack of such equipment "to tell what was going on" had about killed Shorty's enthusiasm for trying to reduce power consumption and for endeavoring to get the most out of equipment.

"Yes," replied Shorty, "I read it."

"Well," said Jim, "what do you think of it?"

"I think," said Shorty, "that I ought to be kicked for not having thought of that scheme myself," and jokingly he added, "I wish you had let me buy those power-factor meters."

"Shorty, after reading that article I am persuaded that power factor *is* something practical. That big increase in tonnage without adding to the substation capacity shows that low power factor must be an awful drain on a.c. equipment. I want you to make out a requisition for the power-factor meters. I understand that these meters will not correct power factor, but that they are necessary to indicate when power factor should be corrected.

"I see now that it might have been a good thing for us if the power contract had contained a power-factor clause. I couldn't see before how good power factor could benefit anybody but the power company.

"Shorty, while we are on the subject, do you know of any other points we are overlooking?"

These words from Jim, the superintendent, made Shorty want to pinch himself to find out if he was awake or dreaming. After a pause he replied: "Well, I know that we could save a lot on our power bill if we could only control the power factor at the south substation. Since we made that automatic, and don't see it more than once in 24 hours, we have to keep the field current so high that the synchronous motor runs awful hot. The a.-c. ammeter shows a big wattless current in the line at light loads. We are paying the power company to heat the line and the motor.

"At the north substation we can do a lot by regulating by hand. Maybe I can connect the meter in the main line feeding the hoist and motor-generator, and get the hoistman to take an interest in regulating the power factor.

"There is nearly two miles of line from the power company meter to the south fan. That 150-hp. induction motor is really too large for the job, but you say we need the reserve capacity. I know the power factor on that motor is rotten; maybe it would pay to install a static condenser there. When we get the meters I'll be able to tell more about it."

If your power contract contains a power-factor clause and the power company has enforced it, what changes did you make in equipment or method of operation? How was the power bill affected?

Assuming that automatic power-factor control can be applied to all synchronous motor-generator sets, do you think that the synchronous converter still has a place in the mining field?

Do you have available figures relating to a specific instance where power cost was reduced by improving power factor?

What part can the mine foreman play in saving power?

All mining men are urged to discuss these questions.
Letters accepted will be paid for.

Bringing Down Coal Is Specialized Job

The Iron Fist of System

SOME YEARS AGO the management of a new mine became much disappointed because of inability to make the plant pay. All the difficulties that other operations had were encountered, and then some, so a study of possible changes that might benefit the plant was instituted.

It was decided first of all that the average miner is not capable of properly blasting his coal or of laying good track. Therefore the management decided to use trained men for drilling, shooting, laying track and making falls. The big boss knew the truth of the saying, "It's hard to train an old dog to do new tricks." He tried his plan out for some time in one section of the mine and after he had collected impressive facts and figures he called in all bosses for a review of the situation.

Knowing it to be practically impossible to put over any new program without the fullest co-operation of the men in charge, he sold them first. They decided to hold a meeting of all workmen and invite some of the miners from the section where the plan had been tried to give their experience. These miners were favorable to the plan because it had increased their earnings. Before the plan was extended over the entire mine the bosses asked that the important changes be made a company policy, so that each miner would know just what the foreman would do in case the regulations were not carried out.

Responsibility was divided as follows: The duty of the night boss was to see that the coal be cut, drilled and shot; that the track be extended and a car placed in every working place every night. The primary duty of the day boss was to have every working place cleaned up every day. If a miner consistently failed to clean up his place he was either fired or put on other work.

It might be imagined that a miner not used to such discipline would not seek employment at this mine; but the opposite was true, for the mine had a good supply of men at all times, which was not the case before the new plan was put into effect.

As a result of the change all miners came to work early, knowing that an empty car would be waiting for them when they arrived at their respective working places. All places were cleaned up early. Miners were proud of their earnings and many showed their statements to relatives and close friends.

This advertising of earnings probably was the greatest labor-getter the company had. More coal was produced, of better size and at lower cost. The lesson learned from this experiment is this: The average miner cannot plan his own affairs. If he is allowed to have his own way he will not do well and consequently will quit the mine and look for a better place. The truth in most instances is that he doesn't need a better place, but he does need a better plan to work under.

His wife will say: "We are doing well here. John complains they are terribly strict and often talks of quitting; but he never does." He is doing well only because he is working under a plan that brings out the best that is in him. If he fails to meet the production standard the boss must discharge him, and he knows it.

Most mines fail because they expect the mine foreman to accomplish results without a definite working plan. Where this is the case the miner is more or less a privileged character. If he feels like taking a day off or decides to go home early he does so without notifying the boss. He does his work as he pleases and not as it should be done.

The bosses see these things but they are powerless to remedy them in the absence of systematic operation. At the mine in question the management decided which practices were good and which bad and made plans accordingly. Every mine should follow this example.

Welch, W. Va. GEORGE EDWARDS.

In the April Issue

Dispatching and Telephones

Next month Jim and Mac and Shorty will discuss a better organization of their haulage system.

They are thinking about dispatching and signaling by the use of telephones underground.

Read what they say next month about speeding up haulage and saving money.

Hand Drilling by Miners Glaring Operating Weakness

IN AN EXPERIENCE of thirty years in coal mining I have tried various methods for bringing down the coal, even to experiments with hydraulic cartridges. While I was more or less successful in some of these ventures I must say the results were not in general as good as might have been obtained had we gone after the problem along the lines suggested by Jim, the super, last month. I heartily agree with him that the bringing down of coal should be made a specialized operation.

Some years ago I was in charge of a number of mines for one of the largest producing companies in the United States. In those mines great care was exercized in the job of bringing down the coal. The places were inspected religiously several times a day—once for each phase of the job—in a carefully co-ordinated system of supervision. Cuts and drillholes were carefully examined and bug dust removed to the extent that a broom was a requirement in the preparatory cleanup. Yet the system had one glaring weakness: *The miners drilled the holes.*

In this case, so far as the placement of drill holes was concerned, rigid inspection went for naught. When the average miner is "called" for poor judgment or carelessness in the placing of holes, he solemnly promises to do better next time. The man shouldering the responsibility for correct face preparation turns away with the belief that he has impressed John in the matter. But has he? Tomorrow's practice will be the same as today's.

I think the organization for bringing down the coal should comprise the miners, machine men, drillers and shotfirers. The miner should see that the face is properly squared for the machine crew. The machine crew should note, on a report provided for that purpose, the places that have not been squared up and, if conditions warrant it, should refuse to cut them. This is a check on the miner. The drilling crew should examine the undercuts for uniformity of depth and enter their findings on a report. This is a check on the machine-runners.

The shotfirers should make certain that holes have been properly placed, drilled to the proper depth and cleaned of all drill dust; that all bug dust has been cleaned from the undercut and shoveled back a sufficient distance from the working face and thoroughly wetted down or, preferably, loaded out. They must enter on a daily report the number and depth of holes fired in each working place together with the amount of explosive used; also any violation of rules observed. This will be a check on the miners, machinemen and the drillers. The mine foreman should examine these reports every day.

J. W. POWELL,
Welch, W. Va. Mining Engineer.

On the Right Track

THE conversation between the Old Gent and Jim, the mine superintendent, relative to increasing the percentage of lump coal at the working face is difficult to analyze without knowing their system of mining, the structure of the coal and the thickness worked. However, from the nature of the superintendent's conversation it seems that he

and his mine foreman have been experimenting more or less with different methods of shooting without accomplishing any marked results.

It is possible that they are now on the right track, but it is evident to any practical mining man that they are going to experience more or less trouble in adjusting their wage scale to offset the expense the proposed system will bring about. It will be necessary for them to increase considerably the efficiency of the loaders, or the output per man employed with be lowered and operating cost will go up. This is one of the many things that will make the Old Gent focus his glasses when the first payroll reaches his office.

I would suggest that Jim and Mac feel their way along with their proposed plan. Most likely they will have more or less trouble in figuring out a wage scale that will satisfy the miners, who know that whatever may be the cost of this new scheme per ton it must be deducted from the tonnage rate paid the miners.

There is no question but that systematic cutting, drilling and shooting will give better results than the old method—or lack of method—providing the newly created department has full supervision over all machine runners and loaders. It is just as essential that all places be properly cut and cleaned up as it is that drillholes be properly located and the quantity of powder for each shot regulated.

You may rest assured that the new system will reduce the number of minor and fatal accidents. No coal company will make a mistake in employing competent shotfirers or shooting inspectors to look after its coal loaders, for these inspectors will be able to lower the accident rate at the working face and increase the volume of lump, inasmuch as they will have the say on all questions of shooting.

Cushion blasting, while not advisable under certain conditions, will, when properly handled, increase the percentage of lump in a room-and-pillar layout. It may be advisable for Jim and Mac to consider some modification of the longwall plan if roof condition will permit. Longwall faces will produce more lump coal with less drilling and shooting than narrow workings.

Adrian, W. Va. C. T. GRIMM.

He Agrees With Mac

I HAVE BEEN USING Mac's system of bringing down the coal for two years with good results. By snubbing and close supervision of shooting the percentage of 1¼-in. screenings has been reduced about 10 per cent by actual test. I believe that the tonnage rate of pay is best for jobs involved in bringing down the coal for the simple reason that good, efficient workmen are worth more than careless and listless men who look forward only to quitting time and pay day.

CHARLES NEWBY,
Mine Superintendent,
Boonville, Ind. Center Coal Co.

Supervision

VISITING many mines as an inspector, I have been able to observe changes taking place that probably were not so noticeable to those on the spot daily, in charge of the operations.

It is common to find a section of a mine change from an orderly place to one of disorder all in a period of three months. This happens most often when the management begin to take it easy—things having moved along without complaint, they became self-satisfied. I've noticed good miners, men who had been well trained, grow indifferent to the safe practices they knew so well in a short period of three months of work under an indifferent assistant foreman. And miners who appeared hopeless I have seen changed from the poorest kind of workmen to worthwhile workmen in a very short time.

When a section begins to slip, the remedy in some instances is a big problem. As a usual thing a change should be made without delay. In some cases the mere changing of a foreman from one section to another does the trick; in others it becomes necessary to give the man in charge a change of work entirely different from that which he has been doing. A change of occupation sometimes is a rest. Regardless of everything else, it is the boss' job to keep his men from growing stale.

When the supervision is up to a high standard, the official making inspections of the workings finds each and every man doing his work in such a manner that little or no special recommendations need be made, but when the direction of work is below standard we find on each inspection many workmen to be sadly in need of this, that and the other. When a mine or a section of a mine gets in this condition, accidents increase, production is hard to maintain and, of course, the costs go up.

Welch, W. Va. FRANK MILLER.

WHAT have these Bosses been talking about during the last few months?

JULY—*Too many bosses?*

AUGUST—*Can you schedule development?*

SEPTEMBER—*Does safety pay?*

OCTOBER—*Are you loading dirty coal?*

NOVEMBER—*Can a standardized mine layout be adhered to?*

DECEMBER—*Can repair costs be cut?*

JANUARY—*Responsibility for equipment maintenance.*

FEBRUARY—*Bringing down the coal.*

Foreman More Efficient When Relieved of Equipment Upkeep

RESPONSIBILITY for equipment maintenance should be in full charge of the chief electrician or master mechanic. The mechanical upkeep of all equipment should be placed in his charge, and he should be invested with authority to remove from duty any employee operating mechanical equipment whom he considers incompetent. If he is given a free hand, and allowed to exercise his initiative, he will realize his responsibilty. This is the golden key that opens the gates allowing those powerful forces of energy, zeal and enthusiasm, which when combined with the machinery of the mind—brain power—enable a man to achieve the best results.

It is a mistake and a reflection of poor management, in my opinion, to subject the chief electrician or master mechanic to the authority of a mine foreman. However, as their interests are mutual—to produce a maximum tonnage at a minimum cost—it is absolutely necessary that perfect harmony and co-operation exist. They should get together frequently and discuss their troubles in a general and friendly manner, ever keeping before them safety, production and costs.

Having worked in every capacity officially from fireboss to general superintendent, I know from personal experience that a mine foreman has enough problems to solve along the lines of ventilation, methods of working, roof control, efficient haulage layout, drainage, distribution of supplies to the working faces, blasting, proper preparation of coal and the numerous other things that contribute to the safety, welfare and contentment of the workers—which if attended properly will keep his mind and his legs busy enough—without having to worry about equipment maintenance.

Any sensible mine foreman, I am sure, would welcome a system of this kind, for in my opinion the chief reason that mine foremen extend their authority over the chief electrician is because the superintendent expects them to have a hand in all that goes on in the mine. This is not advisable, as the average mine foreman is not versed in the technique of mine equipment.

The chief electrician or master mechanic should report direct to the superintendent in all mines under 2,000 tons capacity. For mines of larger capacity another system of organization should be worked out. In fact, some of the large producers have already found that a maintenance department for mechanical equipment has become a practical necessity, as the introduction of mechanical equipment in coal mining has increased to such an extent that the equipment maintenance problem has become an outstanding factor in the successful management of their mines.

The maintenance department should be a branch of the engineering department, its duties being to handle all matters in connection with equipment

maintenance. The functioning of this department should be under the direction of a power and equipment superintendent, this official to be directly under the control of the general manager and to report only to him. While the chief electrician at the different mines would work under the superintendent, he would be directed by the power and equipment superintendent in all matters of a technical nature connected with mining equipment. J. W. POWELL,
Welch, W. Va. Mining Engineer.

Don't Fire Careless Worker; Train Him in Safe Methods

I HAVE READ with great interest "Safety Gives Returns," by C. E. Lively in the February issue of *Coal Age*. There is one passage in his article I can't agree with, however, at least off hand.

He says safety rules should be inforced by dismissing any person that disobeys them. I feel this is not right because, as I understand it, safety laws are to conserve life and prevent accidents; so to dismiss a man for violation is no solution. If a mine foreman has a careless or disobedient worker under his charge it is his job to cure him. He knows this particular man's weakness; by tact and close supervision his bad habits can be overcome. On the other hand if he is dismissed, he may get a job at some other mine, where at first the foreman gets to know only his virtues. Before his vices become known something serious may happen.

This may be all right for the foreman who fired him, since he has passed the hazard on to some other company. But safety has become a national problem, and every mine foreman is trying to clear his mine of dangerous workers. If all foremen were to follow Mr. Lively's plan, they would have to employ new men to fill the vacant places, and naturally they would be employing one another's safety-law breakers. They would get rid of one danger only to assume another.

Only after all efforts to correct his faults have failed should the workman be discharged. But if dismissal is necessary the name of the person dismissed should be published as a warning so as to protect other companies and perhaps the lives of many workers.

Neffs, Ohio. ROBERT EMERY.

Human Relations a Big Factor

WE ALL know Mac. As a lad he entered the mines as a trapper, became buddy for his father, then a machine man and later boss driver of a motor. By studying at night and working out formulas which he never used except on examination he obtained a foreman's certificate and landed a job as a boss. Thereupon he proceeded to make a record by working 18 hours a day walking, crawling through dog holes, inspecting working places, listening to complaints, seeing after haulage, measuring yardage and air in circulation, laying out work for company men —trying to get the coal, yet retain the good will of the men—making tonnage reports, time sheets, coal cost and yardage cost.

Possibly the night before Mac spent hours planning how to get the tonnage the company required, when suddenly a pump or fan went down. Mac, of course, had to get it started and, being naturally of a nervous disposition, it didn't help his temper any. Arriving at the mine the next day and finding a motor stalled, he naturally exploded.

Mac's mistaken attitude was due not alone to the physical strain in trying to make a record; lack of education made him narrow-gaged. Having entered the mine at an early age, he lacked broad understanding of human relations.

Mac probably was to blame to some extent for the stalling of the motor if he allowed it to be overloaded in his desire to make a record. It must be remembered, however, that Mac's job is production and that therefore he is a buffer or differential that touches the management and the miner at all points. As he is responsible for safety of operation no change in methods of mining and no machines should be introduced without consulting him.

There should be an electrician or mechanic as well as a foreman, each with clearly defined responsibilities and committed to close co-operation. It may be necessary for the management to correlate strong personalities.

Altoona, Ala. JOHN JONES.

Changes Should Be Gradual

STANDARDIZATION of mine layout is advisable, but should not be too rigid. Where unforeseen circumstances arise or under extremely unfavorable conditions, adhering to standardized layout and equipment may result in serious losses. In making any modifications the changes should be gradual to allow everyone concerned to get used to the altered conditions. Alterations, however desirable, if made abruptly may lead to a certain amount of confusion, largely because of the inertia of the human mind. Non-standardized layout should be used, however, only where the standard would be dangerous or inefficient.

W. E. WARNER.
Brentford, England.

The Ideal Foreman

A RECENT number of the Midvale Safety Bulletin carries an interesting definition of the "Ideal Foreman." Howard J. Montgomery, of the Midvale Steel Co., describes "one of the best foremen" as likable, tactful and human. "He is not selfish in his relations with his assistants; he is well liked by the workers; he makes no promises which he cannot carry out. He does not have to apologize. He does not envy the man of higher skill; he is ambitious. He does not worry about losing his position; he does not play politics. He is a leader. The company's interest is foremost in his mind during working hours. He is first in line for promotion, because he has developed an assistant who is qualified to take his place. His reward will be advancement to a more responsible position with corresponding increase in pay."

Publications Received

The Lighting Power of Flame Safety Lamps, by R. V. Wheeler and D. W. Woodhead. Safety in Mines Research Board. Paper No. 40. Price, 1s. net. Pp. 66; 6x9 in.; illustrated. H. M. Stationery Office, Adastral House, Kingsway, W.C.2, London, England.

The Miners' Welfare Fund, by The Rt. Viscount Chelmsford. Miners' Welfare Committee. Price, 3d., net. Pp. 57; 6x9 in.; illustrated. H. M. Stationery Office, Adastral House, Kingsway, W.C.2, London, England.

Report of an Enquiry into Apprenticeship and Training for Skilled Occupations in Great Britain and Northern Ireland, 1925-1926. Group III, covering mining and quarrying. Price, 3s. Pp. 110; 6x9 in.; tables.

Seventh Annual Report of the Scientific and Industrial Research Council of Alberta, 1926.

Trade Literature

Industrial Car Equipment for Mines, etc. Atlas Car & Mfg. Co., Cleveland, Ohio. Pp. 12; illustrated. Describes various types of dump cars, mine skip automatic dumps, cages, etc.

Rotary Car Dumpers. Roberts & Schaefer Co., Chicago, Ill. Bulletin No. 103, illustrating and describing construction, types of installations, car cagers, feeders and spraggers.

Rollway Bearing Co., Inc., Syracuse, N. Y., has issued catalog 4-A on its wide series and utility type of bearings; also the following bulletins; No. 53, Self-Aligning Pillow Blocks equipped with Rollway Adapter Type Bearings to fit Standard Commercial Shafting; No. 54, Various Precision Types of Rollway Radial Bearings; No. 55, Self-Aligning Pillow Blocks equipped with Standard Rollway Bearings, and No. 56, Large Rollway Bearings in the recently adopted international sizes.

Screw Conveyor Book No. 989. H. W. Caldwell & Sons Co., Chicago, Ill. Pp. 85; illustrated. Besides descriptions of the Helicoid and Sectional-flight Types, prices and dimensions are given, superseding all previous catalogs.

The Rheolaveur Process for Washing and Preparing Coal. American Rheolaveur Corporation, Wilkes-Barre, Pa. Pp. 10, illustrating and describing the sealed discharge plant and the free discharge plant. Economies in operation and maintenance are covered. Wedge Wire Screen for dewatering coal also is described.

Type T. Heavy Duty Reliance Motors for Direct Current with Ball and Roller Bearings. Reliance Electric & Engineering Co., Cleveland, Ohio. Bulletin No. 202. Pp. 7; illustrated.

The Esterline-Angus Co., Indianapolis, Ind., has issued Bulletin 1227, illustrating and describing its new Frequency Recorder.

General Electric Co., Schenectady, N. Y., has issued the following bulletins: GEA-712A on its Type BTA Motors having alternating current, adjustable speed and shunt characteristics; GEA-887, CR 3110 Drum Controllers for series and compound-wound motors used on crane hoists and similar applications.

WORD *from the* FIELD

Industrial Stocks Decline; Consumption Gains

Bituminous coal stocks in industries in the United States decreased approximately 2½ million tons during January, according to the National Association of Purchasing Agents. Coal held in storage on Feb. 1, 1928, including anthracite and bituminous, by industries in the United States and Canada amounted to 50,595,000 tons. Consumption during January was 37,678,000 tons, which showed an increase of nearly 500,000 tons over the preceding month.

Industrial stocks in the United States and Canada constituted an average supply of 42 days as compared with 40 days a year ago. Total coal stocks on hand were equivalent to the stocks on hand Feb. 1, 1926, which was a normal coal stocking year. On the other hand, consumption was 14 per cent lower than the same period in 1926.

Business conditions have not improved to the extent anticipated in last month's estimate of requirements for the latter part of January and through February of approximately 10,750,000 tons on an average per week, which proved high, as during January the average per week was 10,000,000 tons.

Requirements for February and March, business and weather conditions remaining about the same, should be approximately 92,000,000 tons. Of this quantity, 10,000,000 tons, the association estimates, will be drawn from stocks off the docks up the Lakes, from retailers' yards and from industrial storage, leaving a balance required of 82,000,000 tons.

DAYS' SUPPLY OF COAL ON HAND IN VARIOUS INDUSTRIES

Byproduct Coke	38
Electric Utilities and Coal Gas Plants	57
Railroads	38
Steel Mills	34
Other Industries	42

COMPARATIVE ESTIMATES OF OUTPUT CONSUMPTION AND STOCKS

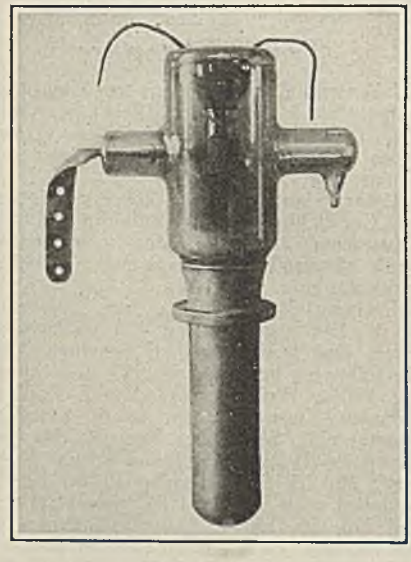
(In Tons)

	U. S. Output	Industrial Consumption	On Hand in Industries
June	41,999,000	36,690,000	66,510,000
July	38,597,000	33,560,000	62,585,000
August	48,907,000	33,900,000	59,697,000
September	48,592,000	33,195,000	59,179,000
October	51,400,000	35,813,000	60,154,000
November	47,100,000	35,514,000	57,940,000
December	47,309,000	37,225,000	55,725,000
January	49,645,000	37,678,000	52,909,000
Feb. 1	.....	.....	50,595,000

Bituminous coal stocks held by railroads of the country on Feb. 1 showed a decrease of 655,672 tons from the reserves held on Jan. 1, according to reports made to the American Railway Association. Total stocks held by the carriers on Feb. 1 were 14,073,700 tons, consisting of 2,774,270 tons on cars and 11,299,430 tons in ground storage.

Wireless Power Transmission Shown to Be Nearer

Transmission of power currents a distance of several feet through space has been demonstrated with a new high-power short-wave radio tube developed in the Schenectady laboratories of the General Electric Co. This tube radiates 15 kw. of power into space at a wave length of 6 meters or a frequency of approximately fifty million cycles per second. The capacity of 15 kw. is about fifty times that formerly obtained from a short wave tube.



Mystery Tube

So far, applications of the new tube have not been studied. Physiological effects, however, such as increasing blood temperatures of men standing too close to the radiating aerial indicate the possibility of using such equipment to hasten convalescence from certain infectious diseases.

Frick Fires 375 More Ovens

Hope of a revival of activity in the Connellsville coke region was kindled by the announcement late in February that the H. C. Frick Coke Co. would add 375 ovens to the active list. Two hundred ovens were to be lighted at the Hecla No. 3 plant and 175 at Morewood. Other additions were expected within a short itme.

Electric Railway Journal Wins A.B.P. Award for Service

The award set up during the past year by the Associated Business Papers, Inc., for the business paper contributing the most definite and outstanding service to the industry with which the publication is concerned was won by *Electric Railway Journal*, published by the McGraw-Hill Publishing Company, Inc. The prize is to be a medal, which is now being designed.

In announcing the winner on Feb. 10 the jury of award emphasized the service rendered by the winning paper in campaigning for practices and policies considered in the best interest of its industry. This was carried out by articles, editorials and original investigations published in the paper and by numerous talks made by members of the editorial staff.

A cash prize of $500 for the best editorial appearing in a business paper during the same period was won by Sydney A. Hale, managing editor of *Coal Age*, the announcement and presentation taking place last October.

Army Receives Bids for Coal

Bids opened Feb. 24 by the Board of Engineers, U. S. Army, at New York for furnishing and delivering, f.o.b. piers, New York Harbor, 20,000 net tons semi-bituminous coal resulted in five tenders ranging in price from $4.74 to $4.95 per ton being received. The bidders and prices were:

W. A. Marshall & Co., New York City, $4.84; E. Russell Norton, Boston, $4.89; White Star Coal Co., $4.74, and W. H. Bradford & Co., New York, $4.95, all f.o.b. Pier 18; Cambria & Lackawanna Coal Co., Black Tom pier, $4.74.

On the preceding day bids were opened by the Board of Engineers, U. S. Army, at Philadelphia for furnishing and delivering f.o.b. piers, 15,000 net tons of semi-bituminous coal. The following bids, per ton, were received:

W. A. Marshall & Co., New York, $4.75; Jenkins & McCall Coal Co., Frostburg, Md., $4.79; Commercial Coal Mining Co., Philadelphia, $4.83; Hall Bros. & Co., Inc., Baltimore, $5, t.i.b., and $4.72, scows; Steamship Fuel Co., New York, $5.96, t.i.b., and $5.11, scows; Vetterlein Fuel Co., Philadelphia, $4.83; George C. Foedisch & Co., Philadelphia, $4.66; Sterling Coal Co., Philadelphia, $4.94; W. H. Bradford & Co., New York City, $4.71; William M. Hollenbach, Philadelphia, $5.16; Maryland Coal & Coke Co., Philadelphia, $4.95.

Lewis Blames Operators and Railroads For Plight of Union Miners

REPUDIATION of the Jacksonville agreement, by some of the large producers, abuse of injunctions by the operators and a conspiracy by leading railroads to beat down the price of coal are blamed by John L. Lewis for unemployment and attendant grave conditions among union miners in the bituminous coal fields of Pennsylvania, Ohio and West Virginia. The president of the United Mine Workers occupied the stand for four hours March 7 as the first witness called by the Senate committee on interstate commerce in its inquiry into the situation in the soft-coal industry.

The taking of oral evidence followed a tour of the coal fields of central and western Pennsylvania by the committee in the course of which the members observed living conditions among the men on strike and questioned mine officials, workers and union representatives. Senator Frank R. Gooding of Idaho is chairman of the subcommittee, and the other members are Senators Burton K. Wheeler, Montana; Robert F. Wagner, New York, and W. B. Pine, Oklahoma.

The Jacksonville wage pact, which, according to Mr. Lewis, had the active support of the government, was, he asserted, treated as so much worthless paper by the operators, who repudiated it, he said, and cast into unemployment tens of thousands of miners. There are something like 200,000 jobless at this moment, he declared.

Besides calling attention to a letter sent to President Coolidge in 1925, asking the intervention of the government in inforcing the Jacksonville pact Mr. Lewis made public for the first time the President's reply, in which Mr. Coolidge declared the government took no part in the negotiations and was in no sense a party to the contract.

"I profoundly deplore the breaking of any contract, whenever this is the case," the President wrote, "especially as the faithful compliance with agreements between the employers and employees is the sole hope of collective bargaining—a principle now accepted in American life.

"On the other hand, as you are aware, the arm of the government provided for the enforcement of contracts is the courts, and if such contracts have been violated it is the duty of the injured party to appeal to the courts.

"The government, not being a party to contracts, has no status in enforcement. If no enforcement is found by appeal to the courts in labor contracts when properly formulated, then the law-making powers should enact the legislative measures necessary to enable the courts to give such relief in the future."

The first to abrogate its contractual obligation, Mr. Lewis said, was the Consolidation Coal Co., of which he named John D. Rockefeller, Jr., as "a controlling factor." The Bethlehem Mines Corporation, a subsidiary of the Bethlehem Steel Co., was next, and was followed by the Rochester & Pittsburgh Coal & Iron Co. and the Pittsburgh Coal Co., the last named a Mellon company, Mr. Lewis said.

The bituminous industry, said Mr. Lewis, is today in the worst state of demoralization it has ever known. In some sections, he added, the work day has been increased from eight to ten hours while wages have been reduced to $2, $3 and $4 a day. So meager are the wages, he said, that miners who work a day now and then cannot even meet their bills at the company stores. A work-year of 150 days, he said, is a good one; one of more than 200 days an exception.

General W. W. Atterbury, president of the Pennsylvania R. R., Mr. Lewis declared, took advantage of the demoralization and made it known that the Pennsylvania wanted the wages of miners substantially reduced.

"General Atterbury," continued Mr. Lewis, "began to reach out and use his influence with other railroad heads to depress coal prices on their lines.

"The railroads have become so bold in their aggressiveness to depress mine wages that even the most humble isolated non-union miner is aware of the forces that are driving him to further depths of pauperism."

The miners' union president said that what the United Mine Workers desire of Congress is legislation to correct the abuses "that have sprung up in the issuance of injunctions by federal courts in labor disputes." They also want the interstate commerce law amended so as to prevent the railroads "from practicing methods designed to exploit the bituminous industry," and finally, said Mr. Lewis, the union wants something done to put an end to "usurpation of governmental functions by coal companies."

Capital and Labor Air Views On Voluntary Arbitration

Public hearings on proposals to make the federal arbitration law applicable to industrial disputes were held Feb. 16-18 by a subcommittee of the committee on commerce of the American Bar Association at the headquarters of the New York City Bar Association. The hearings had their genesis in declarations made before the committee two years ago by Matthew Woll, vice-president of the American Federation of Labor, who intimated that legal validity and inforceability could and should be given to contracts resulting from mutual agreement and stressed the advantages of voluntary arbitration.

At the hearings in New York last month representatives of capital, labor and the public were invited to voice their views. William Green, president of the American Federation of Labor, expressed his sympathy with the work of the committee without committing his organization to support of the specific proposals before the committee. James Emery, counsel, National Association of Manufacturers, gave qualified approval. Mervin K. Hart, employers' representative on the New York State Industrial Commission, feared that the proposal would help the closed-shop movement and disapproved of the committee's entrance into the field of discussion at this time.

Gilbert H. Montague was enthusiastic in his indorsement of the scheme as a step in improved industrial relations. Spokesmen for the garment industry in New York also spoke favorably. The left wing labor movement was represented by William Z. Foster, who clashed with the committee in the presentation of his views. Julius Henry Cohen, chairman of the subcommittee, said the committee was taking no stand on the closed vs. open-shop question, but did feel the wisdom of making agreements voluntarily entered into inforceable at law.

Senate Quiz Responsible for Stalemate in Illinois?

The labor situation in Illinois has simmered down to watchful waiting on the part of both sides—the operators and the miners. Indications are that a suspension of mining for at least 30 days will occur when the truce Jacksonville contract expires March 31.

The view of certain of the best informed operators is that the union officials have shunted off peace because of the Senatorial quiz on coal in the Pennsylvania fields. It is believed that the union leaders hope to arouse enough public sentiment to prolong the Jacksonville agreement.

In the event of failure of the Senatorial investigation to benefit the union's position it is expected that the miners' officials will permit the next move to come from the rank and file of the Illinois membership. This is anticipated by the operators within a short time after any suspension.

It is considered the only way out for the union leaders. If the miners demand employment a conference of the policy committee of the United Mine Workers can be called and informed that the miners of Illinois wish a reduction. Such a move would eliminate the stigma of the "no backward step" of the union officials, it is declared.

Stripping operations and machine mines have been informed that they may operate at the Jacksonville scale after March 31, it is reported.

A news story from Cincinnati, Ohio, March 7 reported that operators of Illinois, Indiana and Iowa were planning a tri-state organization with John W. Davis, Democratic candidate for President in 1924, as the head of the new association. Illinois operators prominent in the councils of the state mining

industry, however, denied all knowledge of such a development.

In Iowa last month a coalition was effected in the Centerville district between the organization of miners launched in Missouri last summer by former members of the United Mine Workers and a group of Iowa insurgents. The amalgamated organization, known as the Southwest Miners' Association, has signed up with some of the Iowa producers, who have banded together as the Southwest Coal Operators' Association, on a basis slightly higher than the 1917 scale. The Iowa Coal Operators' Association is not a party to the new agreement, according to recent reports.

Oppose Confirming Esch

By a vote of 10 to 7 the Senate Interstate Commerce Committee reported unfavorably March 6 on confirming the reappointment of John J. Esch as a member of the Interstate Commerce Commission. Opposition came principally from Senators from Southern coal producing states because of Commissioner Esch's action in switching his vote to favor the Northern producing fields in the lake cargo case.

Personal Notes

J. F. Musgrove has been appointed vice-president and general manager of the Pacific Coal Co., Kemmerer, Wyo. The company has been inactive since 1924, but is increasing its capital stock and getting in shape for a large production.

Colonel W. M. Wiley, of Sharples, W. Va., a prominent producer in southern West Virginia, is reported to be a candidate for a post in the Chamber of Commerce of the United States.

H. T. Wilson, who has been president of the Red Jacket Consolidated Coal & Coke Co., Columbus, Ohio, for the past four years, resigned effective Feb. 27. No successor has been named. Previous to becoming head of the Red Jacket company Mr. Wilson was with the Norfolk & Chesapeake Coal Co., of Detroit, which was the selling agent for the Red Jacket production. Mr. Wilson will return to that company.

George J. Dorsey, of Scranton, Pa., has been appointed inspector of the second inspection district, United Mine Workers. Named by Rinaldo Cappellini, district president, to succeed the late James A. Gleason, he assumed his duties Feb. 21.

Edgar J. Gealy has resigned from the editorial staff of *Coal Age* to join the engineering force of the Pittsburgh Coal Co. He will have an active part in working out the electrical features of the company's new central cleaning plant. Mr. Gealy, who is a graduate of Pennsylvania State College, was connected with the Lehigh Valley Coal Co. before becoming associate editor of this paper in March, 1923.

Washington Letter

By Paul Wooton
Special Correspondent

THE first round of the investigation of the Gooding sub-committee of the Senate Interstate Commerce Committee seems to have gone to the United Mine Workers. The committee seems to lay at the door of the operators the responsibility for the conditions in which the families of the miners are living. Apparently the investigators were not particularly impressed by the allegations of violence on the part of the coal and iron police.

There is every reason to believe that the sub-committee feels that it turned up a major issue in connection with the use of injunctions in the strike area. The opera bouffe scene in the church where the committee members participated in the singing of hymns gave nationwide publicity to the injunction phase of the situation.

The position taken by Pittsburgh operators that the Jacksonville agreement does not specifically forbid the hiring of non-union men seems not to have made a favorable impression on Capitol Hill. Even those who are out of sympathy with the union believe that a frank statement that the agreement was unworkable would have impressed Congress more. They believe that such a contention could have been substantiated to the satisfaction of many members.

FROM the emphasis which the committee seems to place on the abuse of the injunction some observers are of the opinion that the principal byproduct of the whole inquiry will be support for the proposals to curb the power of the courts to use the injunction in connection with labor disputes. The Judiciary Committee is now considering bills to that end. Organized labor is throwing the full weight of its influence behind legislation of this type.

The controversy over the confirmation of Commissioner Esch of the Interstate Commerce Commission and the decision of the Interstate Commerce Commission to suspend permanently the proposed reduction in lake cargo rates from points on Southern railroads have resulted in freight-rate regulation being dragged further into politics than ever before. Many who are in no way involved in the quarrel over lake cargo rates are concerned greatly with the larger question involved. It is pointed out that unless public confidence can be maintained in some body with discretionary powers the only alternative is rate fixing by general formula, such as the distance tariffs.

A rate structure based on the cost of handling shipments at each end of the line, plus the rate based on distance, might be preferable to arbitrary action by a body if its integrity is constantly being assailed, some contend. At the same time it is well recognized that distance tariffs would upset trade relations of a century and would work great hardships to many communities and to certain areas of the country. Claims are made, however, that communities are destroyed any way and industries disrupted by the fixing of rates by a commission which places its interpretation upon what is best from an economic standpoint.

THERE has been a decided trend toward distance rates in the last few years and that basis of rate making unquestionably has received great stimulation by the increasing tendency to drag the Interstate Commerce Commission into politics. The general conclusion is that no worse calamity could befall American business than the subordination of the Interstate Commerce Commission to political influences. There are indications that organized business throughout the country is going to make itself heard in this connection.

The far-reaching results of the factor of labor and the factor of transportation in the bituminous coal markets are shown by the figures of the U. S. Bureau of Mines covering production in 1927. The year as a whole showed an output of 519,804,000 tons, practically the same as for 1925. The union states affected by the strike show large decreases in 1927. The non-union states show a corresponding increase. For the first time West Virginia has passed Pennsylvania. West Virginia's production was 151,000,000 tons, while that of Pennsylvania was 131,000,000 tons. If the 80,000,000 tons of anthracite is included Pennsylvania would still hold its place as the greatest coal-producing state. Before the war the bituminous output of Pennsylvania exceeded that of West Virginia by 100,000,000 tons.

Kentucky occupied third place among the coal-producing states during 1927, having passed Illinois. Its production was 72,600,000 tons, as compared with 45,400,000 tons produced in Illinois. Alabama passed both Indiana and Ohio in 1927, climbing from seventh into fifth place. Alabama produced 18,400,000 tons in 1927, as against a production of 17,699,000 tons in Indiana and 14,668,000 tons in Ohio.

It is these staggering losses of the Northern fields that suggest the real issues with which an investigation of the coal industry should concern itself, many believe. It no longer is a question of the ethics of conducting a strike but one involving the very existence of collective bargaining.

To Introduce Conveyors

The Mining Engineering Co., Worcester, England, has established an office at 715 Continental Building, Baltimore, Md., for the sale of its underground belt and shaker conveyors. The company is best known by its abbreviated name "Meco." It has for years been serving the British market in the manufacture of machinery. Clarence E. Claghorn, who put the first conveyor in an American mine, has charge of this development.

James H. McGraw Wins Harvard Award For High Advertising Standards

THE HARVARD Advertising Award for Distinguished Services to Advertising (in 1927), the highest of ten awards established by Edward W. Bok, was presented to James H. McGraw, president of the McGraw-Hill Publishing Company, publisher of *Coal Age*, at a dinner held Friday night, Feb. 17, under auspices of the Graduate School of Business Administration of Harvard University.

The award to Mr. McGraw took the form of a gold medal given to the "individual or organization deemed by the jury of award to merit recognition for contemporary services to advertising."

The Bok awards are administered by the Graduate School of Business Administration of Harvard University. They are offered in the conviction that advertising, wisely utilized, is a great economic power to broaden markets and decrease the cost of distributing goods; but, if unscientifically employed, is wasteful to the community.

The reasons for bestowal of the medal upon Mr. McGraw are given in the following quotations from the announcement from Harvard University on Feb. 14:

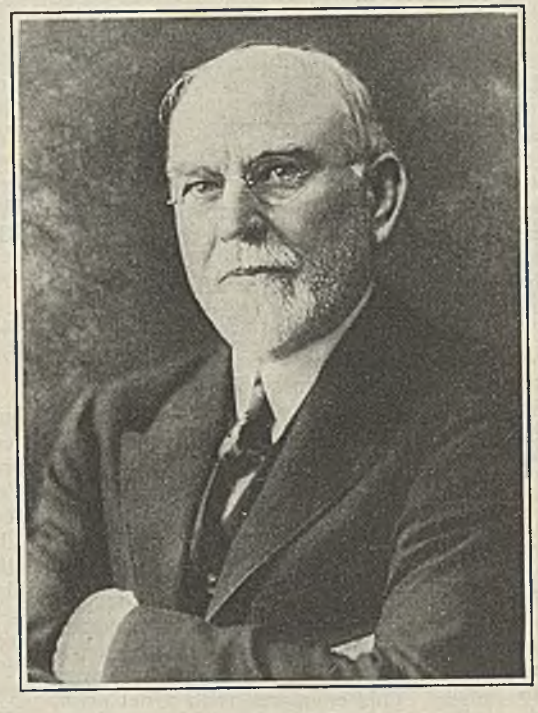
"(1) James H. McGraw, president of the McGraw-Hill Publishing Company, Inc., was awarded the Gold Medal for Distinguished Contemporary Service to Advertising because of his lifelong service in the upbuilding of higher standards in advertising in the business press of the country.

"(2) In making the award of the gold medal, which is the greatest honor in the series of Harvard Advertising Awards, Professor Sprague spoke of Mr. McGraw's pioneering work in the recognition of advertising's relation to marketing, and of his constructive services in the upbuilding of the highest advertising practices among the organized business press."

Prof. O. M. W. Sprague, who is acting dean of the Graduate School of Business Administration of Harvard, presented the awards in the absence in Europe of Dean Wallace B. Donham.

Mr. McGraw, who is in the South, was not allowed by his physicians to come North to receive personally the medal. It was received for him by Malcolm Muir, vice-president of the McGraw-Hill Publishing Company, Inc., who read Mr. McGraw's address, which was on the subject of "Advertising and the Maintenance of Prosperity." He described the functions and importance of advertising in modern distribution.

"Primarily the function of advertising as a business force," said Mr. McGraw,



James H. McGraw

"is to interpret or expand a personality, whether of a product or of a service or of an industry. Products and services vary greatly in personality or distinctiveness. And it has long been recognized that a distinctive product has a decided advantage and security in the market. Excessive competition, with the squeezing out of normal profits, results from a surplus of identical or alternate products, or a surplus of products believed to be alternate."

Mr. McGraw then took up in his address the elements of distinction to be considered in advertising, and the benefits to the advertiser from the searching out of the advertising appeals.

"Advertising failures have resulted less from lapses in advertising technique than from advertising misapplied. Advertising cannot create qualities. Advertising cannot give market standing to a product where market value does not exist. It is sheer folly to assume that a product will take on compelling qualities if only they be claimed in advertising. Advertising can express, develop and amplify what is already present. It can stimulate the seed of product or service personality to growth and vigor. It cannot create the seed.

"Advertising works for the public as well as for the advertiser," continued Mr. McGraw. "It helps stabilize industry and thus employment and dividends. It emphasizes quality and use, which, with price, are sounder criteria of value than price alone. It assures, through price stabilization, the continued improvement of product and the development of new products to minister to the consumers' needs.

"For myself and my colleagues in business-paper advertising I pledge you our best endeavors in a continuance of study, research and experiment to correct misapplication of advertising to make it a still more effective tool of business and a still more beneficent agent in advancing the public welfare."

James H. McGraw is president of the McGraw-Hill Publishing Company, the largest business publishing organization in the world. It has grown from one paper, purchased by Mr. McGraw in 1888, until today there are published fourteen engineering and industrial publications —twelve in New York, one in San Francisco and one in London. Mr. McGraw is chairman of the McGraw-Shaw Company, publishers of industrial papers in Chicago. He also is chairman of the McGraw-Hill Book Company.

The weekly and monthly journals over which Mr. McGraw exercises executive control cover the fields of civil engineering and heavy engineering construction; the electrical, radio, electric railway and bus industries; the machine-using industries; the generation and application of power; the chemical industries, coal mining, and non-ferrous metal mining.

Mr. McGraw is the third person to be honored with the medal for distinguished services to advertising. The two men previously honored are Earnest Elmo Calkins, president of Calkins & Holden, and O. C. Harn, managing director, Audit Bureau of Circulations.

Rioters at Ohio Mines Ignore Injunction

About 1,500 union miners and sympathizers made a march on the Wolf Run mine of the Warner Collieries Co., at Amsterdam, Ohio, March 5, but no casualties resulted, according to the report of Sheriff Allison of Jefferson County. The mine is being operated with non-union labor under the protection of a federal court injunction.

The eviction of miners from more than 300 company owned houses in Jefferson, Belmont and Harrison counties was asked in a supplemental petition filed in the U. S. District Court at Columbus March 4 by the Clarkson Coal Mining Co., Warner Collieries Co., Boomer Coal & Coke Co. and the Wheeling & Lake Erie Coal Mining Co. Hearing on the petition is set for March 24 before Judge Benson W. Hough, who heard the applications for an injunction obtained by the plaintiff companies.

Six non-union miners and three guards at the Dorothy mine of the Youghiogheny & Ohio Coal Co., at Glen Robbins, Ohio, were seriously beaten by alleged union sympathizers who stormed the mine in an effort to keep 50 non-union miners from going to work Feb. 28. Three houses occupied by non-union men were wrecked and several windows were broken by the rioters, who hurled sticks and stones at the non-union men.

Seven alleged union sympathizers were arrested and taken to Columbus by deputy U. S. marshals who were on guard. The company operating this mine also was a party to the injunction granted by Judge Hough.

Colorado Miners Vote To End Strike

Colorado coal miners affected by the strike called by the Industrial Workers of the World Oct. 18 last voted nine to one on Feb. 19 to return to work. Leaders of the I.W.W. urged this action. A ballot in eighteen of the largest companies showed 88 per cent of the strikers in favor of ending the walkout, according to an announcement by the state executive committee.

The State Industrial Commission completed its hearing regarding strike conditions and wages of miners in the Colorado field Feb. 18. An early decision is expected.

Navigation Profits Fall

Net revenue of the Lehigh Coal & Navigation Co. in 1927, after deduction of all expenses, including taxes and interest, was $2,932,295, a decrease of $1,245,150 from the 1926 figure. The company and its lessees produced 4,171,391 tons of coal last year, compared with 3,904,453 in 1926. S. D. Warriner was re-elected president at the annual meeting, Feb. 28.

Strike Theme Wins Prize

Philip Kinsley, a reporter on the *Chicago Tribune*, is the winner of the *Bookman* news story contest for December, 1927, according to an announcement in New York City on Feb. 20. A prize of $100 was awarded to Mr. Kinsley for a story on the refusal of the mine operators in the Pittsburgh district to confer with U. S. Department of Labor officials in an effort to settle the wage controversy in the coal industry.

Mine to Boost Capacity

The Wheeling Coal Co. mine, on the Pennsylvania R.R. five miles north of Wheeling, W. Va., is undergoing improvements in the way of tipple equipment. Larger shaker screens are being installed in order to permit better preparation and increase the capacity from 2,200 to 3,000 tons per day. T. G. Costanzo is general superintendent in charge of the mine.

Terminal Reports Loss

The Pittsburgh Terminal Coal Corporation and subsidiaries report for the year ended Dec. 31, 1927, net loss of $953,640, after depreciation, depletion, interest, &c. This compares with net income of $363,266, equal to $1.22 a share (par $100) earned on 120,000 shares of common stock, after preferred dividend, in 1926.

Byproduct Coke Shows Profit

The report of the By-Products Coke Corporation for 1927 shows a net profit of $1,030,228 after depreciation, interest, federal taxes and premium on the preferred stock retired, equal after preferred dividends to $4.84 a share earned on 189,936 shares of no-par common stock. This compares with a net profit of $1,276,900 after depreciation, interest, federal taxes and writing down investments in 1926, equal to $6 a share on the common stock.

Nay Aug Breaker Burns

Fire late in February destroyed the breaker of the Nay Aug Coal Co., in Dunmore, Pa., causing a loss of $80,000. Nothing in the structure was saved. The property figured in a change of ownership only a few weeks before the fire and it is understood the new company had installed much new equipment. All of this was destroyed.

Lehigh Valley Income Drops

The Lehigh Valley Coal Co. reports net income for 1927 of $2,205,197 after interest, depreciation, depletion, federal taxes and carrying charges on reserve coal lands, against $3,526,813 in 1926.

Eastern Ohio Operators Re-elect Van Horn

At the annual meeting of the Eastern Ohio Coal Operators' Association, held at the Hotel Cleveland, Cleveland, Ohio, on Feb. 13, Ezra Van Horn, vice-president of the Clarkson Coal Mining Co., was re-elected president of the organization. This will make the fifth consecutive term for Mr. Van Horn. Other officers elected were:

Vice-President, W. L. Robison, vice-president, Youghiogheny & Ohio Coal Co.; treasurer, H. R. Sullivan, treasurer, Central Coal Mining Co.; secretary, D. F. Hurd. The executive committee includes Alva Bradley, president, United States Coal Co.; A. W. Dean, secretary, Barton Coal Co.; R. L. Ireland, Jr., general manager, W. & L. E. Coal Mining Co.; T. K. Maher, president, Rosemary Coal Co.; J. C. Nelms, general manager, Ohio & Pennsylvania Coal Co.; Samuel Pursglove, president, Big Five Coal Co.; S. H. Robbins, president, Youghiogheny & Ohio Coal Co.; W. C. State, general manager, Wheeling Township Coal Mining Co.; Whitney Warner, vice-president, Warner Collieries Co.; R. L. Wildermuth, vice-president, Lorain Coal & Dock Co., and W. R. Woodford, president, Rail & River Coal Co.

Bertha Consumers in Hands Of Receivers

The Bertha Consumers Co., Pittsburgh, Pa., was placed in the hands of receivers March 5. John H. Jones, president of the company, and Fred E. Powers, a member of the board of directors, were appointed as receivers. The company has assets of between $7,500,000 and $8,000,000. Mr. Jones placed the liabilities at $2,400,000.

Threat of a suit by another Pittsburgh coal company to collect a debt owed it by the Bertha Consumers Co. made it necessary for the company to apply for bankruptcy in order to protect its other creditors, said Mr. Jones.

"The receivership will be of short duration," he added.

Utilities Consume Less Fuel

Public utility power plants in the United States consumed 3,678,094 net tons of coal in January, compared with 3,719,295 tons in the preceding month and 3,560,085 tons in November, according to the U. S. Geological Survey. Fuel oil used by these plants in January totaled 580,352 barrels, against 649,393 barrels in December and 506,879 barrels in November.

The average production of electricity in January was 232,100,000 kw.-hr. per day—a trifle less than the revised figures of average daily output for December of 232,800,000 kw.-hr. The output by the use of water power was 87,700,000 kw.-hr. per day, or about 38 per cent of the total output.

Cut in Lake Rates by Southern Roads Denied by Commerce Commission

AUTHORITY to reduce rates from the Southern fields to the lakes was denied the railroads in a decision by the Interstate Commerce Commission made public Feb. 25. The decision was rendered in I. & S. Docket No. 2987 and covered the proposal of the Southern roads, made in tariffs filed last summer, to reduce the rates 20c. per net ton. The reduction, if allowed to become effective, would have restored the differential relationship in effect between the Northern and Southern fields prior to the Commission's second opinion in the 1925 lake cargo case: *Lake Cargo Coal Rates, 1925,* 126 I. C. C. 309.

It was contended by the proponents of the reduction, said the report in the present proceeding, that the lower rates were in the public interest and that the reduction was necessary to insure the South its fair share of the lake trade. The record, continues the opinion, is replete with testimony bearing on mining conditions and the ability or inability of producers to market their product. "The shift in tonnage to the Southern districts," says the report, "appears to have been due, in large measure, to lockouts, miners' strikes, and to higher costs of producing coal in the Northern than in the Southern districts, and these conditions, although in constantly lessening degree, still prevail in those districts."

The Commission rejects the argument that so long as the rates proposed are not so low as to burden other traffic there can be no interference by the Commission with managerial discretion. The larger interests of the public and of competing railroads, according to the Commission, must be given weight.

"It must be apparent," said Commissioner Taylor in a separate concurring opinion, "that the argument [that the proposed rates are highly compensatory] is only made to obscure the real purpose of these reductions, which is to destroy the effect of the order of the Commission reducing the rates from the Northern fields. This action of the Southern carriers cannot be accepted as anything more or less than a challenge of the power of the interstate commerce act and of this Commission to prescribe just and reasonable charges for the transportation of this coal traffic."

Commissioners Meyer, Woodlock and Brainerd dissented from the findings of the majority. Commissioner Porter took no part in the disposition of the case. "Commissioner Esch was necessarily absent, but had he been present he would have concurred in the result" —i. e. rejection of the proposed tariffs.

The decision has provoked a roar of disapproval from the Southern districts and from the Northwest.

Proposed Mine Mergers Still a Live Topic

Mergers are a staple topic of conversation when coal men meet these days. The proposed consolidation of a large number of operating interests in the low-volatile fields of West Virginia in which Isaac T. Mann, president of the Pocahontas Fuel Co., is taking a leading part is still under active discussion. In northern West Virginia negotiations have reached the stage where operators representing 17,000,000 tons annually have consented to an appraisal of their properties and an audit of their books as the first steps in reaching a consolidation agreement. The tentative plan in the northern field calls for the issuance of common stock to present owners entering the merger and the raising of working capital, if necessary, by the sale of preferred stock.

Progress is being made in the negotiations in eastern Kentucky, where Hazard operators are taking the lead. A conference to further this merger was held in Cincinnati a few days ago. It is intimated that all the details will not be ironed out before fall. A number of central Pennsylvania operators also are reported to be considering a combination, but information reaching *Coal Age* indicates that this move is still in a nebulous general conversational stage with no definite outline of plans drawn up. From Cleveland come reports that the proposed merger of Ohio No. 8 operating interests has been revived.

Plan Peace Rally in Pittston

A proposed peace rally which it was hoped would adjust conditions among workers at No. 6 colliery of the Pennsylvania Coal Co., Pittston, Pa., was arranged to be held late in the second week of March as the result of a conference in Scranton March 6 by representatives of the workers, district officers of the United Mine Workers and Mayor W. H. Gillespie of Pittston.

The men, who have been idle since Dec. 31, when the No. 6 colliery was shut down because the company asserted it was unprofitably operated, want the contract system at the colliery abolished, on the ground that it violates the five-year agreement between the operators and miners.

Since the colliery closed the district has been torn by fractional strife in the course of which there have been five murders. Those who lost their lives, all in shooting affrays, were Thomas Lillis, Jan. 18; Frank Agati, district organizer, Feb. 17; "Big Sam" Greco, an insurgent, Feb. 18; Peter (Saudargas) Reilly and Alexander Campbell, local president, Feb. 28.

Suspension Looms in Indiana; Terre Haute Parley Fails

Another mine suspension in the Indiana Coal fields on April 1 appears certain. Miners and operators of the district concluded a two day meeting Feb. 24 at Terre Haute without reaching any understanding and with the old Jacksonville agreement again the barrier.

The miners' representatives insisted throughout that the terms of the Jacksonville agreement be kept in effect. The operators insisted on a return to the scale of 1917, which provided for $5 a day for day men and 84c. a ton for loaders in pick mines.

The producers met the proposal of a continuance of the Jacksonville scale with the argument that they could not operate at a profit under it, pointing to the many idle mines in the Indiana field this winter as proof that wages were too high. The miners insisted that with the few working days they probably would get in this district the 1917 scale would not provide a living wage for the men.

Cincinnati Meeting Program Includes Live Problems

Rapid progress is being made in working out the program for the fifth annual Convention of Practical Coal Operating Men under the auspices of the American Mining Congress. More than 75 manufacturers of mining machinery and equipment have already engaged space for the exhibition to be held in connection with the convention, which will be held in Cincinnati, Ohio, May 7-11.

At the afternoon session May 7, which will consider management and safety problems, H. S. Gilbertson, Lehigh Coal & Navigation Co., will speak on the training and selection of personnel, and H. A. Treadwell, chief engineer, Chicago, Wilmington and Franklin Coal Co., on general underground supervision. Charles Enzian, Berwind-White Coal Mining Co., and J. E. Jones, Old Ben Coal Corporation, will speak on advancement of rock-dusting.

Dr. J. J. Rutledge, Maryland Bureau of Mines, will be chairman of the morning session, and Dean E. A. Holbrook, University of Pittsburgh, chairman of the afternoon session, May 8, which will consider cutting, shearing, snubbing and blasting, and ventilation in mines.

The morning session of May 9, presided over by A. C. Callen, University of Illinois, will consider power and transportation in mines. Among the speakers will be C. E. Watt, Berwind-White company, who will discuss the capacity and design of mine cars.

Dr. L. E. Young, operating vice-president, Pittsburgh Coal Co., chairman of the program committee, will preside over the afternoon session on May 9, when mechanization of mines will be considered. G. B. Southward, American Mining Congress, will give a review of the present development in mechanization. Representatives from coal-mining states who will report on

progress in mechanization include E. J. Christy, Ohio; E. E. Fyke, Illinois; J. E. Snoderly, northern West Virginia; J. E. Jenkins, Kentucky; A. W. Dickinson, Wyoming, and G. M. Gillette, Maryland.

Successful mechanized mining operations will be considered at morning and afternoon sessions May 10. A representative of the Hillman Coal & Coke Co. will speak on entry development with conveyors at the morning session. The afternoon session will be presided over by Eugene McAuliffe, president, Union Pacific Coal Co., at which one of the speakers will be T. F. McCarty, who will discuss loading top rock.

Coal cleaning methods and results will be considered at both sessions May 11. At the morning session, presided over by M. D. Cooper, Hillman Coal & Coke Co., the system of dry cleaning coal at the mine of the Berwind-White Coal Mining Co. at Windber, Pa., will be discussed by a representative of the company.

To Resume at Union Scale

Operations will begin under the Jacksonville scale soon at the Chartiers Gas Coal Co. mine near Canonsburg, Pa., officials of the company announced on Feb. 22. The mine employs 80 to 100 men. It will be the first operation in the western Pennsylvania field to resume under the Jacksonville wage basis.

Coming Meetings

American Institute of Electrical Engineers. Meeting of the Lehigh section at Hotel Casey, Scranton, March 23.

New England Coal Dealers Association. Annual convention, April 4-5, Horticultural Hall, Boston, Mass.

Indiana Fuel Conference. April 5-6, at Purdue University, Lafayette, Ind., under the direction of the Engineering Extension Department and the School of Mechanical Engineering, with the School of Chemical Engineering of Purdue University cooperating.

American Welding Society. Annual meeting, April 25-27, at 33 West 39th St., New York City.

American Mining Congress, manufacturers' division. Fifth annual convention and national exposition, May 7-11, Cincinnati, Ohio.

Mine Inspectors' Institute of America. Annual meeting, May 14-16, Lexington, Ky.

National Coal Association. Eleventh annual meeting, May 23-25, Cleveland Hotel, Cleveland, Ohio.

Western Canada Fuel Association. Annual meeting, May 28-30, at Moose Jaw, Saskatchewan, Canada.

National Association of Purchasing Agents. Thirteenth international convention and inform-a-show, May 28-31, American Royal Building, Kansas City, Mo.

American Wholesale Coal Association. Twelfth annual convention, Cincinnati, Ohio, June 4 and 5.

Illinois and Wisconsin Retail Coal Merchants' Association. Annual convention, Edgewater Beach Hotel, Chicago, June 5-7.

National Retail Coal Merchants' Association. Annual convention, June 18-20, at Swampscott, Mass.

Blasts Here and Abroad Take Toll of Lives

Thirteen miners were killed by an explosion in No. 18 mine of the Mama Coal Co., Jenny Lind, Ark., on Feb. 24. Claude Pseigel, state mine inspector, refused to advance any theory as to the cause of the blast until he had made an official investigation.

An explosion in the Kinloch mine of the Valley Camp Coal Co., New Kensington, Pa., on Feb. 20 took 12 lives and little hope was held out for the recovery of nine other imprisioned in the workings. This operation reopened on an open-shop basis about three months ago.

Two cages in the Ewald mine, near Recklinghausen, Westphalia, Prussia, plunged to the bottom of the shaft when a cable broke, killing 13 miners and injuring 35, on March 1.

Thirteen of an inspection party of 21 were killed Feb. 12 by an explosion in the Haig mine, near Whitehaven, England. The group were exploring the works for the first time since a similar disaster closed the mine last December.

New River Men Hear About New Locomotives

Electricians, foremen and other coal-mining officials in the New River field attested in striking fashion their unwavering interest in the effort to promote more efficient and safer mining methods at the monthly meeting of the Fayette County Mining Institute on Saturday evening, Feb. 11, at Mount Hope, W. Va. Nearly a hundred turned out for the meeting, although local sentiment was at a high pitch over a basketball game being played next door.

W. W. Sloane, designing engineer, Goodman Manufacturing Co., Chicago, the principal speaker, described new mine locomotives with inclosed electrical parts. The inclosing cases of this equipment, said Sloane, can be removed without the use of tools. Another advantage is that slight springing of the cover caused by pressure of an explosion on the inside does not make a larger opening for escape of flame.

Six 8-ton 600-volt cable reel and trolley gathering locomotives with the new inclosed electrical parts have been ordered by the Pittsburgh Coal Co.

Other speakers at the meeting were Robert M. Lambie and J. P. Horne. Mr. Lambie, who was introduced as the father of the institute, described briefly a test of the carbon-dioxide bomb method of coal shooting. At a mine in the Pocahontas field air samples were taken after firing one shot and after successive shots up to five in number. Even after the fifth shot appreciable vitiation of the air by presence of carbon dioxide was not indicated by chemical analysis.

J. P. Horne, who is general superintendent of mines of the Crab Orchard Improvement Co. and of the Sun mine of the Stonega Coke & Coal Co., talked briefly on supervision and safety. He said that but few injuries are "accidents." At a mine having frail and uncertain roof, injuries from falls were cut by careful supervision and constant safety compaigning to equal or better the record at average mines having much better roof.

National Coal Association Promotes Research

To crystallize thinking in the matter of technological research into the problems surrounding coal and its utilization and to promote a program for such inquiry the research committee of the National Coal Association called a meeting of 28 representatives of various governmental bureaus, engineering groups, consumer associations, organizations of manufacturers of coal-burning equipment and others on Feb. 9 at the Engineers' Club, New York City. J. P. Williams, vice-president, Melcroft Coal Co., Pittsburgh, Pa., chairman of the research committee, presided and seven officials of the National Coal Association were present.

A motion was offered by F. C. Houghten, director of research, American Society of Heating and Ventilating Engineers, New York City, that the chairman appoint a committee out of those present to formulate, if possible, some plan or plans to promote research into subjects relating to coal in which a common interest might be manifest. This committee will report informally or at another meeting specially called.

Clark and O'Neill Re-elected

That central Pennsylvania operators are unopposed to an investigation by the U. S. Senate of conditions in that field, having nothing to fear, was brought out at the annual meeting of the Central Pennsylvania Coal Producers' Association, held Feb. 21 at Altoona. Harry L. Gandy, executive secretary, National Coal Association, discussed national aspects of the industry.

B. M. Clark, Indiana, Pa., president, and Charles O'Neill, secretary-treasurer, were re-elected. Other officers chosen are: G. Webb Shillingford, vice-president; W. A. Jones, statistician; Charles A. Owen, William Wetter, J. W. Searles, B. M. Clark, James H. Allport, R. H. Somerville, M. J. Bracken, S. J. Willis, F. B. Kerr, C. B. Maxwell, Harry Boulton, F. D. Lambert, D. T. Price, Edgar W. Tait and Mr. Shillingford, directors.

Clinchfield Income Declines

The Clinchfield Coal Corporation, Dante, Va., reports for 1927 a net income of $122,547 after charges, federal taxes and depreciation, equal after preferred dividends to 30c. a share, earned on the common stock. This compares with $391,211, or $2.13 a share, in 1926.

Mine Accidents Kill 165 in January; Death Rate Falls in 1927

Accidents at coal mines in the United States in the month of January, 1928, caused the loss of 165 lives, according to information received from state mine inspectors by the U. S. Bureau of Mines. Of this number 140 were killed in bituminous mines in various states, the remaining 25 deaths occurring in the anthracite mines of Pennsylvania. Based on the total production of coal during the month, the fatality rate per million tons was 3.31, as compared with 3.42 for the same month in 1927. The output of bituminous coal alone was 44,208,000 tons, the fatality rate being 3.17 per million tons, as compared with 3.01 for January last year. Anthracite mines produced 5,690,000 tons with a fatality rate of 4.39, the corresponding rate for January last year being 7.01.

One major disaster—that is, one causing 5 or more deaths—occurred in January, 1928. This was a mine explosion at West Frankfort, Ill., on Jan. 9, as a result of which 21 men lost their lives. There were no major disasters in January, 1927.

A comparison of the principal causes of accidents in January, 1928, with those for the same month last year shows lower accident rates per million tons for haulage, explosives and electricity. The rate for gas and dust explosions was higher than in January a year ago and a small increase occurred also in the rate for falls of roof and coal.

Figures recently compiled for the calendar year 1927 show a total of 2,224 deaths from accidents at all coal mines in the United States. Of this number 1,735 occurred at bituminous mines and 489 at anthracite mines. These figures may be slightly increased on account of a few injuries in 1927 which may yet prove fatal, but as the figures stand at present they indicate a death rate of 3.70 per million tons, based upon the estimated production of coal during 1927. It is believed that the death rate of 3.70 may be increased to 3.73; if so, it still represents an improvement as compared with the death, rate for 1926, which was 3.83.

The following figures show the death rates per million tons by principal causes for January, 1928 and 1927, and for the calendar year 1927:

	Year 1927	Jan. 1927	Jan. 1928
All causes	3.704	3.420	3.307
Falls of roof and coal	1.907	1.639	1.804
Haulage	.586	.662	.481
Gas or dust explosions:			
Local explosions	.153	.221	.060
Major explosions	.258	.....	.421
Explosives	.183	.173	.060
Electricity	.167	.158	.120

Mine Office Destroyed

Fire of unknown origin recently destroyed the district office building of the Vandalia Coal Co., west of Dugger, Ind. The contents of the building were lost, including records and maps of the corporation which cannot be replaced.

Soft Coal Stocks on Jan. 1 Show Decline

Consumers' stocks of bituminous coal on Jan. 1, 1928, amounted to 55,500,000 tons, according to the latest report of the U. S. Bureau of Mines. On Oct. 1, 1927, the date of the last preceding survey, the stocks were 61,900,000 tons. In October production was slightly less than consumption and stocks declined 600,000 tons, reaching 61,300,000 tons on Nov. 1. Thereafter production declined sharply and in the last two months of the year the stocks decreased 5,800,000 tons. The total withdrawn from storage between Oct. 1 and Jan. 1 was thus 6,400,000 tons.

The reduction of stocks took place in spite of the fact that a slowing down of general business curtailed the demand for coal. The average rate of consumption in the last quarter of 1927 was 9,912,000 tons a week, as against 11,200,000 tons in the corresponding period of 1926. Exports also were low, averaging 273,000 tons a week. The total consumption plus exports was thus 10,185,000 tons a week.

In addition to the coal in the hands of consumers there were 8,409,453 tons of bituminous coal and 1,037,594 tons of anthracite on the docks of Lakes Superior and Michigan on Jan. 1. In comparison with a year ago this was an increase of 2,842,203 tons of bituminous coal and of 44,488 tons of anthracite.

Retail coal yards were well stocked with anthracite on Jan. 1. The dealers reporting had a supply sufficient to last 57 days as against 54 days on Jan. 1 a year ago.

Coal-Mine Fatalities During January, 1928, by Causes and States

(Compiled by Bureau of Mines and published by *Coal Age*)

State	Underground												Shaft					Surface							Total by States	
	Falls of roof (coal, rock, etc.)	Falls of face or pillar coal.	Mine cars and locomotives.	Explosions of gas or coal dust.	Explosives.	Suffocation from mine gases.	Electricity.	Animals.	Mining machines.	Mine fires (burned, suffocated, etc.).	Other causes.	Total.	Falling down shafts or slopes.	Objects falling down shafts or slopes.	Cage, skip or bucket.	Other causes.	Total.	Mine cars and mine locomotives.	Electricity.	Machinery.	Boiler explosions or bursting steam pipes	Railway cars and locomotives.	Other causes.	Total.	1928	1927
Alabama	2	....	2	....	....	....	....	....	....	....	....	4	....	....	....	....	....	....	....	....	....	....	....	....	4	6
Alaska	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0
Arkansas	2	....	....	2	....	....	....	....	....	....	....	4	....	....	....	....	....	....	....	....	....	....	....	....	4	2
Colorado	2	....	....	....	....	....	1	....	....	....	....	3	....	....	....	....	....	....	....	....	....	....	....	....	3	8
Illinois	7	....	3	21	....	....	....	....	....	....	....	31	....	....	....	....	....	....	....	....	....	1	....	1	32	20
Indiana	4	....	....	....	....	....	....	....	....	....	....	4	....	....	....	....	....	....	....	....	....	....	....	....	4	3
Iowa	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	1
Kansas	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0
Kentucky	10	....	1	....	....	....	....	....	....	....	....	11	....	....	....	....	....	....	....	....	....	....	....	....	11	27
Maryland	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0
Michigan	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	1
Missouri	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	1
Montana	....	....	....	....	....	....	1	....	....	....	....	1	....	....	....	....	....	....	....	....	....	....	....	....	1	1
New Mexico	1	....	1	....	....	....	....	....	....	....	....	2	....	....	....	....	....	....	....	....	....	....	....	....	2	2
North Dakota	1	....	....	....	....	....	....	....	....	....	....	1	....	....	....	....	....	....	....	....	....	....	....	....	1	0
Ohio	5	....	....	....	....	....	....	....	....	....	....	5	....	....	....	....	....	....	....	....	....	....	....	....	5	7
Oklahoma	1	....	....	1	....	....	....	....	....	....	....	2	....	....	....	....	....	....	....	....	....	....	....	....	2	2
Pennsylvania (bituminous)	9	6	3	....	1	....	2	....	....	....	3	24	....	....	....	....	....	2	....	....	....	1	....	3	27	36
South Dakota	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0
Tennessee	1	....	....	....	....	....	....	....	....	....	....	1	....	....	....	....	....	....	....	....	....	....	....	....	1	3
Texas	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0
Utah	2	....	....	....	....	....	....	....	....	....	....	2	....	....	....	....	....	....	....	....	....	....	....	....	2	1
Virginia	2	....	1	....	....	....	1	....	....	....	....	4	....	....	....	....	....	....	....	....	....	....	....	....	4	2
Washington	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	1
West Virginia	17	4	10	....	....	....	1	....	....	....	....	32	....	1	1	....	2	....	....	1	....	....	....	1	35	43
Wyoming	....	1	1	....	....	....	....	....	....	....	....	2	....	....	....	....	....	....	....	....	....	....	....	....	2	4
Total (bituminous)	66	11	24	24	1	....	6	....	....	....	3	133	....	1	1	....	2	2	....	1	....	2	....	5	140	171
Pennsylvania (anthracite)	9	4	2	....	2	....	....	1	....	....	2	20	....	....	1	....	1	1	....	1	....	....	2	4	25	46
Total, January, 1928	75	15	24	24	3	....	6	1	....	....	5	153	....	1	2	....	3	3	....	2	....	2	2	9	165	.....
Total, January, 1927	91	13	42	14	11	2	10	1	4	1	8	197	1	....	2	....	3	8	....	1	....	2	6	17	.....	217

A.I.M.E. Honors Hoover Amid Oratory; G. O. Smith Elected President

HERBERT HOOVER was the recipient this year of the William Lawrence Saunders mining medal, awarded by the American Institute of Mining and Metallurgical Engineers on Feb. 21 during its annual meeting in New York City. This was the big event of the annual banquet, which otherwise would have been mere refreshment preliminary to a dance. All the past presidents had promised to bottle up their oratory, but when it was announced that Mr. Hoover would be present the speech-making became the biggest attraction of the evening even though the galaxy of past presidents remained under the ban of silence.

Mr. Hoover said: "The pressure of national development advanced our American practice beyond that of the rest of the world. Moreover, the skill of our engineers of that period [40 years ago] owes a great debt to American educators. The leaders of our universities were the first of all the educators of the world to recognize that upon them rested the responsibility to provide fundamental training in the application of science to engineering under the broadening influence and cultivation of university life.

"They were the first to realize that engineering must be transformed into a profession in the highest sense. Our universities poured into our development a great stream of men with this background and training.

"Another feature that after a while came to distinguish American engineering was its transformation from solely a technical profession to a profession of administrators, creating the business manager with technical training.

"Our American engineering practice in many branches, particularly in mines, transportation and electricity, became the envy and ideal of the world. American engineers were solicited to install American methods and American machinery abroad. The first of these demands came from South Africa of such men as Hamilton Smith, of Hennen and Sydney Jennings, of John Hays Hammond. Quickly their brilliant success created a demand for more and more of their kind, followed by hundreds of others.

"The exchange of engineering experience and scientific discovery between nations is one form of internationalism that is beyond any reservations. America has made notable contributions to this advancement. Our metallurgy, our underground engineering, our many inventions for the saving of labor in every industry—our revolution in communications and scores of other directions have been but part of our contribution to the common pool of human knowledge; and we have received more than we have given. We inherited a great store of knowledge from our European forebears and in many branches we have been at times the importers of foreign engineers.

"As our population grows in numbers, as our problems become more complex, so does also grow the need for wider and wider vision of the engineering profession. Our problems of transportation, of housing, of power, of communication, of economical use of our natural resources, of safety and protection to our people, now require long planning in advance. We no longer have a right to think in terms of our own generation. A greater America for our children will in large degree depend upon the engineering profession."

Herbert Hoover

The medal was presented to Mr. Hoover by C. F. Kelley, president of the Anaconda Copper Mining Co. The James Douglas medal was presented by Scott Turner, Director, U. S. Bureau of Mines, to Selwyn G. Blaylock, general manager, the Consolidated Mining & Smelting Co. of Canada, and the Robert W. Hunt medal by J. V. W. Reynders to J. A. Matthews, vice-president of the Crucible Steel Co. of America. The Hunt prize was awarded to C. H. Hartz, Jr., of the U. S. Bureau of Mines, for distinguished work in nonferrous metallurgy, and the J. E. Johnson award to P. H. Royster, of the Fixed Nitrates Laboratories, for distinguished work on blast-furnace problems. After short addresses by E. DeGolyer, president of the institute, and George Otis Smith, Director of U. S Geological Survey, the incoming president, the members and guests adjourned for dancing.

With a probable accession of $118,000 to its fund the institute can look forward to strengthening its service to the members in the far West. This windfall comes by way of a consolidation with the Rocky Mountain Club of New York, which was founded in 1907 for social purposes. That institution collected $1,000,000 for the erection of a clubhouse, but during the war it used these funds almost entirely for the relief of the Belgians and the entertainment of soldiers going and returning from the front. However, some land remained which has been sold and the proceeds deposited. The activities of the club have long ago come to an end. There are 615 members, of whom about 200, including seven past presidents of the institute, belong to the A.I.M.E.

George Otis Smith was elected president of the institute. For vice-president and directors the following were elected: G. D. Barron and W. H. Bassett; for directors H. C. Bellinger, Karl Eilers, H. G. Moulton, J. V. N. Reynders and R. E. Talley. At the board of directors' meeting on Feb. 22 Karl Eilers was re-elected treasurer and H. Foster Bain, secretary.

The treasurer reported receipts of $188,984.61 and expenditures of $177,741.56 or a gain of $11,243.05, a result hardly anticipated early in the year. The assets of the institute are valued at $792,927.21. The total membership at the close of 1927 was 8,560, whereas at the close of last year it had fallen to 8,438.

Illinois Rates Cut 5 Cents

Freight rates on coal from all Illinois mines to Chicago will be reduced 5c. per ton effective April 14. An order reducing the tariffs was issued by the Illinois Commerce Commission on March 1.

Obituary

THOMAS DEVENNY, president of the Williamson Coal Co., Freeburn, Ky., and general manager of the Portsmouth Coke & By-Products Co., Portsmouth, Ohio, died Feb. 13 in a Philadelphia (Pa.) hospital following an operation. Though only 39 years old, Mr. DeVenny has won a place of prominence and esteem in the high-volatile trade.

WILLIAM SLOAN, Minister of Mines for British Columbia since 1916 and Provincial Secretary from 1924 to 1927, died March 2 at Victoria, B. C., after a stroke of apoplexy. He was 61 years old.

WILLIAM H. TAYLOR, president of the St. Clair Coal Co., Scranton, Pa., and also prominently identified with numerous other enterprises, died at his home in New York City, Feb. 28, at the age of 68. He organized the St. Clair Coal Co. in 1895. He also owned the Hazleton Machinery & Supply Co. and the Scranton Supply & Machinery Co.

ROBERT L. IRELAND, formerly a well known operator in the Ohio field, was found dead on the night of Feb. 17 in his apartment in the Hotel Seymour, New York City. There were four bullet wounds in the body, which the police pronounced self-inflicted.

ERNEST MCCOY, president of the McCoy Coal Co., Fairmont, W. Va., was instantly killed Feb. 19 near Mount Morris, Pa., when his automobile skidded and crashed into a culvert abutment. He was 57 years old.

Current Prices of Mining Supplies

SINCE LAST MONTH

ADVANCES in prices of steel shapes, railway spikes, iron and steel scrap, trolley wire, and bare copper wire are offset by declines in March prices of cast-iron pipe, non-ferrous metal scrap, brattice cloth, and feeder cable, at principal centers of distribution. The price of No. 14 solid two-conductor feeder cable is $29 per M. ft., against $30 last month, in larger buying centers east of the Mississippi. The advance in copper wire affects all grades to the extent of ⅝c. per lb. The decline of $1 per ton on c.-i. pipe occurred at Birmingham and Burlington (N. J.) mills, affecting delivered quotations in all cities.

STEEL RAILS—The following quotations are per ton, f.o.b., in carloads:

	Pittsburgh	Birmingham	Chicago
Standard Bessemer rails	$43.00	$43.00	$43.00
Standard open-hearth rails	43.00	43.00	43.00
Light rails, 25 to 45 lb	36.00	34@36	1.80@1.90*

*Per 100 lb.

TRACK SUPPLIES—The following prices are base per 100 lb. f.o.b. Pittsburgh mill for carloads, together with warehouse prices at Chicago and Birmingham:

	Pittsburgh	Chicago	Birmingham
Standard spikes, ½-in. and larger	$2.75@$2.80	$3.55	$3.00
Track bolts	3.80	4.55	3.90
Standard section angle bars, splice bars or fishplates	2.75	3.40	2.95

WROUGHT STEEL PIPE—From warehouses at the places named the following discounts hold for welded steel pipe:

	Black		
	New York	Chicago	St. Louis
1 to 3 in. butt welded	53%	54%	49%
2½ to 6 in. lap welded	48%	51%	46%
	Galvanized		
	New York	Chicago	St. Louis
1 to 3 in. butt welded	39%	41%	36%
2½ to 6 in. lap welded	35%	38%	33%

WROUGHT-STEEL PIPE LIST

Size, Inches	List Price per Foot	Diameter in Inches, External	Diameter in Inches, Internal	Thickness Inches
1	$0.17	1.315	1.049	.133
1¼	.23	1.66	1.38	.14
1½	.27½	1.9	1.61	.145
2	.37	2.375	2.067	.154
2½	.58½	2.875	2.469	.203
3	.76½	3.5	3.068	.216
3½	.92	4.0	3.548	.226
4	1.09	4.5	4.026	.237
4½	1.27	5.0	4.506	.247
5	1.48	5.563	5.047	.258
6	1.92	6.625	6.065	.28

CAST-IRON PIPE—Prices per net ton for Class B in carloads.

	Birmingham	Burlington, N. J.	New York
4 in.	$30.00	$37.00	$39.60
6 in. and over	27.00	34.00	36.60

	Pittsburgh	Chicago	St. Louis	San Francisco
4 in.	$38.50	$38.20	$35.60	$41.00
6 in. and over	35.50	35.20	32.60	38.00

Gas pipe and Class "A," $3.00 per ton extra.

BOLTS AND NUTS—Discounts from new list, Apr. 1, 1927, on immediate deliveries from warehouse in New York and vicinity: Machine bolts, square heads and nuts, up to 1x30-in., full packages, 50%; Carriage bolts up to ½ x 6-in., full packages, 55%; Nuts, hot-pressed or cold-punched, blank or tapped, square or hexagonal, full packages, 55%.

STEEL PLATES—Following are base prices per 100 lb. in carloads, f.o.b., for ¼-in. thick and heavier:

Pittsburgh $1.90 Birmingham $2.00@$2.05

STRUCTURAL RIVETS—The following quotations are per 100 lb., in carloads, f.o.b. mill, for ½-in.:

Pittsburgh $2.75 Cleveland $2.75 Chicago $2.85

WIRE ROPE—Discounts from list price on regular grades of bright and galvanized, in New York and territory east of Missouri River:

	Per Cent
Plow steel round strand rope	35
Special steel round strand rope	30
Cast steel round strand rope	20
Round strand iron and iron tiller	5
Galvanized steel rigging and guy rope	7½
Galvanized iron rigging and guy rope (add to list)	12½

RAIL BONDS—Stranded copper, 28-in., 4/0, arc welded, at points east of the Mississippi, price per 100, $90.36.

DRILL ROD—Discounts from list:

New York 60% Cleveland 55% Chicago 50%

FRICTION TAPE—Size ¾-in. in 100 lb. lots in Eastern territory, per lb., $0.29

RAILWAY TIES—For fair-sized orders, the following prices per tie hold:

	6 In. x 8 In. by 8 Ft.	7 In. x 9 In. by 8½ Ft.
Chicago, white oak, plain	$1.40	$1.78
Chicago, empty cell creosoted	1.80	2.40
Chicago, zinc treated	1.60	2.10
St. Louis, white oak, plain	1.25	1.50
St. Louis, zinc treated	1.65	1.90
St. Louis, red oak, plain	1.15	1.40
Birmingham, white oak	1.25	1.45

STEEL MINE TIES—Prices range from $0.38 to $0.60 per tie, f.o.b. Pennsylvania and West Virginia districts, depending on quantity, gage of track and weight of rail.

CALCIUM CARBIDE—In drums, round lots in New York market, per lb., $0.05@$0.06.

BRATTICE CLOTH—Prices f.o.b. cars New York, Philadelphia, St. Louis or Chicago, per sq.yd.:

Jute, 24-oz., double warp	$0.21	Jute, waterproof	$0.28
Jute, 22-oz.	.18	Duck, waterproof	.34
Jute, 18-oz.	.15	Duck, non-inflammable	.32
Old sail cloth	.59		

COTTON WASTE—The following prices are in cents per lb.:

	New York	Cleveland	Chicago
White	10.00@13.50	16.00	15.00@20.00
Colored	9.00@13.00	12.00	12.00@17.00

MACHINE OIL—Medium bodied, in 55 gal. metal barrels, per gal., as follows,

New York $0.27 Cleveland $0.35 Chicago $0.26

SCRAP IRON AND STEEL—The prices following are f.o.b. per gross ton paid by dealers:

	New York	Chicago*	Pittsburgh
No. 1 railroad wrought	$10.50@$11.00	$11.25@$11.75	$11.00@$11.50
Stove plate	8.75@ 9.00	12.25@ 12.75	.....
No. 1 machinery cast	13.00@ 14.00	13.75@ 14.25	14.50
Machine shop turnings	6.75@ 7.50	7.50@ 8.00	11.00@ 11.50
Cast borings	6.75@ 7.50	8.50@ 9.00	11.00@ 11.50
Railroad malleable	10.00@ 10.50	11.50@ 12.00	14.75@ 15.25
Re-rolling rails	10.50@ 11.00	13.00@ 13.50	.....
Re-laying rails	23.00@ 24.00	.....	.....
Heavy melting steel	7.00@ 10.75	11.25@ 11.75	14.75@ 15.25

*Per net ton.

SCRAP COPPER AND BRASS—Dealers' purchasing prices in cents per lb.:

	New York	Cleveland	Chicago
Crucible copper	12.25 @ 12.50	11.50	11.00@ 11.50
Copper, heavy, and wire	11.50 @ 12.25	10.75	10.25@ 11.00
Copper, light, and bottoms	10.25 @ 10.75	9.50	9.25@ 9.75
Brass, heavy, yellow	7.12½@ 7.37½	7.25	7.00@ 7.50
Brass, heavy, red	9.00 @ 9.50	9.75	9.00@ 9.25
Brass, light	5.50 @ 6.00	5.75	6.00@ 6.50
No. 1 yellow rod turnings	7.25 @ 7.75	7.50	7.00@ 5.50

COPPER WIRE—Prices of bare wire, base, at warehouse, in cents per lb. are as follows:

New York 19.37½ Cleveland 19.37½ Chicago (mill) 16@16½

TROLLEY WIRE—In carload lots, f.o.b., producing point, all sizes, per lb.:

Round $0.1587½ Grooved $0.1612½ Fig. 8 $0.1662½

TROLLEY WHEELS—F.o.b. Jersey City, N. J., 4-in., $1.00@$1.20 each; 6-in., $1.70@$1.90 each.

MINING MACHINE CABLE—F.o.b. producing point, net, per M. ft.:

No. 2 Duplex, Flat, Braided		Two Conductor, Round, Rubber Sheathed	
Size 2	$165.00	Size 2	$607.00
Size 3	147.00	Size 3	512.00
Size 4	129.60	Size 4	427.00

LOCOMOTIVE CABLE—F.o.b. producing point, single conductor, braided, per M. ft.:

Size 3 $81.80 Size 4 $73.50

FEEDER CABLE—Price per M. ft. in larger buying centers east of the Mississippi:

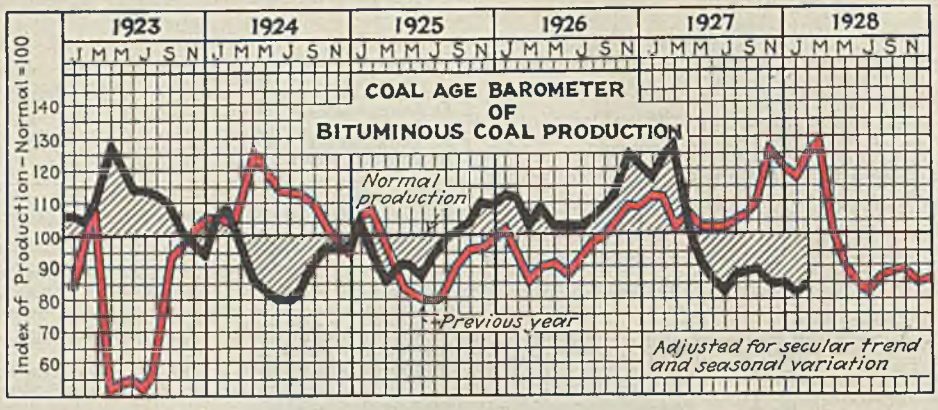
B. & S. Size	Two Conductor	Three Conductor
No. 14 solid	$29.00 (net)	$44.00 (net)
No. 12 solid	136.00	180.00
No. 10 solid	185.00	235.00
No. 8 stranded	305.00	375.00
No. 6 stranded	440.00	530.00

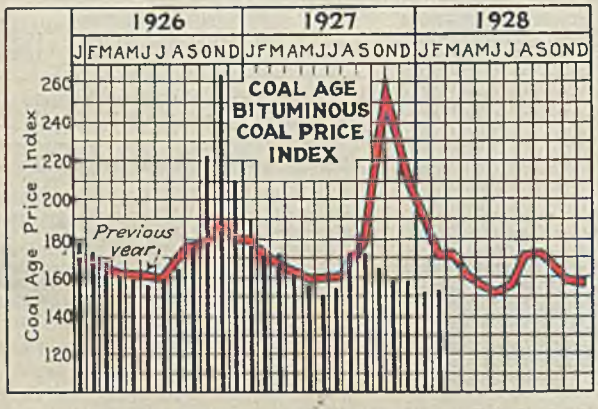
From the above lists discounts are: Less than coil lots, 50%; Coils to 1,000 ft., 60%; 1,000 to 5,000 ft., 65%; 5,000 ft. and over, 67%.

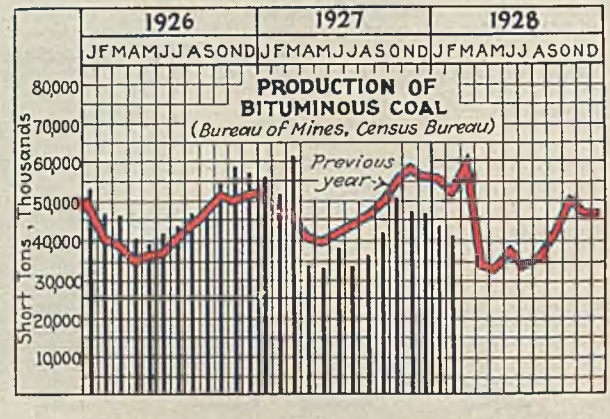
EXPLOSIVES—F.o.b. in carload lots:

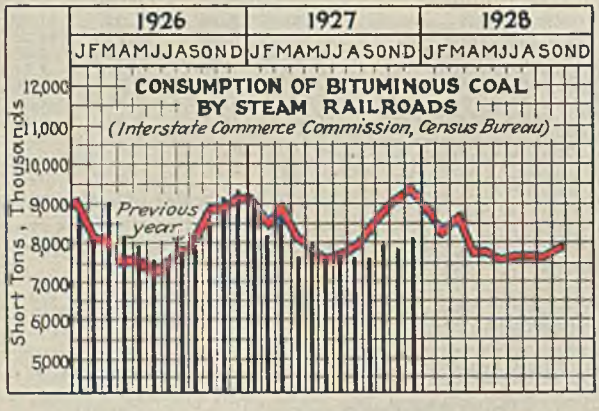
Black Powder, FF, $NaNO_3$ base, 800 kegs per car, per 25 lb. keg	Districts: West Virginia	Pennsylvania	Missouri
	$1.70@$1.80	$1.70	$1.75
Ammonium permissible 1¼ x 8 in. sticks, 20,000 lb. per car, per 100 lb.	14.50@15.50	14.25	14.50

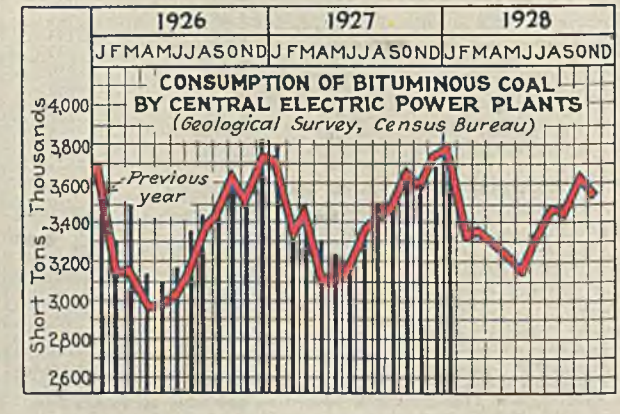
Indicators of Activities in the Coal Industry

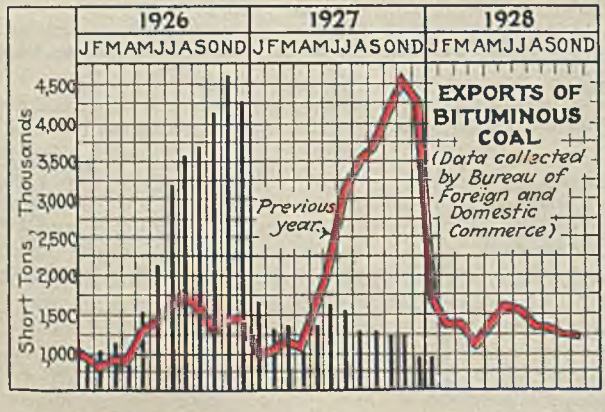


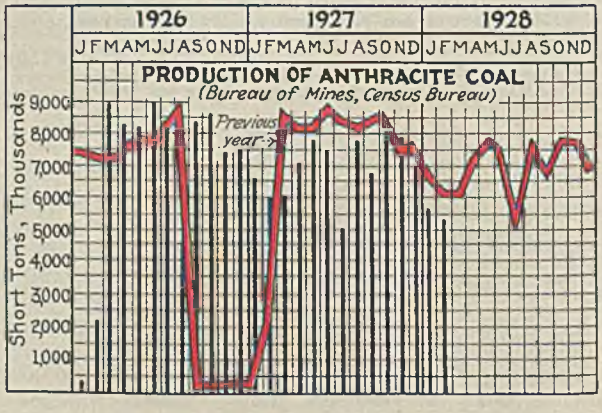












MARKETS *in Review*

BITUMINOUS coal markets of the United States reflected the normal seasonal decline and unevenness during February. On the industrial side conditions in manufacturing lines generally were not of a character to call for any increase in consumption of coal for power purposes. Weather stress, where and when felt, was not severe so that the coal producer received little incentive to increased output from that source.

The possibility of another suspension in Illinois, Indiana and the Southwest on April 1 seemed to have no terrors for the industrial buyer. This calmness is readily understandable in view of the situation in the non-union bituminous districts and the protection still afforded manufacturing plants by reserve stocks accumulated nearly a year ago.

At the present time the non-union mines are furnishing approximately 77 per cent of the current output—and this tonnage could be increased materially if the demand for it could be found. Indeed, the common complaint heard from both union and non-union fields is that the orders in sight fall short of giving a majority of the well-situated operations anything approaching full running time.

WHEN mines which enjoy advantages in production costs by reason of natural operating conditions, competitive wage scales or both are unable to book enough business for current shipment to assure steady running five or six days a week, it is easy to see why the possibility of another suspension of production in the fields mentioned alarms nobody but the coal interests and railroads directly concerned. It also helps to explain the decline in daily production which is registered by the February figures on output.

Coal consumption in the United States during the last quarter of 1927 was estimated at 1,652,000 tons per day. Daily output in February slightly exceeded that figure by 6,000 tons. Stocks on hand on Feb. 1 were estimated by the National Association of Purchasing Agents at 50,595,000 tons. It seems reasonable to assume, therefore, that the draft, if any, upon stocks the past month was not heavy. Railroad stocks on Feb. 1 were 14,073,700 tons.

WHAT will happen in the unionized fields April 1 is something upon which no spokesman for the industry will venture public opinion. In many quarters, however, the belief is held that any suspension will be of short duration. Operators in the affected areas are frankly disgusted with the turn the February negotiations took.

Rumors as to future action and understandings are many, but these all seem speculative. Some interests believe that the workers themselves will demand a resumption of negotiations on a basis acceptable to the operators. Others look for breaks in the producers' ranks.

The most notable developments in the price situation during the month were the sharp cut made in circular quotations on domestic coals in the Illinois and Indiana fields and the pronounced weakness which developed for a time in spot figures on Eastern high-volatile slack, some of which sold as low as 25c. Average prices for the country as a whole were higher than in January. During the week ended Feb. 4 the weighted average was $1.87; week ended Feb. 11 $1.86; week ended Feb. 18 $1.84; week ended Feb. 25 $1.86. *Coal Age* Index of spot bituminous prices for those weeks was 154, 153, 151 and 153, respectively.

NEITHER the threat of a renewed suspension April 1 nor the sharp reductions in prices on domestic coal stimulated demand in the Chicago market last month. Weather offered intermittent aid, but buying under that stimulus was limited to fuel for current consumption. When the mercury rose retail deliveries sank to a summer basis with delivery equipment 35 to 50 per cent idle.

The lead in reduction in prices was taken by southern Illinois operators with a slash of 75c. on lump Feb. 10. This was followed by a stiffening in quotations on fine coal. The latter development, however, was due more to trading between the operators themselves and orders by middlemen seeking to protect low-price business than to any increase in demand from the industrial consumer.

Weather controlled the movement of low-volatile Eastern coals into the Midwestern area, with retailers showing a preference for spot tonnage because many wanted to make deliveries directly from the cars. Lump lagged behind egg and nut; standard shippers were ten days to two weeks behind on orders for the smaller sizes. Mine-run was held at $1.75@$2.25, with the bulk of the buying at the high end.

Current Quotations—Spot Prices, Anthracite—Gross Tons, F.O.B. Mines

	Market Quoted	Week Ended Feb. 4, 1928 Independent	Feb. 4, 1928 Company	Feb. 11, 1928 Independent	Feb. 11, 1928 Company	Feb. 18, 1928 Independent	Feb. 18, 1928 Company	Feb. 25, 1928 Independent	Feb. 25, 1928 Company
Broken	New York	.....	$8.25@$8.75	.....	$8.25@$8.75	.....	$8.25@$8.75	.....	$8.25@$8.75
Broken	Philadelphia	$8.50@$8.75	8.25@ 8.50	$8.50@$8.75	8.25@ 8.50	$8.50@$8.75	8.25@ 8.50	$8.50@$8.75	8.25@ 8.50
Egg	New York	8.50@ 8.75	8.75	8.50@ 8.75	8.75	8.25@ 8.75	8.75	8.15@ 8.60	8.75
Egg	Philadelphia	8.75@ 9.30	8.75@ 8.85	8.75@ 9.30	8.75@ 8.85	8.75@ 9.30	8.75@ 8.85	8.75@ 9.30	8.75@ 8.85
Egg	Chicago*	8.13	8.13	8.13	8.13	8.13	8.13	8.13	8.13
Stove	New York	8.75@ 9.25	9.25	8.75@ 9.00	9.25	8.75@ 9.25	9.25	8.50@ 9.00	9.25
Stove	Philadelphia	9.25@ 9.75	9.25	9.25@ 9.75	9.25	9.25@ 9.75	9.25	9.25@ 9.75	9.25
Stove	Chicago*	8.58	8.58	8.58	8.58	8.58	8.58	8.58	8.58
Chestnut	New York	8.50@ 8.75	8.75	8.50@ 8.75	8.75	8.50@ 8.75	8.75	8.25@ 8.75	8.75
Chestnut	Philadelphia	8.75@ 9.25	8.75	8.75@ 9.25	8.75	8.75@ 9.25	8.75	8.75@ 9.25	8.75
Chestnut	Chicago*	8.13	8.13	8.13	8.13	8.13	8.13	8.13	8.13
Pea	New York	5.50@ 6.00	6.00@ 6.50	5.50@ 6.00	6.00@ 6.50	5.50@ 6.00	6.00@ 6.50	5.00@ 6.00	6.00@ 6.50
Pea	Philadelphia	5.75@ 6.50	6.00	5.75@ 6.50	6.00	5.75@ 6.50	6.00	5.75@ 6.50	6.00
Pea	Chicago*	6.10	6.10	6.10	6.10	6.10	6.10	6.10	6.10
Buck	New York	2.90@ 3.25	†3.00@ 3.25	2.75@ 3.00	†3.00@ 3.25	2.75@ 3.00	†3.00@ 3.25	2.75@ 3.25	†3.00@ 3.25
Buck	Philadelphia	3.00@ 3.50	3.00@ 3.25	3.00@ 3.50	3.00@ 3.25	3.00@ 3.50	3.00@ 3.25	3.00@ 3.50	3.00@ 3.25
Rice	New York	2.25@ 2.40	2.00@ 2.25	2.15@ 2.35	2.00@ 2.25	2.15@ 2.35	2.00@ 2.25	2.00@ 2.25	2.00@ 2.25
Rice	Philadelphia	2.00@ 2.25	2.00@ 2.15	2.00@ 2.25	2.00@ 2.15	2.00@ 2.15	2.00@ 2.15	2.00@ 2.15	2.00@ 2.15
Barley	New York	1.50@ 1.65	1.50@ 1.75	1.50@ 1.60	1.50@ 1.75	1.60@ 1.75	1.50@ 1.75	1.35@ 1.50	1.50@ 1.75
Barley	Philadelphia	1.50@ 1.75	1.50@ 1.60	1.50@ 1.75	1.50@ 1.60	1.50@ 1.75	1.50@ 1.60	1.50@ 1.75	1.50@ 1.60
Birdseye	New York	.....	1.60	.....	1.60	.....	1.60	.....	1.60

* Net tons, f.o.b. mines. † Domestic buckwheat (D.L.W.) $3.75.

EASTERN high-volatiles found rough sledding in the Chicago market, with block and egg prices covering a wide range. Only a fair demand was reported for anthracite, with receipts from the mines below normal for this season of the year. The situation in byproduct coke for domestic consumption closely paralleled that prevailing in hard coal.

Prices on Illinois coal in the St. Louis market moved in sympathy with changes at Chicago. Aside from these changes, spot trading was without distinguishing feature. As for months past the war for business between the Illinois group and the coals from western Kentucky goes merrily on, with price in many cases the determining factor in placing the order.

Louisville traders complained of slack demand throughout the month but a dispassionate analysis of the situation fails to indicate that conditions differed substantially from those normal at this period of the year. Growth of purchased power has, of course, narrowed the market for industrial sales. The mild weather also has taken toll of tonnage affecting both retail business and demand for industrial heating.

IT IS true, of course, that Kentucky has suffered on the production side since the resumption of operations in Illinois and Indiana. What will happen north of the river after April 1, therefore, is a question which is much under discussion. This uncertainty is entering into consideration of contract renewals on steam business. The refusal of the Interstate Commerce Commission to allow the Southern lines to reduce their rates to the lakes is being magnified in discussions of the Northwest trade.

Prices during February worked lower but mines in the state were said to have averaged 50 per cent running time. With the falling off in demand for screened sizes further increases in spot quotations on slack coal are anticipated. Consolidation of sales effort — particularly in western Kentucky—also promises to exercise a stabilizing influence upon the market situation.

Business at the Head of the Lakes during the past month was a creature of the thermometer. Real interest in that section of the country, however, centers less upon the tag-ends which may be picked up in the next few weeks than in the possibilities for the new season of navigation. According to present indications there will be nothing started up the lakes before May 1—approximately three weeks later than last year.

QUOTATIONS on Kansas coal in the Kansas City market were unchanged last month, but the undertone to prices on domestic sizes were weaker. Slow demand for these grades has resulted in reduced production schedules which promise to add strength to the quotations on steam coal. Arkansas figures were less stable and semi-anthracite lump sold all the way from $3.50 to $5, with the harder-structure coals commanding the top of the range. Paris lump was held at $5.50.

The Colorado market also was very sluggish during February. Late in the month 530 "no bills" were reported in the southern field. Prices on domestic coals held to the January range, viz.: Walsenburg-Canon City domestic lump, $5.75; washed nut, $4.75; washed chestnut, $3.25; Trinidad coking lump, $4.25; nut, $3.75; chestnut, $3.25; Routt County lump, $5.75; nut, $4.75; Crested Butte anthracite, $9@$9.50; Kemmerer-Rock Springs lump, $4.50; nut, $4. Steams from Colorado and Wyoming ranged from $1.25 to $1.50.

Business through the Cincinnati gateway was at a low ebb last month. Shipments have been off 1,500 to 3,000 cars weekly when compared with 1927 and the total moving through the gateway the week ended Feb. 25 was the lowest in six months. The refusal of the Interstate Commerce Commission to grant the reductions prayed for by the Southern coalers on lake traffic intensified the gloom which hung over the market after the collapse of a brief weather pick-up.

SMOKELESS coal fared better than high volatile, with egg the star. The contract price on this size last month was $3.75 but sales at $4 were not infrequent. Lump, on the other hand, at times sold 25c. under contract. Stove and washed nut were $3@$3.50; raw nut stiffened to $2.50@$2.75. Mine-run got a poor start at a $2@$2.25 range, but strengthened as the month advanced. Slack was weak, with unbilled loads a problem that had disquieting effects for some shippers.

In the high-volatile division slack coal was a distinct liability to the unfortunate producers. Midmonth some fairly large blocks went at 25@40c., but later the levels advanced to 85@90c., with few offerings down to 50c. and some quotations up to $1. Egg also wobbled, tumbling to $1.50; some shipments were applied on mine-run orders. Lump quotations covered a wide range, with West Virginia coal $1.75@$3 and Kentucky, $2.75@$3.25.

The Columbus trade was quiet. Aside from declining prices and falling demand the situation differed in no material respect from that prevailing in January. Retail buying followed the thermometer; steam business was moribund, but little inroad seems to have been made on industrial stockpiles. Lack of demand holds down production at non-union Ohio Mines. Cleveland also reported a colorless month in the coal trade in northern Ohio.

THE problem in the Pittsburgh district is not one of recruiting working forces to man open-shop operations but to develop enough business to keep existing organizations intact. As a result, prices, which held fairly steady during the first three weeks of the month slipped off towards the close of February as other operators tried to follow the lead of one of the larger producers. Both demand and spot

Current Quotations—Spot Prices, Bituminous Coal, Net Tons, F. O. B. Mines

		Week Ended—			
LOW-VOLATILE, EASTERN	Market Quoted	Feb. 4, 1928	Feb. 11, 1928	Feb. 18, 1928	Feb. 25, 1928
Smokeless lump	Columbus	$3.50@$3.75	$3.50@$3.75	$3.50@$3.75	$3.50@$3.75
Smokeless mine-run	Columbus	1.75@ 2.25	1.75@ 2.00	1.75@ 2.00	1.75@ 2.00
Smokeless screenings	Columbus	.75@ 1.00	.65@ 1.00	.60@ 1.00	.50@ 1.00
Smokeless lump	Chicago	3.50@ 3.75	3.50@ 3.75	3.50@ 3.75	3.50@ 3.75
Smokeless mine-run	Chicago	1.85@ 2.25	1.85@ 2.25	1.75@ 2.25	1.75@ 2.25
Smokeless lump	Cincinnati	3.75	3.75	3.75@ 4.00	3.75@ 4.00
Smokeless mine-run	Cincinnati	2.00@ 2.25	2.00@ 2.25	2.15@ 2.25	2.25
Smokeless screenings	Cincinnati	.50@ 1.00	.50@ 1.00	.50@ 1.10	.50@ 1.25
*Smokeless mine-run	Boston	4.10@ 4.25	4.05@ 4.25	3.85@ 4.15	3.75@ 4.10
Clearfield mine-run	Boston	1.65@ 1.90	1.65@ 1.85	1.60@ 1.85	1.60@ 1.85
Cambria mine-run	Boston	1.75@ 2.00	1.75@ 2.00	1.70@ 2.10	1.70@ 2.10
Somerset mine-run	Boston	1.90@ 2.10	1.90@ 2.10	1.85@ 2.00	1.80@ 2.00
Pool 1 (Navy Standard)	New York	2.50@ 2.65	2.40@ 2.65	2.40@ 2.65	2.40@ 2.65
Pool 1 (Navy Standard)	Philadelphia	2.50@ 2.80	2.50@ 2.80	2.50@ 2.80	2.50@ 2.80
Pool 1 (Navy Standard)	Baltimore	2.15@ 2.25	2.15@ 2.25	2.15@ 2.25	2.15@ 2.25
Pool 9 (super. low. vol.)	New York	1.90@ 2.15	1.90@ 2.15	1.90@ 2.15	1.90@ 2.10
Pool 9 (super. low. vol.)	Philadelpnia	1.95@ 2.25	1.95@ 2.25	1.95@ 2.25	1.95@ 2.25
Pool 9 (super. low. vol.)	Baltimore	1.75@ 1.80	1.75@ 1.80	1.75@ 1.80	1.75@ 1.80
Pool 10 (h. gr. low. vol.)	New York	1.65@ 1.90	1.65@ 1.90	1.65@ 1.90	1.65@ 1.90
Pool 10 h. gr. low. vol.)	Philadelphia	1.65@ 1.85	1.65@ 1.85	1.65@ 1.85	1.65@ 1.85
Pool 10 (h. gr. low. vol.)	Baltimore	1.50@ 1.55	1.50@ 1.55	1.50@ 1.55	1.50@ 1.55
Pool 11 (low. vol.)	New York	1.50@ 1.75	1.50@ 1.75	1.50@ 1.75	1.50@ 1.75
Pool 11 (low. vol.)	Philadelphia	1.60@ 1.75	1.60@ 1.75	1.60@ 1.75	1.60@ 1.75
Pool 11 (low. vol.)	Baltimore	1.40@ 1.50	1.40@ 1.50	1.40@ 1.50	1.40@ 1.50
HIGH-VOLATILE, EASTERN					
Pool 54-64 (gas and st.)	New York	$1.30@$1.50	$1.30@$1.50	$1.30@$1.50	$1.25@$1.50
Pool 54-64 (gas and st.)	Philadelphia	1.25@ 1.60	1.25@ 1.60	1.25@ 1.60	1.30@ 1.55
Pool 54-64 (gas and st.)	Baltimore	1.55@ 1.65	1.55@ 1.65	1.55@ 1.65	1.55@ 1.65
Pittsburgh sc'd gas	Pittsburgh	2.05	2.05	2.05	2.00
Pittsburgh gas mine-run	Pittsburgh	1.80	1.80	1.80	1.75
Pittsburgh st. mine-run	Pittsburgh	1.60	1.60	1.60	1.60
Pittsburgh gas slack	Pittsburgh	1.15	1.15	1.15	1.05
Kanawha lump	Columbus	2.00@ 2.75	2.00@ 2.75	1.75@ 2.50	1.75@ 2.25
Kanawha mine-run	Columbus	1.25@ 1.65	1.25@ 1.65	1.25@ 1.65	1.25@ 1.60
Kanawha screenings	Columbus	.65@ 1.00	.70@ 1.00	.65@ 1.00	.50@ 1.00
W. Va. lump	Cincinnati	2.00@ 3.00	2.00@ 3.00	1.75@ 3.00	1.75@ 3.00
W. Va. gas mine-run	Cincinnati	1.50@ 1.65	1.40@ 1.50	1.40@ 1.60	1.50@ 1.65
W. Va. steam mine-run	Cincinnati	1.25@ 1.50	1.15@ 1.40	1.10@ 1.40	1.15@ 1.50
W. Va. screenings	Cincinnati	.50@ 1.00	.50@ 1.00	.40@ 1.00	.50@ 1.00
Hocking lump	Columbus	2.00@ 2.35	2.00@ 2.35	2.00@ 2.25	2.00@ 2.25
Hocking mine-run	Columbus	1.60@ 1.75	1.60@ 1.75	1.60@ 1.75	1.60@ 1.75
Hocking screenings	Columbus	1.00@ 1.25	1.00@ 1.20	1.00@ 1.20	1.00@ 1.20
Pitts. No. 8 lump	Cleveland	1.75@ 2.00	1.75@ 2.00	1.75@ 2.10	1.75@ 2.10
Pitts. No. 8 mine-run	Cleveland	1.25@ 1.65	1.25@ 1.75	1.25@ 1.75	1.25@ 1.75
Pitts. No. 8 screenings	Cleveland	1.00@ 1.20	1.00@ 1.25	1.10@ 1.25	1.10@ 1.25

*Gross tons, f.o.b. vessel, Hampton Roads.

realizations were lower in the central Pennsylvania field.

Apart from periodic efforts to curtail production, there was a steady pressure to sell in the New England market and steam coal prices fluctuated in sympathy with this condition. The close of the month found Navy Standard coal offered at $3.75@$4.25 per gross ton f.o.b. vessels at Hampton Roads, with prices at Boston and Providence for inland delivery at $5@$5.35 per net ton f.o.b. cars.

Contracting for the season is being pushed by all agencies. On order for 15,000 tons of nut-and-slack is said to have been closed at $4.50 on cars at Providence. A three-year contract for mine-run a. s. has been signed at $5.25. Stoker coal is freely offered at $3@$3.50 f.o.b. vessels for spot shipment. Pennsylvania all-rail interests are canvassing the market for contract renewals at $1.60 and up, mines. Cambria is quoted at $2.10@$2.50, with a few leaders at $2.40@$2.50.

INACTIVITY was the rule in the New York bituminous market last month. Buying was generally held down to necessities as many consumers preferred to eat into stockpiles. Operators appear to have given up hope of an early upturn in spot prices and contracts are being discussed at 15c. over the existing spot basis and approximately 25c. under last year's figures for the better coals. Some bunker coal was offered at $4.05 a. s.

Barring brief weather spurts the Philadelphia bituminous trade continues in the doldrums. Little progress has been made in ordinary contract renewals except in a few cases of long-standing relationship. The bulk of the present spot demand centers upon the highest grade coals. There was little real change in the Baltimore market. Most industries are playing a watchful waiting policy and few are buying ahead. Price fluctuations were minor in character.

Consistent dullness featured the Birmingham market throughout February with spot business in steam grades setting a new low record for winter. Shopping around for bargain offers was the rule. Industrial consumers and railroads buying on contract kept deliveries down to the minimum. Cold spells helped the retail trade, but buying from the mines was limited. Prices on some of the medium grades were forced down, but the better qualities held to circular figures.

HEAVY yard supplies, unseasonable weather and the nearness of the time when producers and retail dealers announce spring prices worked to keep the anthracite market at New York inactive last month. Quotations on independent tonnage fluctuated and were lower at the close of the month than at the start. Reports from the mining region indicated that considerable tonnage was being held in storage yards and some pressure was put upon buyers to accept shipments.

This pressure was particularly noticeable in No. 1 buckwheat where tonnage had been stocked subject to delivery order. On the domestic side the heaviest storage stocks were in egg, stove and pea. Chestnut seems to have fared the best of the domestics. Coke is regaining a foothold as a domestic fuel in this market. Retail prices range from $10.75 to $13.25, depending upon quality and place of delivery. Byproduct coke at the ovens is held around $3.25 per net ton.

ALTHOUGH some disappointment is voiced because activity was not more marked in the Philadelphia anthracite market in February, on the whole opinion leans to the conclusion that the trade was fairly satisfactory—particularly upon the retail side. Many private reports from the mining region, however, are much more pessimistic. While some operations appear to have had good running time, others have been less fortunate. Nut was the leader last month; on the steam side rice and barley held their own in better shape than buckwheat.

It is rumored that a few of the larger independent companies will offer coal this month at April prices, but what the April figures will be is a closely-guarded secret. Retailers assert they expect reductions ranging from 50c. to $2, but it is considered extremely unlikely that the cut will be anywheres near the top figure. The situation is further complicated with respect to March deliveries by reports that certain interests have said "thumbs down" to any proposal to bill at April figures.

Anthracite got off to a flying start in the Baltimore retail market the first week in February, but yard stocks were more than sufficient to take care of the increased weather load. With milder temperatures consumer demand tapered off the second week, declined sharply the week following and was relatively inactive the last week of the month.

PRELIMINARY figures of the Bureau of Mines estimate total bituminous coal production last month at 41,290,000 net tons, as compared with 44,208,000 tons the preceding month and 52,904,000 tons in February, 1927. The anthracite output last month was estimated at 5,497,000 net tons, as compared with 5,690,000 tons in January and 5,852,000 tons in February, 1927.

Bituminous exports in January—the latest month for which figures are available—were 849,881 gross tons, as against 832,408 tons the preceding month and 1,721,884 tons in January, 1927. Anthracite exports totaled 233,162 tons, as against 826,421 tons the preceding month and 218,153 tons in January, 1927. January coke exports were 64,653 tons; in December, 1927, the shipments were 62,836 tons and in January of last year, 59,471 gross tons. The bulk of these exports were to Canada.

Anthracite imports in January amounted to 17,165 gross tons, of which 5,193 tons came from the United Kingdom and 6,998 tons from Japan. Bituminous imports consisted of 13,759 tons of free and 41,191 tons of dutiable coal. All of the latter was imported from Canada. Of the duty-free coal 4,502 tons were shipped from Germany, 5,735 tons from Canada and 3,522 tons from the United Kingdom. Coke imports, principally from Great Britain and Canada, totaled 13,207 tons. The month also saw the importation of 7,831 tons of briquets.

Current Quotations—Spot Prices, Bituminous Coal, Net Tons, F. O. B. Mines

		Week Ended—			
MIDDLE WEST	Market Quoted	Feb. 4, 1928	Feb. 11, 1928	Feb. 18, 1928	Feb. 25, 1928
Franklin (Ill.) lump	Chicago	$2.75@$3.50	$2.50@$2.75	$2.50@$2.75	$2.50@$2.75
Franklin (Ill.) mine-run	Chicago	2.25@ 2.50	2.25@ 2.40	2.25@ 2.40	2.25@ 2.40
Franklin (Ill.) screenings	Chicago	1.65@ 1.85	1.65@ 1.85	1.75@ 1.90	1.75@ 1.90
Central (Ill.) lump	Chicago	1.90@ 3.00	2.25@ 2.65	2.25@ 2.65	2.25@ 2.65
Central (Ill.) mine-run	Chicago	2.10@ 2.25	2.10@ 2.25	2.10@ 2.25	2.10@ 2.25
Central (Ill.) screenings	Chicago	1.40@ 1.60	1.35@ 1.60	1.50@ 1.65	1.50@ 1.65
Ind. 4th Vein lump	Chicago	2.50@ 3.25	2.50@ 3.00	2.50@ 3.00	2.50@ 3.00
Ind. 4th Vein mine-run	Chicago	1.65@ 2.35	1.65@ 2.35	1.65@ 2.35	1.65@ 2.35
Ind. 4th Vein screenings	Chicago	1.65@ 1.85	1.75@ 1.85	1.85@ 2.00	1.85@ 2.00
Ind. 5th Vein lump	Chicago	2.25@ 2.75	2.25@ 2.75	2.25@ 2.75	2.25@ 2.75
Ind. 5th Vein mine-run	Chicago	1.40@ 2.10	1.40@ 2.10	1.40@ 2.10	1.40@ 2.10
Ind. 5th Vein screenings	Chicago	1.05@ 1.50	1.05@ 1.50	1.20@ 1.60	1.40@ 1.60
Mount Olive lump	St. Louis	2.50@ 2.75	2.50	2.50	2.50
Mount Olive mine-run	St. Louis	2.00	2.25	2.25	2.25
Mount Olive screenings	St. Louis	1.40@ 1.50	1.50	1.50	1.75
Standard lump	St. Louis	2.35@ 2.50	2.25@ 2.35	2.25@ 2.35	2.25@ 2.35
Standard mine-run	St. Louis	1.75@ 1.90	1.75@ 1.90	1.75@ 1.90	1.75
Standard screenings	St. Louis	.95@ 1.00	1.00	1.00	1.10
West Ky. block	Louisville	1.75@ 2.00	1.75@ 2.00	1.75@ 2.00	1.65@ 1.85
West Ky. mine-run	Louisville	1.00@ 1.50	1.00@ 1.50	1.00@ 1.50	1.00@ 1.50
West Ky. screenings	Louisville	.80@ 1.00	.80@ 1.00	.75@ 1.00	.55@ 1.10
West Ky. block	Chicago	1.25@ 1.85	1.25@ 1.85	1.25@ 1.75	1.25@ 1.75
West Ky. mine-run	Chicago	1.00@ 1.35	1.00@ 1.35	1.00@ 1.35	1.15@ 1.35
West Ky. screenings	Chicago	.80@ 1.00	.80@ 1.00	.85@ 1.00	1.00@ 1.25
SOUTH AND SOUTHWEST					
Big Seam lump	Birmingham	$2.00@$2.25	$2.00@$2.25	$2.00@$2.25	$2.00@$2.25
Big Seam mine-run	Birmingham	1.50@ 2.00	1.50@ 2.00	1.50@ 2.00	1.50@ 2.00
Big Seam (washed)	Birmingham	1.75@ 2.00	1.75@ 2.00	1.75@ 2.00	1.75@ 2.00
S. E. Ky. block	Chicago	2.25@ 2.75	2.00@ 2.75	2.00@ 2.75	2.00@ 2.75
S. E. Ky. mine-run	Chicago	1.35@ 1.75	1.35@ 1.75	1.35@ 1.75	1.35@ 1.75
S. E. Ky. block	Louisville	2.00@ 2.50	2.00@ 2.50	1.85@ 2.50	1.85@ 2.50
S. E. Ky. mine-run	Louisville	1.30@ 1.65	1.30@ 1.65	1.15@ 1.60	1.15@ 1.75
S. E. Ky. screenings	Louisville	.50@ .95	.50@ .95	.50@ 1.00	.35@ .85
S. E. Ky. block	Cincinnati	2.00@ 3.00	2.00@ 2.75	1.75@ 2.75	1.75@ 2.75
S. E. Ky. mine-run	Cincinnati	1.10@ 1.50	1.00@ 1.50	1.10@ 1.60	1.15@ 1.60
S. E. Ky. screenings	Cincinnati	.50@ 1.00	.50@ 1.00	.25@ .75	.50@ .95
Kansas shaft lump	Kansas City	4.50@ 4.75	4.50@ 4.75	4.50@ 4.75	4.50@ 4.75
Kansas strip lump	Kansas City	3.50@ 4.00	3.50@ 4.00	3.50@ 4.00	3.50@ 4.00
Kansas mine-run	Kansas City	3.00	3.00	3.00	3.00
Kansas screenings	Kansas City	2.00@ 2.25	2.00@ 2.25	2.00@ 2.25	2.00@ 2.25

OPERATING IDEAS *from* Production, Electrical *and* Mechanical Men

Angle Face Rooms Used to Advantage In West Virginia Mine

SEVERAL years ago William Jayne, now general mine foreman of the Nellis (W. Va.) mine of the American Rolling Mill Co., endeavored to determine how (using arcwall machines in that mine) he could keep the gob to one side of the room and thereby avoid the heavy expense of moving part of it before taking the pillar. Operation with 45-deg. angle face rooms was decided upon and, as a result, a large section of the mine is run on this system.

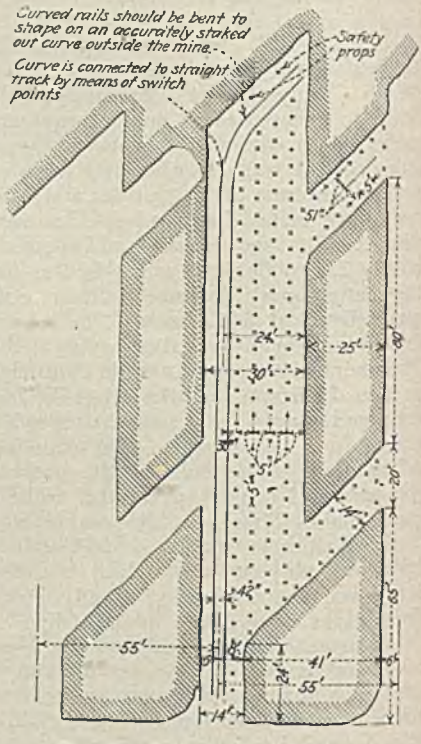
At this mine the No. 2 Gas seam is 54 to 60 in. thick, contains a band of bone coal and is topped by several inches of draw slate. The rooms are driven 30 ft. wide on 55-ft. centers and four rows of props, spaced on 5-ft. centers in both directions, are used.

The accompanying sketch shows the method of mining. On starting a room, the neck is driven by taking four 6-ft. cuts each 14 ft. wide. The breakthrough is then started on an angle of 45 deg. and driven at the same width (14 ft.) through the pillar. The track is then taken up to the inby rib line and a cut 42 ft. long made.

Driving the room is continued by keeping the straight track close to one rib and moving ahead the angle section each time a cut is cleaned up. The photograph, which shows two cars at the face, indicates how the curve is connected to the straight track by means of switch points. With this method, the straight track is extended by adding rails of usual lengths. When the curve section is to be moved, the switch points are slid ahead along the straight rails.

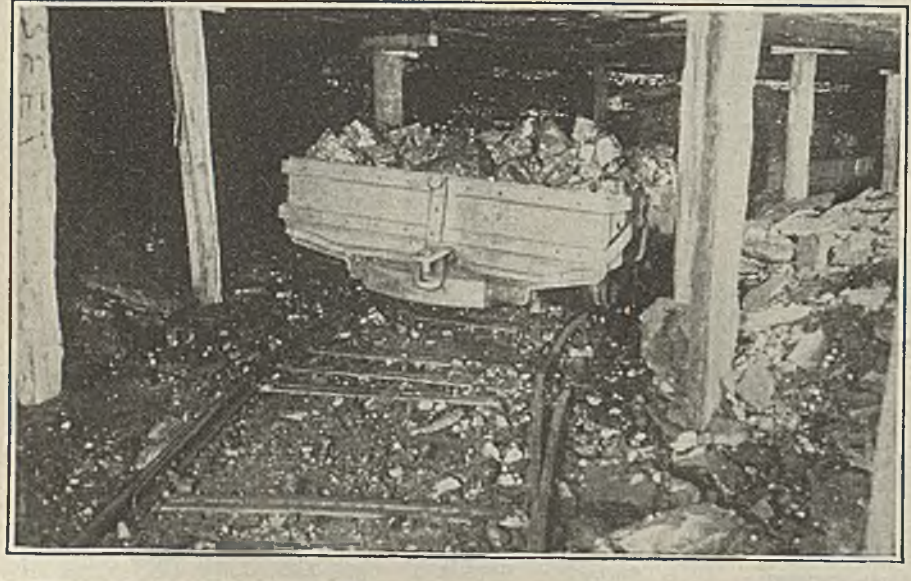
Advantages of using angle face rooms in the Nellis mine are: No moving of the gob before taking pillars is required; two cars at a time can be placed at the face; and more coal is produced per cut. The only disadvantage is the likelihood of allowing rooms to get too wide. This danger prevents the use of the angle face system in those sections of the mine where the roof conditions are below those normally encountered.

Considering the angle face system from the viewpoint of its general application to mines, supervision is the greatest disadvantage. However, unless this actually requires adding men to the payroll it is not a well-founded objection. In mines where a high percentage of lump is important, and where this depends upon the angle of the room faces with respect to the cleavage planes, the angle face system may be impractical.



Details of Method of Mining

Increases Production and Decreases Costs



Hard Rubber Tubing Best For Siphon Lines

According to R. H. Daugherty of Coshocton, Ohio, his company has tried many materials for handling acid mine water in air-tight pipe lines. Nothing has given such satisfaction, particularly for siphon lines, as has hard rubber tubing connected with Abbott couplings. The cost of such piping is not much in excess of that of good wrought iron, and it lasts indefinitely if given ordinary care.

Nova Scotia Mine Hoist Operates Regeneratively; British Regulations Followed

FULL advantage is taken of regenerative braking at a new drop-hoist installation in No. 1-B colliery of the Dominion Coal Co., Glace Bay, Nova Scotia, according to Harold F. Arthur. The equipment for this hoist was built and installed to conform with the British regulations for the use of electricity in coal mines.

The drive is a 400-hp. 750-r.p.m. slip-ring induction motor made by the Canadian General Electric Co. It is a 3-phase 2,200-volt 25-cycle motor and is equipped with roller bearings. The frame is standard open construction but openings in the end shields are fitted with wire screens to prevent entrance of foreign materials. Collector rings are mounted on the end of the shaft outside of the motor frame and are inclosed in a tight case.

Connection to the hoist is through a double-reduction, double helical gearing and through a band friction clutch operated by hand wheel and screw. The hoist has a 50 x 48-in. single drum and is equipped with manual-set post-type service brake and a band-type emergency brake which is arranged for weight set and manual release. The emergency is applied by overspeed, failure of power, or by operation of a switch located on the operator's platform. The hoist was manufactured by the Canadian Ingersoll-Rand Co.

No. 3 heading, where the hoist is installed, is 14,000 ft. from the shaft bottom. Power is transmitted by a 3-conductor paper-insulated and lead-covered cable having single-wire armor. This cable is suspended to the pit props on the air intake road and is assembled in 400-ft. lengths by means of junction boxes.

Termination of the cable at the hoist is in a flame- and explosion-proof switch pillar of the draw-out floor-mounted mining type manufactured by Ferguson & Pailin, Ltd., Manchester, England. The pillar equipment consists of a bus-bar chamber, disconnecting switches in the form of isolating plugs and sockets, oil circuit breaker equipped with two series overload trip coils and time limit dashpots, no-voltage release, and terminal block for external interlock circuit with the emergency switch and overspeed device. Two current transformers and one oil-immersed potential transformer operate an ammeter, a voltmeter and a 3-phase balanced-load wattmeter which has a zero-center scale for indicating energy taken from or returned to the line.

Complete primary and secondary control for the hoist motor was supplied by Allen West & Co., Brighton, England. It consists of a liquid controller with oil-immersed stator reversing switch and hand-operated lever gear. Contacts of the totally inclosed reverser have quick-make and quick-break actions independent of the operative.

Main electrodes of the liquid controller are counterbalanced and fitted with ball bearings. Operation of one lever performs the functions of starting, stopping, reversing and speed regulation.

A type K-3 Keenan water cooler having a capacity of 800 imperial gallons per hour is installed near the liquid controller. This cooler reduces the temperature of the controller cooling pipe circulating water from 120 deg. F. to 80 deg. F. when the air temperature is 57 deg. F. and the humidity 92 to 93 per cent. This gives the controller a capacity of 2,200 horsepower-minutes every ¼ hour, and a continuous dissipating capacity of 150 hp., allowing a creeping speed continuously against 30 per cent full-load torque for rope inspection and rounding curves at reduced speed.

The full trip, consisting of 17 loaded boxes each weighing 6,925 lb., is hauled from the landings up a 10 per cent grade at a speed not exceeding 300 ft. per minute, until a switch on the main headway is passed.

The trip is then lowered down the headway, having a grade of 10 per cent, at a speed of approximately 1,280 ft. per minute, the speed being controlled by the service brake or by the motor operating as an induction generator. The speed is lowered to approximately 400 ft. per minute when rounding the curve at the bottom of the headway.

The empty trip consisting of 17 empty boxes, each weighing 2,400 lb., is hauled from the standage at the bottom of the headway up the incline at a speed of 1,230 ft. per minute, then lowered by gravity, under the control of the service brake, into the levels leading to the rooms.

The total length of the haulage is about 4,000 ft.; the diameter of rope is 1 in. One of the diagrams shows the general disposition of the haulage system.

The method of operation is as follows: The empty trip is started from the standage at the bottom of the headway and is hauled at a speed of from 300 to 400 ft. per minute until after the curve is rounded, then it is accelerated to a speed of 1,230 ft. per minute. This speed is maintained up to a point approximately 100 ft. from the switch leading to the room landing level, after which the speed is reduced and trip is finally brought to rest in a position where the rear end of the trip has just passed the switch. The trip runner, who rides at the rear end of the trip, changes over the switch and signals to the operator to lower. The trip is then lowered by gravity to the landing, the speed being controlled by the service brake.

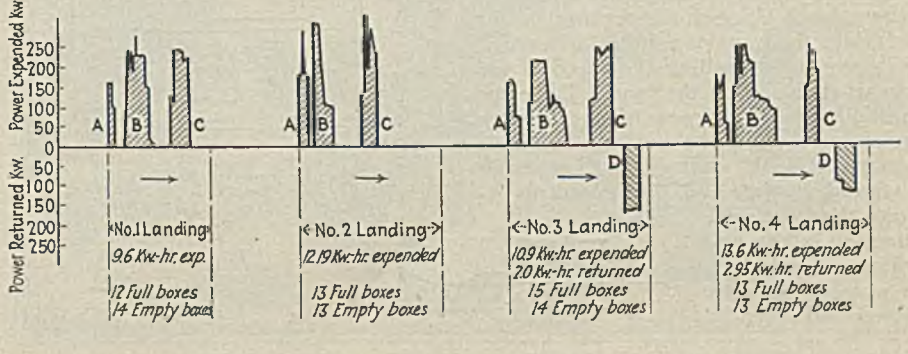
The full trip is hauled from the room level at a speed of 300 ft. per minute until the switch is passed. The trip runner then changes over the switch and signals the operator to lower away. The operator lowers the trip slowly at first to allow the trip runner to take his place at the rear end of the trip, then allows

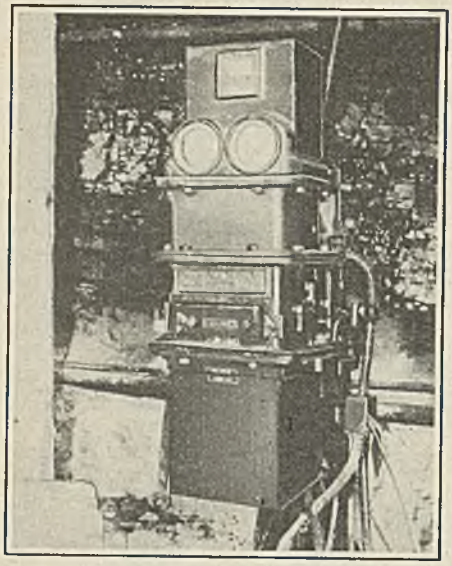
Earn $5 or More

New methods for increasing efficiency and reducing costs are constantly being evolved and tried out by production men, electrical men and mechanical men. Exchange of such ideas is the surest step to progress, and *Coal Age* will pay for them. For those accepted and published in these columns we will pay from $5 up.

Electrical and mechanical pointers, underground methods, shop kinks, haulage devices, tipple arrangements and safety methods are the type of material sought. Short articles—accompanied, if possible, by simple sketches or good snapshots—are most desirable. Our editors and drafting room will do the rest.

Diagrams From Power Charts





Floor-Mounted Switch Pillar at Hoist

it to drop by gravity until a speed of 1,250 ft. per minute is reached, corresponding to 750 r.p.m. synchronous speed of the motor. This speed is indicated by a tachometer placed in front of the operator in the hoist room. The stator switch is then closed and secondary resistance short-circuited.

The motor, now acting as an induction generator, holds the speed of the trip to 1,280 ft. per minute, corresponding to a motor speed of 770 r.p.m.

This speed is maintained up to a point about 400 ft. from the beginning of the curve at the bottom of the headway, when the operator switches off power and de-accelerates the trip by means of the service brake. During the time the operator is bringing the lever of the control gear to the "off" position the speed of the trip increases somewhat owing to the added resistance in the secondary circuit. This operation is performed quite speedily and the trip does not reach an excessive speed. The speed of the trip when rounding the curve is about 400 ft. per minute, after which the trip is de-accelerated and brought to rest on the standage.

Regenerative braking is not resorted to in lowering the full trip from the No. 1 landing, due to the short distance from this landing to the beginning of the curve; speed is controlled by means of the service brake only.

Besides the advantage of using regenerative braking for returning power back into the system, another advantage is its use in controlling the speed of the trip when lowering the load. To lower the full trip by means of the service brake only would be out of the question, as it would wear out the brakes in a very short time and also would necessitate the continual attention of the operator in order not to exceed the predetermined speed.

Diagrams reproduced from charts taken on the motor during October, 1926, show power characteristics of the hauls.

In all cases area *A* represents the energy expended in moving the rope from the rear of the full trip to the head of the empty trip on the standage at the bottom of the headway. This large amount of energy is due to the slow speed at which the rope must be hauled, necessitating a large amount of resistance in the secondary circuit, and also application of the service brake to help keep the speed down.

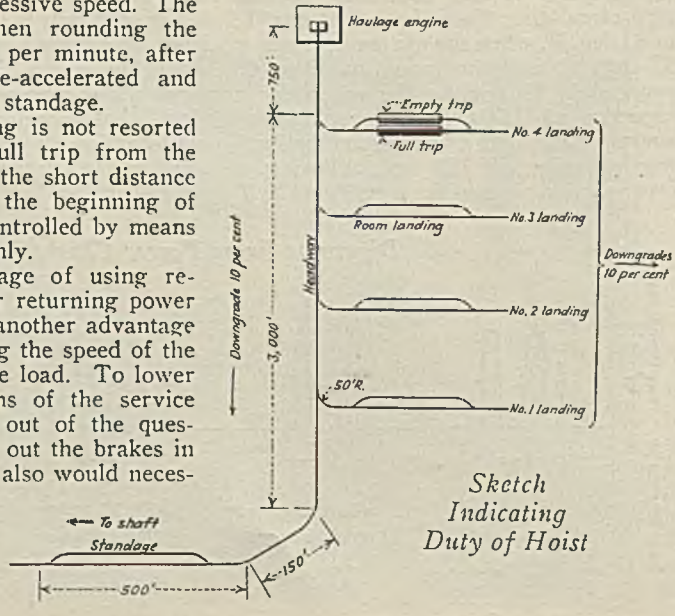
Area *B* shows the energy expended in hauling the empty trip up the main haulage to the room level landings. When rounding the curve the speed must be kept down to 300 or 400 ft. per minute; consequently the power expended is largely due to the energy absorbed by the secondary resistance. This is shown quite clearly on the first part of area *B*.

Area *C* represents power absorbed in hauling the full trip from the room landings past the switch to the main haulageway. The energy here also is large, as the speed of the trip must be kept down to approximately 300 ft. per minute.

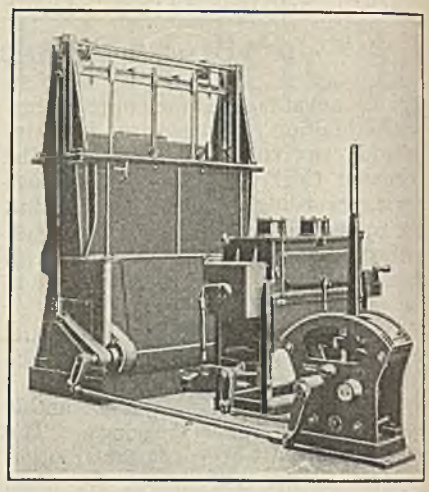
Area *D* shows the energy returned to the system when lowering the full trip.

These diagrams indicate that regenerative braking is employed only when lowering the load from No. 3 and No. 4 landings. Regenerative braking sometimes is employed when lowering the full trip from No. 2 landing, but is never resorted to in lowering from the first landing, due to the short distance between this landing and the beginning of the curve.

Regenerative braking is very efficient, as can be seen from the diagrams. When lowering from No. 3 landing approximately 18.35 per cent of the power is returned to the system, while in lowering from No. 4 landing 21.7 per cent is returned.



Sketch Indicating Duty of Hoist



Liquid Controller and Stator Reverser

The size of motor operating this hoist is larger than necessary for the present duty, but was chosen with the view that the complete hoist and electrical equipment are to operate in the near future where the grade and number of boxes are greater.

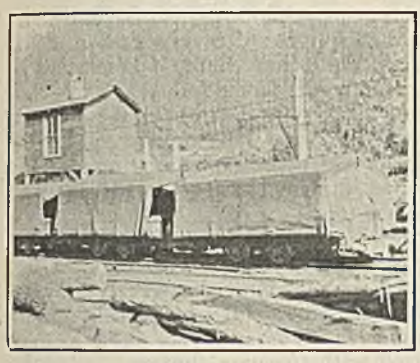
Shanty Cars Get Workers Out in Bad Weather

Most of the houses at the Killarney Smokeless Coal Co. plant, Killarney, W. Va., are near the tipple, according to C. L. Logan, general superintendent, but the distance from the tipple to the drift mouth is about 2 miles by tramroad.

All the workmen have to ride a man trip to and from the mines each day, which formerly caused a lot of trouble on rainy and snowy days due to the disinclination of the men to risk getting sick if they ventured to take the trip in inclement weather. It usually takes six mine cars for the man trip. These cars stood at the tipple overnight exposed to the weather, so that if there was a storm during the night there were no dry seats for the men going to work in the morning.

In the shop were a number of mine cars that were not strong enough for regular duty but too good to cut down. Six of these were taken out and repaired, three steel bows being bolted to the sides so as to make a covered-wagon effect. To these bows well-rounded pieces of flooring were bolted and a regular waterproof wagon cover was stretched tightly over the top. The cover was fastened to the middle piece of flooring or the ridge pole, so that in warm weather the sides could be rolled up.

These cars make a very comfortable shelter for the miners and have prac-



Help Keep the Men on the Job

tically stopped the habit of laying off in bad weather. The new conveyances were named "shanty cars" by the miners the first day they were used, and the name has stuck.

Methods of Starting Mine Substations

Various methods have been devised to control the starting impulse for the power converting units used in mining substations. The most common method, according to M. F. Packard and R. E. Powers, general engineers, Westinghouse Electric & Mfg. Co., is to have someone manually start the machine by closing a knife switch or push button located either in the substation or at some remote point. Under such conditions the unit may then be stopped or started at the will of the operator in charge of the switch or push button. If the station is supplied with energy over an independent alternating-current circuit the starting impulse can be given by merely energizing this feeder line.

In mines with regularly similar working cycles the units may be started by the use of a clock switch set to put the station in operation, for instance, over an eight-hour day six days per week with shutdown arrangement over Sundays. There are a few applications where starting of machines in response to load demand may be used advantageously. The time-element relays necessary with load-demand starting usually make this type of starting inadvisable for mining service.

In two-unit substations the first unit ordinarily is started by one of the above-mentioned methods while the second unit is started by use of a load-indicating relay in conjunction with a time element, or by use of a thermal relay which indicates the temperature of the windings of the first unit and brings the second unit on the line when the first unit reaches a predetermined temperature.

Due to the character of most mining power requirements the load-indicating relay type of starting has proved to be most satisfactory. In general the control and supervision of all units by a remote supervisory system has not proved to be attractive on account of the first cost of the equipment, yet in a few large installations such systems have been used economically.

In the railway field it is common practice to equip automatically controlled converting outfits with load-shifting resistance where two or more stations feed the same system. With this type of control whenever the load rises higher than the safe commutating capacity of the machine, resistance is automatically cut into the circuit. This lowers the bus voltage sufficiently to shift a portion of the load to other stations. Thus the substation control apparatus functions so as to limit its load and yet permit short peak loads or even those of appreciable duration to be carried by the equipment.

If resistance of suitable capacity is installed small-capacity units may be used where larger-size machines ordinarily would be required. To obtain best results from load-shifting grid control the circuit resistance between stations should be relatively low so that a slight lowering of bus voltage will transfer a large percentage of the overload to adjacent stations.

Under the average mine conditions the circuit resistance between stations is so high that effective load shifting may be accomplished only by lowering the bus voltage excessively. Instead of bringing about beneficial results this might be detrimental in a number of respects. In applications where resistance to adjacent stations is low, load-shifting grids can be used successfully. In mines with high-resistant feeders between stations each substation must be equipped with units capable of handling peak requirements around the particular load center it is feeding.

Experience has shown that the resistance-measuring type of direct-current automatic reclosing feeder equipment meets the severe requirements of mine service most satisfactorily. With this type of equipment the circuit is opened on short circuit or overloads exceeding the breaker setting. The resistance of the external circuit is checked by a resistance-measuring relay which closes its contacts when the value of the circuit resistance is such as to indicate removal of the short circuit or passing of an overload condition. Reclosure of the line breaker promptly takes place automatically when the circuit conditions are satisfactory. The duration of the service interruption thus is reduced to a minimum and service restoration is assured at the earliest favorable moment.

Editors Place Reliance on Mazda Lamps For Underground Photography

ENGINEERS and operating men have asked for details regarding the photographic outfit and more particularly the incandescent-lamp equipment used by *Coal Age* field editors. A complete outfit for taking 4x5-in. pictures with the carrying case is here illustrated.

Minimum weight and size are important factors in selecting an equipment which one man can carry and which can be used advantageously in thin-seam workings. Inside dimensions of the carrying case shown are: Length, 18 in.; height, 14½ in.; width, 6¾ in. The combined weight of case and equipment is 27 lb.

Two 500-watt 115-volt type T-20 Mazda projector lamps are used where electric power is available. The reflecting units are Brieloff hand lamps purchased from Chas. Willoughby, 110

All Packs Into the One Case

West 32nd St., New York City. The equipment includes 10 ft. of duplex braided cord.

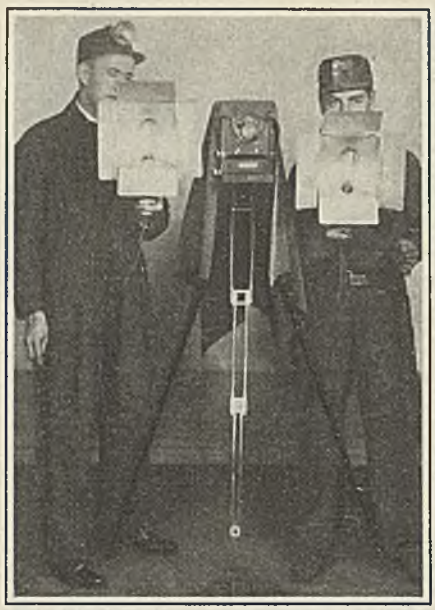
To better adapt the reflectors for use in mines and tipples the short duplex cords were replaced by two 30-ft. lengths of No. 18 Tirex single-conductor rubber-sheathed cord. As compared to duplex the single-conductor cord makes it possible to space the lamps farther apart when they are connected in series and to trolley and rail, as indicated by the sketch.

Two rubber-insulated 30-amp. battery charging clips provide convenient means for connecting to trolley and rail. An insulated "SRK" No. 2 fixture wire connector is used to make the series connection between the other two wires of the lamps. Protection against high current in case of a ground or short-circuit is obtained by a 600-volt 10-amp. ferrule type fuse soldered into the cord near the battery clip that is connected to the trolley or "hot" side of the line.

With the two lamps in series it is practical to connect to any voltage between 200 and 300, a.c. or d.c. Two attachment plugs of the separable screw type are provided for connecting the lamps in parallel on 110 a.c. Three 115-volt 600-watt glow heater resistance units with screw bases are connected in series with the two lamps that are in series when operating on circuits carrying 500 to 600 volts d.c.

The latitude of exposure when making photographs with illumination from incandescent lamps is very wide. There is small likelihood of overexposure. Three times the minimum length of exposure which would produce a useable negative will not be likely to ruin a picture. In a mine where the roof, ribs and bottom are black the approximate minimum timing when photographing a dark object 20 ft. distant is 3 minutes with aperture or stop F:11, and 1 minute with stop F:6.3.

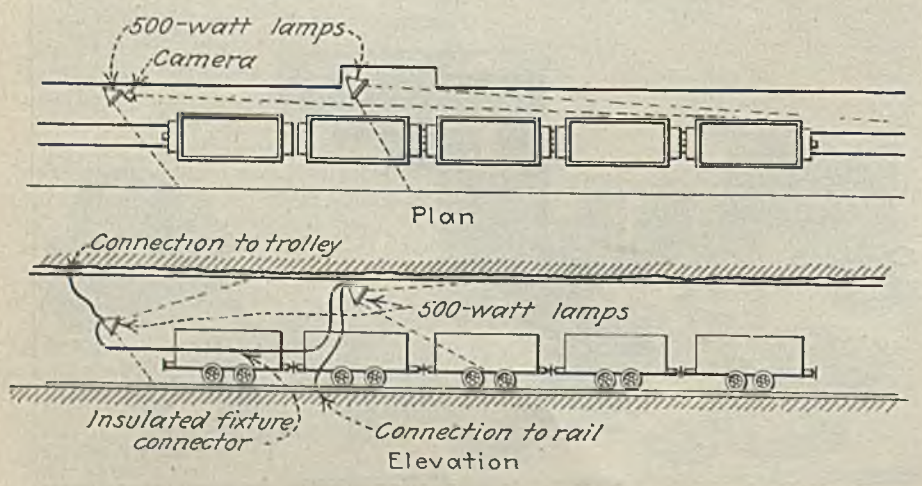
Usually it is best to hold the two lighting units within a few inches of the camera and just back of the front line of the lens. Care should be exercised not to allow the lamps or wires to touch the camera or tripod and thus shake the camera. Experience will indicate how, under certain conditions, lamps should be kept moving to eliminate shadows or carried into the field of exposure and used to "spray" dark portions of the object.



Holding Both Lamps Close but Not Bumping the Camera

Referring again to the photograph of the complete equipment and case, and naming the parts from left to right, these are as follows: Korona View 4 x 5 camera; rubberized focusing cloth; miner's cap; two 2-oz. bottles of flash powder; piece of white chalk in wooden box; caps for flash gun in wooden box; electric flash lamp; spoon for handling flash powder; rubber-insulated battery clip; Agfa film pack; top piece of tripod; attachment plug; film pack adapter; fixture connector; lamp cord attached to reflector; 16-in. flash gun; small roll of friction tape; canvas gloves; carrying case made of ⅜-in. fiber; hand lamp (dimensions 7½ x 9 in. with wings folded); extra 500-watt lamp wrapped in cloth; fog and mist filter for lens; extra socket for reflectors; three resistance units; hand lamp (dimensions 14½ x 14½ in. with wings open); extra 500-watt lamp; screw driver; tripod legs; standard lens, Goerz Syntor F:6.8, angle 35 deg. fitted with Compur shutter; Harvey exposure meter; suit of coveralls; wide-angle lens, Tessar F:4.5, angle 55 deg., fitted with Compur shutter.

Lamps in Series and Placed 50 Ft. Apart



Burial of Carelessness Promotes Safety

A mound about the size of a grave raised about 50 ft. from the man shaft of Federal mine No. 1 of the New England Fuel & Transportation Co. at Grant Town, W. Va., is said to represent the resting place of "Old Man Carelessness." A fence about 12 in. high has been built around it and a tombstone erected with the inscription "Here Lies Carelessness; Born Years Ago; Died—with Our Last Major Accident. Let's Keep Him Dead."

Gone—It Is Hoped—to a Long Home

Conceived as part of a plan to promote safety, says W. H. Forbes, safety engineer of the company, the idea has provoked much favorable comment among the workmen and there has been a distinct falling off in the number of accidents. The proximity of the accident record board has given such emphasis to the goal sought that there are fair indications that the old trouble maker may have gone for good.

Among the Manufacturers

The Mine Safety Appliances Co., Pittsburgh, Pa., announces the appointment of J. C. Calnon, El Paso, Texas, as representative for western Texas and northern Mexico; Charles R. Dever, Nanticoke, Pa., as an additional representative for eastern Pennsylvania and C. E. Noonan as additional representative in western Pennsylvania with headquarters at Pittsburgh.

* * *

The Lincoln Electric Co., Cleveland, Ohio, which has maintained a welding school in its shop for a number of years, recently reorganized and re-equipped the department, increasing its facilities for training electric arc welders. No tuition fees are charged.

* * *

Lorimer Dunlevy has resigned as sales manager for the Climax Engineering Co., Clinton, Iowa, effective March 15, to take on new duties as general sales manager for the O. E. Szekely Co., Holland, Mich., makers of commercial airplane engines and other products now in process of design.

* * *

The George D. Whitcomb Co., Rochelle, Ill., announces the appointment of Ralph Rollins as sales representative in North Carolina, South Carolina and southern Virginia. His headquarters will be 1206 Commercial Building, Charlotte, N. C.

* * *

Donald M. Ryerson, vice-president and general manager, has been elected chairman of the board of directors of Joseph T. Ryerson & Son, Inc., Chicago, succeeding his father, Edward L. Ryerson, Sr., who died Jan. 19, 1928. Edward L. Ryerson, Jr., vice-president in charge of plant operations and several sales divisions, succeeds his brother Donald Ryerson as vice-president and general manager. Everett D. Graff also has been elected a vice-president.

* * *

The Climax Engineering Co., Clinton, Iowa, announces the appointment of the Equitable Equipment Co., 410 Camp Street, New Orleans, La., as representative for the territory of lower Louisiana and Mississippi.

The American Electric Motor Co., Cedarburg, Wis., recently became a subsidiary of the Splitdorf-Bethlehem Electrical Co., Newark, N. J. The Splitdorf company also controls the Splitdorf Radio Corporation, Splitdorf Company of Canada, Splitdorf Electrical Co., Splitdorf Manufacturing Co. and the Perfection Appliance Co. W. R. Davis has been appointed general manager of the American Electric Motor Co. and W. M. Sprinkman will have charge of industrial sales.

* * *

James C. Law, Scranton, Pa., has joined the firm of Lyon, Conklin & Co., Inc., Baltimore, Md., as sales engineer for the anthracite region. He resigned on Feb. 1 from the post of sales engineer for Chandler & Floyd, Inc., Scranton, Pa.

* * *

Charles E. Stone, since 1924 vice-president of the Interstate Drop Forge Co., Milwaukee, Wis., has been elected president, succeeding C. R. Messinger, who is a member of the board of directors and president of the Chain Belt Co. Lamar S. Peregoy was elected vice-president. C. C. Bremer and J. C. Merker were re-elected treasurer and secretary respectively.

* * *

United Conveyor Corporation, Chicago, has purchased from the Conveyors Corporation of America a number of patents, designs and manufacturing rights for conveyors, storage tanks and air-tight doors.

* * *

The American Pulverizer Co., announces the removal of its general offices and manufacturing department to new and modern quarters at 1249 Macklind Avenue, St. Louis, Mo.

* * *

Three Vice-presidents of the Truscon Steel Co. of Youngstown, Ohio, were named late in February by Julius Kahn, president of the company. C. I. Auten, M. T. Clark and C. D. Loveland are the new appointees.

* * *

The Davis Instrument Mfg. Co., Inc., has opened new offices and works at 513-523 East 36th St., Baltimore, Md.

Reorganization of the Young Car Co., Evansville, Ind., manufacturer of mine cars, has been announced by John L. Young, president of the old concern and vice-president under the reorganization plans. The new firm, to be known as the Blakey-Robinson Co., will manufacture material-handling equipment and other articles for use for general engineering service. H. N. Robinson, until recently chief engineer of the Fairmont Mining Machinery Co., Fairmont, W. Va., will be president and secretary of the new company. D. T. Blakey will be treasurer.

* * *

William M. Smith, who for many years was associated with the wire rope department of the Wickwire Spencer Steel Co. and resigned to take up similar duties with another manufacturer of wire rope, has returned to the Wickwire Spencer organization. He will handle the sale of wire rope in the Pittsburgh district.

* * *

L. P. Curtin and P. G. Howe have organized the firm of Curtin & Howe, 11 Park Place, New York City, which will market zinc meta-arsenite, a new wood preservative.

* * *

Barber-Greene Co., Aurora, Ill., recently established a new branch office at 431 Temple Bar Building, Cincinnati, Ohio, under the supervision of Paul Frederick, district manager.

* * *

R. C. Bastress, formerly with the Fort Wayne Iron Store Co., has joined the Black & Decker organization as representative in Indiana and part of Michigan. L. W. Beuhausen, formerly with Slocum & Kilburn, has been employed to handle Black & Decker products through western Massachusetts. G. N. McCarthy will be in charge of the Buffalo territory, taking the place of H. B. Austin, who has been transferred to the Chicago district.

* * *

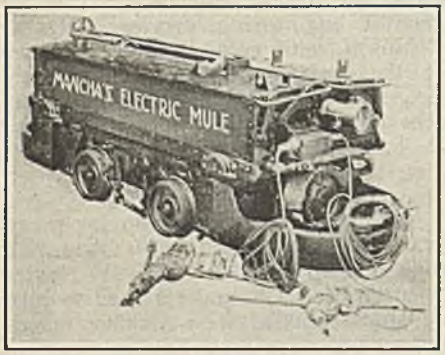
E. O. Johnstone, district sales manager for the American Chain Co., Inc., at 425 Second St., San Francisco, Calif., has been appointed Pacific Coast distributor of Ford chain hoists to the industrial trade.

WHAT'S NEW

In Coal-Mining  Equipment

Electric Mule Equipped For Drilling

An arrangement has been perfected by the Mancha Storage Battery Locomotive Co., St. Louis, Mo., whereby the "electric mule" manufactured by this company can be equipped with two drills, thus adding flexibility to drilling operations. One of these storage-



Develops a New Kick

battery locomotives equipped with two drills, the manufacturer asserts, enables two men to drill from 80 to 150 holes in an 8-hour shift.

Chicago Pneumatic Co. drills are used, low-voltage motors in the drills corresponding to the voltage of the storage battery on the locomotive, which propels the locomotive and supplies power to the drills. Then, too, the system has such mobility that one machine can drill holes for several cutting-machine territories.

This Methane Detector Is Flameless

A recent development in the field of mine safety is a flameless methane detector invented by Professor Martienssen, of the University of Kiel, Germany. The device contains a filament by which the presence of methane is indicated, being in the form of a loop like an inverted U. It is made of a platinum alloy having a higher melting point than platinum.

On the top of the loop, salts of the platinum-palladium group are deposited to form a highly porous mass. When a current is passed through the loop in pure air the top of the loop is invisible but the limbs of the loop glow perceptibly. When the air contains methane exceeding 1 per cent the crest glows faintly, which increases till the percentage reaches 4, when the crest and limbs both turn bright red.

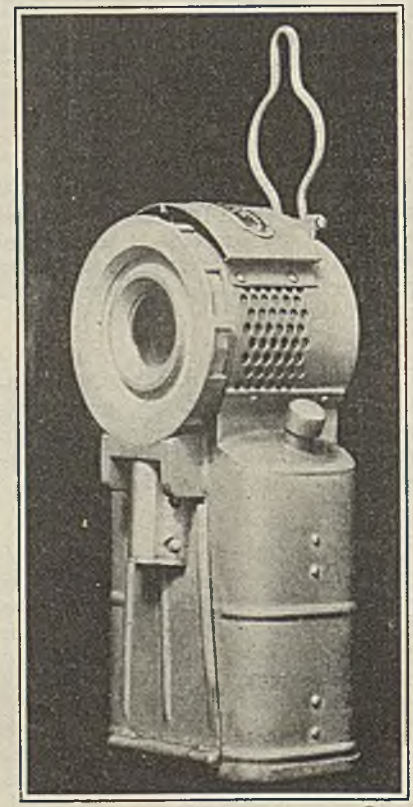
At 6 per cent first one limb and then the other shows a white heat. At 8 per cent the whole filament is as white as that in an incandescent lamp. At 9 per cent the filament remains incandescent after the current is shut off. Further increases in methane decrease the brilliancy.

The indicator cannot explode because when the methane is burning the filament is surrounded by a film of carbon dioxide and because it is shut off from the exterior by the observation window and several gauzes.

The air passes to the filament through these gauzes. If the detector is held by hand or at the end of a pole in the place to be tested for 10 to 20 seconds it will fill with a sample atmosphere. Brought near the eye, pressure on a button will connect the terminals of a battery forming part of the detector and in two seconds the result can be observed. If then air is blown into the gauze openings the detector will be in readiness for another observation.

As the operation is of only a few seconds' duration, 100 to 150 readings may be taken with one change of battery. The weight is a trifle over 2 lb. and the size $5\frac{1}{16}$ x $2\frac{1}{4}$ in. It is so simple that any one can use it and the Bureau of Mines has given it official approval. Speaking at the meeting of the American Institute of Mining and Metallurgical Engineers in New York City, Feb. 20, F. O. Willhofft said it would not show oxygen deficiency. Mr. Willhofft, who is a consulting engineer, holds the American rights to this device. His office is at 68 Beaver St., New York City.

Reveals Presence of Methane



Gasoline Locomotive Has Equalizing Device

A cross equalizing device that gives an additional advantage to Whitcomb gasoline locomotives has been perfected by the Geo. D. Whitcomb Co., Rochelle, Ill.

The device consists of a crossbar centrally pivoted on the front of the frame so that any excess load on either front spring is compensated for by the oppositely operating action of the crossbar. As the name indicates, it exerts an equalizing action that distributes the load equally to both front springs, and thus maintains the rail-load in constant balance.

This device, according to the manufacturer, has peculiar value because in many cases the locomotive is operated over temporary, rough tracks. This equalizing device increases the flexibility of the locomotive, since it tends to keep the weight of the locomotive in constant balance, so that it can ride very rough track not only safely but much more smoothly. Thus equipped Whitcomb gasoline locomotives have an absolute three-point suspension.

Small Fuse Puller Also Is Screw Driver

A combined midget fuse puller and screw driver has been placed on the market by the Trico Fuse Manufacturing Co., Milwaukee, Wis. This little tool is made of genuine horn fiber and is 5 in. long. One end has gripping jaws for handling small cartridge fuses $\frac{1}{4}$ to $\frac{1}{2}$ in. in diameter. The other end has a screw-driver blade for use on

Tool for Removing Fuses

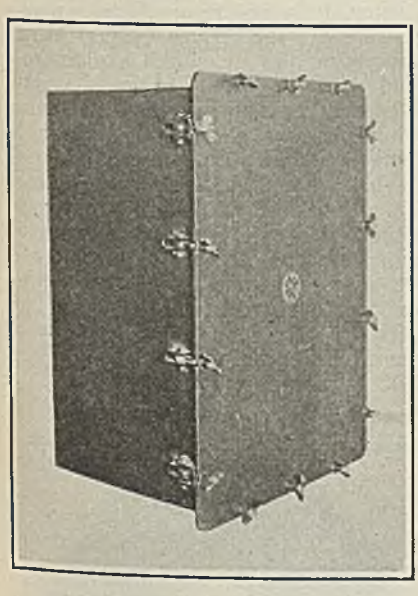
small screws such as are found on electric sockets.

It is a handy tool for use around many kinds of electrical wiring, especially for tightening terminal screws. The device, being constructed of insulating material, prevents short-circuits; only the screw-driver blade is made of metal.

Compact Compensator Resists Dust

To meet the demand for a small automatic compensator whose operation will not be affected by the dust prevalent in coal-crushing plants, grain elevators, and other similar places, the General Electric Co. has announced a device for low voltages, enclosed in a boiler-plate case.

A standard automatic compensator is used in the construction, but the usual conduit box, wall support and top and front covers are omitted. The boiler-plate case in which it is enclosed is built as a unit with angles on which the compensator may be slid in or out. When the compensator is in position, the angles can be raised to a vertical position, thus allowing the door to close.



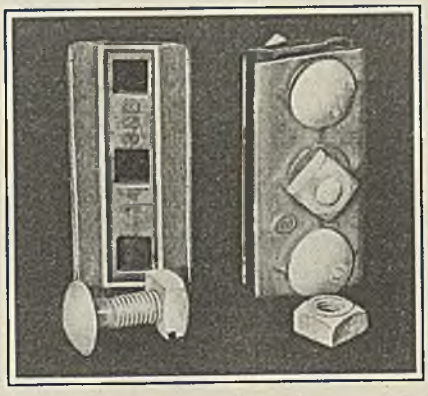
Immune from Dust

The boiler-plate case is made of ¼-in. plate. The front cover is held down by 14 wing nuts and clamps against a vellumoid gasket on the case. An extra cable clamp is furnished with the compensator to hold the cables and to take the strain off the terminal board when the compensator is put into and taken out of the case.

Mine Feeder Clamp Has Twofold Use

The three-bolt feeder clamp produced by the Ohio Brass Co., Mansfield, Ohio, is a mine device for overhead work which, though specially developed for one large mining property, will appeal to operators who are interested in a device which will serve several distinct purposes well.

Its design is said to be such that it will do more than the ordinary feeder



Used as Splice or Tee Connector

clamp—taking the place of the T-connector—and possesses a degree of strength not usually found in devices made for doing this kind of work.

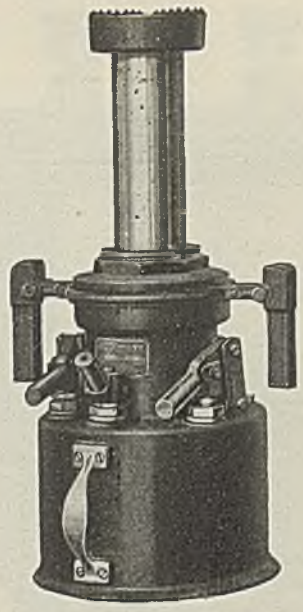
It is constructed with three head nuts which control the feeder and "tap-in" wires, and with two parallel grooves which hold them in place. The jaws of the clamp completely encircle the wire. It will be found valuable for use as a splicer, "tap-in" or feeder clamp, where old trolley wire or bare wire is used on feeder or extension circuits in mines.

This clamp is made of bronze and the one size is suitable for 0 to 4-0 round, grooved or figure 8 wire.

75-Ton Hydraulic Jack Weighs 200 Lb.

A 75-ton hydraulic oil power jack—model G 18—weighing only 200 lb. has been added to its line by the Blackhawk Mfg. Co., Milwaukee, Wis. Equipped with special handles, it may be carried by two men with little effort. Its collapsed height of 18 in. is low enough to go under practically any job, and it has a lift of 10 in.

Included in the equipment are two pumps—a speed pump to raise the plunger of the jack quickly to the point of contact and a power pump to raise the load. Lowering of the load can be fast or slow, as desired, and under control at all times. The release valve being entirely separate from the pump prevents accidental lowering. The load, however, can be raised or lowered a



Lifts Big Loads with Little Effort

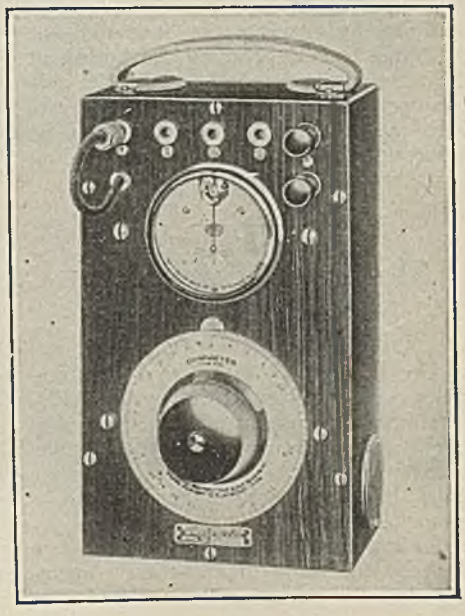
fraction of an inch to any desired point. All working parts such as pumps and ball checks are built on the outside of the jack.

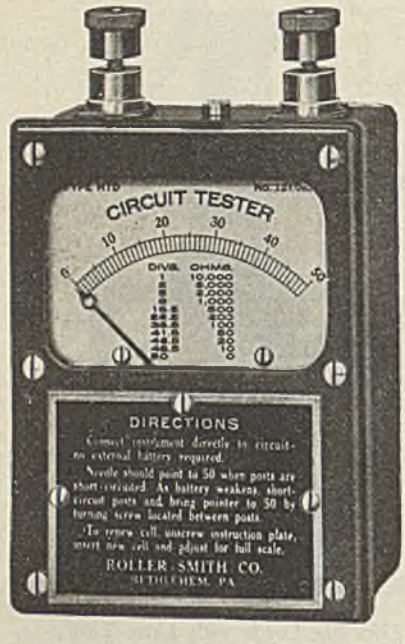
An outstanding feature is the check valve unit, containing both ball checks. This can easily be removed for cleaning by simply unscrewing the pump without tearing down the jack.

Utilize Flashlight Cells In New Instruments

Two new instruments fulfilling electrical department needs have been added to the list of products of the Roller-Smith Co. One is the Type HD circuit tester, which can be used to advantage in place of the ordinary magneto or bell-ringing circuit testers and also for

Type COM Ommeter





Better Than a Magneto

determining the approximate resistance in ohms of circuits ranging in resistance from a few ohms up to 10,000.

Advantages of the tester are light weight and small size—19 oz. and 4½ x 3 x 1½ in., respectively—use of an ordinary flashlight-battery cell, and the fact that inductance and capacity in a circuit being tested will not cause the tester to give misleading indications. The instrument case is sheet steel finished in black. An adjusting screw is provided whereby falling off of battery voltage can be compensated up to the point of practical exhaustion of the battery.

The other instrument is the Type COM ohmmeter, which is intended for measuring the resistance of circuits ranging from 0.5 to 50,000 ohms; with an accuracy of 1 per cent. The battery in this instrument consists of two standard flashlight cells.

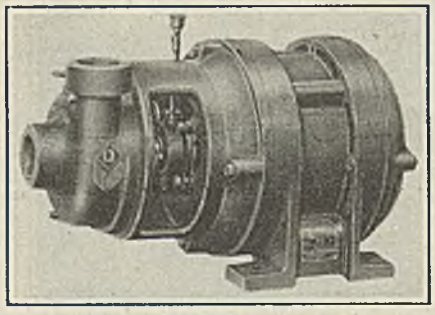
The case is made of black walnut and is 5¾ x 9¼ x 4¼ in. The indication is obtained by turning the face dial—at the same time depressing the button in the center of the dial—until the galvanometer needle is brought to zero. Need for battery replacement can be determined by a test with the binding posts short-circuited.

Motor and Pump Unit Cast Integrally

The type SSU centrifugal pumping units recently brought out by the Allis-Chalmers Manufacturing Co. are combined motor and pump units of simple, compact, substantial design, the complete units being not much larger than a motor alone.

Both the pump and motor parts are built by the same manufacturer, insuring that the pump and motor ends are properly proportioned to work together as an efficient, reliable unit. The unit is close-coupled by fastening the pump impeller to one end of the extended motor shaft and the pump casing is bolted to a special integrally cast extension of one of the motor-end housings. This eliminates a base plate, coupling and pump bearings and does away with the possibility of misalignment between the pump and motor.

The motor bearings, which are the pump bearings as well, are over-size Timken tapered roller bearings, having ample thrust and radial capacity, and are mounted in dust- and grease-tight housings. These bearings have practically negligible wear, carry the thrust of the pump impeller and need only infrequent lubrication.



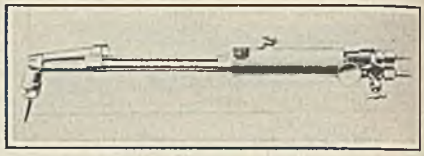
Compact and Dirt-Resisting

The pumps are built in 1¼ x 1¼-in., 1½ x 1½-in., 2 x 2-in., and 2½ x 2½-in. sizes and can be used with 1-, 1½-, 2-, 3-, 5 and 7½-hp. motors. The capacities handled range from 25 to 200 gallons per minute against heads of from 50 to 100 ft. These units are efficient and have many applications within their capacity range.

New Acetylene Blowpipe Is Light but Sturdy

A cutting blowpipe, known as type C-14, which will not backfire even under the most severe operating conditions, according to the manufacturer, has been added to the line of the Oxweld Acetylene Co., New York City. This device uses the same nozzles as the Oxweld type C-2, which it resembles, although several improvements in design have been made. The three gas tubes are straight, having no bends either outside or inside the handle. The cutting valve is of the same design as has been used on the type C-6 for many years and is now used on all hand cutting blowpipes of the same make.

Some time ago the small needle-valve bodies used for acetylene on these devices were improved by making them pressure forgings. Now in addition to these both the head and the rear body of the type C-14 also are pressure forgings instead of castings.



Light, Strong Cutting Blowpipe

The result is better appearance, increased durability and less weight.

Interchangeable nozzles are provided, so that the blowpipe may be used with either medium- or low-pressure acetylene. The low-pressure nozzle can be used with medium-pressure acetylene supply if low pressure is maintained in the hose and blowpipe. The apparatus has been given complete tests in both field and laboratory.

Invert Pavement Solves Culvert Erosion

One of the problems with which railway and mining engineers in charge of drainage work have to contend is culvert erosion. Always a factor to consider, it is especially important in the case of culverts carrying sedimentary streams and those placed with a steep grade. Drainage lines carrying water of a chemical nature also are subject to rapid deterioration. In all of these cases the service life of the installation is often materially curtailed unless some protection against erosion is provided.

After study and research for a number of years the Armco Culvert Mfrs. Association has developed a pipe provided with a specially prepared invert pavement, thus protecting its most vulnerable part against attack and giving the structure practically uniform life throughout. Its distinctive feature is a pronounced floor, which not only fortifies the bottom against wear but facilitates flow. This, the makers assert, adds resistance against invert erosion to the rust resistive qualities for which the company's products have been favorably known.

Paved Floor Combats Erosion