

COAL AGE

A MCGRAW-HILL PUBLICATION — ESTABLISHED 1911

DEVOTED TO THE OPERATING, TECHNICAL, AND BUSINESS PROBLEMS OF THE COAL MINING INDUSTRY

New York, November, 1929

VOLUME 34 . . . NUMBER 11



The Passing of The Tin Cup

WHEN the National Coal Association made public the results of its recent inquiry into profits and losses at the Cincinnati convention of bituminous operators last month, it did far more than confound common impressions of the financial returns on soft-coal sales during the past two years. The figures released were significant and cheering. But the greater service lies in the effect that the trends disclosed will have upon the morale of the industry itself.

THE POST-WAR DECADE was not particularly kind to bituminous coal. Forced liquidations of excess capacities and the more painful readjustments in the thinking of the industry created fertile soil for the development of an inferiority complex. Bewildered and weary operators encouraged its growth by a pathetic eagerness to confess inefficiency—often in advance of proof. Red-ink balances were glorified. Independence was jeopardized and self-respect sacrificed in a futile effort to win public sympathy for the plight of the industry.

PROTEST and resentment against this state of mind were first voiced when a few wise spokesmen had the courage to emphasize the progress made in the technique and machinery of production. Since that time the revolt against pleading guilty to loose charges of inefficiency has grown apace. It is only recently, however, that any large body of the industry has been ready to question publicly the idea that net operating revenues in bituminous coal generally have been non-existent. The facts revealed by the National Coal Association survey show the wisdom of that doubt.

THE SPECTACLE of a great basic industry sitting on the curbstone of commerce and rattling a tin cup is not one to swell the bosoms of men who have a genuine pride in their vocations. Neither is it profitable. That leadership in bituminous coal is repudiating the whine of the industrial mendicant and is speaking boldly of profit-mindedness is one of the most hopeful promises of sane rehabilitation and ultimate stabilization.



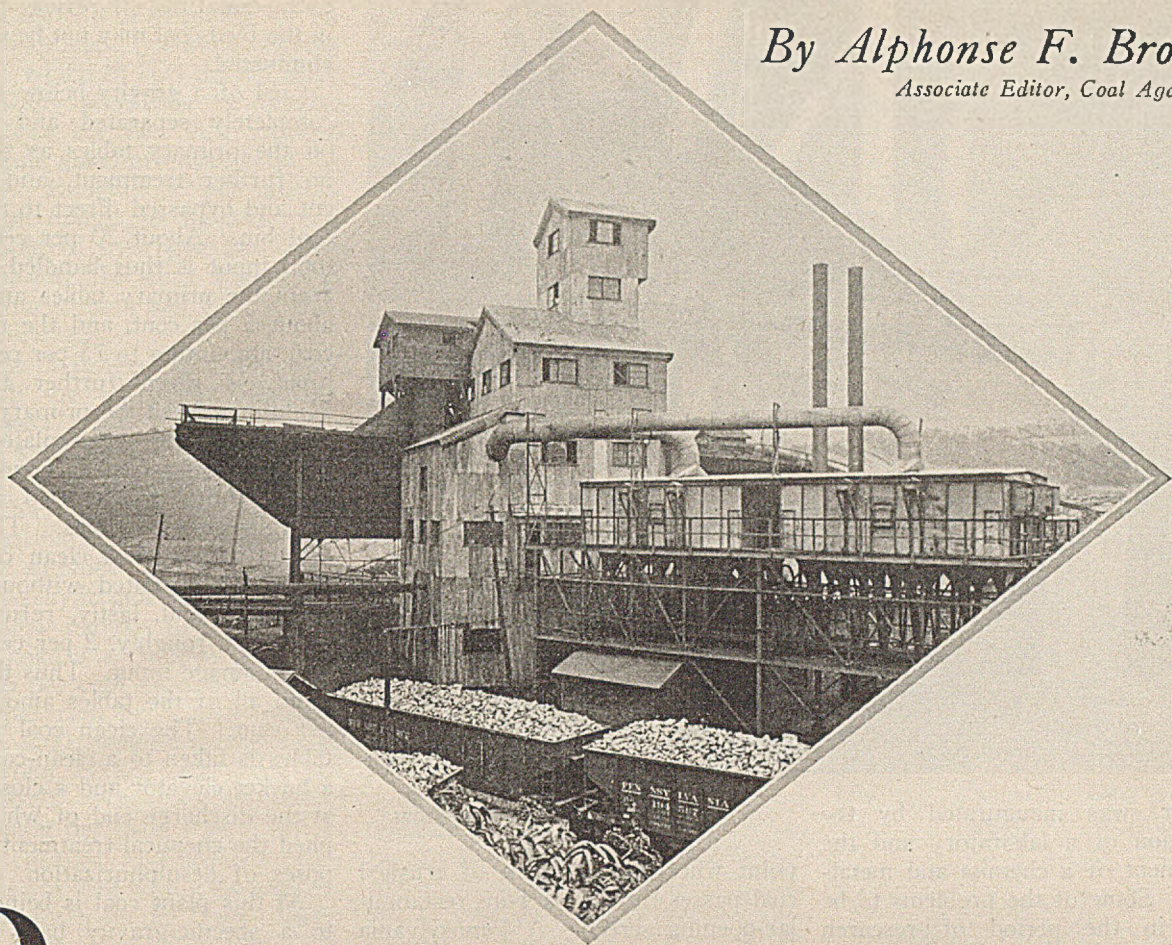


Undercutting a German Coal Bed Which Pitches
At Seventy Degrees

[See Page 697]

By *Alphonse F. Brosky*

Associate Editor, Coal Age



Pneumatic Coal Cleaning

Puts Beehive Coke in Byproduct Class

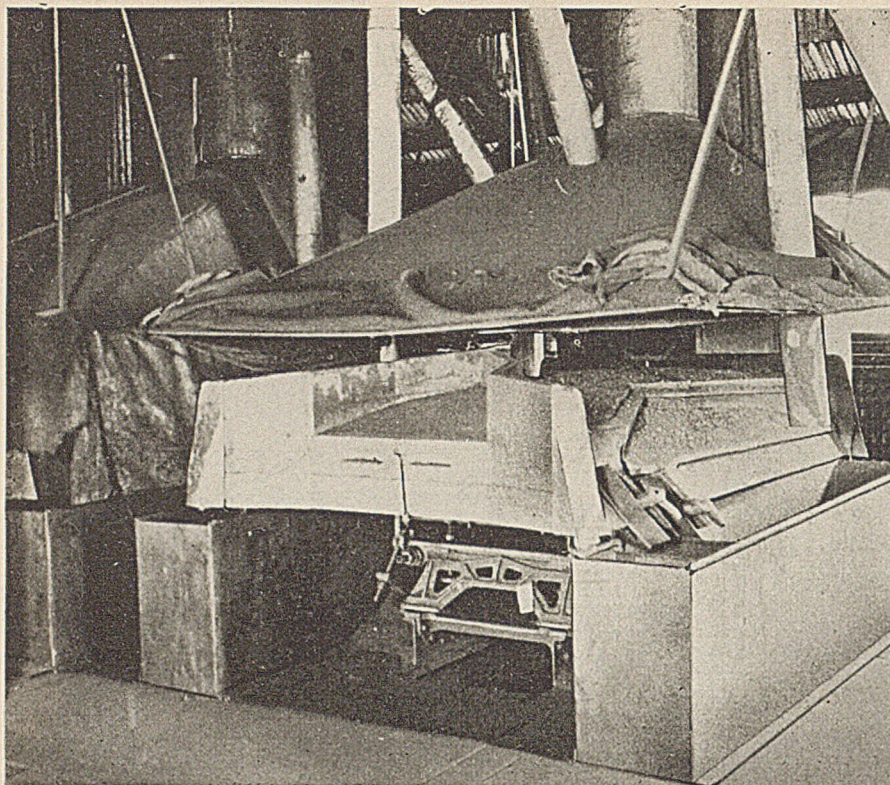
FREQUENTLY the statement is heard that beneficiation by mechanical cleaning of coal intended for heating and steam purposes in many instances is unprofitable. Whatever may be the economic status of refined preparation of coal for use in the raw state at this time, removal of impurities from that coal which goes to metallurgical processes provides wide possibilities for immediate enhancement of sales value, over and above the cost of beneficiation. At least that has been the experience of the Humphreys Coal & Coke Co., subsidiary of the American Radiator Co., with a mine in the Connellsville region of Pennsylvania, near Greensburg, which produces and

cokes Pittsburgh-seam coal for foundry purposes. The installation of pneumatic coal-cleaning equipment, now treating 400 tons a day, has elevated beehive coke from this plant to a competitor of byproduct coke, both in physical characteristics and chemical analysis, and has enhanced its value by 12 per cent.

With growing refinements in foundry practices in recent years, has come a stiffening of foundry-coke specifications and a gradual re-

cession of beehive coke from competition with coke from byproduct ovens. Quite evidently this company could not hope to remain in the foundry-coke business unless some way could be found to step up the quality of its beehive product to a level comparable with that occupied by coke from the more refined process. In the Connellsville region, where more coke has been produced by the beehive-oven process than in any other area of equal size in the world, this had never been accomplished until Humphreys coke was vastly improved by methods hereinafter described in this article.

About three years ago the program, under A. B. Kelley, general



Re-treatment Tables at Humphreys

manager, was inaugurated by the installation of a laboratory and the engagement of a chemist and metallurgist. Some of the problems to be solved in the period of research which followed were as follows: Kind and type of mechanical-cleaning equipment to install; correct size of coal for most efficient removal of impurities and for making the toughest coke in beehive ovens; further desulphurization of coke by chemical treatment of the coal; methods of oven control for improving the porosity, weight and shatter index of the coke.

Briefly stated, the processes followed in the preparation of coal for the ovens, as a result of preliminary studies, are: First the coal is crushed; then it is passed over two batteries of cleaning tables, the first for primary separation of impurities and the second for re-treatment; finally it is subjected to a chemical treatment by which the already greatly reduced sulphur content is further lowered. Betterment from this last process, however, is fully realized only in the resultant coke.

From the mine cars the coal is dumped into a 200-ton bin, whence it is drawn by reciprocating feeders and taken to a crusher. The chute leading from the conveyor to the crusher is provided with a bar screen which, when unveiled, removes the lump coal for separate shipment. All the coal passing to the tables is crushed, the reduction being to the

point where 65 per cent of crushed coal passes through a $\frac{1}{8}$ -in. rectangular-opening screen. A Pennsylvania hammer-mill crusher, with a capacity of 75 tons an hour, is used for the purpose. Crushing adds to the efficiency of the cleaning process and, together with the latter, gives a coke of better physical characteristics. It goes without saying that the cleaning process improves the chemical properties of the coke.

From the crusher the milled coal is taken by a bucket elevator to a 50-ton bin; it is conveyed from this main bin by another bucket elevator to a secondary bin of equal capacity located over two primary cleaning tables. Directly under the two primary tables are two secondary tables utilized for re-treatment purposes. All four tables or separators are identically alike, being of the American pneumatic Y-type, each with a capacity of 20 tons per hour. Dust arising from the operation of these tables and supplementary equipment is handled by a dust-collecting system described elsewhere in this article. In the design and construction of this plant, M. E. Haworth, chief engineer of the Hillman Coal & Coke Co., Pittsburgh, Pa., served as consulting engineer.

Re-treatment is practiced to insure a uniform chemical quality. Where re-treatment of the bulk of the coal is not resorted to, as at most plants,

extra quantities of refuse, in surges, in the feed coal may not be uniformly eliminated.

Coal of a gravity below 1.50 is so completely separated and classified on the primary tables as to require no further treatment, and so it is cut and bypassed direct to the clean-coal bin. About 20 per cent of the total input is thus handled. Refuse from the primary tables amounts to about 5 per cent, and the remaining coal, amounting to 75 per cent of the input, is given further treatment. Middlings from the primary tables is recrushed and recirculated, while the remaining coal is conducted by closed chutes to the two secondary or re-treatment tables. These secondary tables yield clean coal, middlings (recirculated without further crushing) and, lastly, refuse to the extent of, roughly, 2 per cent of the total tonnage input. Thus the refuse from all of the tables amounts to 7 per cent. The clean coal from the tables is taken to a clean-coal bin by a bucket elevator and a closed chute, at the discharge end of which is applied the chemical treatment for purposes of desulphurization.

At this plant coal is being cleaned to a specific-gravity basis of 1.50. Difficulties in the cleaning are accentuated by the fact that the middlings—representing about 15 per cent of the feed to the plant—contains low-gravity, high-ash coal. Ash in the untreated coal runs at an average of 9.25 per cent, but by cleaning this is reduced to an average of 7.25 per cent in the final product. In the raw coal the sulphur content is 1.10 per cent and in the clean coal it is 0.75 per cent. A degree of this desulphurization is effected through the chemical treatment, but how much has not been definitely determined as yet.

In this desulphurization process a small quantity of chemical is introduced drop by drop into a spray of steam, and together these are impinged on the coal. This admixing gasifies the chemical. By capillary attraction the steam is drawn into the coal cells or voids, carrying with it a certain quantity of air. The free sulphur encountered is oxidized in the presence of air and passes off as sulphur dioxide. Simultaneously, surface tension of the absorbed moisture from the condensed steam tends to bring free sulphur and perhaps some inorganic sulphur compounds to the surface of the coal, where they can be readily oxidized by the oxygen of the air.

This steaming of the coal presents a further method of reducing the inorganic sulphides (notably, ferrous sulphide) which in coal do not seem to be readily accessible to oxygen, by reason of the fact that occluded light volatile gases are already in the coal cells. Roughly 50 per cent of this volatile matter, in the coke oven, is composed of hydrogen gas which will unite with the small quantity of free sulphur present and form hydrogen-sulphide gas.

But the hydrogen will not combine with the inorganic sulphides. Heat breaks down the iron pyrites into iron sulphide and sulphur. The chemical as a gas carried by the steam enters into the cells or voids of the coal particles, where it attacks the iron sulphide and releases the sulphur as hydrogen-sulphide gas.

A typical analysis of Humphreys foundry coke is as follows: Shatter index, 76 per cent on a 3-in. screen and 88 per cent on a 2-in. screen; moisture, 0.60; volatile matter, 0.70; fixed carbon, 89.55; ash, 9.75, and sulphur, 0.66—with a porosity of 52 and a weight per cubic foot of 32 lb.

These chemical and physical characteristics are well within the requirements set forth in the "new" specifications of foundry-coke users. Porosity and weight of the coke are varied to meet the requirements of each customer by accurate regulation of air to the ovens as determined by formula in the laboratory. Through the instrumentality of the laboratory close control also is maintained over the performance of the crusher and the cleaning equipment. Coal from every active working place in the mine is analyzed at stated intervals and the working of no idle place is resumed until after a complete analysis of the coal therein is made.

A pneumatic cleaning plant without a highly efficient dust-collecting system is a menace to satisfactory relations with labor and the public. If dust is allowed to escape from the plant in large quantities, it so vitiates the atmosphere and permeates the homes as to render the community almost uninhabitable. Ill - feeling

toward the management is bred by the deleterious effect of free dust on the landscape and there is a large labor turnover from this cause. Difficult relations with employees and the neighboring public are known to have been experienced by operators of plants where only 5 per cent of the dust arising from the process of cleaning escaped.

Desiring at once to maintain good will, preserve the beauty of the landscape and prevent economic waste—also because all the coal is crushed before going to the tables—the question of dust suppression was given more than ordinary attention. The Pangborn system of dust collecting was selected, being guaranteed to function with an efficiency of no less than 99.5 per cent.

It is of the cloth-screen type and operates under a pressure of not more than $3\frac{1}{4}$ in. of water gage, in consequence of which relatively low pressure, ordinary wear on seals causes practically no leakage of dust. Whatever dust might thereby escape from the system is confined within the plant, where most of it is caught by one or another of the hoods connected to the exhaust fan. Fluctuations in the efficiency of the collectors because of leaky dust-discharge valves or seals is so small as to be practically negligible.

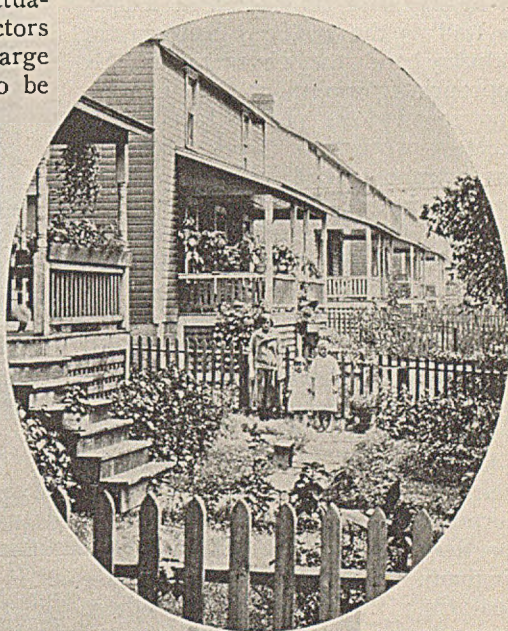
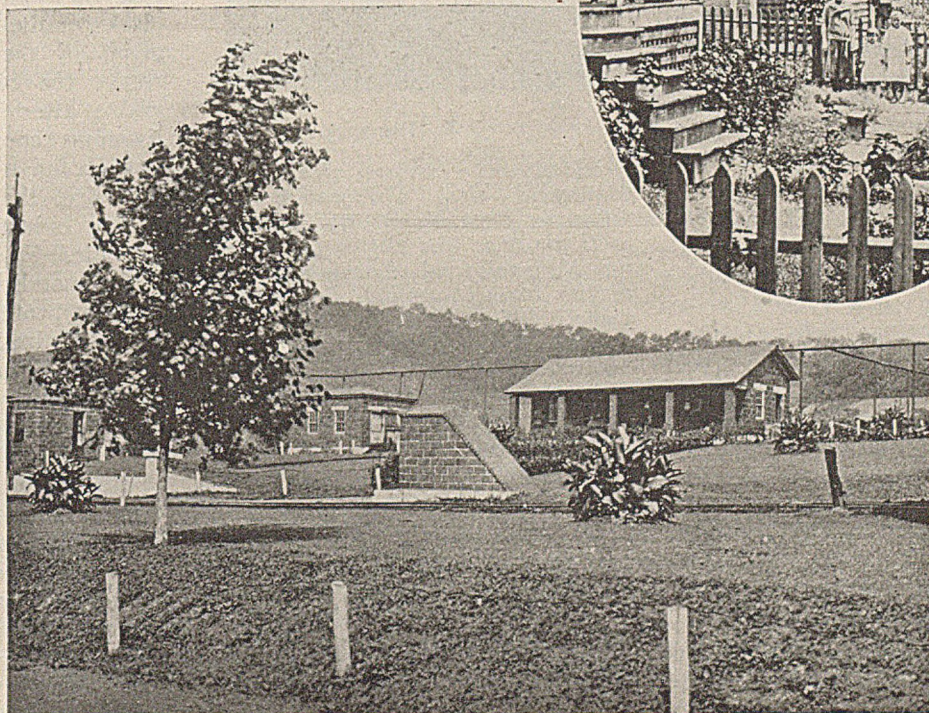
Dust is gathered by hoods and ducts from the cleaning tables, the crusher and elevators by a

100-in. American exhaust fan driven by a 50-hp. motor, which has a capacity of 30,000 cu.ft. From the fan the dust-laden air is discharged into two continuous-pressure, double-duty twin dust-collecting units which comprise a structure separate from the cleaning plant proper. A unit consists of two casings, each containing a screen section on each side of a central classifying section.

In operation, the dust-laden air first enters the classifying section, where, due to the expansion of the air, the velocity is decreased and the heavier particles separate out. The lighter dust, remaining in suspension, then moves into the two screen sections, where it is collected on a bank of cloth screens, the clear air filtering through the screens and into the atmosphere. Control of the passage of air into and from the classifiers and screen sections is effected through doors and valves electrically timed and operated. In each collector there are eight screen sections which, one at a time, are cut off from the dust load and are freed of dust by a gentle

(Turn to page 676)

*A Cleaning-Plant Problem Solved:
Dust Collectors Preserve
Vegetation*



MAKING THE INDUSTRY

LEADERS of the bituminous industry in search of elusive profits were told that their efforts were bearing fruit at the twelfth annual meeting of the National Coal Association, held at the Sinton Hotel, Cincinnati, Ohio, Oct. 23-25. Fortified by this welcome news, they turned their attention to ways and means of obtaining still greater returns. Better merchandising was selected as holding forth the greatest promise and accordingly occupied the spotlight.

But though merchandising received the lion's share of attention, other topics were not neglected as a source of earnings. The trade-practice movement and improvement in safety were considered at length, as well as the relations between the industry and the government. By appropriate resolutions, the convention renewed its pledge to continue accident-prevention work, opposed government control, indorsed legislation in the interest of the industry and the public, requested a survey of industry advertising, expressed approval of charging to current expense cost of items to maintain productive capacity, and urgently recommended the consideration of trade practice codes to those districts or fields which have not adopted them.

C. E. Bockus, president and chairman of the board, Clinchfield Coal Corporation, was elected president for the coming year. W. H. Cunningham, president, Truax-Traer Coal Co.; J. W. Searles, president, Pennsylvania Coal & Coke Corporation; Rice Miller, vice-president, Hillsboro Coal Co., and J. F. Welborn, chairman of the board, Colorado Fuel & Iron Co., were named vice-presidents. W. D. Ord, president, Empire Coal & Coke Co., was given the treasury portfolio, and Harry L. Gandy was again the directors' choice for executive secretary.

Profit and loss in the production of bituminous coal was discussed by Harry L. Gandy in a report based on replies to a questionnaire author-

ized by the Market Research Institute of the National. The questionnaire was submitted to those companies producing in excess of 50,000 tons annually and replies were received from 585, typical of the industry, producing approximately 150,000,000 tons of commercial coal annually. Of that number, 339 were used in the detailed compilation by six-month periods. The results of this compilation are given in the accompanying tables, the net profits representing the net earnings of the



C. E. BOCKUS

President and chairman of the board, Clinchfield Coal Corporation, with offices in New York City and mines at Dante, Va., was elected president of the National Coal Association at the twelfth annual meeting, held in Cincinnati, Ohio, Oct. 23-25. Mr. Bockus, who has been a director since 1918 and treasurer since 1924, has a long record of service in the association. He was born in Dorchester, Mass., July 10, 1868, and before going with the Clinchfield company was, in succession, reporter and editorial writer, Boston Herald, 1890-1906; vice-president and receiver, Helena (Mont.) Water Works, 1906-11, and assistant secretary, Old Colony Trust Co., Boston, Mass., 1911-13. In addition to his position with the Clinchfield company, Mr. Bockus is chairman of the board, Clinchfield Navigation Co., and Port of Asuncion Concession Corporation.

company before either the payment of stock dividends or interest on borrowed money.

Examination of Table I indicates a considerable fluctuation in the return to the industry by six-month periods. To get a better line of the trend in the industry, Table II was compiled for 12-month periods. This table shows that the average net profit increased from 7.3c. to 8.6c. per ton in the second year. This increase of 17.8 per cent represented an increase of \$2,092,640 in net return to the industry.

Mr. Gandy, in commenting on the table, said that loose talk in the past would lead one to believe that every ton is produced at a loss. In 1928, however, the Bureau of Internal Revenue reported that 1,065 bituminous companies mined coal at a profit, though the proportion was not as great as that indicated by the returns to the Market Institute questionnaire. Further, the aggregate loss was greater than the aggregate profit in that year, so that the industry as a whole was in the red, whereas the returns would indicate that the industry had been in the black for the four six-month periods given in the table. "One cannot escape the conclusion," Mr. Gandy said, "after studying the Internal Revenue reports referred to and the compilation of replies to this questionnaire, that the bituminous coal mining industry is definitely on the upgrade."

Merchandising as a means of increasing profits was discussed at considerable length by representatives of the bituminous operators and affiliated businesses. The remarks of each of the speakers are covered in greater detail beginning on page 677 of this issue.

At a luncheon meeting for secretaries and other officials of the coal operators' local associations, presided over by Charles O'Neill, secretary, Central Pennsylvania Coal Producers' Association, Richard M. McClure, secretary-treasurer, Wirebound Box Manufacturers' Association, dis-

MORE PROFIT-MINDED

Keynote Struck at

National Coal Convention

cussed the duties of the association secretary in a paper entitled "The Trade Association Executive."

Safety was the subject of a general discussion under the leadership of Walter L. Robison, vice-president, Youghiogeny & Ohio Coal Co. The remarks of representatives from different producing districts are given in detail on page 685 of this issue.

The trade-practice movement as a solution for unbridled price-cutting was considered at one session of the convention where delegates gave the results of operation in each of the producing districts which have adopted codes. E. R. Clayton, commissioner, Harlan Coal Bureau, led off with a description of the trade-practice code adopted in February, 1929.

A code of ethics was adopted in the Harlan field after careful investigation and the producers operated under it until May, 1929, when a more concise plan was found and adopted. Mr. Clayton was enthusiastic as to the benefits derived from its operation and, among other things, said that "we have not had an instance of one car of coal shipped out of Harlan County on consignment brought to our attention since the code was adopted."

The trade practice code adopted by the Southern Appalachian Coal Operators' Association was discussed by E. R. Howe, secretary. The code was adopted a year ago and contained two important features: an agreement that no coal should be shipped on consignment and a second agreement that producers were not to sell below the cost of production to injure a competitor or to control competition. Upon adoption of the code the Southern Appalachian Coal Exchange was formed to carry out the provisions of the code. The operators are required to inform the

exchange of minimum prices for the next period and also to advise the exchange of any changes made in these prices. Other members are then informed of the prices and any changes by the commissioner.

No effort is made to control prices, the only requirement being that the producer keep the coal exchange informed. Membership in the exchange is not made contingent

appeared since the adoption of a trade-practice code the first of the year. Operating, as it did, to bring questions out in the open, the plan has bred confidence in the operators and has resulted in improved conditions of operation. No attempt is made to govern prices, the only requirement being that they shall be posted in the office and circulars mailed to the trade. Prices, or

Refuting the Critics

That a profit has been shown in spite of not inconsiderable difficulties is a tribute to the bituminous industry. It is a complete answer to the statement frequently made that its incapacity under private management has been demonstrated and that the only way in which efficient and profitable operation can be secured is through the interference of federal and state governments. It is abundant evidence of the fact that the industry is fulfilling its promise to set its house in order if left free to work out its own salvation.

—Harry L. Gandy, before the twelfth annual meeting,
National Coal Association, Cincinnati, Ohio, Oct. 24.

upon membership in the operators' association. Some complaints as to violations have been received, he remarked, but it was found in every case that the informants were mistaken. Operation of the plan has brought to light the facts that competition was between the operators in the field rather than between those in the field and outsiders, that operators are not cutting the published prices, and that the dumping ground is disappearing.

Oliver J. Grimes, secretary, Utah Coal Producers' Association, said that distrust and suspicion had dis-

changes therein, are not sent in to the association.

E. C. Mahan, president, Southern Coal & Coke Co., believed the trade-practice movement would gain impetus in the coal industry with further study and application. He sketched the history of the movement in the Harlan field of Kentucky and expressed himself as well pleased with the results. Increased self-respect on the part of the operator has been one important result of the operation of the code. Before its adoption, selling was of the cut-throat variety wherein both the

salesman and the buyer were in a combination to beat down the price. Complete co-operation is not required, as only a few operators in any one field may receive a material benefit by reducing the competition between themselves.

The final session, on the morning of Oct. 25, presided over by Wm. Emery, Jr., president, Cambridge Collieries Co., was devoted to a discussion of government relations under the leadership of Harry L. Gandy. In his opening remarks, Mr. Gandy reviewed the steps taken in fighting S.4490 and said that the hearings set forth the pros and cons of federal control. As to the future of government control of the bituminous industry, proponents of that type of legislation undoubtedly will be active at the next session of Congress. However, a sound solution of the problems facing the industry cannot be expected from this or kindred efforts and before real help can be had the problem must be approached from a different direction than that of today.

"The Legislative Situation Today" was discussed by W. H. Coolidge, chairman of the board, Island Creek Coal Co. Uncertainty prevails, as a rule, because legislative action is not always along party lines. In discussing the attitude and actions of the Senate, he termed it more of an investigative than a legislative body. The House, on the contrary, functions well from a legislative standpoint.

IN REGARD to a coal commission, Mr. Coolidge expressed his belief that a constitutional bill embodying provisions for its formation could not be passed. However, not much dependence can be placed on that factor alone. Railroads are prosperous because under the terms of the Transportation Act they are allowed a certain profit, but under present conditions the coal industry is not allowed to fix prices.

If a commission was formed it probably would function from a fault-finding and complaining standpoint. As government is a government of men rather than laws, the viewpoint of such a commission probably would change with each administration. Also, in all probability, it would contain no coal men and would not, as a consequence, be so well fitted to cope with the problems of the industry.

"Recent Tax Decisions of the Federal Courts" were discussed by Sidney P. Simpson, of Hines, Rearick, Dorr, Travis & Marshall, New York City. He took up the case of the Gatliff Coal Co., where valuation was made in accordance with Hoskold's formula, but anticipated profits from the operation of the company store were excluded. In the event that this case, which is now awaiting decision in the Court of Appeals in the District of Columbia, is decided in the favor of the coal company, other coal companies similarly situated will be entitled to refunds on the ground that insufficient allowance was made for depletion as a result of failure to take into account store profits in valuing the mine.

"Advisory rates" for depreciation, recently promulgated by the Bureau, were next discussed by Mr. Simpson, who urged that the association oppose their adoption, principally because more than likely they would become the standards, and would not apply to the coal industry, where conditions may vary widely from mine to mine.

Turning to "percentage depletion," Mr. Simpson reviewed the history of the subject, including the recommendation of the division of investigation of the joint House and Senate Committee on Internal Revenue Legislation (*Coal Age*, Oct. 1929, p. 656). He recommended that if the plan proposed by the division would do what was claimed for it, the association should urge its adoption. But in any case, depletion

based on cost should be retained as an alternative method.

In conclusion, Mr. Simpson took up the question of deductibility for tax purposes of expenditures for mine equipment necessary to maintain normal output. The question of whether expenditures for equipment which is necessary to maintain normal output and which does not add to the value of the mine as an operating property should be charged to expense should be very nearly settled by the Circuit Courts of Appeals for the Fourth and Fifth Districts in the Marsh Fork Coal Co. and Roden Coal Co. cases, soon to come up.

IN the absence of Col. W. M. Wiley, vice-president, Boone County Coal Corporation, and director, Chamber of Commerce of the United States, whose illness prevented his attendance, his paper on "The Distinction Between Government and Business," was read by M. L. Garvey, vice-president, New River Co. Colonel Wiley urged business men to take an active part in government, as the time spent in that manner will yield much larger returns proportionately than if spent in the regular pursuit of business.

"Anti-Injunction Legislation" was discussed by Walter Gordon Merritt, counsel, Anthracite Operators' Conference and the League for Industrial Rights. Asserting that collective action can be a great force for good or evil, Mr. Merritt said that by its use society may be oppressed and, consequently, some form of regulation is necessary to protect the liberty and right of action of its members. Stigmatizing the proposed anti-injunction bill, sponsored by the American Federation of Labor, as in direct contravention of these rights, Mr. Merritt asserted that it would remove all the restrictions binding upon the rest of society and prohibit the same enforcement of law upon the unions as on all other branches of industry.

Profits and Losses in the Bituminous Mining Industry

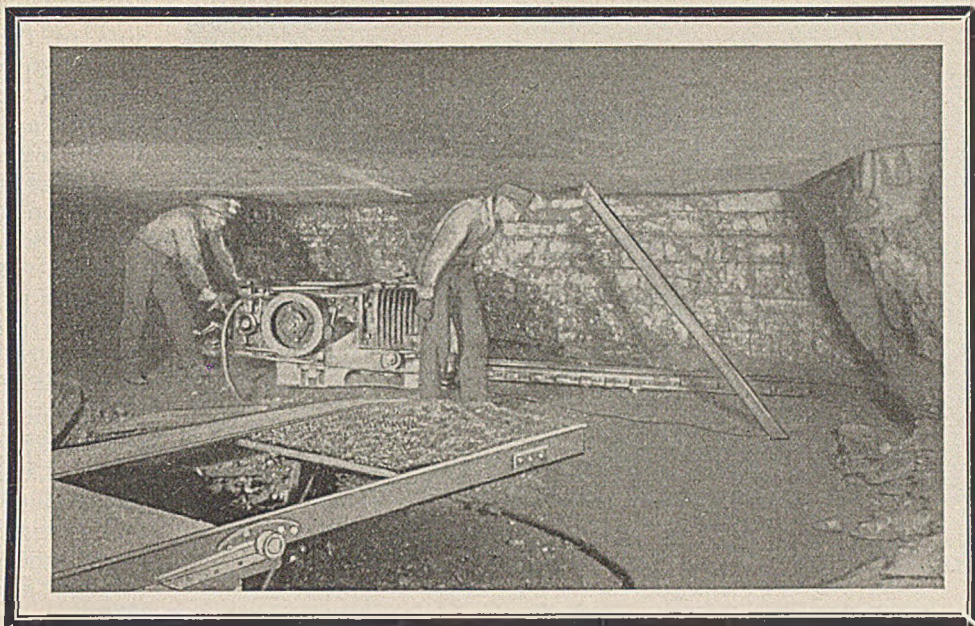
TABLE I—BY SIX-MONTH PERIODS

	Profits				Losses				-Total			
	No. of Com- panies	Production, Net Tons	Amount of Profit	Profit per Ton, Cents	No. of Com- panies	Production, Net Tons	Amount of Loss	Loss per Ton, Cents	No. of Com- panies	Production, Net Tons	Amount of Profit	Profit per Ton, Cents
July 1-Dec. 31, 1927.....	176	48,476,744	\$14,046,662	28.9	144	18,769,963	\$6,476,569	34.5	320	67,246,707	\$7,570,123	11.2
Jan. 1-June 30, 1928.....	153	40,282,135	8,987,871	22.3	177	29,629,026	6,432,205	21.7	330	69,911,161	2,545,666	3.6
July 1-Dec. 31, 1928.....	181	59,877,184	13,379,646	22.3	155	24,915,077	4,994,057	20.0	336	84,792,261	8,385,589	9.8
Jan. 1-June 30, 1929.....	177	51,193,328	10,178,232	19.8	154	24,986,692	4,572,985	18.3	331	76,180,020	5,605,247	7.3
July 1, 1927-June 30, 1929.....	244	199,829,391	\$46,592,411	23.3	229	98,300,758	\$22,475,816	22.8	339	298,130,149	\$24,106,625	8.0

TABLE II—BY TWELVE-MONTH PERIODS

July 1, 1927-June 30, 1928.....	207	88,758,879	\$23,034,533	25.9	208	48,398,989	\$12,908,774	26.6	331	137,157,868	\$10,115,789	7.3
July 1, 1928-June 30, 1929.....	211	111,070,512	23,557,878	21.2	187	49,901,769	9,567,042	19.1	336	160,972,281	13,990,836	8.6
July 1, 1927-June 30, 1929.....	244	199,829,391	\$46,592,411	23.3	229	98,300,758	\$22,475,816	22.8	339	298,130,149	\$24,106,625	8.0

*Starting a Cut
With an A.C. Machine
In No. 4 Mine*



Why Spruce River Coal Co.

Beat 148 Others on

POWER COST

By J. H. Edwards

Associate Editor, Coal Age

BASED on per cent of electrification the Spruce River Coal Co., of Ramage, W. Va., has the lowest power cost per ton in a tabulation of 1928 power data for 149 progressive companies which purchase power and operate principally in the area comprising West Virginia, Kentucky, Tennessee and Virginia. Although this company operated at but 60 per cent capacity during the year, the cost of total power purchased, including that for town water pumping and lighting, was only 4.82c. per ton. Making a deduction for the power not properly chargeable to mining brings the cost down to 4.26c. per ton.

It might be concluded that the natural conditions must be the very best, the company must have a special

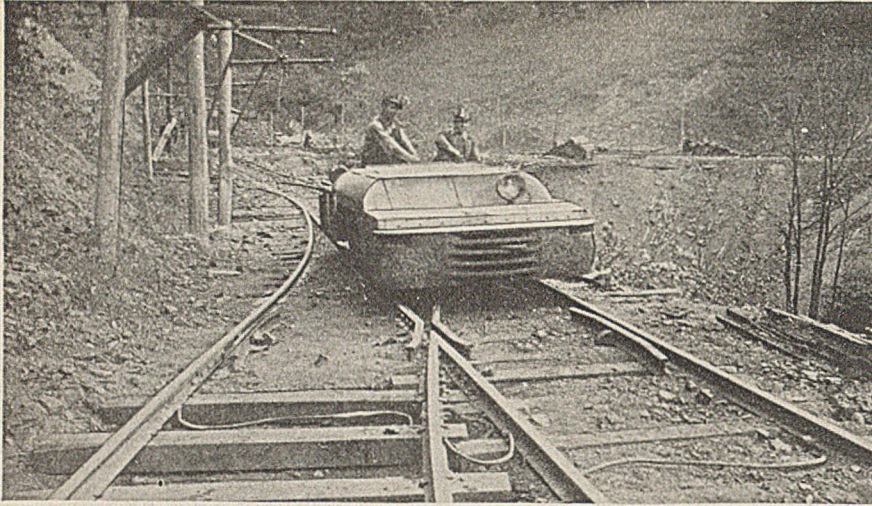
power contract and must produce a large tonnage. Generally speaking, the natural conditions are favorable, but the power invoices are made according to the standard "L.P." tariff of the Appalachian Electric Power Co., which calls for a 15-minute metered demand. The total tonnage produced was 365,216, an average of 30,000 per month, which was exceeded by 36 of the 149 companies included in the comparison, and one of these companies averaged over 93,000 tons per month.

The use of straight storage-battery locomotives for gathering and of alternating-current mining machines is responsible in a large measure for the low power cost. Demand is held down by taking advantage of every possibility which will not interfere with the other items of production cost, and power losses are kept within economical bounds by using lines

of ample capacity, making frequent inspections, and making repairs promptly. Regular inspections and reports are obtained bi-monthly to insure the elimination of all possible sources of power waste and to guard against unnecessary maximum power demands.

In 1928 three mines were operated and produced 365,215 tons. They are in the Coal River field of Boone County and operate in the Alma seam, 62 in. thick, from which the yield of coal is 48 in. No. 4 mine contributed 294,978 tons while Nos. 3 and 5 together were limited to a production of 70,237 tons. Opened in 1922, No. 4 mine now has a maximum haul of 4,500 ft. Eighty per cent of No. 4's output was hauled over a favorable grade of 1½ per cent and the remaining tonnage over an adverse grade of 3 per cent.

Undercutting is done with Good-



In the Foreground: Crossbonds Just Applied to a Repaired Section of the Outside Haulway. In the Background: One of the Battery Locomotives on the Way to the Charging Barn at the Close of the Day

man shortwall machines powered with 50-hp., 220-volt, three-phase, squirrel-cage, induction motors. The distribution system consists of 2,200-volt insulated three-conductor cables extending from drift openings to transformer substations, and of open wiring for transmitting the 220-volt energy from substations to working sections. The No. 4 mine is equipped with four of the transformer substations. Each consists of three 15-kva. single-phase transformers rated 2,200/110-220 volts and of three $1\frac{1}{2}$ -kva. units of the same voltage rating which are connected as volt-

age boosters on the 2,200-volt side.

The smaller transformers, which provide a 10 per cent boost, were added after it was learned that the 15-kva. transformers should have been equipped with 10-per cent taps to compensate for transmission loss.

Okonite "Parkway" cable is used for the 2,200-volt distribution. It contains three No. 6 conductors insulated with varnished cambric for 5,000 volts. The protection consists of a lead sheath, ribbon steel armor and an outside covering of jute. The cable is suspended from the roof along the airways.

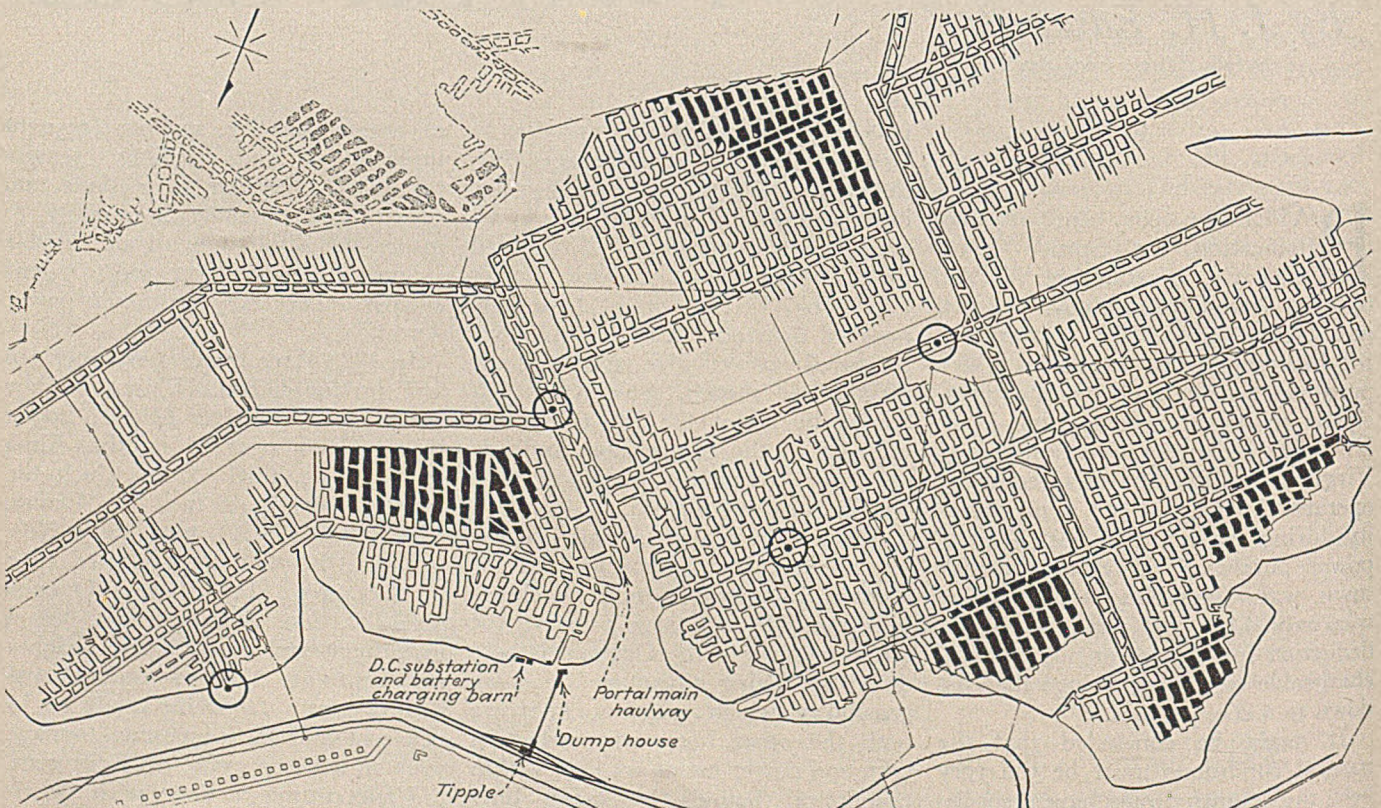
The 220-volt a.c. distribution consists of three bare, solid No. 2/0 wires fastened one above the other on posts set next to the rib. The insulators are No. 3 porcelain knobs, $1\frac{3}{4}$ in. high and 2 in. in diameter. As far as possible, this open wiring is kept on the aircourse. Where the line crosses a traveled way, rubber-covered wire is used, and this is generally put in conduit. To date no electrical accidents have occurred in the mine on this a.c. distribution.

A limit of 1,800 ft. is the standard for conducting the 220-volt three-phase energy, but it has been transmitted 2,500 ft. with fairly satisfactory results. Where a few hundred feet of wire will suffice the lines from transformer stations are paralleled through a three-pole knife switch. This improves voltage and allows the load to divide so as to reduce the transmission loss.

A. W. Pollock, vice-president and general superintendent of the company, who decided upon the installation of a.c. cutting machines after an investigation of their use in Illinois, believes that their advantages far outweigh the disadvantages. This conclusion is based on observation and cost data of a.c. and d.c. machines extending over a period of 8 years. The company still uses d.c. machines in the two older mines.

In a comparison he lists the advantages of the a.c. machine as

Circles Indicate Locations of the Four Transformer Stations Which Supply the Mining Machines in No. 4 Mine



follows: (1) Less power consumption; (2) no commutator or brush maintenance; (3) less motor trouble; (4) power available at all times without requiring an attendant in a substation and without the large power losses suffered when operating converting equipment at low output, which is often the case during hours when mining machines are in operation; (5) not affected by poor bonding nor by broken bonds; (6) satisfactory operation of an induction motor demands that good voltage be maintained, and thereby uneconomical transmission losses and slowed cutting are avoided; (7) under average conditions the a.c. machines will cut more coal than the d.c. machines.

Mr. Pollock charges but two disadvantages against the a.c. machine: (1) Not so flexible in moving from one entry to another, on account of having to trolley with three wires, and (2) approximately one-third more copper is required.

The average cutting for the a.c. machines has been over 300 tons per day in the seam yielding 48 in. of coal. Men who have been trained with a d.c. machine dislike very much at first to operate an a.c. machine, but after they become accustomed to the latter they do not want to go back to the d.c. type.

In the Spruce River mines the a.c. machines are trammed along an entry by having the helper walk along behind the machine and carry the end of the three-conductor trailing cable. For starting he touches the three nips to the three bare conductors

that are suspended along the rib, but for running he slides but two of the nips against wires. The three-phase induction motor must by necessity be energized three-phase in starting but can be operated single-phase on the light load imposed by tramming.

The size No. 3 three-conductor trailing cable used on the a.c. machines has a longer life than the same size two-conductor cable used on d.c. machines. Rubber sheathed cables of the same make are used on both. Presumably the difference in life is due to the fact that the current per conductor is approximately 35 per cent less with the a.c. machines.

Seven straight-storage locomotives all equipped with Edison batteries do the gathering in No. 4 mine. Three are $4\frac{1}{2}$ -ton Mancha equipped with 90 type A-8 cells, one is a 5-ton chain-

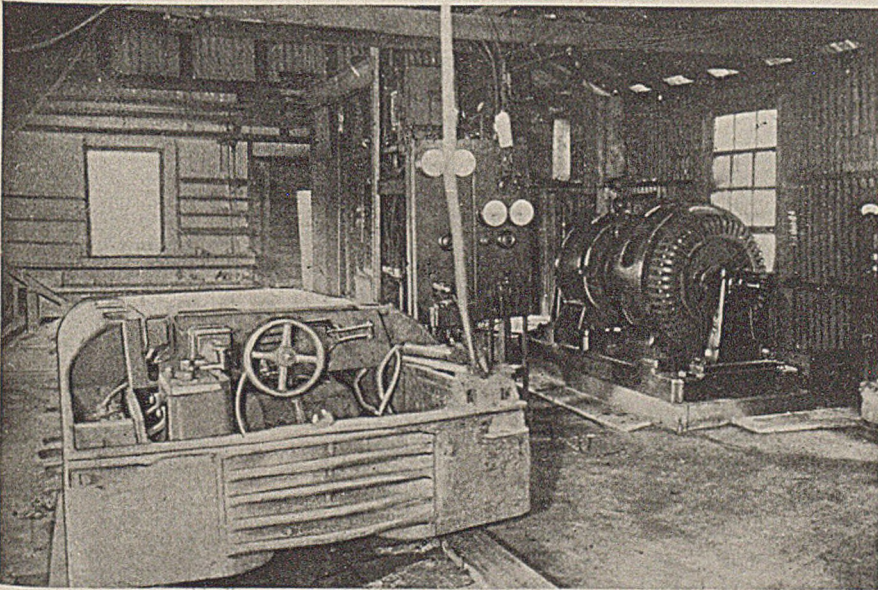
drive Iron-ton equipped with 104 type A-8 cells and three are 6-ton gear-drive Iron-ton containing 88 type A-12 cells. Charging current is supplied from a 100-kw. 250-volt motor-generator set which is located near the dumphouse and which also is the substation unit for power supply to an 8-ton main-haulage locomotive.

"The greatest advantage of battery locomotives," said Mr. Pollock, "is the elimination of trolley wire and bonding in butt entries. And the reduction of peak load means a big saving in power cost. I find that the battery cost, which has run 0.8 to 1c. per ton, is offset approximately by the saving in elimination of bonding and trolley on butt entries together with the saving by not having to buy locomotive cable."

Battery locomotives are charged at night and the cutting is divided between day and night, so as to keep the day and night loads about the same and the power peak at a minimum. Even the battery-charging load is distributed over 16 hours, so that the night peak will not exceed that recorded during the day.

Considering the low power cost per ton, it is only reasonable to expect

At the Right Is the 100-Kw. Motor Generator Which Supplies the Main Haulage Locomotive by Day and Charges the Gathering Locomotives by Night



A. W. Pollock

Table I—Efficiency and Earnings of Labor

Class of Work	Average Efficiency In Tons Per Man Per Day	Average Earnings Per Man Per Year	
		Per Day	Per Year
Machine runners.....	137.97	\$13.06	\$3,489.90
Loading and deadwork.....	11.80	5.56*	1,486.07
Track.....	186.13	4.51	1,204.88
Timbering and airways.....	1,051.19	4.40	1,174.79
Haulage.....	81.70	4.62	1,233.88
Trappers.....	352.64	3.08	822.19
General inside.....	131.56	5.10	1,362.38
Tipple and yard.....	79.35	4.15	1,108.23
General outside.....	88.23	4.27	1,140.04
Total labor†.....	6.90	5.51*	1,473.18

*Actual earnings slightly higher—see text.
†Monthly men not included.

Table II—Power Consumption and Costs

	1927*	1928*
Average tonnage per month.....	40,872	30,521
Per cent electrification.....	90	90
Substation capacity, kilowatts.....	300	300
Average kilowatt-hours purchased per month.....	96,200	78,900
Average monthly demand (15-minute), kilowatts†.....	386.80	264.80
Average monthly demand charge.....	\$562.80	\$397.20
Average monthly energy charge.....	\$1,217.87	\$1,075.87
Average net total power bill.....	\$1,780.17	\$1,473.07
Load factor based on demand.....	40.30%	40.80%
Load factor based on connected load.....	19.43%	15.93%
Energy cost per kilowatt-hour.....	1.26c.	1.36c.
Total cost per kilowatt-hour.....	1.85c.	1.87c.
Percentage demand of total bill.....	31.60	26.95
Kilowatt-hours per ton.....	2.36	2.58
Cost per ton.....	4.36c.	4.82c.
D.C. connected horsepower per kilowatt of substation capacity.....	3.50	5.04
Total a.c. connected horsepower per kilowatt of demand.....	2.78	3.43
Tons per month per total a.c. horsepower connected.....	45	33.60

*Taken from reports rendered to Spruce River Coal Co. by the West Virginia Engineering Co.

†Effective Oct. 1, 1927, a rate change went into effect making the demand base a 15-minute peak in place of a 5 minute peak, and at the same time slightly increasing the energy cost.



Left to Right: A. E. Harris, Chief Electrician; F. R. Scholl, Mine Foreman, and H. D. Parnell, Chief Engineer

that the mine cars are equipped with anti-friction bearings. All of the 188 cars used in No. 4 mine are equipped with anti-friction bearings. The average loading of the cars is $2\frac{1}{2}$ tons.

Bonding of the main haulway over which the 8-ton trolley locomotive operates is done by arc welding, using copper alloy electrodes.

The percentage of electrification of the Spruce River mines is given as 90 in the tabulation mentioned in the first paragraph. This was calculated by the West Virginia Engineering Co., which serves the Spruce River company in a consulting electrical engineering capacity and is the author of the tabulation for the 149 companies purchasing power. If during 1928 mules had not been used for gathering about 20 per cent of the coal, it is estimated that 10 per cent more electrical energy would have been used. In May of this year gathering was made 100 per cent electrical.

For 1928 the over-all power consumption was 2.58 kw.-hr. per ton and the net cost, including demand, was 1.89c. per kilowatt-hour. The tariff is \$1.50 per month per kilowatt of metered 15-minute maximum demand. The energy charge per kilowatt-hour is 2c. for the first 10,000, 1.5c. for the next 30,000, 1.1c. for the next 60,000 and 1c. for all over 100,000. A penalty of 2 per cent is added to the total bill if not paid within 20 days.

The average kilowatt-hours purchased per month by the Spruce River company during 1928 was

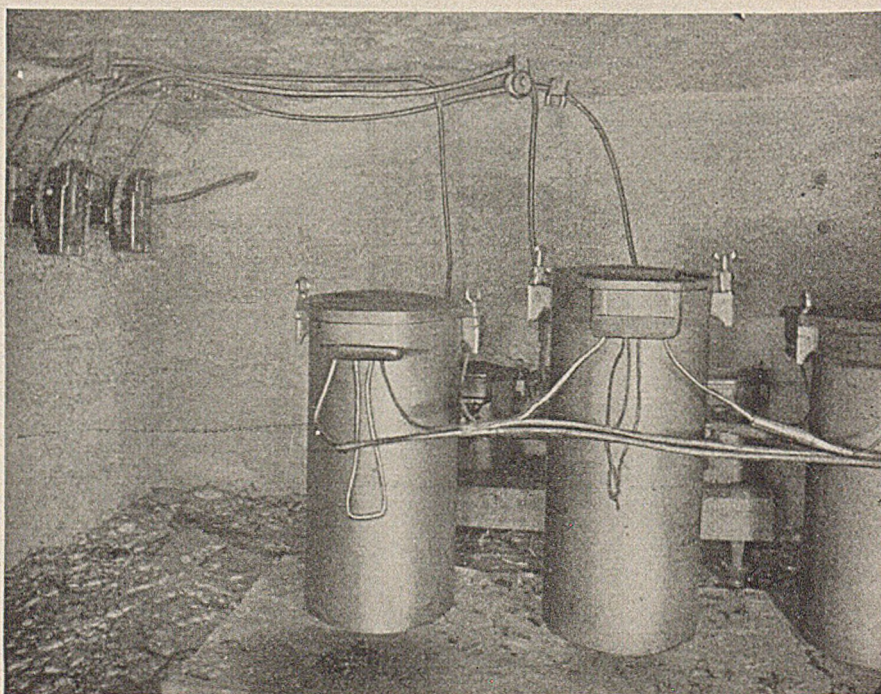
78,900 and the average monthly demand was 264.8 kw. Based on this demand, the load factor is 40.8 per cent, a high figure for the tonnage produced and considering the fact that the continuous fan load is slight compared to what it would be if the mine were gassy. The load factor represents the ratio of the actual power consumption to what it would have been if the load had held continuously at the maximum demand.

Other costs at the Spruce River mines are watched as closely as is

the power cost. The labor efficiency in average tons per man per day for the various classifications are compared from year to year. This efficiency measure for 1928 is shown in an accompanying table. Loaders averaged 11.8 tons, and all labor, outside included, averaged 6.9 tons. The average earnings per day per man are included in the table. The management gives considerable thought to that column in recognition of the fundamental principle that a worker must earn enough money to enjoy a proper living. The figures of \$5.56 for loaders and \$5.51 for all labor are slightly lower than the actual because in the method of keeping the records it is considered that a loader works every day that any of his coal is dumped. On a day that he is off, a car may be dumped that he loaded on the preceding day.

Equipment, methods, and mine workings of the Spruce River company all show the effect of careful planning and of following that plan consistently so far as changing conditions permit. Many years under the same management has contributed to this result, the same as it has to the high degree of perfection in the economic use of purchased power. Mr. Pollock credits F. F. Taggart, of Massillon, Ohio, now acting president and general manager, with the selection of much of the equipment and with the installation of many of the practices current at the mine.

The Transformers Are Isolated in Concrete Vaults—in the Background Are the Three Booster Transformers Mounted on an Insulated Platform



HUMAN MACHINE

Still Major Problem in Coal Mining

By H. S. Gilbertson

*Director of Personnel,
Lehigh Coal & Navigation Co.**

IN COAL MINING there is a great deal of machinery, but the great machine is still the human one. Automatic devices have been coming fast and men are being displaced, but the fact remains that coal mining is primarily an assembly of human energy. Too often, it would seem, the emphasis is upon the physical and mechanical side, while the labor or human elements in the organization are taken pretty much for granted, or are expected to go along and adapt themselves, with little or no direction, to the mechanical requirements of the industry. Much of the so-called "labor trouble" in coal mining as well as in every other industry has its ultimate root in this failure, on the part of those who direct and plan, to reckon on the reactions of men at work. They fail very much as a teacher fails who only has a line of information to hand out and has no conception of the capacities and limitations of his students.

Such knowledge of men does not seem to come intuitively, from long experience and wide contacts, and it is surprising to what extent many practical men often fail to touch the mainsprings of action in those whom they are called upon to lead or direct. The explanation is, I think, that the study of men in industry has only begun to command systematic study and thoughtful attention. The time is not far distant, I believe, when some such systematic knowledge will constitute one of the essentials of preparation for industrial engineering.

A noted American banker once referred to what he called the "economic illiteracy" of the average American. There is a very specific economic illiteracy among the people of the coal industry, including both those engaged in actual mining and those who form the communities

about the mining regions. And particularly is there a woeful ignorance of the relation of the individual, his attitude of mind and his industrial performance to the welfare of the industry as a whole. To clear up the clouds of ignorance on these vital subjects is perhaps the first proper item in any well-designed campaign or program of personnel administration.

How shall we go about it? To begin with, the coal industry as now organized usually is one of big units.



H. S. Gilbertson

Because the units are big they are more or less impersonal. It is usually a long way up the line from the men at the front to the man at the top, who is determining policies and whose activity and thinking impress for good or ill the entire organization. The situation requires that this impersonal character in the organization be either supplanted or offset as far as possible by some other personal force. It is quite possible to do this, in a degree at least. The main thing is to recognize the situation and then to get people all along the line to the

last under-boss thinking about the matter—thinking not vaguely or at random but systematically, purposefully.

Secondly, the coal industry provides a working condition in which the individual worker is largely on his own—this is an outstanding fact of daily operation—just as in a railroad operating organization, the individual is out from under the direct observation of his immediate superior most of the time. Anyone who is at all familiar with the operation of coal mines knows what this means in a practical way and how it often militates against the building of an effective organization.

Thirdly, the individual units of the coal industry are peculiarly subject to forces and influences outside and beyond the control of individual management. No coal company can proceed very far in its dealings with its men without considering or consulting the interests and the probable action of competing organizations. This is a very real handicap when it comes to progressive measures.

Fourthly, the coal industry is one which is peculiarly isolated from other industries, both geographically and technically. This condition makes it difficult for both management and men to make intelligent comparison and thus to really appraise their own performances.

Finally, we have an industry steeped in traditions, some of which are not of the best. We have had opportunism, which is another name for short-sightedness; we have had, in common with most other lines of business, policies of secretiveness; we have had perhaps, more or less disregard of human values in high places and in places not so high. On the other hand, we do have some very solid foundations. I know of no industry which is more calculated to stimulate resourcefulness and leadership. We also have a working condition which gives all of the individuals in it a certain freedom of

*Abstract of an address on "Personnel Administration in the Coal Industry," delivered before a joint meeting of the Lehigh Valley section of the American Institute of Electrical Engineers and the Engineers' Society of Northeastern Pennsylvania, at Pottsville, Pa., Oct. 18, 1929.

action in working out their daily problems. I have found among many miners in our region a pride in their work which is missing in factory workers whose daily task is regulated by the pace of a machine or an established and invariable routine.

HAVING in mind these difficulties and these elements of strength in the human side of the industry, what can we do or should we do to build an organization, or, to put it in another way, to mobilize the manpower, including the loyalties and intelligences of the thousands of men who constitute the industry?

Probably the best answer that I can give to this question is to tell you of certain efforts made in the last few years in the operating organization of the Lehigh Coal & Navigation Co. It is very much easier to tell you of the efforts than of the positive results derived from them. The results in any case would always be intangible and immeasurable. We would have to take most of them on faith, but here is what we have tried to do.

You might suppose that what should be considered more important and fundamental than anything else in personnel administration, in the building of an effective human machine, would be the careful selection of the units. And so it would be. But, here again we are beset with limitations. We are not in the fortunate position of some industries, and particularly the newer ones, which can choose from numbers of applicants the best fitted, the most promising. And this applies to much of our supervisory force as well as to the privates in the ranks. You could not pick up miners anywhere and everywhere and fit them into the mining environment, even if there were no certification law. Still less could you pick up foremen from other industries. It is a peculiar business. We have to take our personnel very much as we find it, expose it to better influences and trust to good fortune.

The most practical point of attack in our personnel policy have been the steps we have taken to give the rank and file and the intermediate men in the ranks free access to the most essential information which the management has as to the economic position, the operating problems, the market problems of the company, the policies which are adopted, and the reasons for them, to meet these problems. We have been pursuing this policy for several years. Just how much good it has done we do not

IN OUR preoccupation with mechanizing the laborious processes of coal mining there is always danger that we may lose sight of the men behind the machine, the men whose toil the machine is designed to lighten. And yet the human machine is still the biggest machine in coal production. It is propelled by economic and personal incentives. Unless management succeeds in capturing and directing the forces which actuate this machine towards certain very definite objectives, efficiency falls and disorganization replaces organization. How to make this human machine effective is the problem Mr. Gilbertson discusses.

know, but we do know that we have heard much discussion of some of our public statements and have known that what might be termed as "the company's point of view" is now more frequently and vigorously upheld than was formerly the case.

This policy of telling things out in the open might be described as the policy of the open book. We have encouraged also the policy of the open door, which is, of course, the other side of the picture. We want to know the real truth as to what the workers are thinking about. We do not believe it is a good thing for the workers to keep their troubles locked up in their own chests. We invite them to speak out. In other words, we believe that one of the essentials of good organization consists of open line of communication from the bottom to the top in both directions.

The lack of such lines, I believe, is a fundamental weakness in many business and industrial organizations. The lack of it is characteristic of the autocratic or military type of organization which provides a line of communication downward but studiously suppresses opportunities for expression and communication from the bottom to the top. I believe, however, that the autocrat often fools himself in thinking that his communications reach their destination in their original form. Think over your experience and you will realize, I believe, that orders from the top source have a peculiar way of dissipating themselves before they really arrive at their destination. The obvious explanation is that somewhere along the

line there are one or more individuals who cannot, or will not, interpret the policy of the man at the top as he intended it. But if there is an open line of communication from the bottom to the top, the facts as to what is going on will come out.

We feel, moreover, that it is desirable, if not imperative, to mobilize all of the intelligence latent in the several thousand of our people and not to be content with the intelligence and abilities of particular men definitely charged with results in particular fields. In other words, every man along the line has something to give, if we can find out what it is, besides the well-defined routine in his daily job. We have profited by this belief in the latent intelligence of our men in numerous instances.

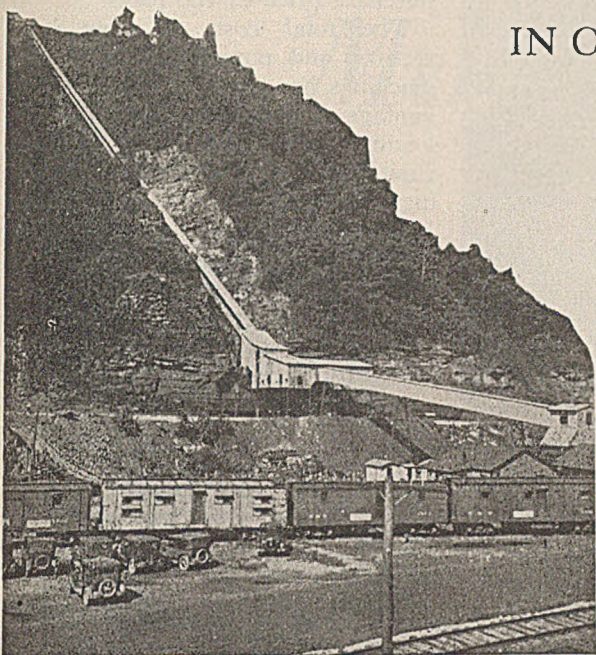
AND THEN, we have attempted something in the way of training. Nothing has been more gratifying in our personnel work than the response we have had to our efforts in the direction of training for foremen, and more especially assistant foremen, and of those who have ambitions to be promoted into these executive positions. For three or four years we have had series of meetings conducted by department heads, superintendents and the more experienced foremen in which we have discussed in a very intimate, informal and practical way the application of cost principles, quality requirements, market conditions, safety, and the like, as applied to the day's work. The most encouraging single thing about these classes has been the fact that, though attendance has been purely voluntary, there have been numerous instances of men who have come back year after year and rarely missed a meeting. We have found these men at their work applying the principles that have been discussed, analyzing their problems in a manner quite different from what seems to have been the rule in former times.

We have only scratched the surface. We are not satisfied. Personnel administration, after all, is not something more or less distinct from the specific activities of an operating organization. There may be a personnel officer, but that is not important or sufficient. The end sought after can be attained when every man who directs the efforts of other men thinks continually and analytically about his operating problems with a full appreciation of the fact that the mining industry is, and is certain always to be, primarily a human machine.

Four Years of Mechanical Loading

IN C. & O. MINES

Dictates "MORE"



This Rope and Button Conveyor at Eunice Must Retard a Maximum Rope Pull of 16 Tons. It Is 1,475 Ft. Long, on an Inclination of 32 Deg.

NEARLY four years ago the Chesapeake & Ohio Railway Co. installed a loading machine at one of its mines at Dorothy, W. Va., on the Coal River extension of Cabin Creek branch, in Raleigh County. That machine is still in use and the cost of repair parts has averaged less than one-fourth of a cent per ton. Two other loaders of the same type, installed at later dates, are doing equally well. Because the machines are operating at a saving over hand loading H. B. Husband, general manager of fuel mine operations, is now considering the purchase of a fourth unit.

These machines are of the type which loads from the track and has a double-motion head. The first machine was installed in March, 1926, to speed development in the Sarita No. 2 mine. This mine is in the Dorothy seam and has a working height of 11 to 12 ft. In ten months the machine loaded the coal from nearly two miles of narrow work—a development which made it possible to increase by 700 tons the 200-ton daily output which was the limit before it began work. The loader was double-shifted most of the time.

In February, 1927, the machine was transferred to Dorothy No. 2 mine, which had just been opened in a 43-acre outcrop area of the No. 5 Block seam. In August of the same

year, a second loader was installed in the mine and put to work driving entries and rooms, and taking pillars. Loader No. 1 was taken out in October, 1928, and was sent to Eunice, where another mine was being opened in the No. 5 Block seam.

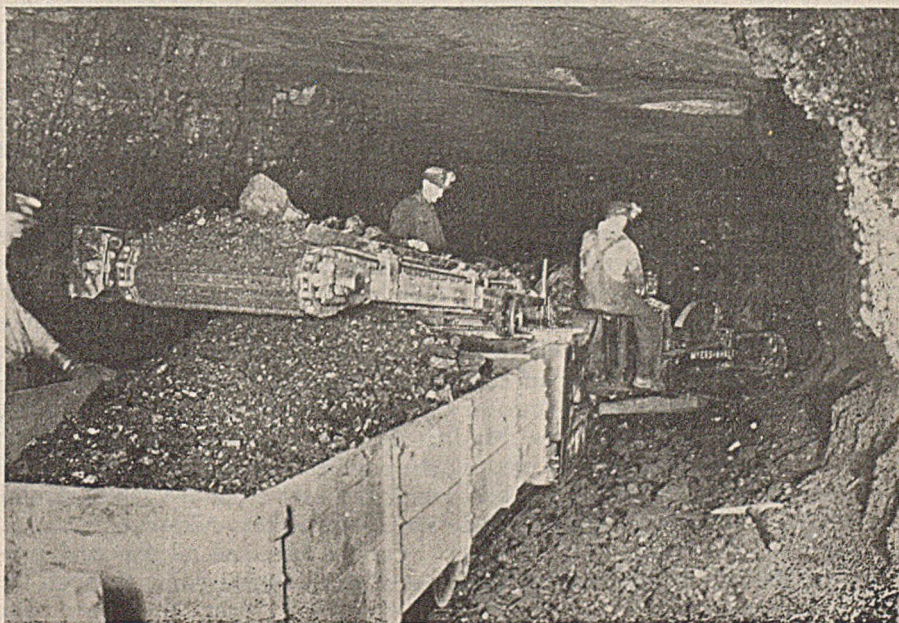
The machine had been operated for 30 months and had been double-shifted most of the time, so the opportunity was taken to determine the extent of wear. The loader was com-

pletely dismantled with the idea of renewing all worn parts and checking the total repair cost to that date. Very little wear was found and no renewals of major parts were necessary.

Loader No. 2 was operated in Dorothy No. 2 mine until the robbing was nearly completed. Hand loading has been resorted to only to recover pillar stumps which in unfavorable places are left by the loading machine crew. Practically all of this 43-acre tract has been loaded mechanically. In May, 1929, the second machine was transferred to Sarita No. 2 mine and put to work driving entries.

On Dec. 7, 1928, loading machine No. 1, which had been checked for wear, was put into use about 100 ft. from the crop, driving the main headings of Eunice No. 2 mine. This area of No. 5 Block coal averages 10 ft. in thickness and for the most part has a sandstone roof which holds in narrow places without timbering. The coal lies practically level and the cover varies up to a maximum of

Loading in Eunice No. 2 Mine. The Helper Is Picking Slate From the Machine Conveyor and the Brakeman Is Trimming the Car.



150 ft. About 3 ft. from the bottom there is a slate parting 5 to 6 in. thick and a few inches above that there is a 6-in. band of hard bone-coal.

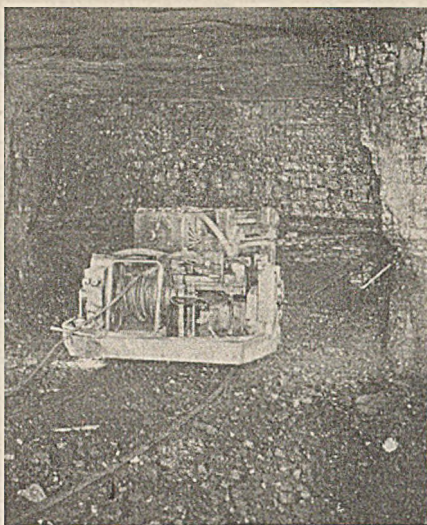
From start to finish this mine will be a mechanical proposition. Pillars will be mined retreating by taking slabbing cuts, which in effect widen the rooms. Entries and rooms are being driven 15 ft. wide, a width which experience has demonstrated to be the best for the mechanical loader in this 10-ft. seam. The rooms are on 50-ft. centers and are 200 ft. deep. Breakthroughs are turned at a 30-deg. angle with respect to the line of advance, and tracks are placed in breakthroughs to provide switching space for the locomotive and cars which serve the loading machine. Thirty-pound steel is used throughout the mine, and the car capacity is 3 tons.

On April 2, 1929, loading machine No. 3, a new purchase, was put to work in Eunice No. 2 mine with loader No. 1. Both machines have been double-shifted most of the time. For the eight months ending Sept. 1, the coal production per loading-machine shift averaged 192 tons. The loaders, however, actually handled a greater tonnage of material than that recorded, because in places slate was encountered, which together with a quantity of coal was loaded for hauling to the refuse dump.

The 5-in. slate band is cut out with a slabbing machine which operates from the track. Three holes are drilled in the coal below the cut and five in that above. The charges total 34 sticks of $1\frac{1}{8} \times 8$ -in. permissible. The bony band above the cut is responsible for the heavy shooting required in the upper bench. Because the mine output is used for railroad fuel, lump can be sacrificed in shooting the coal for the best advantage of the loader.

A loading machine crew consists of five men: Operator, helper, motor-man, brakeman and trackman. While the machine is loading, the helper spends most of his time picking slate and bone from the boom conveyor. That which gets by is removed at the picking tables in the tippie.

Renewal of the loading machine conveyor belt will likely be the first major repair expense. This part consists of a rubber belt attached to roller chains and bearing metal flights. Machine No. 1, now 44 months old, is still operating with the original belt, and its life probably will be extended to 4 years. Over that period it will have handled 144,000 tons of coal and considerable refuse, perhaps 20,-



Cutting Out the 5-In. Slate Parting in a Room Neck in Eunice No. 2 Mine

000 tons of the latter. This major repair will add about 2.3 mills to the present cost of 2.2 mills, making a

total repair cost of 4.6 mills, or less than $\frac{1}{2}$ c. per ton of coal mined. The labor cost of applying the parts has not exceeded 50 per cent of the purchase price of the parts.

The total cost of crew labor, repairs, and power for the loading machines has shown a consistent advantage over the labor cost for hand loading, and deductions of estimated capital charges leave a margin of savings. "The introduction of mechanical loaders at our mines," said Mr. Husband, "has not been an easy problem and considerable supervision has been required. The results obtained have been almost discouraging at times, but our cost records reveal that the poorest mechanical loading showing has been at least 10c. per ton under our best record with hand loading methods and our accident rate has been lowered considerably, so we cannot help but plan for future mechanization."

Pneumatic Coal Cleaning Puts Beehive Coke In Byproduct Class

(Continued from page 665)

whipping action imparted to stay-wires on the screen frames from a shaking mechanism. Automatic valves relieve the individual screen groups of the duty of collecting dust while the particles clinging to them are being removed. A steel baffle plate flanks the dust-air side of the screen bank in the screen section, cutting down the intake velocity of the dust and distributing it uniformly to all screen surfaces. This baffle prevents injury to the screen cloth by the direct impinging of dust particles traveling at high velocity. Collected dust, as two separate products, one from the classifiers and the other from the screen sections, is gathered in underhung hoppers, from which it is withdrawn, when desired, by rotary valves.

From a raw-coal input into the plant of 500 tons, the dust collectors will yield about 12 tons of dust, of which, roughly, 40 per cent comes from the screen section as the finer grade and 60 per cent from the classifiers as the coarser. The sizes and analyses of these two grades, which are marketed as sea coal or reunited with the coal from the tables, are as shown in the next column.

On the basis of all the coal produced at this mine going through the crusher and over the pneumatic

separators, the per-ton cost of cleaning the coal is 23 per cent of the total production cost (for labor, materials, power, taxes and insurance), less royalty and depreciation. The installation cost of the dust-collecting system was approximately 20 per cent of the total cost of the cleaning plant.

This plant is limited to a comparatively small tonnage and in consequence cannot enjoy the relatively lower operating costs desirable from large production. The property is being operated under a leasehold which limits the yearly tonnage. These limitations, without advanced methods and equipment, diminished profitable operation. That the ambition of the Humphreys company in its betterment program has been satisfied is best exemplified by the 12 per cent enhancement in the value of the finished product, at an additional operating cost comfortably less than the premium differential realized.

Grade No. 1 (Fines From Screen Section)

Mesh	Per Cent	Analysis	
Through 100.....	94	Volatile matter...	30.5
Through 200.....	62	Fixed carbon.....	62.5
		Ash.....	7.0
		Sulphur.....	0.80

Grade 2 (Coarse From Classifier)

Mesh	Per Cent	Analysis	
Through 100.....	60	Volatile matter...	31.4
Through 200.....	20	Fixed carbon.....	61.55
		Ash.....	7.05
		Sulphur.....	0.83

National Coal Association Analyzes Merchandising Problems

OF THE INDUSTRY



Milton E. Robinson, Jr.

MERCHANDISING bituminous coal as a means of increasing the profits of the coal industry was accorded a prominent place in the program of the twelfth annual meeting on the National Coal Association, held at the Hotel Sinton, Cincinnati, Ohio, Oct. 23-25. Delegates themselves went exhaustively into all phases of the subject in search of advantages for the industry, and were assisted in their deliberations by representatives of the retailers, equipment manufacturers and the general public as well.

Asserting that "people are now buying the kind of heat that a fuel provides," rather than any particular fuel, Lorin W. Smith, Jr., Minneapolis-Honeywell Regulator Co., urged the members of the association to take the initiative in gathering together representative industries into a conference to study and develop practical merchandising plans that would carry to the ultimate consumer the story of the personal comfort secured through the burning of coal. He recommended that the industry forget other considerations and concentrate on the satisfaction of the consumer's demand for personal heating comfort, translating coal into

automatic heat and furthering its spread by a close relationship between the sale of coal-burning and heat-control equipment and the sale of coal.

The retailers had their innings through the medium of "Some Observations in Retail Coal Merchandising," presented by Milton E. Robinson, Jr., president, National Retail Coal Merchants' Association. First indorsing the remarks of Mr. Smith, Mr. Robinson went on to emphasize the importance of that part of the coal production that goes through the retailers' hands. Those operators who disclaim interest in retail tonnage may be overlooking two important points. The first is that the 20 per cent of the total output going into retail channels yields 40 per cent of the gross income of the operator. "In other words, the retail hundredth of your output brings you 2 per cent of your gross take," said Mr. Robinson, "while each of the other 80 hundredths yields only 0.75 per cent. So, as an income producer, each retail ton is worth $2\frac{2}{3}$ tons of other business."

The second point made by Mr. Robinson is that there is "more conversation in a ton of domestic coal than in a carload of steam fuel." Coal to the lay mind, and to the legislative mind, which looks to the lay mind for a vote, means coal in the cellar at home. The general public, which means the domestic consumer, is responsible for the periodical clamors about coal, and "there is not much danger of overdrawing the picture when I urge you gentlemen to consider the business that flows through the retail channels in the light of its true importance to the entire industry." The retailer is the contact man and leads the offensive into the enemy territory.

In answer to those who might

believe he falls down on the job, Mr. Robinson suggested that they come out and lead the offensive. "You [the operators] can do more for the retailer today, than he can do for himself, if you will, and in doing things for him you are only doing them for yourselves, because the benefits you obtain help you just as much as they do him. Keep before you the attitude of the public, and the analysis of your receipts, rather than that of your tonnage reports. Then will come a better day for all of us."

Referring to the inquiry embracing the two questions: "What the retailer expects from the producer in the way of merchandising co-operation" and "What the retailer ought to give the producer in the same field," the results of which were commented upon in the January, 1929, issue of *Coal Age*, Mr. Robinson discussed some of the points brought out in the answers to 59 letters sent to prominent retailers in coal-burning states in the eastern half of the United States.

"It will be of interest to you," he remarked, "that not a single correspondent was satisfied with the merchandising co-operation he was receiving from his sources of supply. . . . The more I think about it the more I am convinced that the fundamental difficulty lies in the fact that the operator and retailer are occupying the opposite sides of one table and the retailer and consumer are occupying opposite sides of another table. The retailer is trading with the operator in the purchase of the commodity he sells and trading with the consumer in its sale. How much better it would be if both operator and retailer could be brought to sit on one side of the ultimate table, co-operating effectively in mer-

chandising their common commodity to the consumer."

To bring about such a thing would be difficult, Mr. Robinson thought, chiefly because both the operator and retailer have been trained to haggle over price. The consignment coal evil also is a factor tending to perpetuate the situation, though retailers are unanimous in condemning the practice.

IN ADDITION to the consignment question, other practices should be straightened out to pave the way for merchandising co-operation, including such things as uniform preparation and sizing, uniform treatment of competing retailers of supposedly equal standing, protection of the retailer's legitimate field of operation and others of lesser importance.

The problem of leveling out the sales curve for the summer and winter seasons is receiving much attention from progressive retailers. "The first requisite in a program to build up summer sales," said Mr. Robinson, "is an intelligently worked out seasonal variation in prices to the consumer." Details of the plan may vary but there is not much opportunity for a successful summer merchandising campaign "where the householder cannot be assured of a substantial saving."

"New models" in the coal industry—the thermostat, the domestic stoker and dustless coal—came in for a share of Mr. Robinson's attention. With the stoker, the domestic customer can have automatic heat with economy and safety. Dustless coal will eliminate the muss and inconvenience connected with the delivery and use of coal "and thus add another string to

our bow in fighting the new competition from without our industry."

The establishment of trademarks, Mr. Robinson contended, should depend upon whether the producer or the retailer carries the burden of the advertising. Trademarking is a subject of great importance in modern business, but its adoption in the coal industry is hampered by a lack of confidence between operator and retailer. Operators should consider carefully the relationship between themselves and their retail customers before spending money on a trademark and the necessary advertising to establish it.

Planning and furnishing a complete, well-organized advertising plan to their retailers has meant a lot to those operators who prepared them and the dealers who were in position to take advantage of them, but as a rule many such campaigns lose much of their effectiveness because they were prepared without consulting the dealer. With the new competition between industries, rather than individuals, a program of co-operative publicity takes on added importance. The retail branch of the coal industry is feeling keenly the competition of oil and gas, and its answer to the problem of possible loss of markets is a publicity plan, sponsored by the National Retail Coal Merchants' Association. The first objective is the choice of a slogan for the entire coal industry, to be participated in by the industry and the public. Involving, as it does, a review of the benefits of coal for heating, the choice of the slogan will help resell the coal industry to itself and the public.

In closing his address, Mr. Robinson extended an invitation to the

operators' association to join in the campaign. "The success of the plan," he said, "will not necessarily be dependent upon the enthusiasm with which you chip into the hat; a large central fund will not be necessary—much as it would help. What will be necessary is a cheerful desire to boost a good thing—to help us secure the co-operation of your retailers."

IN OPENING the discussion on "The Producer's Marketing Problems," H. A. Glover read a paper prepared by James B. Pauley, chairman of the board, Miami Coal Co. In Mr. Pauley's opinion, merchandising "is the outstanding problem which confronts the operators," and "it is a demonstration of courage to boldly choose the subject, give it a name and step into it." In analyzing the conditions responsible for the present situation, Mr. Pauley called attention, first, to savings in fuel consumption which have denied operators the benefit of the increase in industrial activity. Progress in the utilization of fuel has been hard to bear, but increased efficiency in combustion has reduced the importance of substitute fuels. Progress in the development of equipment for burning the small sizes may ultimately result in a situation where larger sizes must be crushed to augment the natural supply.

The demand for quality coal, which is resulting in the installation of better preparation equipment, may contain elements of comfort for the industry when it is considered that in the future it will be more possible to talk, sell and believe in quality. Overproduction, however, is still a real problem. Advertising as a means of expanding the market does not seem to be so applicable to the coal industry because of the fact that the opportunity for expansion is limited. The element of service seems to be receiving more consideration than in the past. Price still is a problem, but the adverse effects of this factor may be reduced by quoting a price and sticking to it. Direct marketing of the product may eliminate the troubles of the consumer who lives off distress shipments and an established clientele also will be of greater benefit to the operator than chance customers.

How the railroads could help the producer in marketing his product was detailed by Harry L. Gandy. Pointing out that the railroads are the largest customers of the coal industry and that, in turn, the industry takes the largest share of the railroads' commodity—transportation,

A Retailer Sizes Up the Situation

How important is the coal moving through retail channels to the producer? Twenty per cent of the annual production is sold in the domestic trade and brings in 40 per cent of the operator's income. In other words, each retail hundredth of the output accounts for 2 per cent of the gross take and each of the other 80 hundredths yields only 0.75 per cent. As an income producer, each retail ton is worth $2\frac{2}{3}$ tons of other business. Isn't the operator who is not interested in retail tonnage overlooking a good bet?—*Milton E. Robinson, Jr., before the twelfth annual meeting, National Coal Association, Cincinnati, Ohio, Oct. 23.*

Mr. Gandy said that they have a considerable stake in the prosperity of the operator. In the long run, railroads would be affected as much as the coal industry if other means of transporting fuel to the market were to gain headway.

It would be to the advantage of the railroads to establish long-time and relatively stable contractual relationships, dealing directly with the producer and keeping the spread between maximum and minimum requirements as low as possible. They also would do well to take cognizance in contracts of the necessity of disposing of different sizes at different times. As to operating practices, the railroads may assist by furnishing clean, good-order cars, promptly notifying shippers of undelivered shipments and by refraining from increasing reconsignment privileges. Reduction in freight rates may be found to be profitable by stimulating a demand on the part of the consumer, and such a reduction is of especial importance in building up an export business.

Fuel conservation experiments will benefit the industry in the long run, because it is economy in use that will enable bituminous coal to hold its place as the primary industrial fuel of the country. And finally, the co-operative movement launched by some railroads to promote the use of coal produced on their lines undoubtedly will redound to the advantage of both the carrier and operator.

A LARGE share of the blame for low prices and cut-throat competition is laid on the salesman when it really is the fault of the executives, is the opinion of J. W. Searles, president, Pennsylvania Coal & Coke Corporation. Salesmen have a hard job in selling coal and, said Mr. Searles, "executives of bituminous coal companies should see that their salesmen are kept properly informed as to changes in mining methods or preparation which may effect the quality of the coal or its suitability for certain uses, experiences that others in the organization have had in meeting the competition of other coals and companies and any developments which may be of aid and helpful interest to them." Acquaintance with the mining properties and products of the company, knowledge of the newest developments in combustion and equipment and contact with the operating force should serve as a major stimulant for the salesman's interest.



Earl Whitehorne

In his discussion of "The Export Situation," W. T. Coe, director of distribution, Consolidation Coal Co., pointed out that the Middle West should be as interested in the export situation as the Eastern producers, as the steady overseas movement of 6,000,000 tons a year would mean that much less to enter into the markets in which the Middle West competes. Mr. Coe said that there is a possible water-borne consumption of 25,000,000 tons annually which might be secured, most of which is in the Mediterranean area.

Ocean freight rates were originally an item of difficulty, but the use of laid-up Shipping Board steamers has of late stabilized the situation. Rail rates are still too high to allow the trade to develop as far as it might and reductions are now being sought to enable the producers to move about 6,000,000 tons annually of new business.

The impulse toward larger marketing units may be attributed to the pressure of overproductive capacity, is the opinion of W. H. Cunningham, president, Truax-Traer Coal Co.. This pressure has brought about the realization that the best way to minimize it is through larger units, with marked economies in distribution. Pointing out that the industry has only lately awakened to the importance of selling as a way to profits, Mr. Cunningham discussed several methods of increasing the size of the units by co-operative effort. But, Mr. Cunningham said, "the interests of the producer should not be lost sight of, or be sacrificed on the altar of volume."

How to keep control of distribution in the hands of the operator was dis-

cussed by L. E. Woods, president, Central Pocahontas Coal Co. "Lack of control of distribution," he asserted, "has been one of the prime factors, if not the prime factor, in bringing about the present chaotic condition of our industry." This condition is brought about by lack of co-operation and co-ordination between production and selling. Every effort is being made to cut the cost of production, yet the saving is often thrown away in a few minutes of selling effort.

Consolidation and co-ordination of sales effort, as distinguished from monopoly or unbridled competition, was the solution offered by Mr. Woods. Competition would then be on the basis of quality rather than between producers of coal of similar character and quality. Elimination of unbridled competition would enable the margin between the price of finer and coarser sizes to be narrowed, thus placing slack on a firmer basis. Again, such a consolidation would allow long-time fixing of prices and remove much of the confusion now existing. Mr. Woods urged that the initiative in such a movement be taken by the leading producers of each character and class of coal, using their present organization as a nucleus.

Albert Brown, advertising manager, Colorado Fuel & Iron Co., spoke to the convention on the how and why of advertising from the standpoint of domestic consumption. The primary purpose of advertising, he asserted, was to increase the company's share of the total business available, rather than to raise the total consumption. The increase of gas and oil competition is something for the united efforts of the association rather than the individual producer. Mr. Brown predicted that in ten years there would be fewer and bigger operators, making, however, larger profits.

THE purpose of advertising is to carry the advertiser's message to the reader. To do that requires good layout, good art work, good typography and, most important of all, a real selling idea expressed with force and imagination—factors often lacking in many of the campaigns now under way. Also, to be effective, advertising means a campaign carefully worked out in advance and carried out over a long period. And finally, coal should be advertised in co-operation with the dealer as far as possible, for by helping the dealer the producer will greatly further his own interests.

Calling upon the coal industry to look to the experience of other industries for a solution to its problems, Earl Whitehorne, assistant vice-president in charge of public relations, McGraw-Hill Publishing Co., Inc., said that the sickness of the coal industry is "a very familiar malady," which has affected a large number of other old industries based upon the development of natural resources. "The symptoms in each case have been different, but the cause has been the same—failure to recognize the new era and change their old-time, self-satisfied, 'come-get-it-' policy to suit the new conditions in the market place."

Coal in itself is "an unlovely thing" which nobody wants. But as everybody wants to keep warm, they buy it—under that compulsion. But whether or not the man who mined the coal makes a profit is no concern of the public. Customers are interested in the product rather than the business success of the man responsible for it.

of the coal industry than the opinions of the coal men themselves.

"The younger industries—radio, automobiles, cameras, refrigerators—were organized from the start around this idea of selling and service. But many of the older industries have waked up and shaken off the self-satisfaction of former days when demand created a sellers' market, and have modernized themselves." In each case an old industry shook off the old idea that all it had to do was grind out its products and set itself to selling. The cure for the coal industry, said Mr. Whitehorne, is to "stop thinking of coal as coal and think of markets. Think of heating service for industrial, commercial and domestic purposes." It is not a new idea and the experience of other industries has marked out its benefits, but "the whole coal industry must organize around this program before the trick is turned."

To accomplish such a plan, it would be necessary to start in the home, as the basis of the community

gladly pay what it is worth, because America today is ready to pay almost anything for luxury."

To bring all this about would require a long period of time and the local heating service would have to be performed by the retailer. But he would have to be educated to the job, a task to be done by "industry action, by developing a progressive program that will embrace statistics, trade practice, advertising, merchandising and creative co-operation with the dealer."

GREAT THINGS lie ahead for the coal industry in the increasing call for power in the industry, the cooling and ventilation of buildings and improvement in the standards of house heating. In spite of the fact that some say the market cannot be increased, the extension of the heating season in the home, the holding of homes that otherwise would go to oil or gas, the retention of business and industrial heating by better heating service and the delay of electric heating of buildings or its entire elimination as an economical use of power, offer opportunities worth fighting for. "But, the coal man's business is to make the American people want a modern heating service using coal in industrial, commercial and residence buildings."

In Mr. Whitehorne's opinion, "it is time that coal got right with the American people." But it cannot be done if the industry continues to leave market-building to the equipment manufacturers; gluts the wholesaler and retailer with consignment coal and then refuses to help him move it, and continues to clamor about its troubles in public. Excess capacity, overproduction, excess labor, uneconomic marginal mines and ruthless disregard for cost in price competition are universal problems and can be solved only by facing the truth and acting accordingly.

Coal can be sold for a fair price, in Mr. Whitehorne's opinion, but the industry "has lost sight of the very fundamental fact that price does not alone make markets." What domestic consumers will pay "depends upon the value that they have been led to put upon the service or thing they buy." And that attitude also characterizes industry and business. Convincing the American people of the value of a good heating service by advertising and merchandising should build up a new era of prosperity for the coal industry.

Mr. Whitehorne's Ten Rules for Holding The Domestic User

(1) Find or have developed a substantial and dependable, dirtless mechanical stoker for the home and have it painted or enamelled a bright color. This is a job that should be seen to by the operators.

(2) Deliver coal to homes in strong, 50-lb. white bags, in white trucks, by men in white uniforms.

(3) Remove the coal bin, clean the cellar, spray it with white paint and trim it in bright colors for each new contract customer.

(4) Test the furnace and flue and make them right or install a new furnace that will provide efficient heat.

(5) Inclose the furnace with brick

and bright-colored tile so it will be attractive.

(6) Stack the bags of coal neatly on the floor by the furnace and put in a shelf for the empties.

(7) Install a trolley tackle that will lift up the bags of coal by handles on the bottom so that women can fill the hopper without effort.

(8) Install an automatic thermostat control to regulate the furnace.

(9) Remove ashes weekly in the same bags.

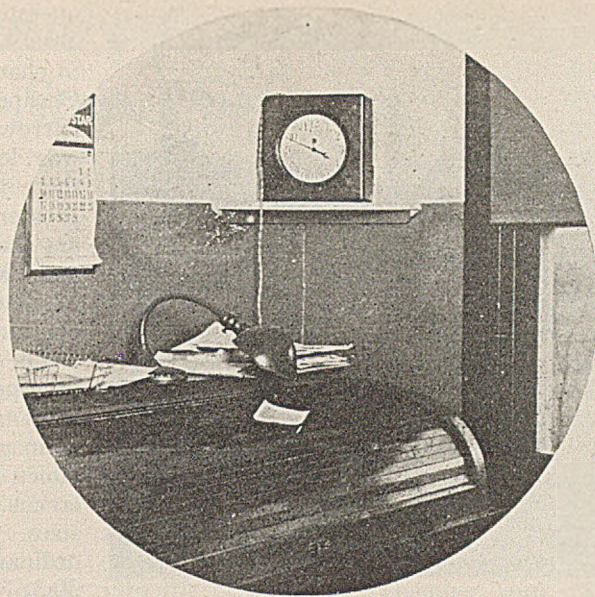
(10) Sell all this service on a yearly contract embodying provisions for regular deliveries, monthly payments and a discount for cash in 30 days.

The trend in industry and business," Mr. Whitehorne said, "is away from specialization in product toward specialization in service. Business is organizing around specialized service to a group or class of customers and adapting production to that practical purpose. But the coal industry is not in tune with that trend.

"It is a fundamental weakness of the coal industry, it seems to me, that it continues to be almost completely absorbed in itself," whereas "the opinion of millions of people who buy and use coal has a more compelling influence upon the prosperity

is the family. Winning the interest of the local public first will in turn work back to the subject of coal for factories and commercial buildings. The retailer in an average city should do ten things to develop the consumption of coal, which are outlined in another column in this issue of *Coal Age*.

The householder would then be relieved of the dirt and trouble commonly associated with the burning of coal and would have a satisfying heating service almost as convenient as gas or oil. "Coal would be only a part of it. And customers would



*Not 3:48 O'Clock
but 3 Hours and
48 Minutes of
Tipple Operation*

Unusual Practices Adopted at Strip Mine in Illinois

PROBABLY no other strip mine of the Central States embodies more out-of-the-ordinary practices than the Black Servant mine, acquired some months ago by the Truax Traer Coal Co. The mine is located at Elkhaville, Jackson County, Illinois; the coal is No. 6 seam and averages 7 ft. in thickness. Although four strippers are in use, they operate in a single pit, and the coal is loaded by two shovels, one operating from each end of the pit. Use of a dragline booster on top of the spoil bank gives higher recovery and cleaner coal. Steel ties of a special design

for easy moving of track are employed in the pit.

The mining conditions are somewhat difficult because the immediate cover is a hard limestone which cleaves directly to the coal and the surface stratum is a sandy clay-content soil which will not stay piled when wet. Use of the booster along that part of the pit where the heaviest cover is found overcomes to a large extent the piling difficulty. The function of this machine is to increase the piling range of the stripping shovel by dragging the deposited material farther back, thus forming a spoil bank that is less steep than it otherwise would be.

For the most part the edge of the bank is kept away from the coal berm, so that the loading shovel can get practically all of the coal without scooping up dirt. This practice conserves the 1- to 3-ft. wall of coal that would otherwise be lost. As a result the recovery, calculated on a yearly basis, has been as high as 98½ per cent.

In places the limestone is 18 ft. thick—said to be the heaviest stratum of that character handled at any strip mine in the state. It is shot with L.O.X. Because of the rock cleavage, special care must be exercised in

Fig. 1—The Stripped Area Is Nearly Flat Where Dragline Has Operated



Fig. 2—All Dirt Is Cleaned Off Ahead of the Loader



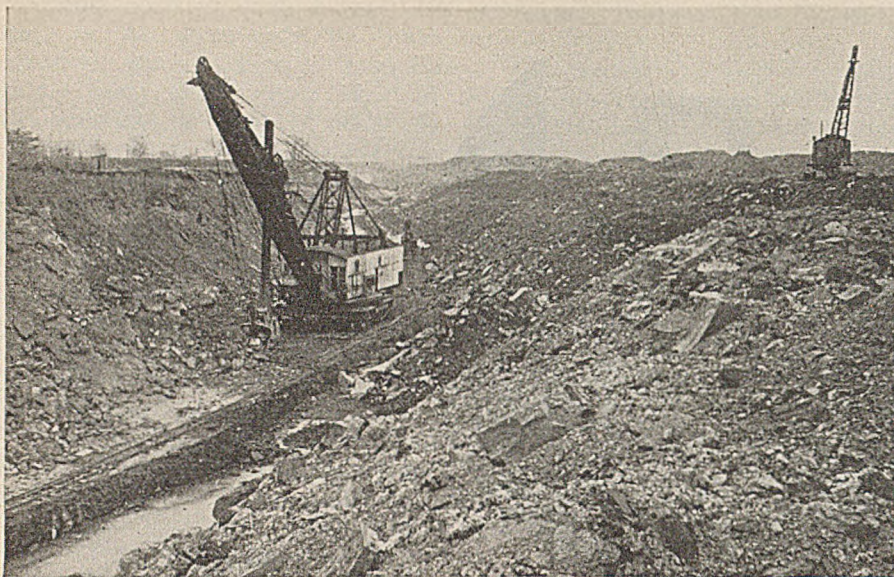


Fig. 3—The Dragline Gives the Material Another Boost

drilling lest the explosive charge be bedded against the coal. If that happens there is a difficult top cleaning job and an excessive quantity of fines.

According to F. S. Burns, general superintendent, the use of L.O.X. has cut the shooting cost by 50 per cent and has reduced the hazard. The operating cost of the L.O.X. plant, including hauling the explosive to the shooting location, but exclusive of capital charges, is approximately 5.14c. per pound of explosive.

The left foreground in Fig. 1 is a wall that has been shot with L.O.X. Along the right side of the track can be seen pieces of limestone which were too large to go through the dipper, so have been carried on the dipper points and deposited at the bottom of the pile. In Fig. 3, which is another view of the same shovel and booster, the effect of the latter machine is evidenced by the flat top of the spoil bank and by the free edge of the coal berm, to be seen at the right near the front wheels of the stripping shovel. Along this section of the pit the cover consists of 14 ft. of hard limestone, 8 ft. of shale and 24 ft. of softer material.

The stripping shovel in Figs. 1 and 3 is a Marion 300-E with 8-yd. dipper, and the dragline a Bucyrus 50-B with 1½-yd. bucket, both electric. Working along other sections of the 6,000-ft. pit are a similar stripper, a Marion 360 electric dragline, and a Bucyrus 175-B steam shovel. Both coal-loading shovels have 1½-yd. dippers. One is a Marion 37 electric and the other a Bucyrus 50-B steam machine.

Preparation for the loaders consists of shooting the coal with black powder and a careful cleaning of the top with picks, shovels and wire

brooms. Channeling machines are not used. Fig. 2 is typical of a cleaning crew at work.

The use of steel ties for all but permanent track was originated at the Black Servant mine because of the trouble from having to dig the wood ties out of the dirt which often comes down from the bank. The steel ties are turned up at the ends to provide a sled runner effect, making it easier to skid the track over. Mr. Burns states that the tie cost has been reduced by the use of these new steel ties and that the lighter weight is an important advantage.

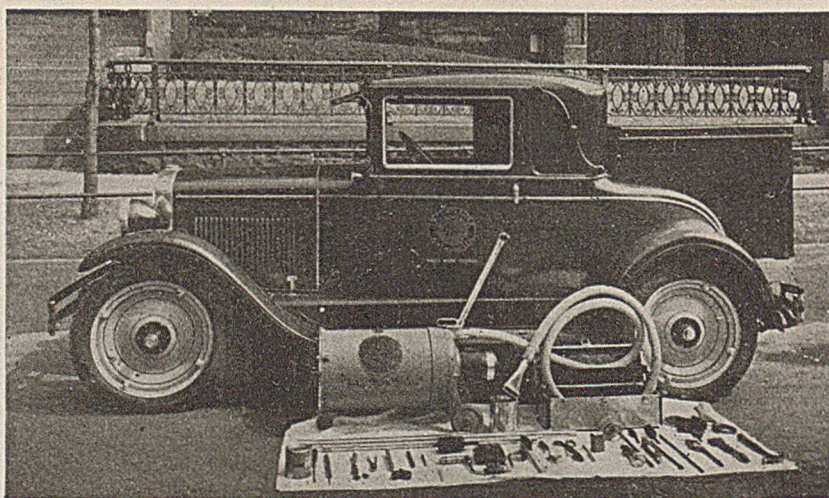
As to the use of narrow-gage track, he is certain that a gage on the order of 36 in.—that used in the Black Servant pit—is much better than standard gage. This opinion is based on the experience with standard gage at the Forsyth mine, a neighboring

operation, now also owned by the Truax Traer company. It is the plan to change that mine to narrow gage. Cheaper haulage has resulted with narrow gage because the initial cost was less, maintenance is less, and there is the important advantage of greater flexibility. The Black Servant haulage equipment consists of four 20-ton side-rod locomotives and fifty-two 6-ton side-dump cars. These operate on 56-lb. rails.

The average production of 2,500 tons per day is handled over a five-track tippie designed for 450 tons per hour and equipped with four picking tables and an equal number of loading booms. Typical percentages of the sizes, other than picked mine-run, ordinarily shipped are: 1½ screenings, 30.3; 1½x2 stove, 13.9; 2x3 small egg, 12.1; 3x6 lump, 19, and 6-in. lump, 24.7 per cent.

As a continuous indication of the number of hours the tippie has operated, Mr. Burns has a standard synchronous motor-driven Telechron clock mounted above his office desk. The hands of the clock move only while the main conveyor of the tippie is operating. The starting and stopping of the clock is automatic by reason of its driving motor being connected across the terminals of the conveyor motor.

Before the beginning of each day's run the hands are set to indicate 12 o'clock. At the end of an average day's run the hands stand at about 5:30, showing that the tippie has operated approximately 5½ hours. The principal object of the clock installation is to indicate how the production is mounting as the hours go by, which it does, because the tonnage is proportional to the total time that the conveyor has been in operation.



Ready to Render Real Service

Each member of the sales service crew of The Hudson Coal Co. has a company car and a set of equipment for giving first aid to ailing furnaces.

Low-Temperature Carbonization Takes a Step Forward

LICKED before he starts is the man who puts too much money in a carbonization plant, according to H. W. Brooks, consulting engineer. But that expression "too much money" depends on how much is received for coke, tar, gas and oil. That also depends on the quality of all four, and the general session of Wednesday, Oct. 9, of the Third Fuels Meeting held at Philadelphia, Pa., under the direction of the Fuels Division and the Philadelphia Section of the American Society of Mechanical Engineers threw not a little light on this question and showed it was a problem with data which were changing for the better, making low-temperature carbonization more hopeful of solution.

Carbonization by the Lurgi process at the plant of the Lehigh (N. D.) Briquetting Co. was described in a paper by Max Toltz read at the opening session by the secretary. This process, invented by Dr. F. A. Oetken and Dr. O. Hubmann, of Germany, and developed by the Lurgi Corporation of Frankfort-on-Main, Germany, is adapted to North Dakota lignite only, in the opinion of Mr. Toltz, and produces a carbonized coal residue which when bound together with one of the byproducts, pitch, and pressed into briquets delivers a smokeless, sootless fuel of high recoverable heat value. The tar contains creosote and paraffin. The result of the carbonization of the lignite is carbon char, which when not briquetted can be used with efficiency in pulverized form for firing boilers and for smelting.

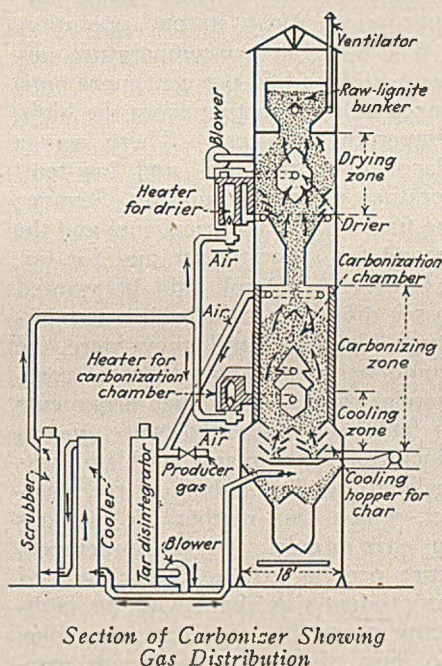
The carbonization plant is built over a lignite mine. The coal bed is 12 to 18 ft. thick and has a cover of 70 ft.; 4 ft. of the seam being retained as roof. The lignite comes from the mine in chunks measuring from 12 to 20 in. across and is deposited in a hopper, whence it is conveyed by belt to a magnetic separator and thence to a crusher. This reduces the size of the coal to 4 in. or less.

The product is then raised by a bucket elevator and goes over a vibration screen which takes out $\frac{3}{4}$ -in. coal and under. The small coal goes to the power house, where it is consumed under the boilers on chain

grates. The larger coal falls into hoppers and is conveyed to another elevator to two raw-lignite bunkers on the top of the carbonizer building.

Thence it falls to a drier heated by gas generated in the drying chamber which is circulated by a fan after it is heated by the combustion of gas from the scrubber in a specially constructed combustion chamber. The temperature in the drier is kept at about 230 deg. C.

The dried coal falls by gravity into the carbonization chamber, into which heat from the cooling zone, as



well as from the combustion of the generated gas similar to that in the drier, is supplied.

It has been established that the temperature of carbonization must not be lower than 600 deg. C. and not higher than 620 deg. There are no moving parts in the Lurgi carbonizer except two gates in the bottom of the char hopper. Producer gas does not have to be added so long as the coal contains no more than 38 per cent of moisture.

The gas generated in the carbonization zone is drawn off at the top of that zone into a Theissen disintegrator in which the tar is extracted. The char, which is of the size of pea coal, is crushed to $\frac{1}{8}$ -in. diameter by carborundum rolls and is fed to a mixing drum where pitch

is introduced in atomized form. Superheated steam sometimes is used to render the mixture pliable. After compression in a briquetting press the mixture appears as briquets the size of an egg.

The carbonizer can produce 100 tons of char in 24 hr. and the briquetting plant 400 tons in the same length of time, so three more carbonizers could be added without any addition to the briquetting plant. The ammonia liquor is at present wasted. The total cost of the plant is \$550,000 or \$5,500 per ton, for it briquets 100 tons per day. If there were three more carbonizers the cost would be approximately \$700,000 and the cost per ton of output \$1,750. This is too high in Mr. Toltz's opinion, but he believes that an 800-ton plant could be built for \$900,000, or for \$1,125 per ton of briquet output. At present the briquets are manufactured for a little more than \$6 per ton, but with a strip mine, producing lignite at half the expense, the cost per ton might be lowered to \$3.30 or less. From 2 $\frac{1}{2}$ tons of lignite can be made one ton of char. The analyses are given in Table I.

Table I—Lignite, Char and Briquets at Lehigh, N. D.

	Mois-	Vola-	Fixed				
	ture	tile	Matter	Carbon	Ash	Sul-	B.t.u.
Lignite....	40.40	26.35	26.45	6.80	0.86	6,380	
Char.....	1.15	10.90	73.80	14.15	2.24	12,759	
Briquets...	1.30	15.95	70.05	12.70	1.98	12,942	

To briquet the char, 6 to 6 $\frac{1}{2}$ per cent of pitch has to be used as a binder.

J. D. McQuade, Coal Carbonization Co., Pittsburgh, Pa., described the Hayes process of low-temperature carbonization established at Moundsville, W. Va. The Hayes process retort consists of an alloy-steel tube of 17 in. inside diameter and 20 ft. long. This tube is placed in a furnace setting and supported by rollers on each end. Stationary feed and discharge castings are located at either end of the retort and are connected to it by special packing rings. The tube is rotated at a speed of 1 $\frac{1}{2}$ r.p.m.

Within the retort is a screw conveyor driven by a train of gears which gives it a progressive oscillating motion. The screw moves the coal toward the discharge end of the retort a given distance and, on the reverse oscillation, returns a distance slightly less. Because of this forward and backward motion the coal has a theoretical travel of 240 ft. in passing through the length of

the retort. The output for 24 hours is 50 tons, and per hour 700 lb.

The coal used is $\frac{3}{4}$ -in. screenings from the tipples of the Ben Franklin Coal Co. and has the following average analysis: Moisture, 2.25 per cent; volatile, 39.40 per cent; fixed carbon, 51.04 per cent; ash, 7.31 per cent; B.t.u. per pound, 13,500. The average yield per ton is: Char (12 per cent volatile), 1,326 lb.; tar, 30 gal.; gas (800 B.t.u. per cubic foot), 5,000 cu.ft.

Mr. McQuade gave an expense sheet for a proposed plant treating 400 tons daily. The labor cost for all operations, including steam plant and tar-distillation plant with common labor at \$4, is figured at 42.5c. per ton of input. The operating cost, including cost of coal at \$1 per ton, the labor item mentioned, interest, depreciation, royalty (30c. per ton), repairs and supplies, power and water, with office and laboratory, totals \$2.80. The income is from 300 tons of briquets at \$5 and 4,000 gal. of distillate oils at 13c. Accordingly the total income per ton should be \$5.05. With operating costs of \$2.80 the profits per ton should equal \$2.25.

In discussing these papers, R. P. Soule, International Combustion Engineering Corporation, New York, said that the labor charge for briquetting should be 75c. rather than 35c., as stated, and that the cost of binder per ton would add about another dollar. This latter had not been included in the cost. He believed that briquetting usually was a more expensive process than carbonizing. To this Mr. McQuade took exception.

Mr. Brooks said that if equipment for a process cost more than \$1,500 per ton of product "you were licked before you started unless conditions were peculiar." The average cost of low-temperature carbonization plants throughout the country is about \$3,000 per ton-day. Some cost, however, only \$2,200 for that unit. One must not omit taxes as a charge. These would run about 2 per cent. Estimates had been made for depreciation at 10 per cent by Mr. McQuade. Mr. Brooks regarded obsolescence as an even more important factor than depreciation.

H. D. Savage, president, Combustion Engineering Corporation, said there was a limitless market for tars, and Mr. Brooks assented and added that it showed poor salesmanship when the low-temperature product was sold at the low prices of the

high-temperature tars. Messrs. Savage and Soule agreed that the 13c. figure used by Mr. McQuade was reasonable. The cumulative value might be even 22c. according to the former. Mr. Soule stated that the tar was of more value when partially cracked and that high-temperature tar was selling as low as 4c. per gal. The quality of low-temperature tars varies greatly.

Formaldehyde, which is used in the conversion of tar acids to Bakelite, is now produced synthetically from water gas and so was getting cheaper, thus increasing the value of the tar. Bakelite was more expensive than steel as steel, but if a cash register has to be constructed the cost of molding, welding and finishing the steel for that purpose would cost more than making a Bakelite product of the correct shape and appropriate finish in one operation.

The oil from low-temperature carbonization had 50 per cent more anti-knock value than that from the high-temperature process. There was a place for both high- and low-temperature methods, said Mr. Savage; the first for metallurgical fuel and the second for domestic use and for tar.

George A. Orrok said he wanted to see dividends paid by low-temperature plants. Until they were, he would be skeptical as to their commercial value, for all such arguments as had been presented were unconvincing. The main problem was really to handle the bulk of the product, which was neither tar nor gas but char or coke. In the low-temperature process 70 to 75 per cent of the product was char; with the high-temperature 65 per cent was coke. To move these was the major merchandising problem, and it was one that had not always been satisfactorily solved. In public-service plants the sensible heat of coke should be saved.

P. Nicholls, U. S. Bureau of Mines, Pittsburgh, Pa., said that in future there will be a disposition to try to reduce the volatile content of char so as to get as much tar and gas as possible. Today, the effort is to pass as much volatile matter over to the public as possible without at the same time creating a product that will smoke in the domestic furnace.

Mr. McQuade said that the Hayes process was delivering a product having 15 to 17 per cent of volatile matter and 8 to 10 per cent of ash. The oscillating screw in the retort works on the principle of an auger in a wet log. When a man can drive

the auger no further into the soggy wood he draws out the auger and gets a new start. Mr. Soule thought that the fact that the counter-current system was not used probably aided to make the process successful. The heat being applied at the beginning of the process probably case-hardened the coal at the start and prevented balling.

LETTER

To the Editor

May I ask the privilege of adding a few words that might tend to clarify the situation so kindly presented in your editorial "A Vacation Suggestion," page 533, September issue, *Coal Age*. The fact that the Union Pacific Coal properties are operated as "captive" mines does not enter into our vacation arrangement in any way.

In 1923, we operated seventeen mines in the State of Wyoming, but only twelve operated in 1928, the production for the year being substantially the same. Much of our excess mine and man power was carried *to protect against the labor suspensions then so much in vogue*. With a more composed labor situation, we found it possible to reduce the number of excess mines.

In 1928, our minimum monthly consumption of coal occurred in June, 311,409 tons, the maximum in October, 481,289 tons, an increase of 55 per cent. The Union Pacific system undertakes to soften this situation by storing a certain amount of coal during the off-peak demand months, April to August, picking up this coal September to December, inclusive. Every large consumer of coal should make this contribution to the betterment of the industry.

It should be understood, however, that our plan to consolidate enforced idle time by shutting down a portion of our mines for ten days or two weeks, those at work running more regularly with the whole situation equalized, is a movement entirely apart from the question of coal storage. During our dull season, we had a measure of idleness to absorb—two or three days per week. Under the plan put into effect, each man was able to compress, say, five or six weeks' lost time, into a definite vacation period without loss of earnings.

UNION PACIFIC COAL CO.,

By EUGENE McAULIFFE,

President.

Without Management's Backing Progress in Safety Falters, Declare Industry's Leaders

WITHOUT management, safety loses its effectiveness, was the consensus of the opinions expressed by representatives from most of the producing fields in the United States at the twelfth annual meeting of the National Coal Association, held at the Hotel Sinton, Cincinnati, Ohio, Oct. 23-25.

Pointing out that safety touches the heart and pocket of both the wage earner and the operator, the latter more than the former, Walter L. Robison, vice-president, Youghio-gheny & Ohio Coal Co., recommended education as the greatest single force in accident prevention. Safety and accident prevention cannot be super-imposed upon an organization, he asserted, and neither can it be legislated.

Apart from the guarding of machinery and dangerous places, it is necessary to enlist the entire working force in a co-operative movement for accident prevention. Wage earners must continuously be educated in habits of thoughtfulness and carefulness and all safety measures should have the absolute backing of the company, its highest officials, their subordinates and all the employees down the line. "If we can devise a plan of educating our workmen to a sense of just what accident prevention means to them," said Mr. Robison, "and thus enlist their whole-hearted co-operation in making our mines safe to work in, we will find little difficulty in accomplishing our purpose."

Thomas G. Fear, general manager, Consolidation Coal Co., spoke of the place of safety in the operating program of that company. "Safety and operating mines," he said, "are inseparable—safety is a part of mining." Any safety program can be divided into two parts—purchase of safeguards by the operator and the setting up of standards for safe operation, with disciplinary provisions

for their enforcement. Both are essential for success.

A prime factor in the Consolidation program is the collection and tabulation of all causes of accidents. These are rated by setting the cost against each class. The mines are then inspected and rated according to the absence of dangerous conditions. Mr. Fear described the operation of the safety court, emphasized cleanliness as a criterion of safe conditions and detailed the results of the operation of the plan in the West Virginia division. The campaign was started Oct. 1, 1926, and in that year 231,000 tons was produced per fatality. In 1927 the figure was 335,000 tons; 1928, 661,000 tons, and 1929 (to date), 1,170,000 tons. At the present time, counting all injuries, 5,000 tons is being mined per injury.

R. M. Lambie, chief, West Virginia Department of Mines, said that 90 per cent of the accidents in mines in that state should not occur. As a rule, they were caused by laxity in enforcing discipline and the mine laws. During 1928 the compensation cost to the industry was \$20,000 a day, based on 192 working days and 132,000,000 tons produced. As a means of reducing this outlay, special committees should be formed by the operators' associations to work with the state in pushing safety.

SAFETY CLUBS were lauded by Mr. Lambie as probably the best means of arousing the workers' interest and thus reducing accidents. In closing, he said that in 1928 in West Virginia the coal industry paid out \$3,930,000 in compensation. In nine years the total was \$25,000,000, as compared to \$10,000,000 for all other industries combined.

Pennsylvania was represented by Walter Glasgow, Secretary of Mines, who said that in his state, safety had progressed in the last five years, but

not as much as it should have. Education, he held, is perhaps the greatest single factor in promoting it, closely followed by good discipline and efficient supervision. That it also is an important item in costs is borne out by the fact that the bituminous and anthracite industry each paid out \$3,000,000 in compensation in 1928. In Pennsylvania, he added, the mining law is accepted as the minimum standard and its provisions are much less severe than are those of several operating companies.

PPOINTING out that 160 fatalities have occurred in Kentucky to date in 1929, John Daniel, chief inspector of mines, was of the opinion that the causes fell into four classes: insufficient discipline, lack of supervision, carelessness and broken or irregular working time. He agreed with Mr. Fear as to the importance of cleanliness and cited instances where rehabilitation had accomplished remarkable reductions in accident rates.

George Harrington, president, Chicago, Wilmington & Franklin Coal Co., briefly reviewed the relation of mining methods in the past to accident rates and said that improved equipment, better shooting and up-to-date mining methods are cutting down the toll. First-aid training is an effective means of promoting safety. In Illinois, in the three years just past, 25,000 men have been trained, one-half of them in 1928. Mr. Harrington also pointed out that the advent of mechanization may result in a temporary rise in the accident rate, but that it would be beneficial in the long run.

C. B. Neel, secretary, Virginia Coal Operators' Association, stated that 100 per cent first-aid training is the goal of the Virginia operators and that they are committed to the theory that safety is an important part of management. He reviewed the progress of the training activities (*Coal Age*, February, 1929, p. 125) and reported that 78 classes have been held, with 2,994 men enrolled and 2,075 certificates issued for first-aid training.

That personal injuries are the result of failures, not accidents, is the point members of the Southern Appalachian Coal Operators' Association are trying to put over, R. E. Howe, secretary, asserted. These failures are due to lack of management and consist of inferior guarding of machines, inferior supervision, inferior discipline and putting men on jobs for which they are not suited.

HOW TO KEEP

THE FIRST
OF TWO ARTICLES

Electric Locomotives

CONTINUOUSLY

By John S. Dean

Renewal Parts Engineering Department
Westinghouse Electric & Mfg. Co.
Homewood Works

ON THE JOB

UNDERGROUND transportation plays such a vital part in setting the daily output of the modern mine that the efficiency and reliability of the haulage system constitute a major operating problem. The first step in the solution of this problem, of course, is adequate equipment. But beyond that lies maintenance. If the electric locomotives are to give the continuous service the situation demands, if the flow of tonnage is not to be dammed up by breakdowns, shop forces must be effectively organized and inspection of equipment must be regular and thorough.

Shop forces in charge of the maintenance of the locomotive equipment should be carefully selected to hold operating costs at a minimum and to turn out the maximum quantity of work in their shops. The various groups of men should be assigned specific duties for which they should be held responsible by one man in charge, who in turn should report to the master mechanic in charge of the maintenance work. This system of organization will eliminate duplication of work and confusion in carrying out orders and reporting troubles. The chief of the maintenance department will be able to keep in close touch with all lines of his work through the heads of the different departments of this organization.

It is well worth the trouble and expense to have some definite system of keeping simple and accurate records of the locomotive equipment

to assist the heads of the various departments to more readily supervise their work in the maintenance organization. The value of such records is unquestionable, as they keep the management advised as to details regarding troubles, repairs, costs, etc., relating to the maintenance of locomotive equipment. In general these records should include armature troubles, locomotive failures, wheel and axle life, tonnage hauled by each locomotive, cost of repairs, locomotive upkeep per ton of coal produced, etc.

INSPECTION

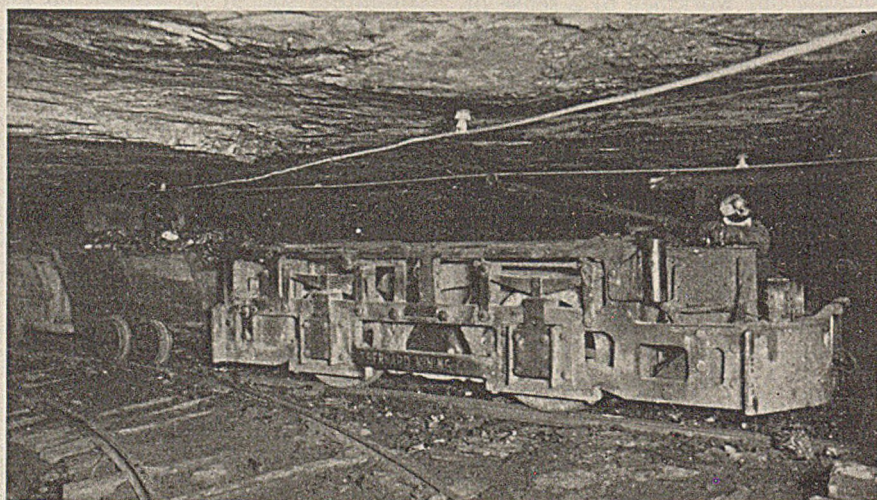
Careful and systematic inspection of mine locomotives is essential. Such procedure, if carried out regularly and carefully, will tend to prevent

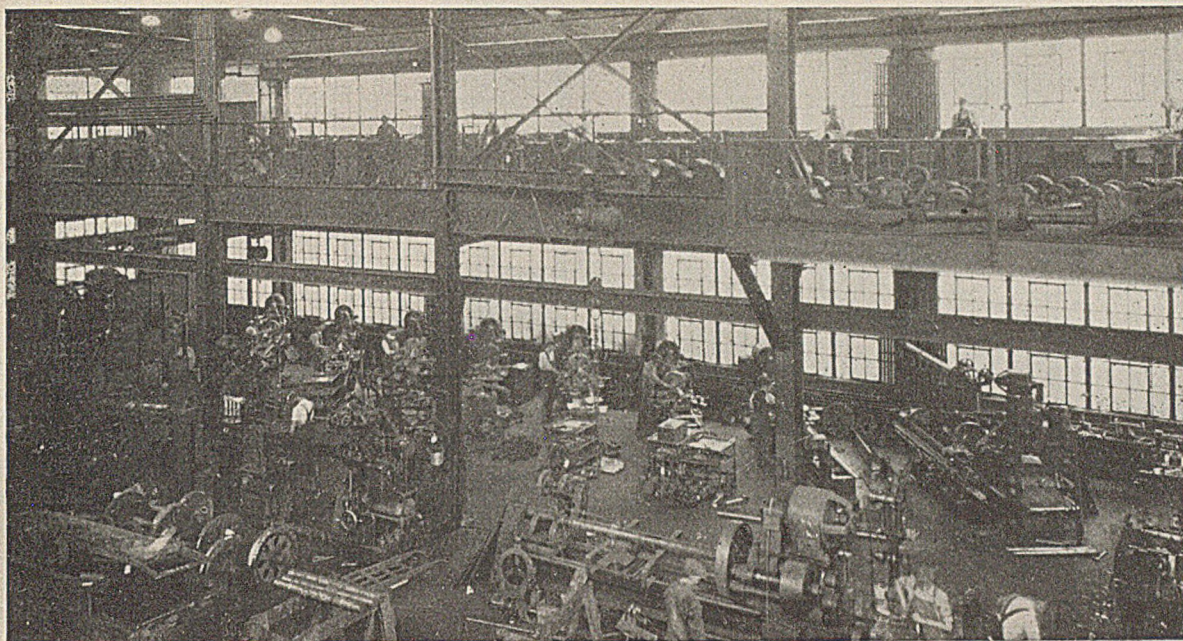
failures and breakdowns in service and be a great factor in increasing the tonnage output of coal. A schedule of inspection along the following lines is suggested for consideration:

Daily Inspection—Brake rigging should be checked and adjusted. Worn brake shoes should be replaced. Tighten motor frame and axle cap bolts. Inspect wiring, covers, controllers, headlights, sanders and all details for any loose or defective parts.

Light Inspection—A light inspection should be given each locomotive about every 30 days. At this time tighten all bolts and carefully adjust the brakes and brake rigging. Remove covers from the motors and inspect the brushholders, carbons and commutators. Check the armature and

A 15-Ton Locomotive in a Kentucky Mine





Putting Locomotives Back on Their Wheels in the Central Shop of a Large Company

axle-bearing wear, also the controller, headlights, wiring and all details of the locomotives. Make the necessary replacements to all damaged and worn parts found during this inspection.

Heavy Overhauling—About every eighteen months to two years take all of the equipment off the locomotives and give these parts a general overhauling. Motors and controllers should be thoroughly cleaned, repaired and tested before putting them back in service. Revamp and put into good condition the mechanical details of the locomotives and all detail electrical apparatus on them and re-assemble.

The work of properly maintaining the locomotive equipment is somewhat simplified if the mechanical department has been thoroughly organized, accurate records of locomotive troubles are available and all locomotives are regularly and systematically inspected. In connection with this work some of the details of the maintenance and repair of the equipment on the locomotives will be given in detail to assist the mechanical organization to more readily handle this line of work.

MOTOR ARMATURES

Cores—The cores for the older types of mine motors were built up with laminations that had a loose fit on the shaft or spider, and the cores with spider construction were held in place by a ring key. The laminations on the more modern motors are now made a tight driving fit on the shaft or spider, depending upon their construction. The ring key has been replaced by a ring nut to hold the

laminations together on the spider. In addition, the modern spider construction has the rear end bell cast integral with the spider. These improvements help to make a more rigid and dependable assembly of the cores.

Commutators—In assembling commutators, extreme care must be taken to keep out all dust and moisture from the machined segments and the mica details, as carelessness on the part of the workmen may result in a short-circuited or grounded commutator. It is of the utmost importance to use high-grade mica cones and insulating bushings. Clean out the "V's" on the assembled copper and mica segments, using fine sandpaper. Thoroughly blow out all the dirt and dust and test for short circuits as given in the following tabulation. The assembled commutator should be heated to a temperature from 125 to 150 deg. C. and pressed while hot at from 20 to 30 tons, depending upon its size. While hot and under pressure, the locking ring nut or bolts should be drawn up tight.

The front "V" should be protected against dirt and oil by giving this surface a smooth, slick finish so that it can readily be cleaned by wiping with a clean cloth. A layer of loosely woven four-ply twine well shellacked and smoothed with a hot soldering copper and then given several coats of a good grade of insulating varnish, furnishes a solid, smooth and good protection at this point. It is advisable to round off the edges at both ends of the face of the commutator and to undercut the mica to a depth of $\frac{1}{16}$ to $\frac{3}{16}$ in. It is important that this be done with care and to be sure

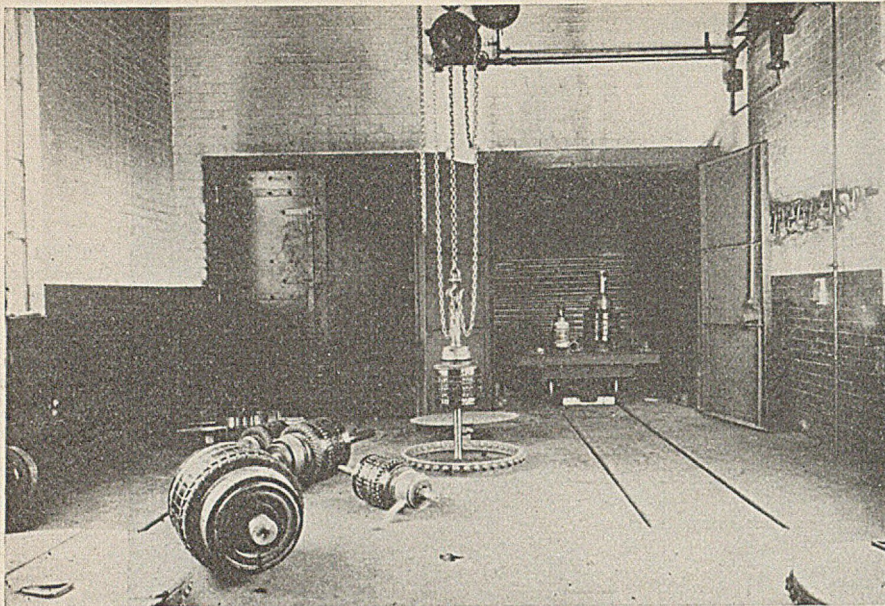
that all small slivers of mica, in the slots between the bars, are removed. All repaired commutators should be tested with alternating current as follows:

Operating Voltage	Test Between Bars	Final Test to Ground
500	300 volts	2,000 volts
250	200 volts	1,000 volts

Shafts—In general the shafts of a large number of the mine locomotive motors are made from special axle steel. There are, however, a few of the more modern types of motors which use heat-treated axle or alloy steel to secure additional strength. In most cases of shaft replacements on mine motors heat-treated axle or alloy steel should be used, to secure an additional factor of safety to meet the severe operating conditions found in service. Heat-treated axle steel is 44 per cent stronger while alloy steel heat-treated is 77 per cent stronger than the untreated axle steel. All bearing seats should be ground and polished to get a smooth, slick finish. Shafts should be made a tight press fit requiring from 15 to 25 tons pressure to force them into place on cores of motors from 25 to 50 hp. in size.

Armature Winding: (a) Tools—The armature winder should be provided with the necessary tools such as rawhide mallet, steel and fiber drifts, screwdrivers, pliers, scissors, etc., suitable for making a good winding job. Improper tools in the hands of the average winder, although the best of coils may be used, may result in a poor winding job that will not stand up in service.

(b) Coils—The most satisfactory results in rewinding armatures can be obtained only by using armature



Dip Tank and Bake Ovens in a Coal Company Shop

coils made from good quality of copper, insulated with high-grade fibrous materials, or a combination of these materials with mica, and wound to the correct shape. If poorly shaped, the coils will not only be abused and damaged while winding but will require a much longer time for the winder to finish the job. The insulation should be carefully reinforced at crossovers and corners and the finished coils thoroughly treated by dipping and baking in a high-grade insulating varnish.

(c) *Winding*—All sharp corners and roughness in the slots that might damage the winding should be removed by filing or by a small portable abrasive wheel. The insulating materials placed on the coil support should be evenly spaced to avoid any thin, unprotected spots. The coils should be a snug fit in the slots and wound so that the top of the coils extend about $\frac{1}{2}$ in. above the band grooves. This is essential to get a good, tight banding job. In winding, the coils should not be twisted, bent or abused any more than necessary to get them in place. Insulating or protecting pieces should be placed at all points where coils or leads cross each other, and where there is danger of short circuiting. The correct winding information with a diagram of connections should be obtained from the manufacturer of the motors.

Soldering—In soldering the leads to the commutator, the soldering copper or tool should preferably be held at the side of the commutator rather than on the top and the pinion end of the armature should be raised about 6 or 8 in. This procedure tends to pre-

vent the solder from running in back of the necks and short-circuiting adjacent commutator bars. When soldering do not use acid flux, as this will tend to weaken the insulating material on the coils. Alcohol and resin gives good results. The best practice



If Parts Are Available Repairs Will Not Be Neglected

in soldering is to use a high percentage tin-base solder for wire-wound jobs and pure strip tin on strap-wound armatures. A heavy soldering copper weighing about 4 lb. gives best results in soldering and it must be kept clean, well tinned and hot when used.

Dipping and Baking—All rewound and repaired armatures should be partly banded and then heated at a temperature of 105 to 115 deg. C. from 8 to 12 hours, depending upon their size, and dipped pinion end down in a good grade of black insulating varnish. After draining, they are baked at a temperature of from

115 to 125 deg. C. (239 to 257 deg. F.) for 16 to 22 hours, depending upon their size. This treatment tends to fill all cracks and openings in the insulating material and greatly reduces the possibility of breakdowns which may be caused by moisture and other conducting materials filling these cracks. Furthermore, this treatment acts as a bond to prevent vibration. The equipment necessary to handle this work is a tank for the varnish, baking oven (preferably electrically heated and fitted with automatic temperature control) and the necessary apparatus to handle the armatures.

Banding—The most satisfactory results are obtained by banding the armature after it has been heated and the windings have been drawn down in place by means of temporary bands. A good grade of tinned steel banding wire ranging in size from No. 14 to No. 17 B.&S. gage should be used with tensions ranging from 100 to 300 lb. A strip of tin placed under the core band tends to strengthen and make these bands less liable to work loose in service. All bands should be soldered, using pure tin, as it has a

higher melting point than the half-and-half solder, and therefore will stand higher operating temperatures before it will tend to soften and let go under severe service conditions. A special high-melting point alloy has been developed and is now being used to solder armature bands. It has a melting point approximately 30 per cent higher than that of pure tin.

Testing—During the process of rewinding, armatures should be given various tests such as a ground test of 2,000 volts for 500-volt armatures, and 1,000 volts for 250-volt armatures. This should be done after all

coils are in place and the bottom leads connected to the commutator. The top leads should be lighted out to see that there are no crossed coils before connecting them to the commutator. Before final soldering, test for short and open circuits, using a testing yoke, bar to bar test, or a telephone receiver outfit. After soldering, the finished armatures should again be tested for grounds, open and short circuits. Recommended ground tests for rewound and repaired armatures are as follows, using alternating current:

Operating Voltage	Rewound Jobs	Repaired Jobs
500	2,000 volts	1,200 volts
250	1,000 volts	600 volts

MOTOR FRAMES

Field Coils—To insure the proper speed of the motor, the field coils must have the correct number of turns. The coils should be made from a good quality of copper of the proper size of wire or strap that will carry the current without overheating. They should have added insulation at sharp corners and at the pole tips and to be so shaped that they can readily be assembled in place. When wound, the coils should be treated in a gum, using the vacuum high-pressure impregnating process. After this they should be carefully insulated and then dipped in a high-grade insulating varnish and baked. All coils should be given three such dipping and baking treatments. The finished coils are fitted with cable leads in preference to heavy brass terminals, the objection to these terminals being that they are likely to break off or to develop loose connections and burn off the leads. Another objection is the difficulty of properly insulating them after the external connections are made.

Assembling Field Coils—Before assembling the field coils, clean off all sharp burrs and edges on all poles and pole seats and paint the inside of the frame at the pole seats with a black insulating varnish. Use steel springs and washers between the field coils and the motor frame. Wipe off the surface of the pole seats and pole tips at the joints before assembling. Be careful that the washers or springs do not work in at the fit between the pole and pole seat while assembling. Taping the coil spring and washers together at several points with a few turns of tape will help to avoid this trouble. Place coils over poles correctly, tighten pole tip bolts until they are pulled down solid to the pole seats. When bolts are pulled up tight, test

by hitting the pole lightly with a small hammer.

Field Winding—To insure a good electrical job, the soldering of all connections between the field coils and the wiring around the frame leads should be made under the direction of some one man experienced in this work. All leads should be cleaned and tinned before soldering. Brass or copper sleeves should be used on the brushholder leads and on field coil leads where terminals are being used on the field coils. The correct winding information with a diagram of connections should be obtained from the manufacturer of the motors. As an additional factor of safety, it is advisable to check the polarity of both the main and commutating field coils after they are assembled in the motor frame.

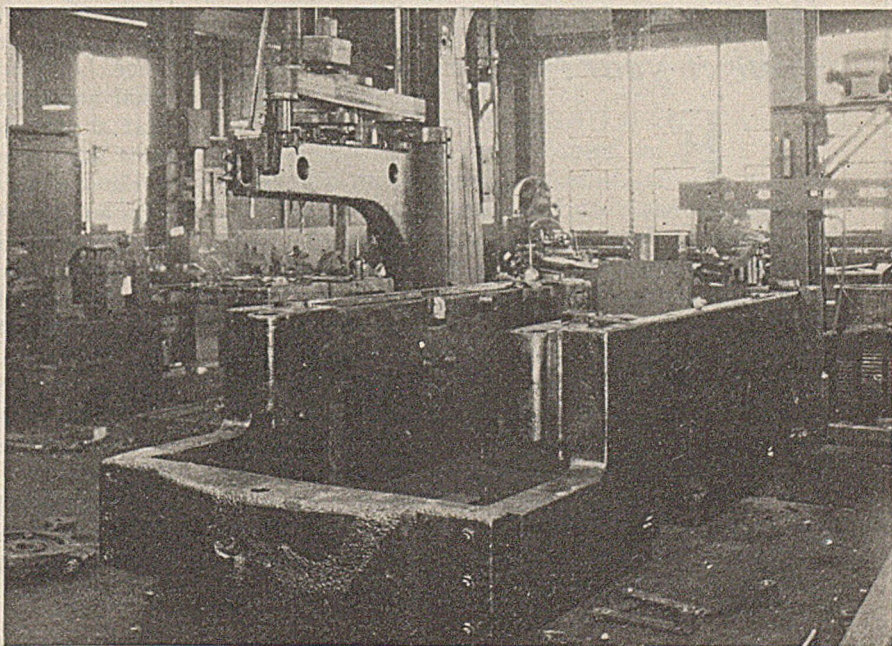
Brushholders—To improve the operation of the brushholders, keep the porcelains clean, the shunts in good repair and the pressure finger mechanism working freely. When more than one finger is used per holder, adjust the tension of each finger approximately 6 to 8 lb. On brushholders using a single finger per holder pressures of about 10 to 12 lb. should be used. Brushholders with a single carbon per holder are more likely to give trouble, due to a low spring tension, than those with two or more carbons. If with the single carbon, it should jump from the surface of the commutator the current is broken and the motor will tend to flash over to ground. Brushholders should be properly aligned on the

neutral position, which usually is at the center line of the poles. They should be adjusted to about $\frac{1}{8}$ in. from the surface of the commutator and spaced around the commutator one-fourth the number of commutator bars on all four pole machines. Clearance between the carbon and the carbon way should not be allowed to exceed $\frac{3}{16}$ in. The ratchet type pressure fingers used on some of the older mine motors are being replaced by a more modern design known as the twin washer finger, which is simpler in construction and free from friction, as there are no rubbing surfaces in the operation of this mechanism.

Carbon Brushes—The use of high-grade carbon brushes on undercut commutators more than pays for them in increased life of the brush and the commutator and, further, they improve the operation of the motors. When the commutators do not have the mica undercut a hard, abrasive carbon brush must be used to keep the mica cut down flush with the surface of the copper bars; otherwise high mica will develop and cause the motors to commutate poorly.

All carbons should have a snug sliding fit in the boxes and should not be copper-plated, as this plating is liable to peel off and cause sticking of the carbons. Shunts on carbons are not usually required on motors designed for 500-volt operation. On the other hand, they are generally used on the carbons for motors operating on 250 volts, due to the heavier working currents required by these motors.

Give Locomotive Complete Overhauling Every Eighteen Months or Two Years



COAL AGE

Published by McGraw-Hill Publishing Company, Inc.

SYDNEY A. HALE, *Managing Editor*

NEW YORK, NOVEMBER, 1929

A lesson in research

UP IN NEW HAMPSHIRE is a company which started its career as a sawmill, changed to a paper mill, abandoned newsprint manufacture to pioneer in kraft and today makes a score of products, including rayon stock, drainage pipes, and sulphite pulp. The production of its mills probably averages less than 1,000 tons per day. Back of that output is a chemical control laboratory and a research staff of 36 men, divided into groups of two to study specific problems of future processes and products.

Coal companies, of course, are not interested in pulp and paper mills as such except as possible consumers of fuel. But the history is here briefed because the origin and development of this particular New England enterprise should be suggestive of possibilities in coal study. How many coal-producing companies can boast of a research laboratory? How many have a research staff as large in proportion to the tonnage and value of the output as this New Hampshire company? Some—but the number is too few when it is recognized that much of the profit in coal tonnage tomorrow will be charted in the research laboratory today. Whether that profit will be retained by the coal industry or by an outsider will be determined by the interest the coal industry takes in research.

Who will run our mines —next year?

FAILURE of the coal-mining industry to attract any great number of students in the engineering schools of the country has disturbed more than one man who has analyzed the present situation with an eye to the future. Warnings such as that repeated by James H. Pierce incident to his recent studies of European practices (*Coal Age*, Vol. 34, p. 528) have been sounded with increasing frequency in the past few months. Co-operative efforts to probe the underlying causes of mutual indifference between the industry and the engineers of tomorrow are under way. The campaign initiated by the American Mining Congress is a case in point.

The economic implications of this failure are tremendous in their bearing upon the future success of the industry. These implications are

impressively set forth in a bulletin of Pennsylvania State College on "Mineral Industries of Pennsylvania." Written as a state document, the picture painted has an application as broad as the industry itself. "Invention, scientific discoveries, and research," it says, "are hurling problems at the industry at a more rapid rate than ever before." Developments in combustion engineering and processing have put a new face upon questions of cleaning, sizing and beneficiation. Electrification and mechanization bring fresh problems.

In the face of these demands for higher technical skill, students pass by the mining courses. Forty per cent of the total annual productive value of all industries in Pennsylvania where technical men may be employed comes from the mineral group, but only 6.3 per cent of the students enrolled in the technical schools of the state are majoring in the mining, metallurgical, and ceramic courses. Other important coal-producing states reveal a comparable state of indifference. Unless something is done, and done soon, to change this situation, the coal industry will find its progress definitely checked at a time when the need for more intensive technical assistance is most imperative.

What of the future?

IN SPITE of the higher rate in the production of coal in the first nine months of 1929, as compared to that in the same period in 1928, the accident rate per million tons produced has noticeably decreased—chiefly as the result of a decrease in the number of major disasters (in which five or more men are killed at a time). In 1929, the rate for all fatalities per million tons mined was 3.475 for the first nine months, as compared to 3.976 in 1928.

There should be no doubt but what the present excellent conditions in regard to the explosion hazard can be maintained. However, the dangerous season of the year is at hand when safeguards will have an extra burden thrown upon them. Rock-dusting will, of course, remain of primary importance, but ventilation well deserves more than the usual attention. Within the past two months, at least three minor explosions and one major disaster have occurred as the result of gas ignitions. In the one major accident, two men were killed outright and six others succumbed to carbon monoxide. Gas explosions, unless extended by dust, do not exact the same toll of lives as the more violent coal-dust blasts, but they are nevertheless an important cause of loss of life and property damage. Ventilation may well be regarded with a critical eye.

Heartening though the decrease in fatalities from explosions may be, the number of workers killed by falls of roof and coal decreased but little in proportion to the increased production, as shown in the accompanying table. Underground haulage also held its own as a cause of coal-mining deaths. Of the total fatalities in coal mining in 1929, falls of roof and coal accounted for 54 per cent in the

first nine months, and for 47.2 per cent in the corresponding period of 1928. Underground haulage also was well to the fore in the fatality toll, the figure for the first nine months of 1929 being 18.3 per cent of the total fatalities. For the corresponding period in 1928, haulage accounted for 14.8 per cent of the total fatalities.

Flame, poisonous gases and cataclysmic force are sufficient to land explosions on the front pages of the newspapers, but they should not be allowed to overshadow the importance of the less spectacular accidents arising from haulage or falls of roof. The latter agencies in 1929 accounted for nearly thirteen times the number of fatalities resulting from explosions of gas or coal dust, or 72.3 per cent, as compared with 5.5 per cent for explosions. In 1928, the percentage fatalities from falls of roof and coal and haulage combined was 62, as compared to 18.8 per cent for explosions.

Despite the seriousness of the explosion problem, the major field in accident prevention still remains in the reduction of fatalities from falls and haulage equipment, the importance of which is not lessened by the fact that they kill their victims one by one. A single fatality merits small discussion in the news of the day and, seemingly, fails to make a lasting impression on the operating officials. But the staggering total is sufficient evidence of the desperate need for a solution to the problem.

*Fatalities From Various Selected Causes,
Jan.-Sept., 1928 and 1929*

	Number of Fatalities		Rate Per Million Tons		Per Cent of Total Fatalities	
	1928	1929	1928	1929	1928	1929
Major disasters	308	83	0.747	0.176	18.8	5.5
Falls of roof and coal	774	819	1.877	1.875	47.2	54.0
Haulage	243	278	0.590	0.636	14.8	18.3
All Causes	1,639	1,518	3.976	3.475	100.0	100.0

Hydro and coal in the South

PLANS for hydro developments in and adjacent to the Southern coal fields have been viewed with alarm by many coal men in those fields. But do they really have anything to fear?

Because of the low cost of steam coal and the relatively high cost of a hydro development, water-power plants will be built only to keep pace with an increasing demand for power. And the industrial development which creates the demand will use a large part of the total energy consumption as heat. Generally speaking, heating by electricity is decidedly uneconomical; fuel, therefore, will be called upon to supply the heat.

There is another angle to be considered. With cheap coal and a combination of hydro and steam power, the economical plan is to operate the steam plant at full capacity and have the reserve capacity at the hydro plant, assuming that the water storage is adequate. This reverse of the former situation is due in part to the fact that a hydro plant can be made entirely automatic. Even if it is a large plant and operating attendance is supplied, this labor cost

is insignificant and is no larger even if several reserve generators are installed.

The installation of hydro generating plants in the soft-coal fields of the South will come hand in hand with an increased local consumption of coal. New industries will need coal for heat, and the power companies will build new steam plants to carry the base load.

Some pages from Appalachian history

IN PALEOZOIC TIME, when there were as yet no land plants, North America probably consisted of five islands, for which geologists have coined the names Laurentia, Appalachia, Cascadia, Columbia and Antillia. Despite all the cataclysmic violence of later ages Laurentia and Appalachia still stood their ground, not indeed always as islands but, at least, as highlands. Today, Laurentia is the highlands of Eastern Canada and Appalachia the Appalachian mountains and the Adirondacks. What is now the anthracite region lies in the depression between Laurentia and Appalachia.

Apparently in Pennsylvania time Laurentian upheavals folded the coal measures in central Pennsylvania, and thus the coals of any one horizon vary in thickness, the thicker coal being in the basins and the thinner coal on the crests of the folds. Concurrently the Appalachians lifted their heads in the area adjacent to the anthracite region and crimped the measures in folds running, roughly, north and south. The folding was not violent but it was persistent, and it also created differences in coal thickness.

Later, perhaps at the close of Pennsylvania time, came a severe uplift, the crest of which ran southwest and the northern end of which lay west and south of the southern end of the other uplift. It caused the "Great Push," as G. H. Ashley has named it. As this uplift came to an end at Nittany Mountain the measures were pushed north and west in southern Pennsylvania and north in northern Pennsylvania. The folds and fields arranged themselves in a segment of a circle around the end of the uplift. Just what happened when some measures were pushed north and some northwest gives food for thought. It was natural that there should be a gaping of the bow as the measures were pressed out. There are gaps in the segment; the coal fields are not continuous. Perhaps the outward pressure in two directions 45 deg. apart explains that situation.

All these are theories more or less confirmed by fact, and if they are true they may well explain the peculiar sickle-like shape of the Northern Anthracite Coal Field, which receives its odd configuration from the combined action of primary folding in Pennsylvania time, and secondary folding in the hectic days that marked the close of that period.

The BOSSES



Co-ordinating Day-Labor Jobs

ABOUT a year ago, Jim and Mac inaugurated a system of daily cleanup by the loaders. When this conversation took place, they were discussing the results of their plan:

"You're right, Mac, as far as you go," said Jim, the Super. "The daily cleanup has helped us a lot in many ways. It has, for example, increased concentration and given us a number of resulting economies. But the results, you must admit, have not all been on the asset side of the ledger."

"I know exactly what's on your mind," Mac answered. "It's the fairly substantial increase in the day-labor payroll, isn't it? Well, didn't we expect that; and haven't we found our over-all costs lower now than before we started the system?"

"Mac, you're right again as far as you go. But don't forget that while putting our scheme into effect we were bending every effort to increase the efficiency of our loaders. To do that we added many more men to the day force. There's the weakness. I'll bet the day-labor efficiency, if anything, is lower today than it was a year ago. We ought to be able to make a big showing by improving in that direction."

Mac scratched his head. "You talk in riddles, Jim. Our crews have been cut to the bone."

"You're thinking of numbers of crews right now, Mac, but I'm thinking of numbers of men on one crew. Has it ever occurred to you that a crew may be too big? Only the other day I heard of a company out West that works most of its track layers without helpers—a one-man crew. It seems to me that idea could be used to tighten up our day-labor efficiency. Some jobs can't be handled efficiently by two men working together; while one is busy the other merely makes a pretense at helping."

WHAT IS YOUR OPINION?

1. Can one man handle the track-laying job at the face?
2. On what other jobs might the customary number of men on a crew be reduced?
3. Where two or more men are needed on a job only part of the time, what method, if any, can be used to keep all of them steadily busy?

All superintendents, foremen, electrical and mechanical men are urged

Talk It Over

To Pay Or Not to Pay for Safety Training

Who Is to Be Blamed If Safety Should Fail?

THE Old Man is absolutely right in his idea to pay those employees who attend and take active part in first-aid training. I think the modern idea is more or less wrong that a man does not appreciate "a gift or a bribe," as Jim expressed it. My first experience in first-aid training started during 1913, along with six other salaried employees of a large corporation. The general superintendent called a meeting for 7 p.m. and we were *supposed* to be there. When I say "supposed," I mean that we had to be there. In that early day of safety organizations each member was asked to pay 50c. for initiation fees and to contribute monthly dues. The bosses came reluctantly a few times; so did a few workmen who had been invited by them. First of all, cut out the dues. Then if Jim cannot handle the men, keep them interested and get their co-operation in working safely, give Mac a trial in Jim's place.

As to the modern idea of "pay as you go," a man's pride may be hurt by an offer of financial assistance, but he will not resent being taught how to bandage an injured leg, whether it be his own or that of a fellow workman. Perhaps the old man is suffering from the mistake of attempting to take advantage of the friendly feeling existing between the company and its employees, created through first-aid meetings, rallies and banquets.

If taking advantage is in the form of a proposal of wage reduction, he will find the bosses and the men reluctant to display any further interest in safety. Usually the pay envelopes of the bosses are the first to suffer from a wage reduction. Some executives go even farther in taking advantage of sound relations thus established by expecting the men, according to their positions, to drop a \$5 or \$10 check onto a collection plate as a free-will offering to help defray the expense of entertainment. The requests for donations may cause some of the men to be embarrassed. While some may give freely to the donation fund and though all may be 100 per cent interested in the cause, none wants to

hear the old man get up in the middle of a meeting and talk hard times.

Safety training should be placed on the same basis as other items on the daily mine cost sheet. If responsibility for safety could be scored in points on the basis of 100, then 99 of the points should be scored by the bosses and the remaining one by the men under them. In matters pertaining to safety the company should pay all expenses. Yes, sir! Men should be penalized by compulsory lay-off for breaking safety rules.

Hartshorn, Okla. C. J. HODGES.

Example the Best Teacher In Establishing Safety

JIM certainly has the right slant on the advisability of the company paying the expense for entertainment at safety rallies as a means of drawing a large attendance. True enough, that scheme will draw out a large crowd, but it is not without its serious and troublesome reactions. Jim sees the results from the practical side. The Smiths and Joneses will be there, attracted by the pink parasol as the prize, and most likely will fall out with each other if one of them wins it. I have seen this plan tried again and again, but in no case was the outcome satisfactory.

Interest in safety should be started with the individual. The best plan for getting a large turnout is to have Mac and his assistants talk over the matter with miners during their visit to the working places. Mac, however, will have to go to the working men with a clean slate; if he preaches safety he also must practice it. Safety talk means absolutely nothing to the man, no matter if the mine mouth is covered with safety signs, when the mine officials are careless and dangerous conditions are allowed to exist. In his contact work Mac can help himself by appointing a live-wire committee of workers to back him up.

As to penalizing for violations of safety rules, of course, it would appear best to discharge any man who knowingly and intentionally violated a rule. However, there is another element which

Your Problem

All of the problems presented in this department have come from the field. Most of them have originated from personal contacts of the editors with operating men, some have been received in the mails and still others have been the result of editorial observation. Obviously, this situation does not give an equal chance to all mine bosses in the choosing of problems for discussion. You are invited to send in problem suggestions. If published, of course, they will be paid for, as are accepted answers.

must be considered; namely, that a miner with a large family to support may take a chance with dangers in loading a car of coal in order to keep up with his turn. This man is quite different from the type that is naturally always unsafe. Such a case requires the foreman to exercise the best of his judgment.

Altoona, Ala.

JOHN JONES.

Foremen Should Take a Hand In All Safety Meetings

WHILE attendance at safety meetings can certainly be stimulated by having music and moving pictures, the offering of prizes is too far-fetched and may defeat the true purpose of the meeting. I believe it is a good plan to invite women and children to safety meetings, because they should be as vitally interested as the men in the subject. Like charity, safety should begin at home. Another thing: the foremen themselves should be more active in safety meetings and occasionally should take the place of the superintendent or safety inspector in presiding over them. Thereby the foremen will become completely inculcated with the spirit of the movement and make it the big issue instead of the car of coal.

I do not believe that interest in first-aid training will be advanced by pay. Men who go to first-aid classes merely because they are paid for attending will not get much out of the training. If the classes are made interesting, it won't take long for the word to be passed around. You will see the results by the appearance of men who theretofore were lukewarm in the safety project. Of the many successful large first-aid classes that I have seen, those that were conducted on the workers' time have given the best results. There are two parties to the safety contract, the company and

to discuss these questions. Acceptable letters will be paid for

the men. The company does its part by providing instructors, equipment, and a meeting place. Plainly, the worker's duty is to take advantage of these facilities. This same line of reasoning should be applied to the whole safety movement. The company having made hazardous conditions safe, it is up to the men to guard themselves.

WILLIAM W. HUNTER.

Mount Hope, W. Va.

Organized Effort for Safety Finally Achieves Success

IN OPERATIONS consisting of several plants in one locality, a general safety committee should be organized for the division, also a safety committee for each plant and one for each section of the individual plant. At the meeting progress toward safety should be reported, an outline made for the safety work to be given during the next period, dangerous practices and conditions and recent accidents discussed and preventive measures determined.

The sectional safety meeting should be recorded by minutes for reference at the next meeting and a copy turned over to the mine safety committee. The mine safety committee will act by reporting to the general safety committee. It is essential that all men of supervisory capacity attend the general safety meeting; a number of the mine employees should be delegated to attend, possibly one from each section. If sufficient room is available, more of the employees should be there, their appointment being so scheduled as to give all of them a chance at one time or another to attend the meeting.

In case standards are violated or dangerous practices followed, the guilty person should be disciplined; the first offense may mean suspension of three days from work; the second ten days; and the third offense summary discharge. It is unnecessary to say that this should apply both to the workers and to the supervisory forces, for unless the standards apply to all and are strictly enforced, success in safety cannot be expected.

C. B.

Fairmont, W. Va.

Safety Club Helps

JIM has the right idea when he thinks workers should not be paid for taking safety training, for after receiving the course of instruction, they will, or should, feel amply paid in terms of greater freedom from accidents. The West Virginia Department of Mines, thanks to Bob Lambie and his deputies, has almost made it compulsory for every mine in the state to have a safety club. It recommends that all men who are absent from its meetings, without just cause, be fined.

WALTER HORNSBY.

Stickney, W. Va.

"Movies" on Mine Safety Impress Minds of Workers

THAT problem confronting Mac and Jim on stimulating safety is interesting, and I am anxious to hear what the other fellows have to say on the subject. As for myself, I believe that to a certain extent safety can be stimulated by the holding of rallies or community meetings accompanied with entertainment; but it must be remembered that this last feature can be carried too far and the main issue side-tracked.

Moving pictures exert a great influence on bringing people to rallies. A reel or two showing exactly how accidents happen, their results and how they can be avoided is apt to be more effective than hours of speech in impressing safety on the minds of the audience. A reel of comics and some music should be a part of the show. These portions of the program should be interspersed with safety talks by men who have had actual experience in accident prevention underground and possess the faculty of putting their story across.

A program of this sort never fails to attract a good crowd. For quite a while afterward you will hear the men discussing the various accidents thrown

on the screen. Broadly, the screen is far more effective than the spoken word in educating people in safety. I have seen men throw away safety literature before they were away from the scene of distribution.

First-aid teams naturally are composed of the more intelligent men; with training they become more valuable to the employer; so it is no more than just that they receive their regular wages for the time spent in training. A good man, honestly paid, will put forth sufficient effort to justify the expense of training him.

You can force a man to say "Yes, sir," and to perform his work in a prescribed manner as long as you are in his shadow, but unless he thinks "Yes, sir," as well as says it, your efforts are wasted. A man must get the safety idea deeply and firmly rooted in his mind. In other words, you cannot drive a man to play safe; he must be educated to it. Lastly, men should not be penalized for violation of safety rules unless these endanger the lives of others.

ARTHUR M. STREAMS.

South Brownsville, Pa.

Advertise Safety

SAFETY is cheap at any price. The spending of money on this activity must be done intelligently, perhaps more so than in the financing of any other project about the plant. Interest in it should be established and sustained in the key men, from the superintendent down to the section foreman, who, in turn, will spread it to the men under them.

Safety can be impressed upon the employee in the same way that business advertises its commodities and services to the public. Put up a bulletin board and keep it attractive looking. It might be well to sign a contract with a safety-display advertising firm and thus get material of real advertising value.

Pruden, Tenn.

JOHN CONLEY.

Avoid Artificial Stimulation

NO permanent good can be realized from artificial stimulation of interest in safety get-togethers, as suggested by the Old Man. This method involves too much expense and the men would expect a continuation of entertainment, also some sort of remuneration or pay to carry on the work. Interest would wane and enthusiasm die should the offering of pay and entertainment cease.

In the organization of safety clubs it is well to consider the value of employee opinion. Therefore, elect leaders from among the men who are influential and who can help to mold opinion in their fellow workmen. Use them as key men for your purpose; work on them individually rather than collectively; let them know that you are depending on their resources and their ability to make this thing a success:

Publications Received

Accident Cost and Mine Safety, by E. H. Denny. Bureau of Mines, Washington, D. C. Information Circular 6, 166; pp. 6.

A.S.T.M. Tentative Standards; American Society for Testing Materials, Philadelphia, Pa. Pp. 901. Price, \$7 in paper, and \$8 in cloth. Contains 173 tentative standards.

Coal-Washing Investigations—Methods and Tests, by H. F. Yancey and Thomas Fraser. Bureau of Mines, Washington, D. C. Bulletin 300; pp. 259, illustrated. Price, 50c. Covers a study of the washing characteristics of bituminous coals.

Mineral Resources of the United States in 1928 (preliminary summary). Bureau of Mines, Washington, D. C. Pp. 116. Price, 20c.

Preliminary Investigations of Rubber-Sheathed Parallel Duplex-Type Cables for Mining Machines, by L. C. Hsley and A. B. Hooker. Bureau of Mines, Washington, D. C. Reports of Investigations, Serial 2961; 10 pp.

Ninth Annual Report of the Scientific and Industrial Research Council of Alberta, 1928. Report No. 24, 53 pp., illustrated.

Report on Prevention of Industrial Accidents. International Labor Conference, Twelfth Session, Geneva, May, 1929. Pp. 219. International Labor Office, Geneva, Switzerland.

Anthracite Sizes for Domestic Use, a report by R. H. Fernald. Covers the results of research by the mechanical engineering department, Towne Scientific School, University of Pennsylvania, Philadelphia, Pa. Pp. 75, illustrated.

Experiments on Mine-Fan Performance, by G. E. McElroy and A. S. Richardson. Bureau of Mines, Washington, D. C. Technical Paper 447. Pp. 61; illustrated.

appeal to their sense of pride. Make the safety club a family affair, let it be informal and invite free discussion on all subjects relating to working conditions. Above all things, cultivate a spirit of pride in your organization. This will go far toward keeping it intact. The superintendent should be the chairman ex officio.

I do not believe compulsory layoff will eliminate violations of safety rules. I would, however, advocate an honor system of some sort or possibly the imposition of light fines.

Stanaford, W. Va. H. A. McCoy.

Take Men Into Partnership In Promotion of Safety

I DO NOT think men should be paid directly for the time they devote to first-aid training, but I do believe they should be rewarded in some way by the company. Appreciation by entertainment and banquets will bring out those who are not particularly interested. A good method to hasten the training of men is to let each member of an already trained team teach green men. Not only should the workers be taught the safety rules but a safety committee of workmen should be appointed for every section of the mine. They should be lobbyists at the working place in the cause of safety. Having once been taught safety rules, men should be penalized for breaking them.

Clairfield, Tenn. T. H. DAVIS.

Training Saves Lives

MANY deaths could be prevented if the witnesses to accidents only had a knowledge of first aid. To create an interest in this activity is not easy to accomplish; yet it can be done, even without the offer of financial reward. But there are certain obstacles that must be overcome. Not all of the men will register a desire to take part in the movement. At the beginning the curious will merely come and look on. In time they will become interested, spurred by a desire to see if they can do a neater job of tying up an injury than can the other fellow. If the management is not vitally concerned in the movement, neither will be the workers. It should provide all the facilities and defray the expenses for training its men.

Sullivan, Ind. JAMES RUSSELL.

Safety Training in Germany

TO HAVE well trained first-aid and mine rescue teams should be the accomplished ambition of every mine management. It is criminal in the event of an explosion or some other mine accident to send underground men who are not thoroughly acquainted with rescue and restoration procedures. Inasmuch as the members of these teams are called upon to risk their lives and

to work strenuously should a disaster occur, unquestionably they should be paid for the time devoted by them to safety training.

In the Ruhr district of Germany rescue and first-aid training is carried to a high degree of proficiency. The teams usually consist of bosses and chargemen, together with a few experienced miners—five in all—headed by a foreman. The mine Zeche Arenberg Fortsetzung, in Battrop, Germany, may be considered as an example of the thoroughness of German methods in safety training. At this plant a building has been provided exclusively for the training of rescue and first-aid teams, in which practice is held once every fourteen days. For rescue train-

ing a smoke fire is started in this building, in a smokeroom, and under such conditions the rescue team, equipped with the necessary apparatus, is required to practice, doing all kinds of arduous work. Pulleys are attached to the walls and from them are suspended 50-lb. weights which must be lifted by the men as often as they are able to do so without overexertion. The leader of the team supervises and records the results of this endurance test. Every third month the teams are put through a practice course underground, doing those things that might be required of them in case of an accident.

Getting back again to the more specific aspect of Mac's problem, should a man not obey safety rules, he ought to be laid off or discharged. It is better to do this than to endanger the lives of hundreds of other men and the investment of the company.

Scranton, Pa. FREDERICK NEUMAN.

Recent Patents

Dumping Car; 1,722,374. John A. Hebb, Hopwood, Pa. July 30, 1929. Filed Nov. 4, 1926; serial No. 146,172.

Lowering Chute; 1,722,675. Frank Pardee and Frank Pardee, Jr., Hazelton, Pa., assignors to the Anthracite Separator Co., Hazelton, Pa. July 30, 1929. Filed June 15, 1928; serial No. 285,540.

Flotation Machine; 1,722,705. Stephen E. Meyer, Hayden, Ariz. July 30, 1929. Filed April 20, 1927; serial No. 185,200.

Miner's Safety Helmet Cap; 1,722,869. John Vanusek, Republic, Pa. July 30, 1929. Filed Feb. 23, 1928; serial No. 256,424.

Blasting Cartridge; 1,723,351. Arthur W. Helmholtz and Dent Ferrell, Harrisburg, Ill., assignors to Safety Mining Co., Chicago, Aug. 6, 1929. Filed June 23, 1928; serial No. 287,863.

Process of Separating Lignite from Sand and Gravel; 1,723,372. Joseph W. Reid, Memphis, Tenn. Aug. 6, 1929. Filed Nov. 23, 1921; serial No. 517,189.

Method of and Apparatus for Mining Thin Vein Coal; 1,723,383. Anthony Smith, West Kittanning, Pa. Aug. 6, 1929. Filed July 22, 1925; serial No. 46,200.

Loading Skip; 1,723,447. Samuel Shafer, Jr., Milwaukee, Wis. Aug. 6, 1929. Filed Dec. 23, 1926; serial No. 157,537.

Apparatus for Carbonizing Coal and the Like; 1,723,932. Frank C. Greene, Waukegan, Ill., and Irving F. Laucks, Seattle, Wash., assignors to Old Ben Coal Corporation, Chicago, Aug. 6, 1929. Filed Oct. 24, 1925; serial No. 64,543.

Vibrating Screen; 1,727,007. James Crabb, Sr., Joliet, Ill. Aug. 13, 1929. Filed Nov. 26, 1926; serial No. 150,823.

Screen; 1,725,061. Emil Deister, Fort Wayne, Ind. Aug. 20, 1929. Filed Dec. 29, 1926; serial No. 157,654.

Attaching Device for Miners' Lamps; 1,725,182. Albert Dorsey, Martins Ferry, Ohio. Aug. 20, 1929. Filed April 19, 1928; serial No. 271,159.

Mining-Machine Bit Box; 1,725,288. William A. Lyttle and Luther C. Haggard, Henryetta, Okla. Aug. 20, 1929. Filed Dec. 23, 1927; serial No. 242,097.

Mine Car; 1,725,604. David H. Turner, Kittanning, Pa. Aug. 20, 1929. Filed May 13, 1927; serial No. 191,126.

Miner's Shirt and Garment Protector; 1,725,718. Annie E. Miller, Newton Hamilton, Pa. Aug. 20, 1929. Filed Feb. 15, 1928; serial No. 254,485.

Method for Gasification of Bituminous Coal; 1,725,739. John M. Rusby, Philadelphia, Pa., assignor to U. G. I. Contracting Co., Philadelphia, Pa. Aug. 20, 1929. Filed June 7, 1923; serial No. 643,859.

Endless Belt Conveyor; 1,726,555. John R. Gammeter, Akron, Ohio, assignor to B. F. Goodrich Co., New York City. Sept. 3, 1929. Filed July 13, 1926; serial No. 122,092.

Coal-Mining Apparatus; 1,726,891. Dudley T. Fisher, Columbus, Ohio, assignor to Jeffrey Manufacturing Co., Columbus, Ohio. Sept. 3, 1929. Filed June 8, 1923; serial No. 644,153.

Mining and Loading Machine; 1,726,963. Edward S. McKinlay, Denver, Colo., assignor to McKinlay Mining & Loading Machine Co., Denver, Colo. Sept. 3, 1929. Filed Sept. 29, 1925; serial No. 59,406.

Drive Unit for Coal Separators; 1,727,215. Joseph T. Norman, Frederick, Md. Sept. 3, 1929. Filed March 21, 1927; serial No. 177,108.

Safety Court Needed

I BELIEVE every employee should be compelled to attend the regular safety meetings and should be penalized by a fine or a layoff for non-attendance. Some men will attend without compulsion. They are glad to get the training and expect no pay for their time. There are others, however, who think of accident prevention measures merely as impositions on the miner. These last can be handled only by a penalty system.

A safety club or court will do much to arouse the workers to the necessity for safe working habits. The court at our plant has gone a long way in the direction of creating among the employees the feeling that to be summoned, given a trial and found guilty of a violation is about the worst punishment that can be dealt to a miner. As all employees have an opportunity to participate in the proceedings of the court, they are constantly on the alert for violations of rules by the other fellow. Finally, there is so much interest appeal in the various court trials that orthodox entertainment is not needed to attract attendance.

VICTOR G. GANDY.

Hepzibah, W. Va.

Indorses Jim's Plan

IN MY OPINION, Jim's notion to the effect that the time spent by miners in training and education should not be paid for by the employer is sound. Every man has some respect for his own safety and welfare, and, if given an opportunity, he will preserve himself and others without the influence of pay. If money is to be spent indirectly for safety, I would suggest that it be paid to those men who contribute the best ideas on safety in a suggestion-box system.

CHARLES W. WATKINS.

Kingston, Pa.

NOTES

From Across the Sea

JUST HOW GREAT a problem roof control is to the mining engineer where seams are many, located at frequent levels and all worked at the same time is well indicated by the necessity for introducing the Schaefer lining at the Powderly Colliery of The Hudson Coal Co., which was described in last month's issue of this magazine. And yet the Powderly mine is not deep. Its difficulties would have been greater had it been so. Doubtless the anthracite region has many mines where some such lining might be used with advantage. It has been extensively adopted in Europe, where, however, it is not the sole form of yielding arch.

A lining described by *Glückauf* recently, the Eigen system, is in the form of a horseshoe arch, but its small voussoirs, or arch stones, are dished on their radial faces so as to resist movement. In order to afford a degree of flexibility, or "give," under pressure, crushable blocks of impregnated pine are inserted at intervals between the arch stones. The latter are made of gravel and cement rammed tightly into steel molds with pneumatic rammers. No binding material is placed between the voussoirs.

Until completed the lining has no strength, and the two sides of it rest on arch templates which are removed after the lining is finished. For 2½ years this type of arch has been used at the Lothringen shaft in Germany for lining main rock tunnels extending from the shaft to the seams, for the main roadways, the shaft landings and for a locomotive and transformer room. The pressure of the roof is very heavy. At one point the crown of the arch sagged slightly out of line without in any way impairing the strength of the lining. It will be noted that the arch ring is just a little under 12 in. thick, so the lining must be regarded as quite light.

In Czechoslovakia, many of the coal and lignite mines have had to introduce concrete linings because of the heavy pressures. The coal seams lie from 1,000 to 1,250 ft. below the surface. The linings invented by Dr. Kabelac and described in the *Schägel und Eisen* are

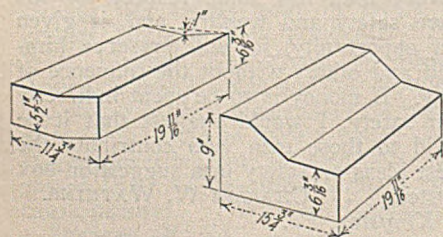


Fig. 1—Arch Stone and Footing

stiff, and reliance is placed on the thickness of the lagging to take up movement. No compression blocks are provided. Where the roadway is located in the fiery sections of the mine, the space between the arch and the roof is filled with wood fagots embedded in cement mortar.

The concrete slabs usually are made of a weight less than 280 lb., which three men can handle without mechanical aid. The number of slabs in the arch ring is based largely on this consideration. Fig. 3 shows one of the segments or slabs with the iron by which it is reinforced. The segments are thicker near the joint than at the center. They are held in place by securing with wedges the reinforcing irons of adjacent blocks which, when the blocks are made, are

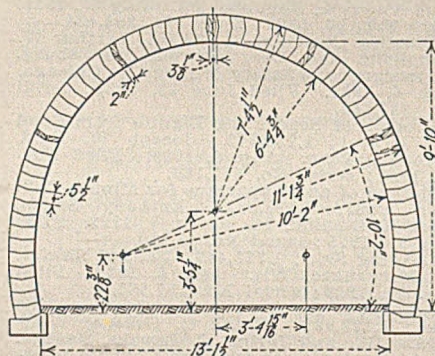


Fig. 2—Lining for Main Roadway

allowed to extend beyond the slab at both ends.

After the erection of the slabs the recesses at the joints are filled with concrete by ramming. Thus the pressure is distributed uniformly from each slab to its neighbor. The joint recess has its surface coated with tar before the concrete is put in. This makes it easier to remove the concrete when, because of the retreat, it becomes necessary to retrieve the lining and allow the roof to cave.

In Fig. 4 it will be seen that the arch sections have each five recesses which lighten the weight about 32 per cent. Tight joints are desirable where the coal is liable to spontaneous combustion because oxygen is prevented thereby from getting into the coal. Also, with a tight lining the gas escaping from the seam does not seep into the entry. A lining for a single-track roadway costs about \$13.30 per linear foot and for double-track about \$20.70.

In the Campine region of Belgium, which lies adjacent to Holland, some of the mines are using concrete block linings without any provision for distor-

tion. The roads are driven about 16 ft. wide and 8 ft. high and lined with timber. Then the bottom rock is lifted so that an inverted arch can be laid with a narrow berm of rock on either side of the excavation to support the legs of the timber and the coal rib.

This inverted arch is the lower half of a full circular ring, 10 ft. 4 in. in the clear. Wood centering is then erected and the circle of masonry completed. The blocks are quite large, 19½ in. through and 9x14½ in. on the inside faces and weighing 250 lb. each. Thirteen men and nine laborers, says the *Annales des Mines de Belgique*, advance the work about 4½ ft. a day, the time of driving



Fig. 3—Section of Kabelac Lining Showing Reinforcement

the roadway and lining it being included in that figure.

To make the lining more flexible, small slabs 1½ in. thick are placed between the bigger blocks. With such depths as are confronted in the Campine, where the mines are among the deepest in the world, there is little wonder that some trouble is experienced with inflexible linings. Wherever blocks break, the block is removed and replaced by brickwork set in cement mortar. As the blocks are wedged, it is impossible, of course, to replace them, but the ring must adjust itself to major pressures by the breaking of the block or while the repair is being made. It has been found to be important to pack the space back of the arch carefully. It is expected that the arches will prove satisfactory, only slight repairs having been made up to the present, but it is not certain that the system will be found permanently adequate.

An arch is by no means "gone" in the mines when a single voussoir has suc-

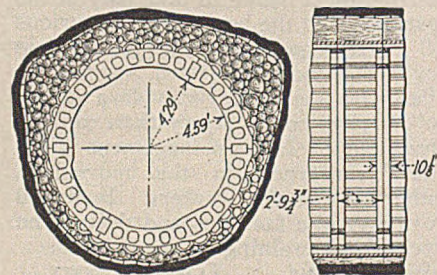


Fig. 4—Kabelac Roadway Lining

cumbed to pressure. In this respect the mine arch is different from one thrown across a river or a highway. There the entire strength is in the voussoirs. In the mine the arch supports merely the lower roof. The upper roof supports itself on the coal or caved areas. So when a little movement in the arch lets the upper roof adjust itself, the excessive load is relieved. The failure of a block, a slab, or a crushable unit, if such is

provided, permits such a movement, and when the arch is repaired (and that is not needed with small crushable units) it is ready to take up the strain again. It is, however, merely repair that is needed and not replacement, as is the case with timber. No large quantity of the arch has fallen and none of the draw rock. A single patch and the work is done. Sometimes the blocks in the Campine region are reinforced by $\frac{1}{4}$ -in. round bars laid in spiral formation. This adds to the strength but also to the cost.

The frontispiece of this issue, on page

662, shows an Eichhoff bar undercutting a seam on an inclination of 70 deg. The "cutter bar," or horn, with the bits set on its periphery can be seen in the slot it has already cut in the seam. Behind it is the machine by which it is actuated. This machine not only has an operating chain but is held in place by a safety rope kept taut by an air winch, in a level above that in which the men are congregated.

R Dawson Hall

On the

ENGINEER'S BOOK SHELF

The Ignition of Firedamp by the Heat of Impact of Metal Against Rock. Safety in Mines Research Board paper No. 54, by M. J. Burgess and R. V. Wheeler; 30 pages, 6 x 9½ in.; Paper. H. M. Stationery Office, Adastral House, Kingsway, London, W. C. 2. Price, 12c.

No more complete study of the ignition by the heat of impact of metal against rock has ever been published than in this monograph. In the opening pages it gives the reasons that led mining men to believe that sparks would ignite gas. As the scientists of many nations vainly strove to obtain ignitions in that manner, they did for a while question it, and yet they were loath to declare positively that it could not be done. The booklet records these early observations in some detail. Now, at last, scientists are willing to admit that under unexceptional circumstances the ignition will occur with firedamp.

The report does not say, unfortunately, what kind of gas was used—mine gas or gas from thermophilic bacteria. No word is said as to catalysis as a possible cause, nor is any further investigation reported as to the use of catalytic dusts to aid ignition. One wonders if sometimes hydrogen or ethane is not present, and whether catalysis does not aid in lowering ignition temperatures.

Among the conclusions are these: It was found possible to ignite firedamp by the heated edge of a steel rod pressed against a rapidly revolving wheel made from a hard quartzite sandstone from the Maindy Pit, Glamorgan, Wales. This rock has been found to cause ignition most readily during experiments on the ignition of firedamp by the heat of impact of rocks described in Safety in Mines Research Board Paper No. 46. Ignitions were obtained in less than 4 sec. on five occasions with a load of not more than 100 lb., the energy required varying

from 1,390 to 5,210 ft.-lb., and the power from about 1 to 1½ hp. Tests under similar conditions with wheels made from Derbyshire Grit and carbonundum failed to cause ignitions.

Where a steel disk rubbed against the two rocks, that from Maindy Pit and that of Derbyshire Grit, and against flint, no ignition occurred. Disk cutters of tungsten steel and coal-cutter bits ignited the gas by the heating of the rocks, which they cut with little sparking. A chain coal cutter cutting through hard rock in an experimental chamber filled with an explosive atmosphere ignited the gas when a cutting speed between $\frac{1}{4}$ in. and 18 in. per minute was used, and when picks of carbon steel and tungsten steel had been inserted in the cutter bar.

The author quotes the *Annales des Mines de Belgique* of 1907, describing an ignition of gas by a frictional spark at the Fontaine l'Eveque coal mine, saying "The gas ignited, however, was not firedamp, but contained hydrogen, which was liberated from the ironstone." It seems quite a suggestive statement, if the analysis was correct. The assumption that mine gas derives its mechanical ignitability solely from methane in all instances may be incorrect. The evidence seems to lead to a different conclusion.

* * *

Tests of Strength of Roof Supports Used in Anthracite Mines of Pennsylvania. Bulletin 303, by George S. Rice, Chief Mining Engineer, U. S. Bureau of Mines; 44 pages, 5¼ x 9 in.; paper. Price, 15c.

This report was first rendered on Feb. 26, 1913, by the U. S. Bureau of Mines to the Pennsylvania State Anthracite Mine Cave Commission, and was appended to the general report on mine caving made by that commission under date of March 1, 1913. That report has never been published. The

tests of the compressive strengths of the artificial supports were made in testing machines of the U. S. Bureau of Standards, including one capable of exerting 5,000 net tons pressure.

Two yellow-pine props of about 12 in. in diameter exhibited bearing strengths of 163.15 and 196.15 net tons per square foot, respectively, or equivalent to the weight of about 2,000 ft. of rock. Two chestnut-oak props of about 8 in. in diameter had bearing strengths of 340.20 and 350.65 net tons per square foot, respectively, or equivalent to the weight of about 4,250 and 4,400 ft. of rock. The larger figures in each case were obtained when the smaller diameter was upward. The props were almost 7 ft. long. Nine props, 5 ft. long and of almost 12-in. diameter, set in a group, failed under a pressure per square foot of 176 net tons after a reduction in length of 0.63 per cent.

Transversely, a yellow-pine prop of 12¼ in. diameter lost 49 per cent of its vertical diameter at a weight equivalent to 75.295 net tons per square foot, which is equal to that of less than 1,000 ft. of rock. A chestnut-oak prop of 7¾ in. diameter did not lose that same percentage of its diameter until a load of 232.25 net tons per square foot was imposed on it and lost 58 per cent with a load of 309.7 net tons per square foot, which is equivalent to the weight of about 3,900 ft. of rock.

The reviewer can scarcely refrain from quoting with comment the results obtained from the experiments with mine-rock cogs with and without filling, timber cogs filled and unfilled with rock, cement mortar cogs with filling, masonry shells filled with hydraulicked sand, hydraulicked sand and broken rock with breaker refuse in a steel cylinder, and concrete columns with and without reinforcement. But space forbids. The concrete columns were extremely disappointing. The best, composed of one part cement, three parts sand, and seven parts mine rock, seven days old, 8 in. in diameter and only 16 in. long, failed under a pressure of 20.695 net tons per square foot, equivalent to weight of about 260 ft. of rock. Hard-burned brick stood ten times the weight, but it received not only seven days, but a full calendar month for seasoning.

The book will bear close perusal, but with regard to props it should be used with caution, for props cannot be set close enough to support any such weight, and they do not long retain the strength attained when first put into mine service. The other materials are more permanent, and cement mortar actually improves with age. Some tests are given of the strength of coal from the Pittsburgh bed, but the bulletin warns the reader against too much reliance on them, as the blocks were more or less injured in removal and could not be tested under natural conditions. Besides, they were cubes, and, as Mr. Rice explains, mine pillars usually are longer and wider than they are high.

OPERATING IDEAS from Production, Electrical and Mechanical Men

Rail Extensions Are Easily Made With These Steel Ties

AN effort to cut track-laying expense and to reduce loading delays imposed by miners working on track or waiting for a track crew led to the development of two types of steel ties by A. R. Long, superintendent of the Scarbro mine of the New River Co., Scarbro, W. Va. These ties are used in a set of five under extension rails. Instead of balling them, the extension rails are set upside down. Mr. Long prefers using the rail in this position because of the greater strength and greater contact surface between locomotive wheel and rail.

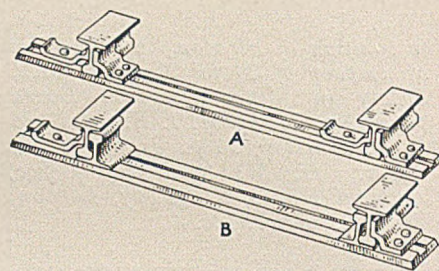
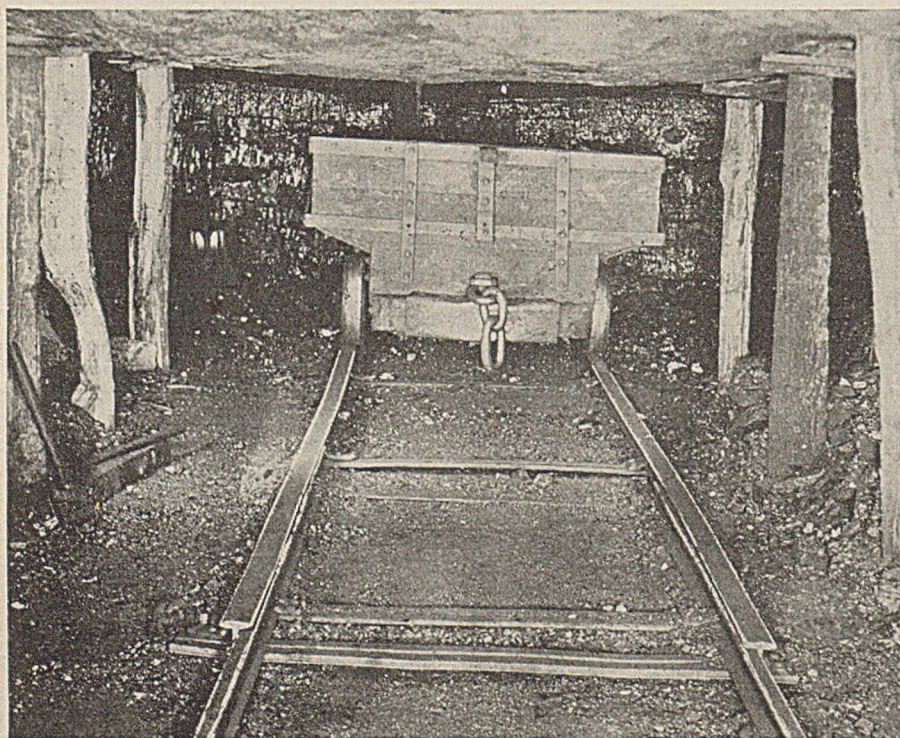
Four of the five ties required per pair of 20-ft. extension rails are provided with clips, arranged for holding the rail in the inverted position, as at *A* in the sketch. The tie *B* in the sketch is used only at the outby end; where the bottom

is favorable—the important exception being at a knuckle to the dip—it need not be used at all. This last tie has but two clips. Application has been made for patents covering these ties.

Obviously the gage of the inverted-rail track is slightly wider than that of the track with the rail in regular position. The difference, however, is so small that it is not a practical consideration.

Six sets of these ties have been in continuous use in Scarbro mine since the beginning of this year. In the room where the accompanying photograph was made the loader had laid his own track for the full 250 ft. He explained that with the necessary material at hand in the room, he prefers to lay the track so as to have it where and when he needs it, rather than depend on the track crew. In this mine shortwall undercutters are used, which requires

**These Extension-Rail Ties Cut Track
Labor and Increase Output**



**A Set Comprises Four Ties of
Type A and One of Type B**

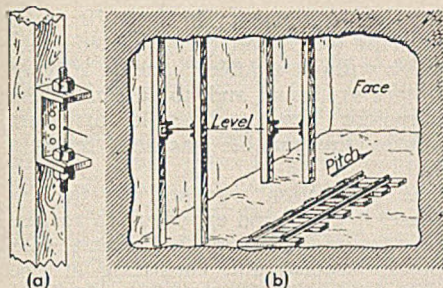
that the track be moved clear of the face after each cleanup.

Mr. Long thinks he can cut off approximately one-third of the track layers by equipping the whole mine with the ties. "We are having 100 sets made for the Scarbro mine and are planning on getting some for the other mines," said J. M. McCauley, manager of mines, when asked his opinion of the ties. "Using them, I think a track layer may be able to serve twice as many loaders. Personally I do not believe in allowing the loader to lay his own permanent track in the room."

Runs Roads to Grade

Many occasions arise in which it is desirable to drive roadways to a definite gradient, but except for periodic checking the worker in the particular face usually is left to his own devices to keep the roadway at the correct elevation. The common practice is to use a "grade stick," a piece of board cut to the inclination, to which is attached a level or plain bob. This is a ready means but one likely to give trouble. In the illustration (a) shows a bracket that has been designed by P. W. Brown, of Cowdenheath, Scotland, to overcome objections to the "grade stick."

A pair of these brackets are placed on upright posts and a fine brass wire is



Setting Level Lines on a Roadway

laced between them as shown at (b). At a convenient distance another pair is fixed. The wires are then adjusted level and in line by the aid of a transit. For checking purposes a fixed point may be provided well outside the place being driven. The wires may be placed at any height from the floor. Plumb lines or sight lines may be hung from a similar bracket and in such a manner that the gradient and sight line may be taken at one and the same time. The screw arrangement on the bracket admits of a fine adjustment being made, the horizontal and plumb lines corresponding to the cross hairs of the transit.

An Impregnating Tank Made in Mine Shop

An impregnating and baking tank, large enough to accommodate a 50-hp. a.c. motor completely assembled, has been designed and installed in the Gallitzin shop of the Pennsylvania Coal & Coke Corporation, of Cresson, Pa., by J. F. MacWilliams, electrical engineer. This tank is said to impregnate so thoroughly that a 5-hp. a.c. motor after treatment ran completely submerged in water in a test of five hours' duration without ill effect. It is used for waterproofing armatures and field coils and a.c. motors.

The liquid-compound container or tank proper is 33 in. in diameter and 5 ft. deep, being adapted from a dismantled boiler of $\frac{7}{8}$ -in. plate. Half of the tank is buried below the floor line of the shop. Bolted to the tank, when the latter is in use, is a heavy head, 1 in. thick, reinforced by eight double-section ribs, each $\frac{5}{8}$ in. thick, which extend radially from the center. The holding bolts are $1\frac{1}{2}$ in. A hand wheel screw on a swinging jib raises and lowers the cover and takes it out of the way while pieces are being inserted or taken from the tank. This tank, of course, is protected by a safety valve.

Around the entire cylindrical surface of the tank is inclosed a 3-in. air spacing by a 6-in. annular shell of reinforced concrete. This shell has eight door openings spaced at equal intervals and these are covered by inserts of 1 in. asbestos. Through these doors the heating elements or coils in the annular

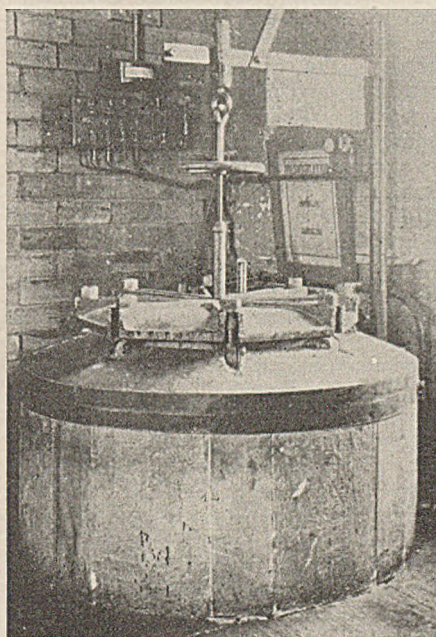
Operating References

How frequently is heard the remark, "We ought to do something about this." Those words should be a peremptory order for immediate remedial action. The wheels of industry turn with such great speed that pause for plodding consideration of details will leave the plant official behind in one or more of his daily duties. Many of the changes in works details can be made simultaneously with the determination of necessity, by the application of known formulas, data and information. These pages of operating ideas, covering all types of problems, are in the category of immediately useful information. They should be filed away, month after month, and used as reference when plant problems arise. Your sense of co-operation, if acknowledged, will lead you to contribute to the further compilation of this operating knowledge. Your ideas, appropriately illustrated, will be paid for if accepted, at the rate of \$5 or more for each.

air space are made accessible from the outside.

These coils are 30 in number, each of 500 watts, and five switches control them. Two switches each control two of these elements; one controls three elements; one controls seven elements and the last controls sixteen. The full

Has Paid for Itself Many Times



electrical capacity of these elements, 15 kw., is used merely to heat the tank quickly; baking requires only 5 kw.

In the following is indicated the operating procedure: The electrical piece having been duly inserted in the tank and the latter sealed, the temperature within is raised to 180 deg. F. to drive off moisture in the insulation. Then the compound General Electric 150 is dropped into the tank by gravity from a reservoir above. With the piece completely submerged, a pressure of 85 lb. is applied for one hour. Finally, the compound is pushed back into the overhead reservoir and the piece is baked at 220 deg. F. for six hours. During the baking process a drain at the bottom of the tank and a $\frac{3}{4}$ -in. pipe vent leading through the roof of the shop building, for bleeding off the naphtha fumes, are opened.

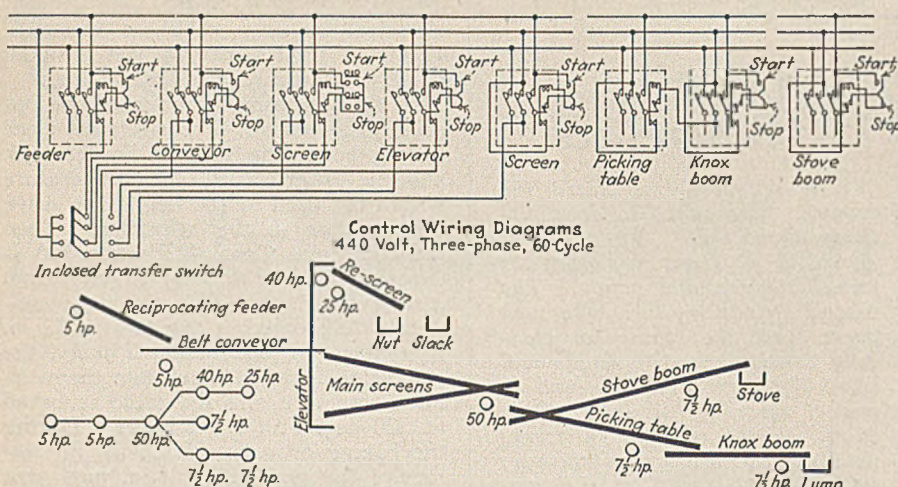
Labor and materials for the construction of this tank cost about \$500. Mr. MacWilliams asserts that this equipment paid for itself many times the first year.

Interlocking for Motors Started at Full Voltage

The Calumet Fuel Co., is installing at Mine No. 2, Del Carbon, Colo., some tippie equipment recently moved to Colorado from one of its mines in Utah. Three slow-speed squirrel-cage motors arrived on the job without control equipment and five new high-reactance, high-torque motors were purchased. The engineer had intended using hand control for all eight motors, says F. H. Doremus, General Electric Co., Denver, but when shown how easily he might obtain superior operating features and a saving in labor of attendance by using magnetic control, he immediately decided to use magnetic starting switches.

It was desired to lay out the control scheme to use a master transfer switch for five of the motors, one throw for separate operation in the usual manner and the other throw for sequence operation. The sequence operation was considered necessary in order to prevent coal from piling up at any point if some motor were to stop on account of overload or for any other reason. This was accomplished, as shown in the accompanying diagram, by using a Trumbull 4-pole, double-throw switch as a transfer and making it necessary to start the 25-hp. rescreen motor, the 40-hp. elevator motor, the 50-hp. main screen motor, the 5-hp. belt conveyor motor, and the 5-hp. reciprocating feeder motor in the order listed. If the 40-hp. elevator motor, for instance, should stop, the 25-hp. rescreen motor would continue to run and clear the screen, while the motors back of it would stop, preventing piling up of coal on the elevator.

In case some other combination of motors is desired, it can be obtained by moving the transfer switch to the



Magnetic Control of Tipple Equipment

"separate" position, when the motors can be operated by push buttons, as usual, or they can be tested out individually. The 7½-hp. picking table

motor and the 7½-hp. Knox Boom motor are always operated together, and consequently are started by one push-button station. While this sort of scheme is not elaborate or unusual, many operators and electricians are not familiar with it.

electrical equipment; in fact, 70 to 90 car trips were soon being hauled practically without trouble. Today, trips of 75 cars are usual and, to safeguard the equipment against possible armature failures, this number has been set as a limit.

As production was still on the increase, it was found expedient to replace the remaining 10-ton single unit with another tandem unit consisting of two 8-ton locomotives equipped with General Electric No. 819 motors. At the present time, due to the ever-changing conditions in the various collieries of The Hudson Coal Co., the two 7-ton locomotives which formed the original tandem unit have been separated and are now at one of the other collieries. This unit was replaced by a modern General Electric locomotive of the nominal 8-ton weight, equipped with two No. 832, 50-hp. motors. This locomotive, as noted, is of modern type and includes, in addition to the drum controllers, a line contactor which reduces the effect of arcing in the drum controller and thus lengthens the life of the equipment.

Tandem Locomotive Unit Speeds Transportation And Cuts Costs

ADVANTAGES to be gained by the use of a tandem locomotive unit for main-line haulage underground are exemplified in the application of this type of equipment in No. 21 Tunnel, Wilson Creek section, Coal Brook Colliery, of The Hudson Coal Co. The underground workings of the Clinton and Coal Brook Collieries are contiguous, and in the year 1924, coal from certain sections was diverted from the Clinton openings to what is known as the No. 21 Tunnel opening of the Wilson Creek section of Coal Brook Colliery. To handle this coal, two 10-ton General Electric locomotives were used equipped with HM-802 motors, operating between No. 22 Plane foot branch and the mouth of No. 21 Tunnel. The length of this haul is approximately 3,200 ft., with a grade ½ per cent in favor of the loaded cars.

As the tonnage to be hauled through No. 21 Tunnel increased, the 10-ton locomotives became more and more inadequate to handle the coal during the regular working day and soon had to work from ten to eleven hours in order to haul out the day's production of approximately 350 cars. Difficulty was experienced with this method of transportation, for no passing branches were available on the No. 21 Tunnel haulage road, and to construct one would involve much expense.

Not only was there much congestion along the haulage road but locomotive armature failures occurred at such frequent intervals that it was deemed advisable to seek a remedy.

It was imperative that something be

done in the matter inasmuch as production was still on the increase. After various proposals had been considered, including the installation of a passing branch or double-tracking the haulage-way, it was finally decided to replace one of the 10-ton locomotives with two 7-ton locomotives equipped with General Electric No. 819 motors and to operate them in tandem. At first, the two locomotives were coupled together mechanically only, with two motormen employed, one on each locomotive. The experiment was successful; transportation was accelerated and armature failures were reduced. The application of the tandem unit, however, did not decrease the operating force as two motormen and two brakemen were still employed. The next step in the procedure was to connect the two 7-ton locomotives electrically as well as mechanically. This permitted the operation of the unit by one motorman and one brakeman.

It is a well-known fact that, due to better distribution of weight on driving wheels, a tandem locomotive can exert a drawbar pull somewhat greater than twice that exerted by one of the units operating singly. This fact was forcefully shown by the substitution of the 14-ton tandem unit for the 10-ton single unit. With the separate 10-ton locomotive only twenty loaded cars could be handled under which condition, as previously noted, many armature failures occurred. The tandem unit, however, when connected both mechanically and electrically, hauled successfully 49 cars with no apparent ill effects on the

Open Storage Shed

Good housekeeping is a virtue borrowed from the home and applied to modern industrial plants. It has done much to establish and maintain order in the general appearance of the plants; at the same time it has influenced management toward system in the storing of tools and materials. In general, coal-mine plants have been slow to appraise the value of orderliness in plant maintenance and even in the storing of materials. In the supply rooms and houses, parts are stored with some eye for system; but not so with respect to the storing of heavy materials, such as rails, pipes and raw steel, outside of buildings.

The plant accounts of the Peabody Coal Co. are the last word in accuracy and so it is not surprising to find this company insisting on system in the matter of supplies storage in agreement with the bookkeeping system. At the No. 8 mine of the Peabody Coal Co., at Tovey, Ill., everything is made to

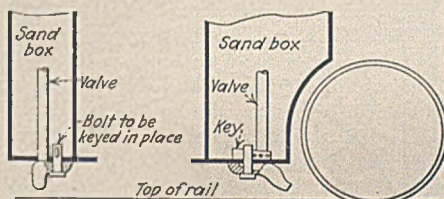
Everything in Its Place



have its place. Those materials stored on the outside which are likely to suffer damage on exposure to rain are stored under an open shed. One of these sheds is shown in the accompanying photograph. Each piece is given a place: pipes are stored in individual partitions over the rafters of the shed; bar iron is kept on hooked racks which are inclined downward toward the middle of the shed; under these are stored angle irons and rods. Each space is given a number together with the size to agree with the book accounts.

Locomotive Sand Pipe Keyed to Box

When sand pipes are attached to mine locomotives in the customary manner, trouble is constantly experienced. The sand soon cuts out the threads in the bottom of the sand box, as well as the bolts which hold the pipes in place. This difficulty can be eliminated, R. J. Till-



Details of Sand-Pipe Design

son, of Cassity, W. Va., has found, by using, instead of the threaded bolts, a wedge-shaped key, as shown in the attached sketch. To replace a sand pipe, the key is placed in the slotted bolt and is set to place by a few taps of a hammer. It is held thus by a small cotter pin through a hole in the key. Removal of a pipe is accomplished with equally as little effort.

Cine-Film "Stills" Aid At Safety Meetings

In the promotion of safety, mine officials are confronted with the problem of providing something of interest for the regular safety meetings. Moving pictures telling a safety story are excellent, but the supply of appropriate films is soon exhausted, and the frequent making of motion pictures for that purpose inside the local mine is generally beyond consideration.

H. B. Husband, general manager of fuel-mine operations of the Chesapeake & Ohio R.R., Dorothy, W. Va., has found that the projection of still pictures, made with a small camera on short strips of standard 35-mm. cine film, is a practical method of utilizing the screen for increasing interest at local safety meetings. A camera which

measures only 2x3x4 in., but which can be loaded with a strip of film on which 50 pictures can be made, and a supply of flash powder are the only items of equipment required in making these pictures inside the mines. The cost of flash powder is the principal expense. The cost of negative films is but 1c. per exposure and printing of the projection roll adds only 3c. or 4c. per picture.

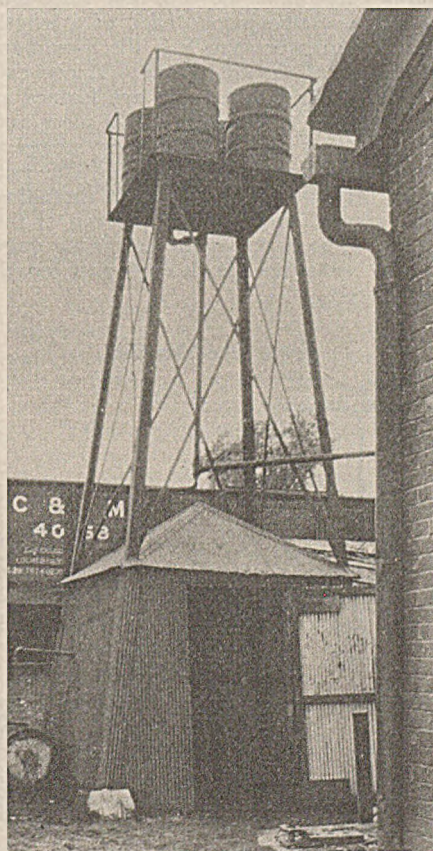
This camera is of the fixed-focus type and the film is extra fast. The combination makes it possible to take pictures quickly and with relatively small charges of flash powder. Pictures of safe and unsafe conditions pertaining to timbering, haulage and other phases of operation, taken in places that the men recognize, seem to create a lasting impression when projected in large size on the screen.

Bit-Sharpening Furnace Is Fueled by Gravity

Bits for cutting machines at many of the modern mines today are sharpened by a machine in conjunction with a fuel-oil heating furnace. This method in the main would be entirely satisfactory were it not for the inconvenience in handling the fuel oil and the difficulty of arranging a simple, positive fuel-oil feed.

At the No. 8 mine of the Peabody Coal Co., Illinois, fuel oil is fed to the

A Positive Furnace Fuel Feed

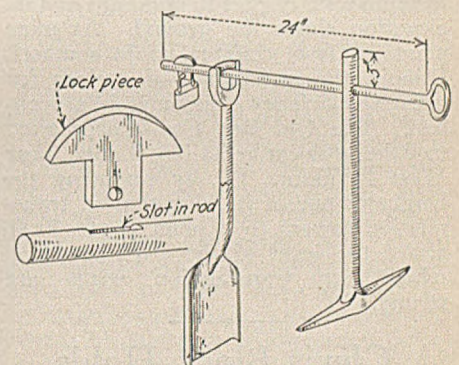


furnace by gravity from an elevated storage reservoir, consisting of four regulation drum containers resting on a fabricated steel platform about 20 ft. from the ground. Secondary pipes from the drums join a main vertical column which at the bottom terminates in two branch pipe lines. One branch line leads to the furnace and the other to a small single-acting plunger pump located in a shelter house under the platform structure.

Valves regulate the flow through one or the other of these two branch pipes. A horizontal suction line from the pump extends through the shelter house to the outside for refilling the reservoir.

Thwarts Tool Thieves

If tools are to remain safe while the miner is away from his working place, some means must be provided for keeping them under lock and key. A. F. Johnstone, McRoberts, Ky., has successfully applied an idea borrowed from European practice which solves the problem. His method is to drill a hole in each tool large enough to allow a

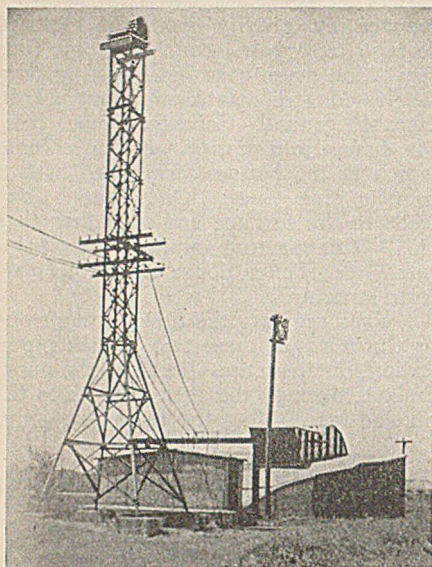


Locking Miners' Tools

$\frac{1}{4}$ -in. round rod of iron to be threaded through it. One end of the bar is flattened into a knob and the other end is slotted for the reception of a lockpiece.

The best location of the hole, in his judgment, is about 3 in. from the end of the handle. A shovel need not be drilled at all, as the crutch of the handle can be used for the purpose. This arrangement is one of the few available to the miner for keeping his tools safe from temporary and permanent borrowers.

IN THE AUGUST ISSUE OF *Coal Age*, p. 500, appeared an operating idea by W. J. Leonard, of Broomhill Collieries, Ltd., Northumberland, England, describing the use of wedges on the bottom of shaker-conveyor pans for upgrade transportation of coal. These wedges were described as being made of wood, whereas the material should be steel or wrought iron.



This Siren Can Be Heard

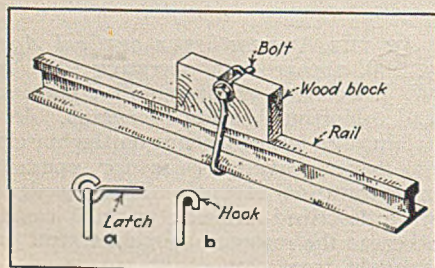
Old Ben Mounts Siren on Transmission Tower

The effectiveness of a signal or work siren at a plant largely depends on its location with respect to buildings and its elevation above the ground. At mine plants in level country, as in southern Illinois, the installation of a siren for greatest efficiency sometimes is a problem. The Old Ben Coal Corporation met the problem at its No. 8 mine, near West Frankfort, Ill., by extending the height of one of its high-tension transmission towers to a point about 30 ft. above the level of the cross arms on which the transmission wires are strung.

Clevis Block Holds Cars in Place

Two safeguards are used in the mines of The Hudson Coal Co. to prevent a mine car from moving while the loader is filling it and endangering him or others who may be in the chamber or on a gangway back of him. The car is first blocked by a short piece of rail which rests against the end of the car or the bumper and is braced against a tie in the track. Additional protection is supplied by a clevis block, shown in the accompanying illustration.

Easily Applied Clevis Block



Its construction is such that it may easily be applied, the notched wooden block being held in place on top of the rail by a U-shaped piece of iron which passes under the rail and a bolt which is slipped through the loops on the ends of the legs. In the alternative form of construction shown at *a* and *b*, the bolt is replaced by a latch, permanently fastened to one leg of the U and slipping under a hook on the other.

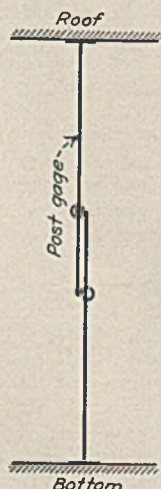
A Simple Replacement Of Air Valve Wheels

Control wheels on compressed air valves used underground are constantly being lost or broken and therefore it is advisable always to keep a reserve supply of them on hand. The type proposed for replacements by Charles W. Watkins, Kingston, Pa., is made in numbers from a strip of $\frac{1}{4}$ x 2-in. wrought iron, cut into 2-in. squares. Into the middle of the pieces a square tapered hole to fit the valve stem is punched by the blacksmith. A little filing will take off the rough edges.

Handy Timbering Tools

Two simple devices made of $\frac{3}{4}$ -in. round iron have been developed by Walter Hornsby, Stickney, W. Va., to ease the task of cutting mine posts to proper length. One is a post gage and is made of two pieces, each of a length slightly greater than half the maximum thickness of the coal seam. At one end of these pieces is a small eye formed at right angles to the stem of the piece and at the other end is welded or forged a small bearing or foot piece. The two parts are joined together by threading the stem of one through the eye of the other. The result is an extensible gage which measures the desired post length accurately.

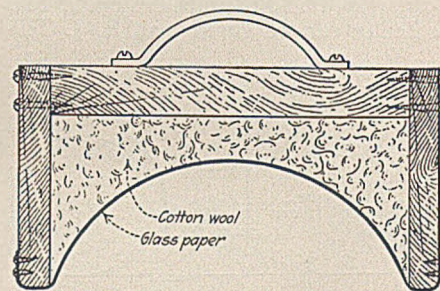
For a One-Man Job



A second tool intended for use in conjunction with the first is a post holder, a 30-in. staple with points about 3 in. long. Two of these staples are used for rigid holding of one post upon the other while the uppermost of the two is being sawed to correct length, as shown in the sketch. These staples, of course, are driven into the posts. Mr. Hornsby asserts that the efficiency of a timber man working alone is greatly increased by the use of these tools. They enable him to use a one-man saw dexterously.

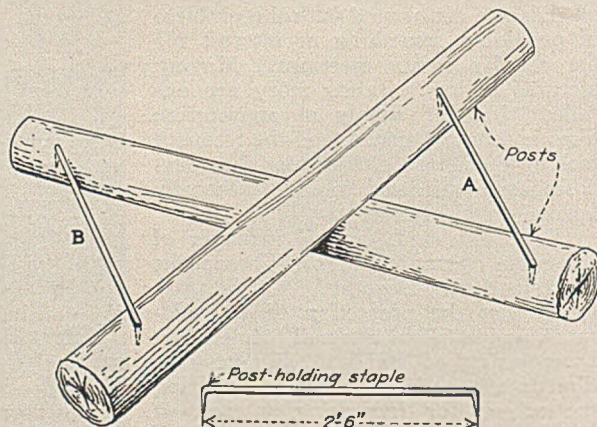
Commutator Sander

Many types of commutator sanding blocks have been devised, but few have met the test in use. One of the chief drawbacks to most of them is that their use is limited to merely one size of commutator and even then they do not bear evenly over the entire surface.



Handles Several Sizes

In the Oct. 1 issue of *Power* a sanding block is described by W. E. Warner, of Brentford, England, which is said to be more flexible and universal in use. It is made up of three heavy pieces of wood which are so joined together that in sections a channel is formed; across the inside of the channel is a curved strip of glass paper connected as shown in the accompanying sketch. As this strip is flexible, it adjusts itself to conform with the periphery of commutator being smoothed. A backing of cottonwool is placed behind the convex side of the strip.



WORD *from the* FIELD

Illinois Union Breaks With U.M.W.

Internal dissension in the ranks of organized labor in the bituminous coal fields of Illinois developed into an open break between the international organization of the United Mine Workers and the state district union last month. Following publication in the *United Mine Workers' Journal* of minutes of an international executive board meeting at which two of the officials of Subdistrict 9 (Franklin County), deposed by International President Lewis some months ago, were reported to have confessed to embezzlement of union relief funds and to have accused district officials of irregularities, two suits for libel asking damages of \$250,000 each were filed against Lewis and his associates by A. C. Lewis, counsel for District 12, and Harry Madden, former board member for Illinois. The district union also struck back by an order abolishing Subdistrict 9 and parceling out the territory to other subdistricts and by refusing to depose another official attacked by John L. Lewis.

The latter answered this defiance with an order revoking the district charter and deposing the district officers. Provisional officers named by Lewis were prevented from taking control, however, by a writ of temporary injunction issued on the petition of Harry Fishwick, district president, and his associates other than William Sneed, vice-president. The injunction also ran against the operators and banks holding district funds and barred them from recognizing the Lewis order or the provisional officers named by the international president. District officials have followed this up with a bitter attack upon the Lewis régime, accusing the international administration of wrecking the organization outside of Illinois.

In Colorado, where petitions asking a union scale have been filed with the State Industrial Commission by miners in the northern field, the operators have reported that the petitions were filed without the knowledge or consent of the majority of the workers at the three mines involved. The commission has promised to investigate the origin of the petitions before taking further action.

New Executive Committee Appointed for N.C.A.

Eleven appointments to the executive committee of the National Coal Association for the year 1929-30 have been made by C. E. Bockus, chairman of the



\$1,000 for Coal Slogan

Twenty cash prizes totalling \$1,000 will be awarded for the best slogan for coal in a nation-wide, industry-wide contest to stimulate interest in bituminous coal inaugurated by the public relations committee, National Retail Coal Merchants' Association, says an announcement by Harry Turner, Topeka, Kan., chairman of the committee.

The contest is open to any one who mines, sells, uses or benefits by coal, and will close on Feb. 28, of next year. Mr. Turner stated that retailers in Eastern cities, Southwestern retail associations and representatives of retailers on the Pacific Coast are co-operating in stimulating the public interest, and that the campaign is indorsed by the National Coal Association; the Pocahontas, New River and Winding Gulf operators' associations and operators' groups in the Southwestern field. The value of this co-operative movement was discussed by Milton E. Robinson, Jr., whose remarks at the annual meeting of the National Coal Association, on Oct. 23, are given in detail on page 678 of this issue of *Coal Age*.

board and president, Clinchfield Coal Corporation, New York City, in his capacity as president of the association. Other members of the committee, which includes Mr. Bockus, are as follows: E. C. Mahan, president, Southern Coal & Coke Co., Knoxville, Tenn.; Geo. J. Anderson, president, Consolidation Coal Co., New York City; Walter Barnum, president, Pacific Coast Co., New York City; J. D. Francis, vice-president, Island Creek Coal Co., Huntington, W. Va.; W. J. Freeman, president, Bon Ayr Coal Co., Terre Haute, Ind.; Geo. B. Harrington, president, Chicago, Wilmington & Franklin Coal Co., Chicago; Otis Mouser, Stonega Coke & Coal Co., Philadelphia, Pa.; W. L. Robison, vice-president, Youghiogheny & Ohio Coal Co., Cleveland, Ohio; J. W. Searles, president, Pennsylvania Coal & Coke Corporation, New York City, and Geo. J. L. Wulff, president, Western Coal & Mining Co.

Propose Segregation of L. C. & N. Properties

Directors of the Lehigh Coal & Navigation Co., Lansford, Pa., have recommended to their stockholders for their approval the selling of all its coal properties as the first step toward segregation. A new corporation is to be formed to carry on the coal business of the company and terms and conditions of the transfer are to be decided upon by the board of managers. The directors also have recommended that the company's capital stock be increased from 543,355 shares of \$50 par value to 3,000,000 shares of no par value, the outstanding capital stock to be converted for new stock on the basis of three for one. Stockholders will vote on the recommendations at a special meeting called for Jan. 15, 1930.

Drainage Board Formed

Organization of the Bituminous Coal Mine Drainage Board of Pennsylvania, a fact-finding committee representative of both the state and the bituminous coal industry in Pennsylvania, was approved Oct. 10 by the State Sanitary Water Board. Provision was made for a co-operative study of present and future uses of water from streams in the bituminous fields and the board will attempt to determine plans and policies for the improvement of stream conditions. Forty-six coal companies, representing a production of 68,700,000 tons annually, signed the agreement.

Dr. Theodore B. Appel, Secretary of Health, Harrisburg, Pa., is chairman of the new Board and Chester M. Lingle, vice-president, Buckeye Coal Co., Nemacolin, Pa., and W. L. Stevenson, chief engineer, Department of Health, are vice-chairman and secretary, respectively. Bituminous representatives on the Board are: L. W. Householder, Rochester & Pittsburgh Coal Co., Indiana, Pa.; E. S. Taylor, Pittsburgh Coal Co., Pittsburgh, Pa.; M. L. Coulter, Clearfield Bituminous Coal Corporation, Indiana, Pa.; W. L. Affelder, Hillman Coal & Coke Co., Pittsburgh, Pa.; W. W. Helman, Keystone Coal & Coke Co., Greensburg, Pa.; J. A. Saxe, Bethlehem Mines Corporation, Johnstown, Pa.; Charles Enzian, Berwind-White Coal Mining Co., Windber, Pa.; Fred Norman, Allegheny River Mining Co., Kittanning, Pa., and J. William Wetter, Madeira-Hill Coal Mining Co., Philadelphia, Pa. Another representative is to be appointed by the H. C. Frick Coke Co., Pittsburgh, Pa.

Americans and Germans Aid Soviet Program

Three American engineering firms and one or two German concerns are playing a part in the ambitious program of the U.S.S.R. to increase Russia's annual coal production from 35,000,000 tons to 75,000,000 tons in the next five years. Pointing out that the story appearing on page 658 of the preceding issue of *Coal Age* might create the impression that this development was in the hands of one firm, the Amtorg Trading Corporation, American representative of the Soviet Union, says:

"The coal industry of the Soviet Union, which is undergoing a very large expansion, will employ the services of three leading American mining engineering firms. Aside from the Allen & Garcia Co., Stuart, James & Cooke and the Roberts & Schaefer Co. are assisting the Soviet Coal Trusts in realizing their ambitious program which calls for an increase in coal production of from 35,000,000 tons last year to 75,000,000 tons in 1933."

Technical assistance in the second phase of the Russian mining program will be rendered by Stuart, James & Cooke, Inc., New York City, as the result of the signing of the thirty-second contract between the Russians and American engineering firms.

The contract represents the second phase of the program of the Donugol State Coal Trust and provides for assistance in obtaining a maximum output from the properties, the most efficient utilization of all underground and surface equipment, the best possible quality of production and the maximum increase in the individual output of the worker.

Anthracite Club Meets

How to eliminate complaints on the installation of heating systems was the theme of the October meeting of the Anthracite Club of New York City, held in New York City, Oct. 14. This point was stressed by the speaker of the evening, Dr. Alphonse A. Adler, consulting engineer and lecturer on heating and ventilating, New York University, who said that installation and servicing should be based on the fundamental operating principle that the motive force for the creation of a draft through the system must be greater than the resistances encountered.

James Pierce, consulting engineer, Stuart, James & Cooke, Inc., talked on conditions in Russia and said that the anthracite industry in the United States was perhaps unduly alarmed over the prospect of competition from Russian anthracite.

A. S. Moody, Balanstat Corporation, announced that the manufacture and sale of this heat-regulating device would be controlled by the newly formed Anthracite Equipment Corporation, and stated that experimental work in selling and servicing the device was under way.

Bureau of Mines Issues Permissible Plates

Approvals of permissible mining equipment issued by the U. S. Bureau of Mines during the period July-October, inclusive, are as follows:

(1) Duncan Foundry & Machine Works, Inc.; turntable-type Duncan conveyor; General Electric Co. 1-hp. motor and control, 500 volts, d.c.; Approval 166A; July 11 (original Approval 166, issued March 13, covered 230-volt equipment only).

(2) Chicago Automatic Conveyor Co.; pit-car loader; Goodman Mfg. Co. 1-hp. motor and interlocked fuse and switch; Approval 175; July 26 (original Approval 175A, issued June 24, covered 500-volt equipment only).

(3) Sullivan Machinery Co.; Class CD-4 and CD-5, self-propelled, coal-drilling machine; Westinghouse 5-hp. motor and control, 250 or 500 volts, d.c.; Approvals 176 and 176A; Sept. 9.

(4) Sullivan Machinery Co.; Class CD-4 and CD-5, self-propelled, coal-drilling machine; General Electric Co. 5-hp. motor and control, 250 or 500 volts, d.c.; Approvals 177 and 177A; Sept. 13.

(5) Northern Conveyor & Mfg. Co.; pit-car loader; Continental Electric Co. 1-hp. motor and Union Electric & Mfg. Co. control, 500 volts, d.c.; Approval 168A; Sept. 27 (original Approval 168, issued April 5, covered 230-volt equipment only).

(6) Northern Conveyor & Mfg. Co.; pit-car loader; Continental Electric Co. 2-hp. motor and Union Electric & Mfg. Co. control, 230 volts, d.c.; Approval 178; Oct. 5.

(7) Mancha Storage Battery Locomotive Co.; pit-car loader; Continental Electric Co. 13-hp. motor and Union Electric & Mfg. Co. control, 500 volts, d.c.; Approval 179A; Oct. 19.

(8) American Mine Door Co.; Type H rock-dusting machine; Westinghouse 20-hp. motor and control, 230 volts, d.c.; Approval 180; Oct. 30.

Williamson Operators Meet

Trade-practice codes were the principal theme of discussion at the annual meeting of the Operators' Association of the Williamson Field, held at the Mountaineer Hotel, Williamson, W. Va., Oct. 10. A committee to study the subject and make recommendations for the Williamson field was appointed at the meeting.

All officers of the association were re-elected for the coming year, as follows: president, L. E. Woods, president, Crystal Block Coal Co., Welch, W. Va.; vice-president, L. D. Heustes, general manager, Portsmouth By-Product Coke Co., Portsmouth, Ohio; treasurer, W. S. Leckie, general manager, Leckie Collieries, Afex, Ky., and secretary, J. J. Ardigo, Williamson.

Timely topics of interest to the mineral industry of the country will claim the attention of delegates to the annual convention of the American Mining Congress, to be held at Washington, D. C., Dec. 4-7. Transfer of public lands to the states, mineral taxation, problems of the coal industry, and trends in business will be discussed. Dr. L. E. Young, vice-president, Pittsburgh Coal Co., will report on advances in mechanized mining.

Financial Reports Issued

The Lehigh Valley Coal Co., for the quarter ended Sept. 30, reports a net income of \$358,683 after interest, federal taxes, depletion, depreciation, etc., as compared with a net loss of \$168,707 in the preceding quarter and net profit in the third quarter of 1928 of \$267,812. For the nine months ended Sept. 30, net income, after all deductions, totaled \$664,509 in 1929 and \$869,281 in 1928.

For the quarter ended Sept. 30, the Pennsylvania Coal & Coke Corporation and subsidiaries report a net profit of \$56,612 after ordinary taxes, depreciation, depletion and other charges but before federal taxes, as compared to a loss of \$28,519 in the preceding quarter and \$94,775 in the third quarter of 1928. For the nine months ended Sept. 30, the net profit was \$32,361, against a loss of \$547,366 in the corresponding period in 1928.

The Colorado Fuel & Iron Co. and subsidiaries, for the quarter ended Sept. 30, report a net income of \$190,237 after interest, depreciation and depletion but before federal taxes, against a deficit of \$157,117 for the corresponding quarter last year. Net income for the nine months ended Sept. 30 was \$1,574,401 against \$563,411 for the same period in 1928.

The Pittsburgh Terminal Coal Corporation, for the quarter ended Sept. 30, reports a net loss of \$186,104 after depletion, depreciation and other charges, as against a net loss of \$244,717 in the preceding quarter and \$96,647 in the first quarter of this year.

For the quarter ended Sept. 30, the Island Creek Coal Co. reports net profits, after all charges, of \$766,903. This compares with net incomes of \$669,498 in the preceding quarter and \$788,386 in the third quarter of 1928. For the first nine months of 1929, net earnings were \$2,254,555, equal, after preferred dividends, to \$3.54 per share of common stock, as compared to \$2,011,290 in the corresponding period in 1928.

The Pond Creek Pocahontas Co., for the quarter ended Sept. 30, reports net earnings of approximately \$63,000 after all charges and taxes but before depreciation and depletion, as compared to earnings in the first six months of the year on the same basis of \$100,000.

The Virginia Iron, Coal & Coke Co., for the quarter ended Sept. 30, reports a net loss of \$11,929 after interest, depreciation, depletion and other charges, as compared to a deficit of \$61,011 in the preceding quarter and \$27,772 in the third quarter of 1928. The net loss for the first nine months of 1929 was \$39,893, as compared to \$95,381 for the same period last year.

The United States Distributing Corporation reports for the quarter ended Sept. 30, consolidated net profit of \$211,923, as compared to \$189,349 for the same period last year. Net profit for the nine months of 1929 was \$750,791 after all charges and federal taxes, against \$476,118 for the corresponding period last year.

Engineers Study Human and Electrical Outages

Giving something for nothing, the slogan of welfare work, has proved unsuccessful in reducing labor unrest, said H. S. Gilbertson, director of personnel, Lehigh Coal & Navigation Co., at the joint session of the Lehigh Valley Section, American Institute of Electrical Engineers, and the Engineers' Society of Northeastern Pennsylvania, Pottsville, Pa., Oct. 18. His remarks are given in detail on pages 673 and 674 of this issue of *Coal Age*.

Following Mr. Gilbertson, R. E. Argersinger, chief electrical engineer, Stone & Webster Engineering Co., Boston, Mass., spoke on transmission-line insulation with wood poles.

Anthracite Shipments Rise

Anthracite shipments in September, 1929, as reported to the Anthracite Bureau of Information, Philadelphia, Pa., were 5,360,130 gross tons, an increase of 719,135 gross tons over September, 1928, and 795,704 gross tons over August, 1929. Shipments by originating carriers during September, 1929, compared with the same month last year, and those for August, 1929, are:

	Sept., 1929	Sept., 1928	Aug., 1929
Reading Com- pany	952,132	832,356	847,625
Lehigh Valley R.R.	1,083,593	769,794	835,825
Central R.R. of N. J.	448,406	498,016	377,590
Del., Lack. & Western.	771,915	726,427	745,570
Delaware & Hudson	739,198	549,590	587,592
Pennsylvania.	443,792	448,414	443,313
Erle	615,499	484,768	408,737
N. Y., Ontario & Western..	121,928	124,536	113,093
Lehigh & New Engl'd	283,667	207,095	205,081
Total....	5,360,130	4,640,995	4,564,426

New Plant Construction

New contracts for topworks and construction under way or completed at various coal operations reported in October include the following:

Liberty Coal Co., Paris, Ark.; contract closed with the United Iron Works, Inc., for all-steel tippie and equipment, including breaking and picking table for mine-run, shaker screens for four grades of coal and loading booms for lump and egg; capacity, 400-500 tons per day.

New Shockley Coal Co., Paris, Ark.; contract closed with United Iron Works, Inc., for all-steel tippie and equipment similar to that of the Liberty company, above; capacity, 400-500 tons per day.

Perry-Hannibal Coal Co., Perry, Mo.; contract closed with the Pittsburgh Boiler & Machine Co. for furnishing and erecting complete stripping plant, including one 225 Bucyrus shovel, 27-D Bucyrus loader, Sanford-Day drop-bottom mine cars, haulage locomotive and complete tippie. The tippie will be of all-steel construction, equipped with shaker screens, picking table, loading booms, crusher and mixing conveyor to load three sizes of coal; capacity 1,500 tons per day.

Sullivan Coal Co., Paris, Ark.; contract closed with United Iron Works, Inc., for complete all-steel tippie and equipment, similar to that of the Liberty company, above.

Superfuel Co., Paris, Ark.; contract closed with United Iron Works, Inc., for all-steel tippie and equipment practically similar to that of the Liberty company, above.



The Late Otis Mouser

Otis Mouser Dies

Otis Mouser, 61, president, Stonega Coke & Coal Co. and Valley Coal Co., and chairman of the board, Westmoreland Coal Co. and Admiralty Coal Co., died of pneumonia at his home in Merion, Pa., Nov. 6, following a three weeks' illness. Mr. Mouser was born in Kentucky and was a railroad telegrapher before going with the Virginia Coal & Iron Co. and the Stonega company in 1906. Twenty years later he became vice-president in charge of operations of both companies and their subsidiaries and six years ago went to Philadelphia as executive vice-president. In 1926, Mr. Mouser became head of both concerns.

In addition to his connections with the companies named above, he was a director of the American Mining Congress and the National Coal Association, being appointed as a member of the executive committee of the latter a few days ago. Other business affiliations included the Interstate Railroad Co., Whitehall Cement Manufacturing Co., Hazle Brook Coal Co., General Coal Co. and Corn Exchange National Bank & Trust Co. of Philadelphia.

Trade Practices Discussed By Kanawha Operators

The trade-practice movement was considered at length at the annual meeting of the Kanawha Coal Operators' Association, held at Charleston, W. Va., Oct. 17. The meeting also was the occasion for celebrating the 25th anniversary of the association and for signal recognition of the 25 years of service of Duncan C. Kennedy as secretary. The program of the meeting was featured by the unveiling of a portrait of Col. John Quincy Dickinson, first president of the association, who died four years ago.

Members of the association heard representatives from Kentucky and Tennessee on the growth and results of the trade-practice movement in their localities and, as a result of their enthusiastic praise, a committee was appointed to consult with the Williamson and Logan associations toward a co-operative movement in that direction.

Officers for the coming year were re-elected by the board of directors as follows: president, Col. W. M. Wiley, vice-president, Boone County Coal Corporation, Sharples, W. Va.; vice-president, F. O. Harris, vice-president, Cannelton Coal & Coke Co., Cannelton, W. Va.; treasurer, John L. Dickinson, vice-president, Dickinson Fuel Co., Charleston, W. Va., and executive secretary, Duncan C. Kennedy, Charleston, W. Va.

Black Knight Directors Meet

At the get-together meeting of the board of directors, Black Knight Club, held at the Twin Oaks Country Club, Cincinnati, Ohio, Oct. 26, Bishop Canterbury, resident manager, Black Knight Country Club, announced that the next meeting of the membership, comprising about 500, would be held at the new club house, Beckley, W. Va. It also was announced that the Edwin F. Daniels Co., Chicago, won the car of Black Knight coal offered for sales in 1929, and that Walter Gallond, Mitchell & Dillon Coal Co., Chicago, won the \$100 prize for the best coal slogan.



New Club House of the Black Knight Country Club, Beckley, W. Va. Members Are Connected With the Raleigh Coal & Coke Co., Beckley, W. Va., and the Various Sales Agencies of the Company.

Washington Letter

By PAUL WOOTON
Special Correspondent

ON THE HEELS of the convention of the National Coal Association at Cincinnati, at which Harry L. Gandy, executive secretary, presented a report on profit and loss which showed that much of the bituminous industry is on a profit-making basis, comes the Bureau of Mines' final report on all operations in 1928. In brief, this report pictures substantial progress toward stability in coal.

Comparison of the figures of 1928 with those of 1923, as reported by F. G. Tryon and L. Mann of the Bureau, shows that the most marked changes have been in a reduction in excess working force and a deflation of excess mine capacity. Fewer mines and fewer miners are working more steadily and more efficiently than in former years. There has been a growing concentration of the available business in the hands of the larger companies.

From 1923 to 1928 the number of men on the payroll declined 26 per cent. In 1923, 705,000 men were employed in bituminous coal mining and in 1928 the number had dropped to 522,000. On the other hand, 572,000 men were engaged in the mining of coal in 1913. It is notable that the number on the payroll is not only less than that of 1923, but actually is less than the number employed before the war.

Another great change is shown in the number of mines in operation. In 1923 there were 9,331 commercial mines competing for the trade in coal. This number declined to 6,450 in 1928. In other words, five years of depression wiped out 2,881 mines. Fewer men and fewer mines brought about a sharp reduction in capacity, despite the fact that the mines remaining work more efficiently. Assuming a potential working year of 280 days, the annual capacity of the bituminous mines in 1923 was 882,000,000 tons. In 1928 the capacity was 691,000,000 tons, a decrease of 191,000,000 tons. The mines that managed to survive now work more steadily. In the boom year of 1923 the mines averaged only 179 days of working time. In 1928 they worked 203 days. This is a gain of 24 days in the average, in spite of the fact that 1928 was a year of low consumption.

The higher efficiency of 1928 is shown in many ways. The percentage of coal cut by machine has advanced from 66.9 in 1923 to 73.8 in 1928. The quantity mined by stripping operations increased from 11,850,000 to 19,800,000 tons, or 67 per cent. The tonnage loaded mechanically on the ground has increased five-fold. The net result of this change is shown in the output per man per day, which increased from 4.47 tons in 1923 to 4.73 tons in 1928.

With higher efficiency and fewer mines there has been a remarkable shift from small mines to larger ones. In

1923 the mines producing less than 100,000 tons supplied nearly 30 per cent of the nation's coal. In 1928 their share dropped to less than 20 per cent, with a corresponding increase in the proportion furnished by larger mines. The pressure on the price structure, and on the wage rate as well, is illustrated by the decrease in average sales realization. In 1923 the average value of a ton of coal at the tippie was \$2.68. Five years later it had slumped to \$1.86, a decline of 82c. per ton, or 31 per cent, during a period when the general level of wholesale prices showed no great change. This is eloquent testimony on difficulties which the industry has had to face. How much farther the process of liquidation is destined to go still is a question. It can be said, however, that if the present tendency continues it will not be long before the relation of capacity and men will be back to that of 1913, which was perhaps the closest approach to normalcy in the annals of the bituminous industry.

Earnings and Employment Increase in August

Forecasting the usual autumn demand for coal, employment in coal mining — anthracite and bituminous coal combined — increased 4.5 per cent in August and payroll totals increased 13 per cent, according to the monthly *Labor Review* of the U. S. Department of Labor. The 1,247 mines reporting in August had 280,513 employees whose combined earnings in one week were \$7,116,079. In anthracite mining in August, 1929, there was an increase 9.5 per cent in employment and an increase of 21.2 per cent in payroll totals.

Employment in bituminous coal mines was 1.7 per cent greater in August, 1929, than in July and payroll totals were 8.4 per cent higher. These figures

are based upon reports from 1,085 mines in which in August there were 177,852 employees whose combined earnings in one week were \$4,354,862. The principal gains in employment were 7.6 per cent, 9.3 per cent and 9.9 per cent in the East North Central, West North Central and West South Central divisions, respectively. Small increases were reported in three other divisions, and slight decreases in the Middle Atlantic and Pacific.

Coming Meetings

Southern Appalachian Coal Operators' Association; annual meeting Nov. 15, at Knoxville, Tenn.

Indiana Coal Operators' Association; annual meeting Nov. 19, at Terre Haute, Ind.

The National Industrial Traffic League; annual meeting Nov. 20-21, at the Palmer House, Chicago, Ill.

West Virginia Coal Mining Institute; annual meeting Nov. 26 and 27, at Fairmont, W. Va.

American Society of Mechanical Engineers; annual meeting Dec. 2-6, 29 West 39th St., New York City.

Eighth National Exposition of Power and Mechanical Engineering; Dec. 2-7, Grand Central Palace, New York City.

American Mining Congress; annual convention at Washington, D. C., Dec. 4-7.

Lafayette College, Department of Mining Engineering, Easton, Pa., will hold dedication exercises of new John Markle Mining Engineering Hall Dec. 6, and beginning at 8:30 that night and continuing on Dec. 7 a conference will be held on the subject "The Relation of Mining Education to Industry."

Coal Mining Institute of America; 43d annual meeting Dec. 11-13, at the Chamber of Commerce, Pittsburgh, Pa.

First International Heating and Ventilating Exposition; Jan. 27-31, 1930, at Commercial Museum, Philadelphia, Pa.

Second World Power Conference; June 16-25, 1930, Berlin, Germany.

Employment and Payrolls in Identical Bituminous Coal Mines In July and August, 1929

	Mines	Number on Payroll			Amount of Payroll		
		July, 1929	Aug., 1929	Per Cent Change	July, 1929	Aug., 1929	Per Cent Change
Middle Atlantic.....	339	58,163	56,479	- 0.8	\$1,356,017	\$1,440,410	+ 6.2
East North Central....	163	27,172	29,232	+ 7.6	608,027	730,424	+20.1
West North Central....	45	3,643	3,982	+ 9.3	75,833	88,892	+17.2
South Atlantic.....	237	38,487	38,553	+ 0.2	897,889	946,594	+ 5.4
East South Central....	194	37,978	38,587	+ 1.6	781,345	823,664	+ 5.4
West South Central....	26	1,377	1,513	+ 9.9	25,710	31,479	+22.4
Mountain.....	71	7,998	8,179	+ 2.3	232,796	252,951	+ 8.7
Pacific.....	10	1,347	1,327	- 1.5	39,714	40,447	+ 1.8
All divisions.....	1,085	174,815	177,852	1.7	\$4,017,331	\$4,354,862	+ 8.4

Per Cent Change in Each Line of Employment, July to August, 1929

	Establishments	Employment			Payroll in One Week		
		July, 1929	Aug., 1929	Per Cent Change	July, 1929	Aug., 1929	Per Cent Change
Manufacturing.....	12,594	3,520,352	3,530,342	+ 0.4	\$93,289,385	\$97,271,480	+ 4.0
Coal mining.....	1,247	268,531	280,513	+ 4.5	6,295,785	7,116,079	+13.0
Anthracite.....	162	93,716	102,661	+ 9.5	2,278,454	2,761,217	+21.2
Bituminous.....	1,085	174,815	177,852	+ 1.7	4,017,331	4,354,862	+ 8.4
Metalliferous mining...	321	58,776	59,797	+ 1.7	1,738,252	1,757,070	+ 1.1
Quarrying and non-metallic mining.....	666	38,109	38,847	+ 1.9	1,004,276	1,057,819	+ 5.3
Public utilities.....	9,070	716,097	724,605	+ 1.2	21,221,904	21,122,013	- 0.5
Trade.....	6,905	260,045	260,325	+ 0.1	6,738,925	6,693,629	- 0.7
Wholesale.....	1,645	59,804	60,329	+ 0.9	1,826,469	1,817,464	- 0.5
Retail.....	5,260	200,241	199,996	- 0.1	4,912,456	4,876,165	- 0.7
Hotels.....	1,677	143,366	145,528	+ 1.5	2,402,789 ²	2,393,248 ²	- 0.4
Canning and preserving	432	43,358	63,174	+45.7	679,150	1,119,858	+64.9
Total.....	32,012	5,048,634	5,103,131	1.1	\$133,370,466	\$138,531,196	+ 3.9

¹Weighted per cent of change for the combined 54 manufacturing industries; remaining per cents of change including total are unweighted. ²Cash payments only.

Fuel Engineers Discuss All Phases Of Combustion at Philadelphia

INCREASED interest in smokeless combustion and a greater realization of the value and possibilities of low-temperature tar seem to be the greatest advance in the study of fuels during the last few months, as set forth in the sessions of the Third Fuels Meeting, held at Philadelphia, Pa., Oct. 7-10, under the auspices of the Fuels Division and the Philadelphia Section of the American Society of Mechanical Engineers.

Two sessions were devoted exclusively to smoke abatement and one to low-temperature carbonization. In the former emphasis was laid on the need for either perfectly smokeless combustion or on the use of a truly smokeless fuel. In the latter the discussion all raged on the increased use for, and the augmented price of, tar acids and on the importance of keeping investment cost low enough to permit of profitable operation. The account of the low-temperature distillation discussions will be found on page 683 of this issue.

At the general session on Tuesday the paper of Frederick H. Dechant, consulting engineer, W. H. Dechant & Sons, Reading, Pa., on the "Economics of Reclamation of Anthracite Silt Coal and Culm" was presented. The author declared that "7 to 13 per cent of the entire production of anthracite, the proportion depending upon the particular field under consideration," is fine anthracite or silt ranging from $\frac{3}{8}$ in. diameter to dust and, as discharged from the breaker, is usually mixed with about 25 per cent of non-combustible matter. About 9,000,000 tons of fine anthracite is produced annually."

Mr. Dechant declared that of the fine anthracite produced annually only 14 per cent is now being used; the rest is being dumped, used for mine filling or permitted to flow directly into the streams draining the coal regions. The uses of fine anthracite are given in Table I.

Table I—Fine Anthracite Consumption
In Tons per Year

Fired under boilers direct using mechanical stokers	375,000
Pulverized and burned under boilers	500,000
Agglomerated as briquets with binder	300,000
Used as fuel in metal trades for sintering and other processes and for facing foundry molds	25,000
	1,200,000

Mr. Dechant stated that as pulverized silt can be burned at a rate of 20,000 B.t.u. per cubic foot of combustion space it is worth \$1.20 a ton more than silt coal for direct-stoker firing at the point of combustion. He would suggest, that the larger silt or about 2,300,000 tons be shipped for comparatively long distances and used for direct-stoker firing. The other 5,400,000 tons he would pulverize near the mines in mills running—not 50 per cent of the time, as at central power stations—but 100 per cent. Such plants should pulverize and

dry 250 tons per hour. The coal thus prepared might command a price of \$2.20 and cost no more than 60c. to prepare. He believes the railroads, realizing that this is a new market, should put an attractive freight tariff on all such pulverized coal.

T. M. Chance, H. M. Chance & Co., Philadelphia, Pa., described the "Preparation of Anthracite," and Clarence B. Wisner, president, Carbocite Co., Canton, Ohio, discussed "Coal Treatment." Mr. Chance said that the crushing of anthracite must always be a heavier task than the crushing of bituminous coal. The tests made by the

AN EVENING was spent discussing the merits of domestic fuels. Faust conservatively set forth the possibilities of off- and on-peak domestic electric heating and showed that it had a broader application already than has been generally believed. Unless on-peak heating is to be introduced, only about 400,000 homes can be heated electrically. Smoke abatement absorbed all the last day with one speaker calling for 100-per cent smokeless furnaces or smokeless fuel and coal with low-sulphur content, which last requirement means in the main anthracite, semi-coke or coke, for non-sulphurous coals are pre-empted for metallurgical use.

Scranton Engineers' Club showed that specimens broke at pressures up to 8,000 lb. per square inch, but it has been ascertained that small cubes $\frac{1}{8}$ in. square did not break till a load of 18,000 to 20,000 lb. per square inch was imposed on their faces. Larger blocks might collapse along lines of weakness, but in sound small blocks there were no such lines, so higher pressures were necessary to effect pulverization. It has been observed that much of the finest coal was not coal at all but ash. The high-ash coal is easier to crush than the low-ash.

F. L. Moore, mechanical engineer, Scranton Coal Co., Scranton, Pa., said that the ash percentage in the minus 60-mesh coal was so high that it was not desirable. Coal from culm banks, however, was usually of good quality. In cases the coal from the culm bank produced 14,000 B.t.u. and from the mine only 12,000.

In reply to a question Mr. Dechant said that experiments were being made to gasify anthracite silt in a 2½-ft. producer at Bridgeport. The silt ran from $\frac{3}{8}$ in. to 80-mesh. Two-thirds as much blue-gas was being obtained from anthracite as from coke. There are hopes that this equipment will solve the problem of gasifying anthracite silt.

On Wednesday afternoon a special meeting was called to discuss research under the chairmanship of F. R. Wadleigh, Consulting Fuels Engineer, Consolidated Gas Co. of New York, New York City. The purpose of the meeting was to formulate some program of coal research for submission to the American Society of Mechanical Engineers.

H. W. Brooks, consulting engineer, said that the society should not fail to exhibit its interest in low-temperature carbonization, the prospects of success of which have been greatly advanced by the immensely increased manufacture of Bakelite, which afforded a market for the tar acids obtained from the distilling of coal at low temperatures.

H. C. Porter thought the physical characteristics of coals should be studied, the methods adapted for their sampling and the speed and manner in which coal burns. Mr. Brooks thought the matter of research should be approached somewhat more practically. It was not enough to decide what should be investigated but to approach the problem with a knowledge that money would have to be obtained for the project. Success would be obtained only if the subject chosen would appeal to the manufacturers who would have to be asked to finance the research.

Mr. Brooks thought sampling of powdered coal was possibly a subject that needed to be solved and might be financed and to this W. H. Fulweiler, chemical engineer, United States Gas Improvement Contracting Co., Philadelphia, Pa., agreed. P. Nicholls, U. S. Bureau of Mines, Pittsburgh, Pa., favored an effort to increase the economical use of fuel in small plants. G. A. Orrok, consulting engineer, New York, said that it was hopeless to expect that small plants would make great efforts to effect economy. Coal formed only from $\frac{1}{4}$ to $\frac{3}{4}$ of 1 per cent of their whole costs. Perhaps $\frac{1}{2}$ of 1 per cent might be saved but no more. The companies were paying for recording instruments and men as much as the traffic would bear. Efficiencies of 80 per cent can be obtained with any furnace and even with the utmost care and the best of furnaces no more than 90 to 92 per cent of the thermal equivalent can be obtained.

J. B. Morrow, preparation engineer, Pittsburgh Coal Co., said that he believed that fuel engineers wanted to know "What is clean coal?" One could erect larger and larger plants and throw away increasing quantities of valuable combustible in order to get cleaner and cleaner coal but at a considerable cost. How far should the coal producer go? The public has set no standard to be attained.

In the contention that the coal industry needed to know just what the consumer desired, Howard N. Eavenson, consulting engineer, Pittsburgh, Pa., agreed, saying that to lower ash 0.5 per cent may increase the cost of a preparation plant 25 to 50 per cent.

R. D. Hall said that the average anthracite hot-water domestic furnace received all its heat from radiation below

the surface of the coal bed. All the heat above that point left the furnace without heating the water materially, as the flues around which it passed were covered with ash and were short. It was necessary to provide a means by which the heat would be radiated rather than convected. It is the ash in the coal that refracts the heat of anthracite, thus making it effective. It would seem to be a proper inquiry to ask "With what percentage of ash in anthracite will maximum efficiency be obtained in the hot-water domestic furnace?"

F. H. Faust, electric refrigeration department, General Electric Co., Schenectady, N. Y., presented the paper "A Study of Electric House Heating," of which he and A. R. Stevenson, Jr., were joint authors. Mr. Faust said that the convective type of heater usually is operated at a much lower temperature than the radiant type." It is not at all necessary that the heater element be hot enough to be visible." Unfortunately, the top of the room is heated first. In England several department stores have been equipped to heat with electric resistance heaters, because they have been able to get a rate of 1c. per kilowatt-hour, which is lower than the present American rates for on-peak domestic power. Yet the actual cost exceeded the cost of coal, oil or gas. In deciding on electric heat, cleanliness, lessened depreciation, lower handling charges and greater convenience were regarded as overbalancing the increase in cost.

Electric resistance heating has been installed in this country in a few localities where power is cheap, principally along the Pacific Coast. Perhaps not much progress will be made with the method of heating unless an on-peak rate of 1c. per kilowatt-hour should be established. The Hall Electric Heating Co., Philadelphia, Pa., has been heating buildings and water for domestic purposes experimentally and commercially and has been co-operating with public utilities in improving load factor so that off-peak power rates may be obtained to make electric heating economically justifiable.

Pea gravel is being used in Germany for the storage of heat from off-peak current. The Hall company uses water-storage tanks, electric immersion heaters, heat transfer surfaces and suitable control devices. The electric immersion heaters are automatically turned off during the off-peak period, and heat is stored in an insulated tank at 250 to 300 deg. F. The heating is either by radiators or by forced draft through ducts to a finned radiator near the storage tank. The company endeavors to have the house insulated and fitted with storm doors and windows, to automatically control temperatures, to keep the day temperature down to 70 deg. F. and the night temperature to 55 deg., and to shut off bedrooms from the rest of the house when bedroom windows are opened.

Only from 2 to 5 per cent of all the wired homes in this country could be equipped for heating with off-peak heat. More would bring the so-called "off-

DECHANT would have silt pulverized at the mines and shipped to points of combustion. Thus prepared it is worth \$1.20 per ton more than the unpulverized article. Chance explains why anthracite silt is so hard to crush. Gasification of silt a possibility. Morrow and Eavenson would have consumer define his needs as to clean coal. Questioned, he demands the preposterously extravagant, even the impossible. What is it he really should have and what is he willing to pay for?

peak load" up to or above the on-peak. The potential market, if 2 per cent of wired homes were thus heated, would comprise about 400,000 installations in the United States. Off-peak heating, though new here, has been used for years in several European countries.

R. V. Frost, Frost Research Laboratory, Norristown, Pa., said that gas cannot be regulated as readily as anthracite. For three years a furnace had been charged merely by pressing a button. With such automaticity it will not be necessary to gasify solid fuel.

Thursday was devoted to smoke abatement, the morning being devoted to the problems of enforcement. The paper of Harvey N. Davis, president, Stevens Institute of Technology, Hoboken, N. J., declared that the state had shown appropriate interest in our water and food supplies, but had so far been indifferent as to the quality of the ton of air which every individual takes into his lungs every month. He can select his food, he can filter his water, but the air he breathes he can neither select nor filter but must take it with all the impurities added to it by apartment houses, tug boats and industrial establishments.

In discussion Victor Azbe, chairman, Fuels Division, declared that "we must stop talking about 'smoke abatement' and begin to talk 'smoke elimination.' So long as we allow half-way methods we shall have smoke. This does not mean that we must stop burning soft coal and substitute smokeless fuels, for this, while desirable, is not entirely practicable as yet. Any equipment that cannot be fired entirely smokelessly with coal should by law be operated with smokeless fuel. Furnaces should be either put in or equipped for smokeless burning of coal, or smokeless fuels should be used.

"Only comparatively foolproof furnaces or devices that are completely smokeless, or very nearly so, in the hands of a careless person should be allowed, and the firing of these must be simpler than firing by the ordinary method. Updraft combustion of coal when firing is done intermittently is wrong from a smoke-abatement standpoint. It is permissible only when coal is fed both continuously and in very small quantities by automatic methods."

Mr. Azbe advocated the use of a sloping baffle extending almost down to the

surface of the coal bed at the point where the green coal meets the already burning fuel. Smoke-abatement agencies, he said, should recommend—or, if they have the power, insist—that the larger boilers, such as are located in industrial establishments, be equipped either with chain-grate stokers or with some form of underfeed stoker. Others should be looked upon with suspicion.

Mr. Azbe urged that in thickly settled communities coal of low-sulphur content be burned. Heavy smoke from low-sulphur coal should be considered less objectionable than light smoke from coal having $4\frac{1}{2}$ per cent sulphur. The ideal should be fuel having less than 1 per cent sulphur and no black smoke.

World Power Conference To Meet in Berlin

Specialists in the different fields connected with power will discuss the financial and economic aspects of the power problem at the Second World Power Conference to be held June 16-25, 1930, at Berlin, Germany. At the same time the conference will enable those connected with power and fuel to speak to the public on the vital questions affecting the economic and administrative structure of all countries as a result of the rapid progress of engineering.

The production of coal as a problem in itself will be considered in a condensed review of the legislative basis of coal mining in the countries engaged in international trade, and a discussion of the reasons why any coal beds not workable in 1913 have become so since that date. As the coal-mining industry is connected, however, with the problems of power distribution, either as suppliers or consumers of power, the conference suggests consideration of the coal mining industry as a basis for a national gas supply; a comparison, from the standpoints of economics and of practical working, between compressed air and electricity for use underground in collieries, and studies on the difference in cost of power as produced by gas and steam. Papers dealing on broad lines with the above aspects are especially desired.

Arkansas Sales Boosted By Dealers' Visit

A complete trainload of 70 cars of Arkansas coal is expected to leave Fort Smith, Ark., about Oct. 25 for Minneapolis and St. Paul, Minn., as a result of a visit by 23 coal dealers from the Twin Cities to mines in western Arkansas and eastern Oklahoma, according to J. G. Puterbaugh, president, McAlester Fuel Co., McAlester, Okla. The cars will be assembled in Fort Smith from the mines of the company in the Bernice, Spadra and Mammoth Vein fields and will go north with each car carrying posters advertising the fact that the coal is from Arkansas.

Rehearing on Appeal Asked In Patent Case

Application for a rehearing by the U. S. Circuit Court of Appeals in the case of *Sutton, Steele & Steele and American Coal Cleaning Corporation vs. Gulf Smokeless Coal Co. and Roberts & Schaefer Co.*, involving the alleged infringement of patent rights, has been made by defendants following the decision of the appellate court handed down at Richmond, Va., Oct. 15 in which the decree of the federal district court was affirmed.

Suit against the defendants was started in the U. S. District Court for the Southern District of West Virginia in June, 1926. In July, 1928, Judge McClintic filed an opinion holding the defendants had been guilty of infringement of the rights under the Sutton, Steele & Steele patents for processes and apparatus for separating and grading material. Damages were awarded and injunction issued against the Roberts & Schaefer company. From this decision an appeal was taken.

Personal Notes

F. W. WILSHIRE, formerly vice-president in charge of sales, Consolidation Coal Co., has been elected a vice-president of the Island Creek Coal Co., with headquarters at 26 Broadway, New York City.

FRANK L. MCCARTY, the inventor of the "Duckbill," retired from the service of the Union Pacific Coal Co., Oct. 30, after 13 years of service as mine superintendent of the Rock Springs properties, because of ill health. Mr. McCarty, who was originally employed

in October, 1887, as an engineer's helper at Erie, Colo., served in various capacities at the Hanna, Carbon, Cumberland, Reliance and Superior (Wyo.) properties of the company before going to Rock Springs.

ELLSWORTH H. SHRIVER, mine superintendent, American Rolling Mills Co., Nellis, W. Va., has been elected vice-president and chairman of the Coal River Mining Institute for the coming year. The promotion of safety in mines in the Coal River district is the primary objective of the Institute.

JOSEPH L. OSLER, formerly associated with the Red Jacket Consolidated Coal Co., Red Jacket, W. Va., has been appointed general manager of the Blackwood Coal & Coke Co., Blackwood, Va., vice George M. Thorn, deceased.

J. W. POWELL, consulting engineer, formerly of Welch, W. Va., has returned from Siberia, where he was engaged as consulting engineer in connection with the coal mines of the Kuznetz Basin and later with the Soviet State Planning Bureau for Coal Mining in Siberia and the Far East Republic.

Obituary

ISAIAH GOOD, senior vice-president, Quemahoning Coal Co., Somerset, Pa., died Oct. 5. Mr. Good became vice-president of the Quemahoning company upon its organization in 1906, and also was president of the Farmers' National Bank of Somerset, Pa., for 15 years preceding his death.

RALPH J. STEGALL, 61, treasurer, Amherst Coal Co., Amherstdale, W. Va., and the Amherst-Logan County

Coal Co., Charleston, W. Va., died at his home in Charleston, W. Va., Oct. 13. Mr. Stegall went to West Virginia from Georgia and began his career in coal in the former state in 1884.

STEPHEN B. ELKINS, JR., son of the late Senator Stephen B. Elkins, of West Virginia, and president, Elkins Coal & Coke Co. and the National Fuel Co., both West Virginia concerns, died Oct. 20 at his Park Avenue (New York) apartment.

GEORGE MAXWELL THORN, 40, general manager, Blackwood Coal & Coke Co., Blackwood, Va., died Oct. 12, at a hospital in Norton, Va. Mr. Thorn was a director of the Virginia Manufacturers' Association and the Virginia Coal Operators' Association. Before going to the Blackwood company in 1923, he was consulting engineer to the Pardee interests and built the Calvin (Va.) plant for the company.

ROBERT R. WARD, treasurer and principal stockholder of the Franklin County Mining Co., Benton, Ill., died Oct. 19 of injuries received from a fall at his farm near Benton. Mr. Ward was 49 years old.

CLAUDE J. RYAN, aged 53, chief engineer and general superintendent, Hutchinson Coal Co., Fairmont, W. Va., died Oct. 24 of a paralytic stroke at his home near Bridgeport, W. Va.

CLARENCE DELMAR ROBINSON, 57, an official of the Lambert Run Coal Co., Robinson Coal Co., Delmar Coal Co., New Superior Coal & Coke Co., Greater Fairmont Investment Co., Howard Coal Co., Hughes Coal Co. and Sardis Coal Co., died at his home in Fairmont, W. Va., Oct. 20. Mr. Robinson also was widely interested in business activities in the Monongahela Valley.

King Coal's Calendar for October

Oct. 1—The Glen Alden Coal Co., Scranton, Pa., starts sinking operations for two shafts, each approximately 1,200 ft. deep. The shafts will tap a virgin coal area lying between the Loomis and Truesdale collieries, near Wilkes-Barre, Pa.

Oct. 7-10—Fuels Division, American Society of Mechanical Engineers, discusses better utilization of fuels at the third annual meeting, held in Philadelphia, Pa.

Oct. 8—Anthracite Institute, with offices in New York City, formed "to keep the consuming public thoroughly posted on all developments in the anthracite industry, with special reference to the research work now conducted for the benefit of both domestic and commercial consumers; to protect anthracite users against unfair practices, and to promote the best interests of the industry and all engaged therein." S. D. Warriner, president, Lehigh Coal & Navigation Co., is chairman, and Elliot Farley, president, Delaware, Lackawanna & Western Coal Co., is chairman of the executive committee.

Oct. 10—Creation of the Bituminous Coal Mine Drainage Board of Pennsylvania, containing representatives of the state and the bituminous industry, agreed upon by the State Sanitary Water Board. This body will act as a fact-

finding organization to promote anti-stream pollution.

Oct. 11—In the struggle for control of the Illinois miners' union, John L. Lewis, president, United Mine Workers, deposes Harry Fishwick, president of the Illinois union, and appoints Frank Hefferly, Collinsville, provisional president of District 12, comprising the state. A temporary injunction restraining the provisional governing body from interfering in any way with the affairs of the Illinois union allows President Fishwick and his followers to remain in control and bars operators and banks holding district funds from recognizing the Lewis order or the provisional officers named by him.

Oct. 17—The Kanawha Coal Operators' Association signally recognizes the 25 years of continuous service of Duncan C. Kennedy, executive secretary, and celebrates its twenty-fifth anniversary at Charleston, W. Va.

Oct. 17—The British government hands to the miners' union a draft of the proposals for meeting its demands for a 7-hour day and other concessions, which the owners oppose. J. H. Thomas, Lord Privy Seal, it is said, offers to reduce the hours of work to 7½ per day without reduction in wages as the first step. An alternative of an 8-hour day from entry to exit of the mine is proposed instead of the 7½-hour day. In addition

to the shorter hours, the scheme, it is stated, includes nationalization of mineral royalties early next year; initial operation of the owners' co-ordinated marketing scheme in January, provided both consumers and miners are represented on the marketing board; provision for immediate action on the proposal to pension elderly employees to relieve unemployment among the younger men, and an endeavor to persuade the owners to meet the miners in an attempt to settle the question of a national wage agreement.

Oct. 17—Ten thousand miners strike in the Mons district of Belgium, tying up 20 collieries, because their demands for an increased wage were not fully met. Increases of 3 and 5 per cent were obtained as against the 5 and 10 per cent asked. As coal stocks are now less than 300,000 tons, a serious shortage is predicted if the strike is not settled.

Oct. 23-25—National Coal Association discusses merchandising, safety, trade practices and government relations at twelfth annual meeting, held at the Hotel Sinton, Cincinnati, Ohio. Harry L. Gandy, executive secretary, tells delegates that the industry shows a net profit before payment of dividends or interest on borrowed money of 8c. per ton in the period July 1, 1927-June 30, 1929.

Coal-Mine Fatalities Higher in September Than in August and a Year Ago

ACCIDENTS in the coal-mining industry of the United States in September, 1929, resulted in the death of 189 men, according to information received from state mine inspectors by the U. S. Bureau of Mines. The production of coal for the month was 51,307,000 tons, of which 44,515,000 tons was bituminous and the remaining 6,792,000 tons was anthracite. Of the 189 deaths reported, 146 occurred in bituminous mines in various states, and 43 in the anthracite mines of Pennsylvania. Based on these figures the fatality rates per million tons of coal mined were 3.28 for bituminous mines, 6.33 for anthracite mines and 3.68 for both.

The record for September a year ago showed 154 fatalities, 116 of which occurred in bituminous mines and 38 in anthracite mines. During that month 47,898,000 tons of coal was produced; 41,971,000 tons of bituminous and 5,927,000 tons of anthracite. Based on these figures, the corresponding fatality rates were 3.22 for the entire industry, 2.76 for bituminous mines, and 6.41 for anthracite mines. The fatality rate in September, 1929, was slightly higher for bituminous mines and for the industry as a whole than in the preceding month of August and in September, 1928, but the anthracite rate showed an improvement over both of the previous periods. Reports for the first nine months of 1929 showed that 1,518 deaths had occurred in the coal mines, an improve-

ment over the same period in 1928, in which there were 1,639 deaths. During the 1929 period 436,854,000 tons of coal was produced, indicating a fatality rate of 3.47. The fatality rate for bituminous mines alone was 3.08, based on 1,177 deaths and 382,246,000 tons. For anthracite mines, the rate was 6.24, based on 341 deaths and 54,608,000 tons of coal mined. The rates for the 1928 period were 3.64 for bituminous, 6.22 for anthracite, and 3.98 for both.

On Sept. 27 of the present year an explosion at Tahona, Okla., caused the death of eight men. This major disaster—that is, a disaster causing the loss of five or more lives—brings the number of such accidents for 1929 up to five, with a resulting loss of 83 lives. There were eleven such disasters for the same period in 1928, with a loss of 308 lives. Based exclusively on these figures, the fatality rates per million tons of coal produced were 0.19 for the present year and 0.75 for the corresponding 9-months period last year. Comparative fatality rates for 1929 and 1928 are shown in the following table:

	Year 1928	Jan.- Sept., 1928	Jan.- Sept., 1929
All causes.....	3.777	3.976	3.475
Falls of roof and coal.....	1.854	1.877	1.875
Haulage.....	0.626	0.590	0.636
Gas or dust explosions:			
Local explosions.....	0.087	0.102	0.085
Major explosions.....	0.566	0.747	0.176
Explosives.....	0.128	0.141	0.156
Electricity.....	0.153	0.167	0.142
Other causes.....	0.363	0.352	0.405

Equipment Exposition

The next annual convention of practical coal operating officials and national exposition of coal-mining equipment of the American Mining Congress will be held at the Music Hall, Cincinnati, Ohio, the week of May 5, 1930, according to a decision of the board of governors, manufacturers' division of the congress. More than 100 manufacturing companies are expected to exhibit the latest and finest types of machinery, equipment and supplies for the safe and economical operation of the coal mines of the country, says the board.

Trade-Practice Conference For Utah Producers

A trade-practice conference for the bituminous coal industry of Utah, has been authorized by the Federal Trade Commission. Applicants for the conference, the Commission states, represent approximately 85 per cent of the coal tonnage shipped from Utah in interstate commerce and about 80 per cent of the total bituminous production of the state. Practices to be discussed are: misrepresentation, breach of contract, commercial bribery, secret rebates, price discrimination, and anti-dumping. Dec. 3 is the date scheduled for the meeting, which will be supervised by Commissioner William E. Humphrey.

Coal Mine Fatalities During September, 1929, 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	1929	1928
Alabama	1		1				1					3													3	3
Arkansas																									1	0
Colorado	1	1					1					3										1			4	2
Illinois	6											6													7	13
Indiana	2		1		1		1					5							1						5	0
Iowa																									0	3
Kansas																									0	1
Kentucky	16		2		1		1					20													21	17
Maryland																									0	0
Michigan																									0	0
Missouri																									0	0
Montana																									0	1
New Mexico																									0	1
North Dakota	1	1	1									3													3	2
Ohio	4											5													5	5
Oklahoma				8			1					9													9	3
Pennsylvania (bituminous)	16	4	5		2				1			28						3							33	19
Tennessee	1				2							3											2	5	33	3
Texas																									0	0
Utah	2											2													2	2
Virginia																									1	3
Washington		1	1									2													2	0
West Virginia	23	3	12				1		1			40						2	1						44	37
Wyoming	1											2											1	4	2	3
Total (bituminous)	74	10	26	8	8		6		2			134						5	2			2	3	12	146	116
Pennsylvania (anthracite)	21	7	5	3	1						2	39	1				1	5	1			1	1	3	43	38
Total, September, 1929	95	17	31	11	9		6		2		2	173	1				1	5	3			3	4	15	189	
Total, September, 1928	86	12	25	1	5		8		2		5	146					1	2		2		2	1	7		154

Among the Manufacturers



THE GENERAL REFRACTORIES Co., has appointed the Desch Supply & Equipment Co., Baltimore, Md., as its representative in Maryland and Washington, D. C.

* * *

THE PALMER-BEE Co., Detroit, Mich., has appointed Geo. M. Demorest as district representative for Pittsburgh, Pa., and vicinity.

* * *

M. E. DANFORD, works manager, Middletown division, American Rolling Mills Co., Middletown, Ohio, has been appointed vice-president.

* * *

THE KOPPERS-RHEOLAVEUR Co., Pittsburgh, Pa., has opened a district office in Birmingham, Ala., in charge of Willard C. Adams, formerly connected with the Allen & Garcia Co., Chicago. The office will serve Alabama, Tennessee, western Kentucky, Indiana and Illinois. The company also has opened a branch office in Huntington, W. Va., in charge of C. L. Miller.

* * *

HIBBARD S. GREENE, formerly vice-president and director, Barber-Greene Co., has been appointed assistant to the president, Chain Belt Co., Milwaukee, Wis.

* * *

THE DE LAVAL STEAM TURBINE Co., Trenton, N. J., has taken a license to manufacture under the American Bauer-Wach patents, covering the use of exhaust turbines and gears to utilize the exhaust from reciprocating engines.

* * *

R. B. POGUE, engineering department, American Brake Shoe & Foundry Co., has been made assistant chief engineer.

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H. C. THOMAS, assistant general manager merchandizing department, has been promoted to the position of director of manufacturing stocks, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

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THE HERCULES POWDER Co., Wilmington, Del., has purchased 300 acres of land near Wilmington and announced its intention of building an experimental station consisting of experimental and chemical research laboratories.

* * *

THE SULLIVAN MACHINERY Co., Chicago, has moved its Huntington, W. Va., office to 702-704 Eighth Avenue.

JOHN W. MCCOY, formerly assistant general manager, explosives department, E. I. du Pont de Nemours & Co., Inc., Wilmington, Del., has been appointed general manager, vice-president J. Thompson Brown, elected a member of the executive committee. Edward B. Yancey, manager, Birmingham plant, has been made assistant general manager of the department.

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THE MORRISON RAILWAY SUPPLY CORPORATION, Buffalo, N. Y., has appointed George J. Diver, former president, Interstate Car & Foundry Co., as general manager of sales, frog and switch division. The company states that the new plant being erected at Chicago will commence operation Sept. 15.

Trade Literature

Catalog F of the De Laval Steam Turbine Co., Trenton, N. J., covers centrifugal blowers and compressors and includes descriptions of turbine-driven blast furnace blowers and single- and multi-stage blowers and boosters.

Sangamo Electric Co., Springfield, Ill., has issued an addenda to Bulletin No. 73 on its Type HN alternating-current switchboard meter, in the form of a four-page illustrated folder.

"M-S-A Rock-Dusting Equipment"; Mine Safety Appliances Co., Pittsburgh, Pa.; pp. 16, illustrated. Among the equipment described are the standard rock-dust distributor, the smaller type 65 distributor, high-pressure rock-dust distributor, stationary nozzle distributor, rock-dust testing kit and Griffin mill.

American Blower Corporation, Detroit, Mich., has issued Bulletin 10401 on its Sirocco forced draft fans for domestic heating plants, in which use is made of the low-grade coals. Application and technical data are included.

The Geo. D. Whitcomb Co., Rochelle, Ill., has issued a booklet entitled "Locomotives with Internal Combustion Engine Drive," telling of the uses and economies effected by internal combustion-engine locomotives.

Bulletin 159; Wagner Electric Corporation, St. Louis, Mo., is devoted to large vertical motors and emphasizes that these motors all have the same flange or lug dimensions, making it unnecessary to change the mounting base in order to interchange vertical motors of different types and ratings, and the "labyrinth seal" which prevents the leakage of lubricant into the motor windings.

Ramsey Chain Co., Inc., Albany, N. Y., has issued Catalog 628, containing illustrations and data on power transmission with silent chain.

"Making Primers" is the title of bulletin A-2904 issued by E. I. du Pont de Nemours & Co., Inc., Wilmington, Del., covering priming with electric detonators, with delay electric detonators and with delay electric igniters. Another bulletin, A-2928, issued by the same company is entitled "Density of Explosives as a Factor in Execution and Blasting Costs," by A. E. Anderson.

W. S. RUGG, vice-president, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., has been appointed to the Edison award committee of the American Institute of Electrical Engineers.

* * *

F. B. CALDWELL, vice-president, Chicago plant, Link-Belt Co., has resigned because of ill health, his duties being assumed by W. C. Carter, formerly vice-president in charge of production. E. J. Burnell, manager, Pittsburgh office, has been appointed sales manager, Western division, with headquarters in Chicago. He is succeeded at Pittsburgh by Nels Davis, of the Chicago engineering sales force.

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LELAND B. SNODDY, Lexington, Ky., has been granted an Edison Fellowship for Research in the research laboratory of the General Electric Co., Schenectady, N. Y.

* * *

F. L. FARRELL and D. F. JONES, formerly of the Schumacher-Santry Co., Boston, discontinued as the New England representative of the Combustion Engineering Corporation, New York City, have taken over the accounts handled by the Schumacher-Santry Co. The Combustion Engineering Corporation has established a district office at 100 Arlington St., Boston, Mass.

* * *

THE WAGNER ELECTRIC CORPORATION, St. Louis, Mo., has opened a branch office at Dallas, Texas, in charge of Alfred B. Emrick.

* * *

THE GARDNER-DENVER Co., Denver, Colo., has let a contract for an addition to the Quincy, Ill., plant, to be finished Dec. 1.

* * *

H. D. CONKEY & Co., Mendota, Ill., has appointed the Cleveland Tool & Supply Co., as their Cleveland, Ohio, representatives. The Conkey company is building an addition to its Mendota, Ill., plant to double its capacity.

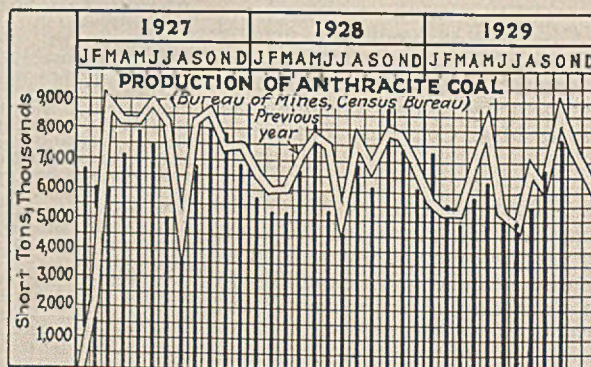
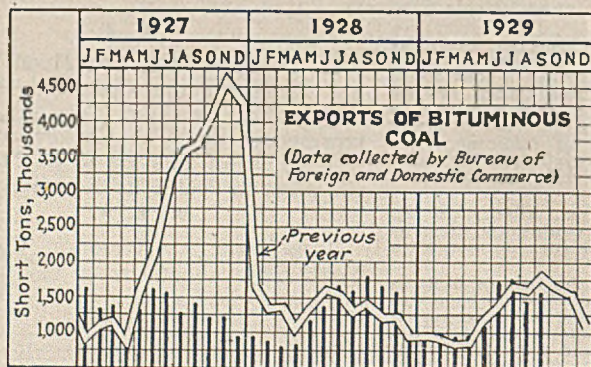
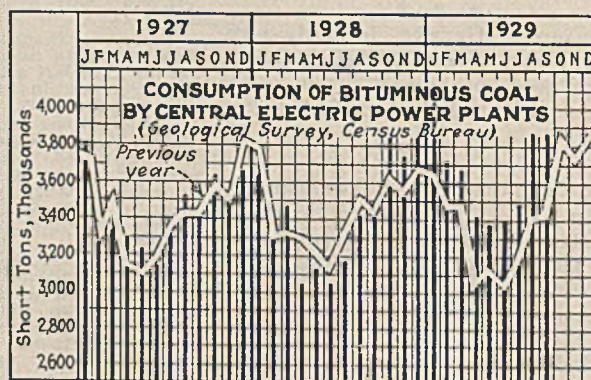
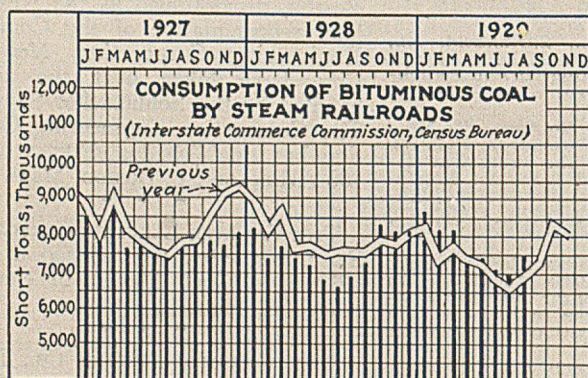
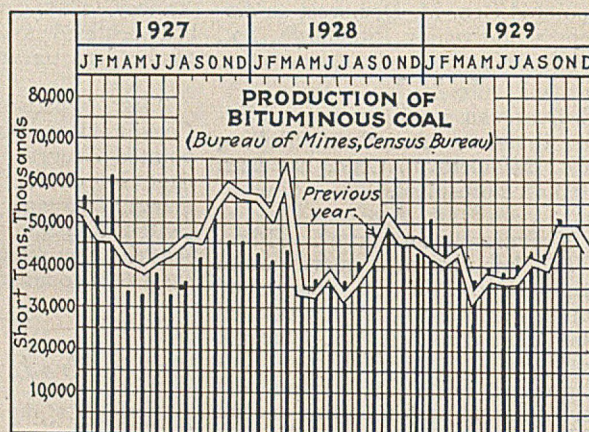
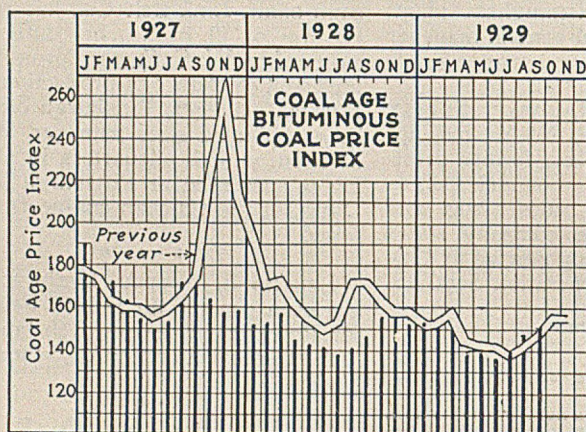
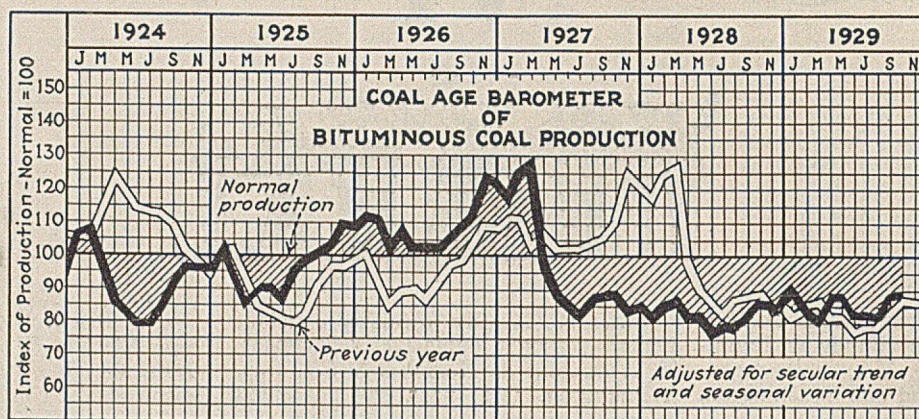
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THE LINDE AIR PRODUCTS Co., New York City, announces a new oxygen plant at Erie, Pa.

* * *

H. O. K. MEISTER, formerly general sales manager, has been appointed assistant general manager, Hyatt Roller Bearing Co., Newark, N. J.

Indicators of Activities in the Coal Industry



MARKETS

in Review

UNSEASONABLY warm weather in many localities slowed down business in most of the bituminous coal markets of the United States in October. Domestic buying, however, continued in good volume and is expected to materially increase with the advent of cold weather. Stocking increased slightly, though users, as a rule, were still reluctant to add to reserves. Prices showed a distinct rise over the country, reaching a figure in excess of those for the preceding months of the year.

Illinois, Indiana and western Kentucky continued to have trouble with screenings and were forced to dispose of them at very low prices. Mine-run also was adversely affected in those fields. The car supply continued to be adequate, though the number of surplus coal cars, as reported by the Car Service Division, American Railway Association, declined from 21,345 on Sept. 23, to 14,104 on Oct. 23, a total decrease of 7,241 cars. In the week preceding Oct. 23, however, there were 3,070 less surplus cars than the figure given above.

October coal production is estimated by the U. S. Bureau of Mines at 51,200,000 net tons, an increase of 6,685,000 tons over the preceding month, and 24,000 tons over October of last year. Coal Age Index of spot bituminous prices (preliminary) was 156, Oct. 5 and 12, and 159, Oct. 19 and 26. The corresponding weighted prices were as follows: \$1.89, Oct. 5 and 12, and \$1.90, Oct. 19 and 26. The revised Index figures for September were 147, Sept. 7; 152, Sept. 14; 151, Sept. 21, and 154, Sept. 28. The corresponding weighted average prices were \$1.78, Sept. 7;

\$1.84, Sept. 14; \$1.83, Sept. 21, and \$1.87, Sept. 28. The monthly Index for September was 151, as compared to the unrevised figure of 156½ for October.

Shipments to the lakes in October continued at substantially the same rate as for the same season last year. Dumpings at the lower lake ports for the season to Oct. 28 were 34,057,551 net tons, an increase of 4,286,700 tons over the same period in 1928. Cargo dumpings to Oct. 28 were 32,776,115 tons and bunker fuel loadings were 1,281,436 net tons.

ANTHRACITE enjoyed an excellent demand during the month of October, both for steam and domestic sizes. Collieries are running full time and an increase of 4.53 per cent in business in the last quarter of 1929, as compared to the same period in 1928, is expected, according to a report by the Coal, Coke and Ore Committee, Atlantic States Shippers' Advisory Board, delivered at the twenty-first regular meeting, held at Utica, N. Y., Oct. 3. Shipments in the last quarter were estimated at 455,679 cars as compared to 435,947 cars in the corresponding period of 1928, and the report says that cold weather may easily cause an increase of 20,000 to 40,000 cars.

Cold weather twice came to the rescue of the domestic market in Chicago in October after the protracted mild temperatures of Indian summer. The first snow of the season came in that month and caused dealers about to cancel shipments to reconsider. Smokeless and Eastern high-volatile premium coals were booked far ahead, especially the prepared sizes. Spot prices on smokeless lump and egg were \$4@ \$4.25, as

compared to \$3.75 on contracts, with a good demand. Stove moved well, nut was sometimes slow and mine-run dragged. The mine-run price, however, was firm at \$2@ \$2.25.

Eastern high-volatile premium block was strong at \$3@ \$3.50 and egg maintained a fairly good position, except for the second grades. Eastern slack was scarce and commanded fancy prices, with smokeless byproduct at \$1.40@ \$1.50, and high-volatile at 90c. @ \$1.10. The close of the lake season, however, is expected to ease the situation and buyers placed orders for immediate requirements only. Unfilled orders on domestic sizes were sharply reduced in Illinois, Indiana and western Kentucky and the mines were able to ship promptly on lump, egg and nut in the last two weeks of the month. Prices on domestic coals from Middle Western mines were steady throughout the month because buying was recognized as a weather proposition. A rush is expected with the arrival of snow and cold weather.

DEMAND for steam coals from Illinois, Indiana and western Kentucky mines was none too good in spite of the lag in domestic. Prices failed to improve and there were few offers above the low of the market. Southern Illinois screenings improved as the result of pooling the production and selling it to one of the companies with utilities outlets to keep them off the market. Curtailed operation also caused Indiana screenings to take a stronger tone. Quotations on Indiana No. 4 were \$1.40@ \$1.50, with some offered at \$1.25. Low prices on the secondary grades of Midwestern screenings were

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

Market Quoted	Oct. 5, 1929		Oct. 12, 1929		Oct. 19, 1929		Oct. 26, 1929	
	Independent	Company	Independent	Company	Independent	Company	Independent	Company
Broken.....	New York.....	\$8.40@ \$8.50	Philadelphia.....	8.40	8.40@ \$8.50	8.40	8.40@ \$8.50	8.40
Broken.....	New York.....	8.60@ 8.70	Philadelphia.....	8.60	8.60@ 8.70	8.60	8.60@ 8.70	8.60
Egg.....	New York.....	8.60@ 8.85	Philadelphia.....	8.60	8.60@ 8.85	8.60	8.60@ 8.85	8.60
Egg.....	Chicago*.....	7.77	7.77	7.77	7.77	7.77	7.77	7.77
Stove.....	New York.....	9.10@ 9.20	Philadelphia.....	9.10	9.10@ 9.20	9.10	9.10@ 9.20	9.10
Stove.....	Philadelphia.....	9.10@ 9.35	9.10	9.10@ 9.35	9.10	9.10@ 9.35	9.10	9.10
Stove.....	Chicago*.....	8.22	8.22	8.22	8.22	8.22	8.22	8.22
Chestnut.....	New York.....	8.60@ 8.70	Philadelphia.....	8.60	8.60@ 8.70	8.60	8.60@ 8.70	8.60
Chestnut.....	Philadelphia.....	8.60@ 8.85	8.60	8.60@ 8.85	8.60	8.60@ 8.85	8.60	8.60
Chestnut.....	Chicago*.....	7.77	7.77	7.77	7.77	7.77	7.77	7.77
Pea.....	New York.....	4.50@ 5.00	Philadelphia.....	4.50	4.50@ 5.00	4.50	4.50@ 5.00	4.50
Pea.....	Philadelphia.....	4.90@ 5.15	4.90	4.90@ 5.15	4.90	4.90@ 5.15	4.90	4.90
Pea.....	Chicago*.....	4.46	4.46	4.46	4.46	4.46	4.46	4.46
Buckwheat.....	New York.....	3.00	3.00	3.00	3.00	3.00	3.00	3.00
Buckwheat.....	Philadelphia.....	2.75@ 3.00	2.75	2.75@ 3.00	2.75	2.75@ 3.00	2.75	2.75
Rice.....	New York.....	1.75@ 2.00	2.00	1.75@ 2.00	2.00	1.75@ 2.00	2.00	2.00
Rice.....	Philadelphia.....	2.00@ 2.25	2.00	2.00@ 2.25	2.00	2.00@ 2.25	2.00	2.00
Barley.....	New York.....	1.35@ 1.50	1.50	1.35@ 1.50	1.50	1.35@ 1.50	1.50	1.50
Barley.....	Philadelphia.....	1.50@ 1.60	1.50	1.50@ 1.60	1.50	1.50@ 1.60	1.50	1.50

*Net tons, f.o.b. mines. †Domestic buckwheat, \$3.50 (D. L. & W.).

a considerable hardship on western Kentucky shippers. Indiana No. 5 and central Illinois prices were around 40c. and the low level kept Standard producers out of the market. Western Kentucky operators were unable to get more than 20c. for 1½-in. and 30c. for 2-in. screenings. Some jobbers bought at 15c. This condition caused some of the operators to abandon the Chicago market temporarily for others closer home where prices were better. Mine-run from Indiana, Illinois and western Kentucky was forced out of the market by the low-priced screenings. Mines not preparing their coal ran only on contract business.

St. Louis reported a poor domestic trade in October as a result of unseasonably warm weather. Buying is unusually late and prospects are poor unless cold weather arrives. Prices, however, were firm and showed no change throughout the month, except in the case of screenings. Standard screenings dropped to 25c.@60c. and Mt. Olive screenings to 35c.@75c. Steam business was fair.

MILD weather during October caused shipments from the docks at the Head of the Lakes to fall slightly below the expected volume. Coal receipts from the Lake Erie ports during September were 1,239,553 tons, of which 1,208,541 tons was bituminous and 306,122 tons was anthracite. Bituminous coal and coke receipts for the season to Oct. 1 were 8,834,981 tons, an increase of 741,366 tons over the same period last year. Anthracite shipments were 391,804 tons, a decrease of 110,657 tons as compared to last year. Shipments from the docks in September were reported to be 22,252 cars, as compared to 19,294 cars in the preceding month,

and 25,003 cars in September, 1928.

All classes of consumers held their requirements down to the minimum during the month. Retail dealers were especially affected by a light household demand. Credits are being held down in all quarters in the Northwest, many dealers specifying 60-day settlements and others charging interest on overdue accounts. Industrial consumers, however, showed a disposition to take on more coal than in the past.

Prices on all grades of bituminous coals were strong, as follows: Pocahontas lump, egg, stove and nut, \$7.90; dock-run, \$5; screenings, \$4.10; Kentucky block and lump, \$6.55@7.25; stove and egg, \$5.55; egg and dock-run, \$6.05; stove, \$5.80; dock-run, \$5.50; screenings, \$4.10; splint block, \$5.85; egg, \$5.35; lump and egg, \$5.85; dock-run, \$4.75; screenings, \$4.85; Youghiogheny block, lump and egg, \$5.75; stove, \$5.40; dock-run, \$4.50; screenings, \$3.85; Hocking block, \$5.60; lump and egg, \$5.35; stove, \$5.10; dock-run, \$4.50; screenings, \$3.85.

Unseasonably warm weather caused the Southwestern market to slow up in the middle of October, but enabled operators to catch up on their orders after being a week behind. The few instances of "no bills" were cleaned up in a cold spell at the last of the month. Prices were unchanged, as follows: Kansas deep-shaft lump, \$3.75@4; nut, \$3.25@3.50; mine-run, \$2.65@2.75; screenings, \$1.50; Kansas strip lump and nut, \$3; mine-run, \$2.50, and crushed mine-run, \$1.50.

A substantial improvement in conditions was in evidence in the Colorado market in October. Dealers filled up their storage bins and, as a result, the mines increased their running time to 75 per cent. Steam sizes, in particu-

lar, were very much sought after. Prevailing prices were as follows: Walsenburg-Canon City lump, \$5.25; nut, \$4.30; Trinidad coking lump, \$3.50; nut, \$3.35; fancy chestnut, \$3.25; northern lignite lump, \$3; Crested Butte anthracite, 5x2 in. and 2½x1½ in., \$8.25; base burner, 2x1 in., \$8.25; brooder mixture, \$4.75; Rock Springs lump, \$4.25; nut, \$3.75; Colorado and Wyoming steam sizes, \$1.40@1.65.

The demand for prepared sizes in the Louisville market slackened materially in the month of October, with the result that "no-bill" cars increased in both eastern and western Kentucky. Movement is expected to pick up with the advent of cold weather, however. The steam coal situation was very unsatisfactory in the western part of the state, where jobbers and utility companies have been getting screenings at 10c.@15c., as compared to a price of 20c.@30c. to the trade. Low prices on screenings also resulted in an unsatisfactory mine-run situation in spite of the somewhat better prices for prepared sizes. But little nut and slack was produced because of the better price for nut. Western Kentucky block was quoted at \$2@2.25; lump and egg, \$1.75@2; mine-run, 90c. up.

Screenings from eastern Kentucky were in a much more favorable position than those from the western part. They were quoted generally at 50c. up, with byproduct grades as high as \$1.25. The stronger market is said to have been caused by a more than normal movement to the lakes and, when the season ends, trouble is expected with this size unless buying from other sources develops. Eastern Kentucky block was quoted at \$2.50@2.75, with some specialty coals as high as \$3.50. Mine-run sold at \$1.35@1.65.

October business in the Cincinnati market, though attaining the high point of the year, failed to come up to September forecasts. There were, however, no severe breaks in prices. High-volatile dealers took the worst of the soft going but were able to work through without accumulations—the bane of October trading. Prices on good grades were kept on a fairly even keel, but the low-grade coals showed some fluctuations. Egg got away to a good start at the first of the month but failed to maintain its pace, being quoted at \$1.50 at the last.

THE lighter demand gave smokeless people a chance to catch up with orders, which in some instances were two weeks behind. Spot prices on lump and egg, \$4.25@4.50 at the first of the month, came down closer to the contract price of \$3.75. Such was the position of the trade during the month that most of the selling agencies carried October circulars over into November. A heavy demand for coking purposes kept screenings in a favorable position. There was no change in retail prices during the month, with smokeless lump and egg at \$8.25; mine-run, \$6@6.25; bituminous lump, \$6@6.25, and slack, \$4@4.25.

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

LOW-VOLATILE, EASTERN	Market Quoted	Week Ended—			
		Oct. 5, 1929	Oct. 12, 1929	Oct. 19, 1929	Oct. 26, 1929
Smokeless lump.....	Columbus	\$3.50@3.75	\$3.50@4.00	\$3.75@4.25	\$4.00@4.50
Smokeless mine-run.....	Columbus	2.00@2.35	2.00@2.50	2.00@2.50	2.00@2.50
Smokeless screenings.....	Columbus	1.00@1.30	1.10@1.40	1.35@1.50	1.35@1.50
Smokeless lump.....	Chicago	3.75@4.00	3.75@4.25	3.75@4.25	3.75@4.25
Smokeless mine-run.....	Chicago	2.00@2.25	2.00@2.25	2.00@2.25	2.00@2.25
Smokeless lump.....	Cincinnati	3.75@4.50	3.75@4.25	3.75@4.25	3.75@4.00
Smokeless mine-run.....	Cincinnati	2.25@2.50	2.25	2.25	2.00@2.25
Smokeless screenings.....	Cincinnati	1.25@1.35	1.25@1.35	1.25@1.50	1.25@1.50
*Smokeless mine-run.....	Boston	4.40@4.60	4.60@4.80	4.75@5.00	4.75@4.85
Clearfield mine-run.....	Boston	1.65@1.85	1.65@1.90	1.70@2.00	1.70@2.00
Cambria mine-run.....	Boston	1.85@2.10	1.85@2.15	1.90@2.25	1.85@2.25
Somerset mine-run.....	Boston	1.75@1.95	1.80@2.00	1.85@2.10	1.80@2.10
Pool 1 (Navy Standard)	New York	2.15@2.50	2.15@2.50	2.15@2.50	2.15@2.50
Pool 1 (Navy Standard)	Philadelphia	2.25@2.60	2.25@2.60	2.30@2.65	2.30@2.65
Pool 9 (super. low vol.)..	New York	1.70@2.15	1.70@1.90	1.70@2.15	1.70@2.15
Pool 9 (super. low vol.)..	Philadelphia	1.75@2.00	1.75@2.00	1.85@2.10	1.85@2.10
Pool 10 (h. gr. low vol.)..	New York	1.50@1.75	1.50@1.75	1.50@1.75	1.50@1.75
Pool 10 (h. gr. low vol.)..	Philadelphia	1.55@1.75	1.55@1.75	1.70@1.90	1.70@1.90
Pool 11 (low vol.).....	New York	1.35@1.50	1.35@1.50	1.35@1.50	1.35@1.50
Pool 11 (low vol.).....	Philadelphia	1.45@1.65	1.45@1.65	1.55@1.75	1.55@1.75
HIGH-VOLATILE, EASTERN					
Pool 54-64 (gas and st.)..	New York	\$1.25@1.40	\$1.25@1.40	\$1.25@1.40	\$1.25@1.40
Pool 54-64 (gas and st.)..	Philadelphia	1.15@1.40	1.15@1.40	1.15@1.40	1.15@1.40
Pittsburgh sc'd gas.....	Pittsburgh	1.90@2.00	1.90@2.00	1.95@2.15	2.00@2.15
Pittsburgh gas mine-run..	Pittsburgh	1.65@1.75	1.65@1.75	1.65@1.80	1.70@1.80
Pittsburgh mine-run.....	Pittsburgh	1.40@1.75	1.50@1.75	1.50@1.80	1.50@1.80
Pittsburgh slack.....	Pittsburgh	1.00@1.10	1.00@1.10	1.00@1.15	1.00@1.15
Kanawha lump.....	Columbus	2.00@2.30	2.00@2.35	2.00@2.50	2.00@2.50
Kanawha mine-run.....	Columbus	1.30@1.60	1.30@1.60	1.30@1.60	1.30@1.60
Kanawha screenings.....	Columbus	.50@.75	.60@.80	.75@1.10	.75@1.00
W. Va. lump.....	Cincinnati	2.25@2.75	2.00@3.00	1.85@3.00	1.85@2.75
W. Va. gas mine-run.....	Cincinnati	1.45@1.65	1.45@1.60	1.50@1.60	1.35@1.60
W. Va. steam mine-run.....	Cincinnati	1.25@1.40	1.25@1.35	1.20@1.40	1.15@1.40
W. Va. screenings.....	Cincinnati	.60@1.10	.60@.90	.60@1.00	.60@1.00
Hocking lump.....	Columbus	1.90@2.25	1.90@2.25	1.90@2.25	1.95@2.25
Hocking mine-run.....	Columbus	1.35@1.65	1.35@1.65	1.35@1.65	1.35@1.65
Hocking screenings.....	Columbus	.90@1.00	1.10@1.15	1.00@1.25	1.00@1.25

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

DEMAND for domestic sizes continued to be the chief feature of the Columbus market. Steam business showed some signs of improvement as well, and screenings especially developed considerable strength toward the latter part of October. All grades shared in the active domestic demand, smokeless coals taking the lead. Premium splints and Kentucky block reflected the trend, with the result that orders increased and in some instances mines were oversold. Despite the extremely mild weather which prevailed, household buying was unusually heavy. Smokeless lump and egg sold at \$8.75; premium splint lump, \$7.50@\$.75; ordinary splint lump, \$6.50, and Ohio lump, including Hocking and Pomeroy, \$5.75. Retail stocks were not large and rural dealers were especially short. Mine prices showed a distinct advance and there was little free coal on the market.

Industrial consumers displayed a tendency to take larger tonnages on their contracts, especially screenings, but railroads and utilities were the best users of steam sizes. Reserves, however, were still low, presaging a better demand as the winter advances.

An increasing demand for domestic coal in the Pittsburgh market in the month of October resulted in a steady price advance throughout the month, and even caused a slight rise in the quotations on industrial grades—the first in some months. In view of the fact that little cold weather has yet been encountered and that the smaller mines have failed to open up in large numbers, a still further advance in price levels is expected. Domestic lump at the last of the month averaged \$2.50@\$.27 in the Pittsburgh district, with some grades going even higher. Screenings, however, failed to show any marked improvement over past months.

ASTEADILY increasing demand and rising prices featured the central Pennsylvania market in October. Loadings showed a substantial rise and increased running time has brought in its train the problem of labor shortage, though no trouble has as yet been encountered. Prevailing prices at the last of the month were as follows: Pools 11 and 18, \$1.80@\$.1.90; Pool 10, \$2@\$.2.15; Pool 9, \$2.25@\$.2.30; Pool 71, \$2.35@\$.2.45; Pool 1, \$2.45@\$.2.60.

While quotations were strong and deliveries on contract were urgently requested, the New England trade in October pursued a policy of waiting for the close of the lake trade, and the possibility of lower prices. As a consequence, spot business was practically absent. On the average, No. 1 Navy Standard mine-run held firm at \$4.75@\$.4.85, f.o.b. vessels, Virginia terminals. Nut and slack were quoted at \$4.30, with some shippers short on contract tonnage. Prices on cars at Boston for inland delivery were as follows: Mine-run, \$5.85@\$.6; nut and slack, \$5.50. All-rail shipments from central Pennsylvania increased somewhat, though the tonnage was not heavy.

Steadiness featured the New York market in October. Demand was fair, dealers reporting better conditions than at tidewater. Labor shortage at Pennsylvania mines was complained of and it is feared that a heavy demand in the future might overtax the productive capacity. The best grades moved easily throughout the month and there was no change in prices.

SATISFACTION with the trading situation pervaded the Philadelphia market in October. The demand was such that dealers found themselves unable to get the same prompt shipment as in the past, though this adverse condition was overbalanced by slight increases in prices. Industrial users also showed more signs of adding to stocks and this movement is expected to hold until the first of the year. The tidewater market, however, proved disappointing, though bunkering activities continued at a fair rate.

Some gain in strength was noted in the Birmingham market in October as a result of increased industrial demand. Consumers, however, showed little interest in stocking and little new business was offered in the bunkering trade. Mine prices on the lower and medium grades of steam coal were especially unstable as a result of sharp competition for the available business. Quotations were as follows: Big Seam mine-run, \$1.25@\$.1.50; washed coal, \$1.50@\$.1.75; Carbon Hill mine-run, \$1.50@\$.1.75; washed, \$1.50@\$.2; Cahaba washed, \$1.75@\$.2; Black Creek, \$2@\$.2.25; Corona mine-run, \$1.90; washed, \$2.15.

Better grades of domestic coal sold well, though considerable effort was required to keep them moving. Cheaper

grades were very poor sellers. Dealers carried light stocks and refused to consider contracts, securing their requirements in the open market. Quotations were as follows: High quality lump, \$4.75@\$.5.75; egg, \$4.50@\$.5.75; nut, \$3.25@\$.3.50; medium-grade lump, \$3.25@\$.4.25; egg, \$3.10@\$.4; nut, \$2.75@\$.3.75; low-quality lump and egg, \$2@\$.2.75; nut, \$2@\$.2.25.

All sizes of anthracite moved quite freely in the New York market in October. Egg eased off somewhat the last week, but the increase in the price of buckwheat No. 1, put into effect Oct. 1, caused no slackening in the demand for that size. Rice and barley moved steadily throughout the month.

October was a big month in the Philadelphia anthracite market despite the fact that the retail trade was somewhat intermittent as a result of changes in the weather. Stove was heavily in demand with no prospects of immediate diminution. Nut improved its position, but pea was slow, most operators having a surplus on hand. Egg apparently has passed the peak of its demand for this season. Buckwheat was bought at a heavy and constantly increasing rate. Rice dragged throughout the month as a result of the transfer of industrial plants from buckwheat to barley.

EXPORTS of bituminous coal from the United States in September—the latest month for which figures are available—were 1,631,396 gross tons, as compared with 1,440,952 gross tons in August and 1,578,161 gross tons in September, 1928. Anthracite exports dropped from 1,748,565 gross tons in August, 1929, to 323,247 gross tons in September. Exports in September, 1928, were 263,416 gross tons.

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

		Week Ended			
		Oct. 5, 1929	Oct. 12, 1929	Oct. 19, 1929	Oct. 26, 1929
MIDDLE WEST					
Franklin, Ill. lump.....	Chicago	\$3.15	\$3.15	\$3.15	\$3.15
Franklin, Ill. mine-run.....	Chicago	2.15	2.15	2.15	2.15
Franklin, Ill. screenings.....	Chicago	.90@ 1.60	1.25@ 1.60	1.25@ 1.60	1.25@ 1.60
Central, Ill. lump.....	Chicago	2.40@ 2.65	2.40@ 2.65	2.40@ 2.65	2.40@ 2.65
Central, Ill. mine-run.....	Chicago	1.70@ 1.85	1.70@ 1.85	1.70@ 1.85	1.70@ 1.85
Central, Ill. screenings.....	Chicago	.80@ 1.25	.40@ 1.25	.40@ 1.25	.40@ 1.00
Ind. 4th Vein lump.....	Chicago	2.75@ 3.40	2.75@ 3.40	2.75@ 3.40	2.75@ 3.40
Ind. 4th Vein mine-run.....	Chicago	1.50@ 2.10	1.50@ 2.10	1.50@ 2.10	1.50@ 2.10
Ind. 4th Vein screenings.....	Chicago	.85@ 1.35	1.10@ 1.40	1.10@ 1.40	1.10@ 1.40
Ind. 5th Vein lump.....	Chicago	2.00@ 2.25	2.00@ 2.25	2.00@ 2.25	2.00@ 2.25
Ind. 5th Vein mine-run.....	Chicago	1.25@ 1.75	1.25@ 1.75	1.25@ 1.75	1.25@ 1.75
Ind. 5th Vein screenings.....	Chicago	.50@ .90	.40@ .90	.40@ .90	.40@ .90
Mount Olive lump.....	St. Louis	2.50@ 2.65	2.50@ 2.65	2.50@ 2.65	2.50@ 2.65
Mount Olive mine-run.....	St. Louis	1.75	1.75	1.75	1.75
Mount Olive screenings.....	St. Louis	.35@ .75	.35@ .75	.35@ .75	.35@ .75
Standard lump.....	St. Louis	1.85@ 2.15	1.85@ 2.15	1.85@ 2.15	1.85@ 2.15
Standard mine-run.....	St. Louis	1.65	1.65	1.65	1.65
Standard screenings.....	St. Louis	.25@ .60	.25@ .60	.25@ .60	.25@ .60
West Ky. block.....	Louisville	2.00@ 2.25	2.00@ 2.25	2.00@ 2.25	2.00@ 2.25
West Ky. mine-run.....	Louisville	.90@ 1.25	.90@ 1.35	.90@ 1.30	.90@ 1.30
West Ky. screenings.....	Louisville	.25@ .35	.25@ .30	.20@ .30	.20@ .30
West Ky. block.....	Chicago	2.00@ 2.25	2.00@ 2.25	2.00@ 2.25	2.00@ 2.25
West Ky. mine-run.....	Chicago	.85@ .90	.85@ 1.00	.85@ 1.00	.85@ 1.00
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	1.25@ 1.50	1.25@ 1.50	1.25@ 1.50	1.25@ 1.50
Big Seam (washed).....	Birmingham	1.50@ 1.75	1.50@ 1.75	1.50@ 1.75	1.50@ 1.75
S. E. Ky. block.....	Chicago	2.50@ 2.75	2.50@ 2.75	2.50@ 2.75	2.50@ 2.75
S. E. Ky. mine-run.....	Chicago	1.30@ 1.60	1.30@ 1.60	1.30@ 1.60	1.30@ 1.60
S. E. Ky. block.....	Louisville	2.25@ 2.75	2.50@ 2.75	2.50@ 2.75	2.50@ 2.75
S. E. mine-run.....	Louisville	1.25@ 1.65	1.35@ 1.65	1.35@ 1.65	1.35@ 1.65
S. E. Ky. screenings.....	Louisville	.40@ 1.00	.40@ 1.00	.50@ 1.00	.50@ 1.00
S. E. Ky. block.....	Cincinnati	2.25@ 3.00	2.00@ 3.00	2.00@ 3.00	1.85@ 2.75
S. E. Ky. mine-run.....	Cincinnati	1.20@ 1.65	1.25@ 1.60	1.15@ 1.60	1.15@ 1.60
S. E. Ky. screenings.....	Cincinnati	.60@ 1.10	.60@ 1.00	.50@ 1.00	.60@ 1.00
Kansas shaft lump.....	Kansas City	3.75@ 4.00	3.75@ 4.00	3.75@ 4.00	3.75@ 4.00
Kansas strip lump.....	Kansas City	3.00	3.00	3.00	3.00
Kansas mine-run.....	Kansas City	2.50@ 2.75	2.50@ 2.75	2.50@ 2.75	2.50@ 2.75
Kansas crushed mine-run.....	Kansas City	1.50	1.50	1.50	1.50
Kansas screenings.....	Kansas City	1.50	1.50	1.50	1.50

WHAT'S NEW

In Coal-Mining



Equipment

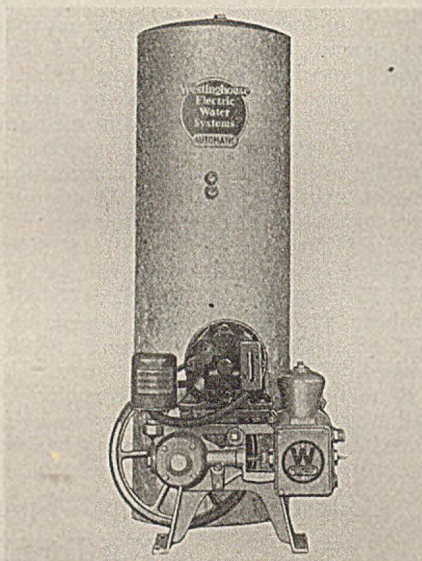
Dust-Tight Linestarter Developed

Dust-tight and weather-proof line-starters have been developed by the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. These are remote-controlled, non-reversing, across-the-line type magnetic starters for single-phase and polyphase induction motors, and are recommended by the company for use in coke plants, steel mills, cement mills and other places where a dust-tight starter is desirable.

Several features, it is said, have been added to the linestarters to insure continuous operation. In construction, a cast-iron cabinet is used with a gasket seal on the door. The conduit is brought in through the top and bottom in threaded openings, so as to make a dust-tight connection. All the linestarters are equipped with the deion, grid-type arc quencher, said to provide a high degree of protection against flash-overs, even under severe operating conditions. To prevent the operator breaking the seal whenever the motor is put back into service after an overload, the two smaller linestarters are equipped with automatic reset thermal overload relays, having interchangeable heaters, accessible calibration lever and quick make and break contacts. The dust-tight linestarter, the company says, is available in three sizes up to 50 hp.

The Westinghouse company also is marketing a new automatic electric water system, designed, it is said, to fill the need for an adequate water supply with constant pressure for country or suburban homes and similar places where city water is not available. The system consists of the tank and a Westinghouse Type AR heavy-duty motor operating a double-acting, reciprocating

pump. The pump is started and stopped as the water pressure becomes low or high by an automatic electric pressure switch and the right proportion of air to prevent waterlogging is kept in the tank by an automatic air-volume control and pressure gage. Motor protec-



Automatic Electric Water System

tion is afforded by an automatic "Sentinel" circuit breaker.

Features of construction emphasized by the company include the following: precise mechanical construction and good materials; high intake and discharge ports, allowing the pump to stay primed at all times; unusually large water passage through the pump; vertically mounted, unusually accessible valves; valve seat and pin cast in one piece to prevent pin coming loose or getting out of alignment; built-in, readily accessible strainer; built-in relief valve which allows the water to recirculate through the pump when the pressure becomes too great, and intake and discharge connections so arranged that they need not be disturbed when the pump is completely taken down and re-assembled.

The automatic electric water systems, the company states, are available in tank sizes of 42, 80 and 120 gal., with a capacity of 300 g.p.h. at an operating range of 20 to 40 lb. pressure per square inch.

Ash-Handling Equipment Employs Suction

Ashes can now be removed expeditiously and economically, with a minimum of labor and no diffusion of dust, by an electric-pneumatic suction system employing a pipe reaching from the sidewalk to the ashpit, says the General Electric Co., Schenectady, N. Y. The equipment consists of an ash-handling truck containing a large hopper into which the ashes are drawn by suction, and from which they are carried by a totally inclosed belt conveyor to a carrier truck.

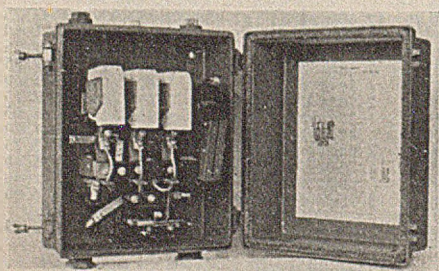
The first of these new ash-handling trucks, designed and built by the American Car & Foundry Motors Co., and electrically equipped by the General Electric Co., has been put in service in New York City by the Pneumatic Conveyors Corporation. The ash-handling truck is equipped with the gas-electric drive, and power for operating the suction system and conveyor are obtained from the generator.

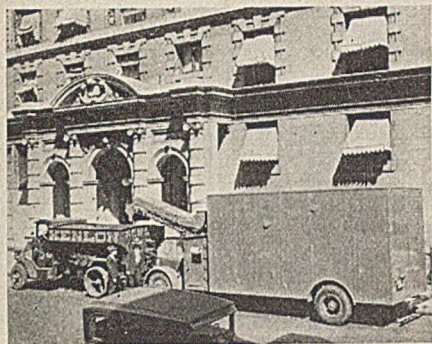
The present unit, it is said, is designed for a permanent rigid pipe line extending from the sidewalk to the ashpit, but plans are under way for the installation of a flexible pipe line to enable the apparatus to remove ashes from cellars in residences. It is claimed that the capacity of the equipment is about 12 ash cans of the ordinary size per minute.

Pneumatic Ash-Conveyor System:
Truck With Pipe Placed in
Sidewalk Opening



Westinghouse Dust-Tight Linestarter





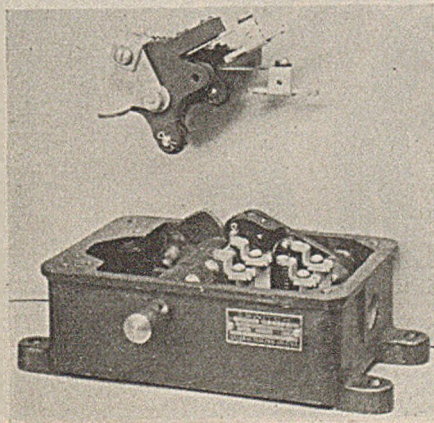
**Pneumatic Ash-Conveyor System:
Conveyor Truck and Carrier Truck**

A new portable electric arc-welding machine has been announced by the General Electric Co. It is driven by a Buda Model HS-6, 6-cylinder gasoline engine and replaces the former 4-cylinder unit. Advantages claimed are ease of starting, steadiness of operation and greater capacity. The welding generator—WD-300-A—is a ball-bearing, self-excited, single-operator machine rated 300 amp., 1 hour, 50 deg. C., with a current range of 90 to 375 amp., N.E.M.A. standards. Included with the set is a current-reducing resistor by which welding currents down to 25 amp. may be obtained. The current may be adjusted by turning the brush-shifting handle. When operating so that the potential at the generator panel, including reactor drop, is 25 volts, the company asserts that any value of current can be obtained between 25 and 400 amp.

The complete outfit is mounted on a welded, structural-steel base and may be made portable by adding running gear. It is 88 in. long, 32 in. wide and 69 in. high, the last dimension including 18 in. for running gear. Net weight without running gear is said to be 3,300 lb. The weight of the running gear is 180 lb., and that of the conopy, 140 lb.

A cam-operated limit switch for industrial control applications has been developed by the company to supersede the various older types formerly manu-

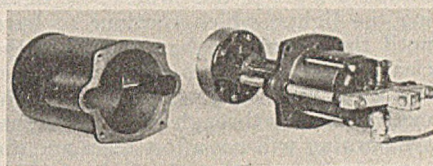
**Track-Type Limit Switch, Cover and
Contact Mechanism Removed**



factured and combine all their advantages in one device. The new switch, bearing the designation LS-438, also is said to be very low in price.

Electrically, the switch, which is inclosed in a cast case, is of the two-circuit type that can be made either normally open or normally closed or one circuit open and one closed. It is, according to the company, a snap-action, cam-operated device and can be obtained with either spring or star-wheel return with any one of four operating levers; roller lever with 1- or 3-in. roller, forked lever or straight lever. The contact tips are interchangeable with those of standard General Electric cam-operated master and geared limit switches.

For operating brakes, clutches, door



**Hydraulic Operator With
Oil Tank Removed**

and window openers, spot welders, pumps and other equipment on which solenoids and air cylinders are now used, the company has developed the hydraulic operator. It is composed of a motor-driven oil pump, the impeller of which is mounted in a piston and driven by means of a spline shaft. The normal position is with the piston at the bottom of the cylinder, which is approximately two-thirds full of oil. When energized, the motor drives the impeller, creating a pressure between the bottom of the piston and the bottom of the cylinder and causing the piston carrying the push rod to move the full length of the cylinder. Three standard sizes, according to the company, give a push of 200, 300 and 600 lb., respectively.

The new rectangular-type meter with non-glare glass and a new type of field-actuating relay have been incorporated in the synchronous motor starters recently redesigned by the General Electric Co. Designations are as follows: CR-1135 is the semi-magnetic, reduced-voltage starter; CR-7061, the magnetic reduced-voltage, and CR-7065, the magnetic, full-voltage starter. The operation of the new field-actuating relay, which controls the field contactor, is dependent upon the speed of the motor and, in addition, on a definite time delay after the motor reaches approximately 95 per cent speed. When full voltage is applied to the motor, the immediate closing of the relay contacts is prevented by a lock-out coil in parallel with the discharge resistor and energized by the voltage across this resistor.

The lock-out coil holds the relay contact arm motionless until the motor accelerates to approximately 95 per cent of synchronous speed, when the

voltage across the resistor decreases and allows the lock-out coil to release the timing mechanism. After the predetermined time, the relay contacts close, energizing the field contactor and applying field to the motor. The closing of the relay contacts may be delayed several seconds after the lock-out coil releases the timing mechanism, insuring that the motor will accelerate its load to the maximum possible speed before the field voltage is applied for operation.

Power and control cable with interlocked, flexible-metal armor for installation without conduit in central station, industrial and other interior wiring also has been developed by the company. Cable provided with armor, it is said, can be run along walls, between partitions and under floors without the use of ducts, and the construction of the armor is said to be such that turns can easily be made. Varnished cambric and rubber-insulated—taped, braided or leaded—and paper-leaded cable may be obtained with armor, in lengths up to 1,000 ft. for cables with an over-all diameter of less than 1 in., and in lengths up to 2,000 ft. for diameters between 1 and 3 in. The cables, it is said, can have any number and combination of conductors desired by the purchaser.

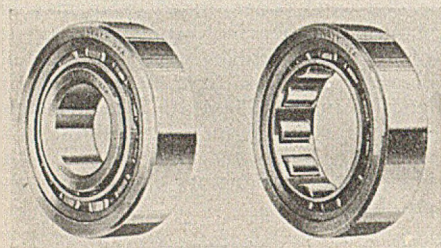
Rollers Can Replace Balls For Bearing Use

To satisfy an increasing demand for a roller bearing interchangeable with standard S.A.E., single-row, ball bearings, but having greater load capacity, the Hyatt Roller Bearing Co., Newark, N. J., is now manufacturing single-row radial bearings. This new line of bearings, made up of solid rollers, is, according to the company, not intended to replace the standard Hyatt roller bearing, which uses spirally wound rollers, but is offered as a supplement to it for use in places where space limitations exist and loads beyond the capacity of ball bearings must be sustained. The design employed is one in which the rollers are permanently retained within the outer race, the inner race being separable.

A separator, floating on the rollers, spaces them properly, and heat-treated end rings retain them endwise within the outer race. The end rings and separator function to keep the rollers in proper alignment, insuring, it is said, positive contact along their full length. This full-line contact of the rollers, the Hyatt company states, enables the single-row radial bearings to sustain greater loads than can safely be carried by ball bearings of equivalent sizes which have only spot or point contact between balls and races. The rollers and races of this bearing are made of a special analysis, chrome-nickel alloy steel and the end rings are of vanadium steel to eliminate

any wear by the ends of the rollers. The roller separator is so made that the pockets are parallel and equally spaced, thus assuring, according to the company, uniform load distribution on the rollers.

The bore, outside diameter and width of Hyatt single-row radial bearings correspond to standard S.A.E. metric dimensions. The company says that they are, therefore, interchangeable with all single-row ball bearings of equivalent sizes, providing greater load capacity within the same space and increasing the efficient life of the installation. It is further stated that the possible separation of this bearing into two parts, the inner race being removable, offers opportunities of developing more economical methods of assembling for all applications with or without the inner race. The roller ends are sufficiently rounded to facilitate assembly where the inner race is not used and both the outer and inner races are chamfered at one end.

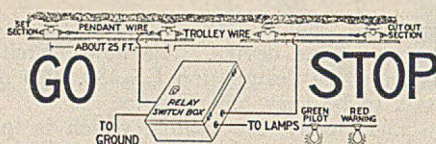


**Hyatt Single-Row Radial Bearing
Including Inner Race and With
Inner Race Removed**

Hyatt engineers assert that a roller of a length greater than its diameter has a much greater load capacity than the equivalent size ball, for the reason that it provides line instead of spot or point contact and wider distribution of the load, thereby preventing bearing fatigue or fractures due to overloading. Therefore, it is claimed that this type of bearing should not fail under extraordinary conditions and should last longer under normal conditions of operation. These bearings, the company says, are now in regular production in a range of sizes sufficient to cover the needs of the present for this type of bearing.

Automatic Signal System For Mine Use

The American Mine Door Co., Canton, Ohio, has developed the "Canton" automatic signal system for use in mines, quarries and industrial plants to prevent collisions, expedite haulage and decrease the overhead expense by eliminating flagmen. By its use, the maker asserts, a locomotive with any number of cars may travel past dangerous crossings and turnouts, into partings or switches and over blind or lengthy stretches of single track in per-



"Canton" Automatic Signal System

fect safety. Signals or warnings may be given by either bells or lights and the locomotive is enabled to travel without stops from the face to the tippie.

The system embodies a relay switch and suitable contacts, as shown in the accompanying diagram. The contacts consist of a pendant wire suspended above the trolley wire. When the locomotive enters a protected section the trolley wheel raises the trolley wire up against the pendant wire. The contact throws a lever in the switch box, lighting the lights, which continue to burn until the locomotive has gone into the clear. Here it passes another contact and turns off the lights. A second locomotive passing through while the lights are burning will not affect them and the company asserts that the lights cannot be tampered with while the trip is in the section. The company also says that the system is adaptable to any condition met with in mining work.

Coal Drill Mounting Is Portable

A collapsible drill mounting for hand use with loading machines is now being marketed by the Charleroi Iron Works, Charleroi, Pa. The weight is given as 100 lb. and it is adjustable for variations in the height of the coal. When not in use, the setscrews, one of which is shown in the accompanying photograph, are loosened and the mounting folded for transportation. In boring holes the drill is laid on top and fed into the coal by hand. One or two men are required, the company says, depending upon the size of the drill.

Several advantages are claimed for

the mounting. It is said that it is more quickly set up and aligned than the usual type of post-drill mounting, and can be placed so as to drill a hole at any desired angle. With hand feeding, the striking of some hard substance in the coal does not cause wearing out of the feed nut. The drill will either work itself through without excessive wear, or it may be removed and another hole started.

Motor Starter Designed For Mine Conditions

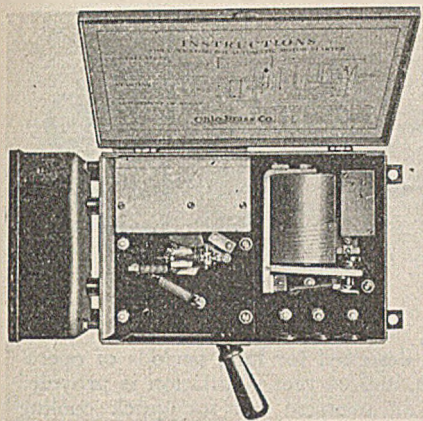
Combining a motor-starting unit with a circuit-breaker for overload protection, the new automatic motor starter offered by the Ohio Brass Co., Mansfield, Ohio, is said to offer excellent resistance to rough usage, dampness and other adverse conditions encountered in mining work. In operation, the circuit-breaker switch, or a line knife switch, if such be the means used for operating the circuit, is closed. This connects the motor to the line through the starting resistance. The operating mechanism consists essentially of a magnetic coil and armature. The coil is connected in series with the motor-shunt field, and is short-circuited by a contact made between two bi-metals. As the field current heats the bi-metal contacts, it causes them to open. Thus, the operating coil is inserted in the circuit, pulls up the armature to short-circuit the starting resistance and connects the motor to the line. Upon the completion of the starting cycle, the motor continues to run connected directly across the line.

When the motor attains full running speed, the starting resistance and bi-metal contacts of the thermal-breaker are automatically shunted out of the circuit. Resistance and thermal-breaker then cool and are ready for the next starting operation. The time interval for starting is readily adjustable by turning the adjusting screw on the thermal element, which increases or decreases the pressure on the bi-metal contacts.

The connections are so made that dur-



**Portable
Drill Mounting
for Hand Feed**



Automatic Motor Starter

ing the starting operation only one-third of the windings of the circuit breaker overload coil are in the starting circuit. This, according to the company, permits the inrush of current needed to start the motor without possibility of the circuit breaker tripping. Without such a scheme, it is asserted, the overload device would prove useless as an element of protection to the motor once it had attained its normal running speed. The setting of the breaker, it is said, would necessarily be so high to accommodate the inrush of starting current that it would be ineffective in protecting the motor against continuous running overloads. Once the starter has completed the starting cycle, the complete overload coil is inserted in the circuit and protection against overloads is procured.

The starter is equipped with a low-voltage release which, at the failure of power, automatically releases the starter and allows it to return to the starting position; when power returns, the starter automatically brings the motor up to full running speed and cuts it in on the line. No personal attention, it is claimed, is required to again start the motor unless the circuit-breaker opens. When the circuit-breaker opens, the company says, it is an indication of trouble and the operative can locate it and correct it without danger of the motor burning before it receives attention.

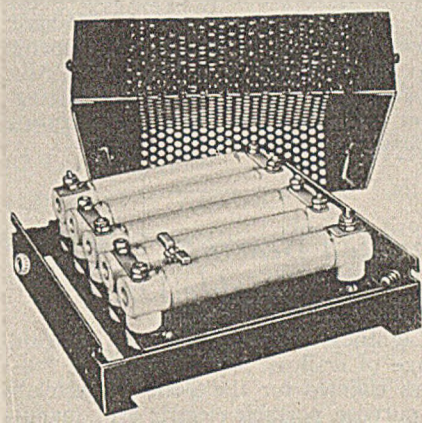
These starters will carry out the starting cycle even though the voltage is only one-third of the normal value. They will hold in the running position, although the line voltage drops to one-quarter normal value. Ohio Brass automatic motor starters are for use with shunt- and compound-wound motors. They are regularly furnished for standard motors from 2 to 15 hp. at 250 and 600 volts, but can also be obtained for motors under 2 hp. and over 15 hp.

The company also has developed a new headlight resistance for electric railway and mining service, which is said to embody two principal refinements: increased efficiency of the individual units and greater ease of maintenance. The units of the resistance are of the exposed-wire type, which are said to operate at a comparatively low tem-

perature. Nickel-chromium wire is said to completely eliminate all rust, corrosion or brittleness brought about through long use.

The tubes which support the wires are threaded in order to remove all possibility of the individual turns coming into contact and shorting a part of the coil. These tubes are arranged side by side so that the heat given off from one cannot strike another. Ventilation is afforded by two baffles, mounted on top of the resistance, forming a duct for air circulation. These baffles also serve to prevent the heat of the tubes from rising to the surface on which they are mounted. In order to exactly meet the requirements of individual users and to make up for possible variations in line voltage, the company has attached a sliding shunt to two adjacent tubes. In this way, it is asserted, the proper amount of current essential to good operation is always delivered to the lamp.

Exposed operating parts have been eliminated in the new resistance, according to the company. The cover may readily be removed without danger of losing the holding ratchets, which are securely fastened to the base. If, after long service, it finally becomes neces-



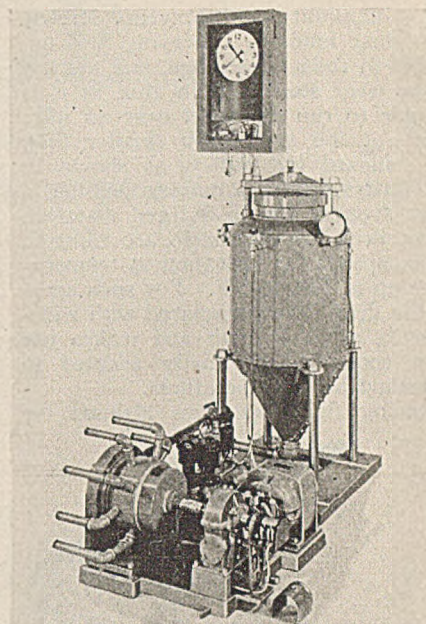
Ohio Brass Headlight Resistance

sary to replace a tube, it is said that it can be accomplished very quickly without disturbing any of the others. In place of the pigtailed which were formerly used as connections the new units are joined with brass strips to prevent loosening and overcome the sagging and resultant danger of grounded contacts.

Knock-out plates have been included to accommodate conduit and the company says that by conforming to certain requirements it is possible to obtain the Board of Fire Underwriters' approval on the installation. The new unit resistance may be had for all voltages.

Lubricator Designed

Combining the automatic safety lubricator and the rotary distributor, the New Keystone Pneuma-Electric lubricating system is said by the Keystone Lubricating Co., Philadelphia, Pa., to



Pneuma-Electric Lubricating System

provide complete automatic operation with intermittent grease feed adjustable to the requirements of the unit being served. The pneumatic lubricator is served by a motor compressor unit with an automatic pressure switch, which maintains the correct pressure in the header line leading to the distributor. The rotary distributor is operated by a motor through a speed reducer and its operation controlled by an electric clock which can be set for any predetermined time period of operation.

When the time period is reached the clock actuates a relay, which in turn applies current to the motor. The motor operates the rotary distributor, which delivers a charge of grease to each bearing consecutively. To prevent the distributor stopping at any open port, a drum control switch has been installed to keep it in operation until the safety zone is reached. Also, the drum switch will cause the distributor to complete its cycle and stop in the safety zone even though the master switch be opened.

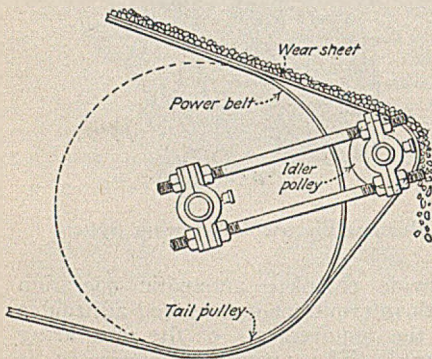
Duplex Conveyor System For Abrasive Materials

A new system in belt conveying, known as the Duplex, has been introduced by the Boston Woven Hose & Rubber Co., Cambridge, Mass. In brief, it consists in the superposition of a wear sheet, or pad, upon the conveyor belt, whereupon the latter serves merely to transmit power, while the wear sheet carries the load and takes the abrasion. The wear sheet is made in various thicknesses up to 1 in., depending upon service. It is manufactured from pure gum stock with two plies of duck, one at the face next to the power transmission belt and the other at the center. This construction, it is claimed, permits ex-

treme flexibility and prevents stretch.

In some kinds of conveying it is desirable to reduce breakage, and the use of the wear sheet permits this, as it is possible to run the sheet over an idler pulley at the tail, much smaller than the standard tail pulley, as shown in the illustration, thus making possible a short drop of the discharged material. Wear sheets are obtainable, according to the company, for operation at temperatures up to 500 deg. F. For such service the sheet is manufactured with wire-inserted asbestos cloth and makes use of a compound especially adapted to withstand high temperatures.

Among the advantages claimed for

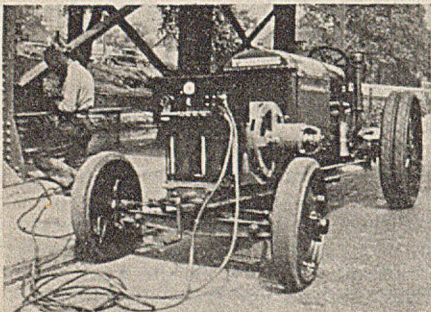


Wear Sheet Over Standard Belt

the Duplex system are savings in conveying costs, ease of replacement, less breakage of material, possibility of troughing at any angle up to 45 deg. without injury to the wear sheet, use of a narrower power belt than would be necessary to carry the load, increased life of the power transmission belt, and a saving in conveyor cost through the possible use of smaller sizes of head and tail pulleys for the power belt.

Tractor-Mounted Welder

The Pontiac Tractor Co., Pontiac, Mich., offers the new Lincoln "Stable-Arc" welder on the McCormick-Deering tractor mounting. The welder unit, complete with panel, is mounted on the tractor frame ahead of the power unit and takes its power from the power pulley at the side of the tractor by



Lincoln "Stable-Arc" Welder Mounted on McCormick-Deering Tractor

means of a belt. The company says that it is a compact and self-contained unit, capable of a road speed of 15 m.p.h.

First-Aid Products Listed

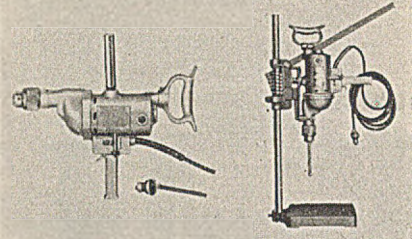
First-aid products and new kits are now being marketed by Bullard-Davis, Inc., San Francisco, Calif. The products listed include a small compact kit for eye dressing; "Pyrol," a burn dressing said to relieve pain almost instantly and practically prevent scarring; "Boon," an antiseptic cream said to protect workers against infection by drying on the skin and forming an invisible and imperceptible film that is solvent only in water; antiseptic swabs filled with mercurochrome, which is exuded upon crushing and applied with the swab, and an ammonia inhalant in ready-to-use ampoule form. The company states that many mines supply the workers with the latter to prevent headaches as a result of breathing powder smoke.

Four types of new kits have been developed. The first is the vest-pocket type, $3\frac{1}{4} \times 2 \times \frac{3}{8}$ in., for the use of men whose work takes them away from the central dressing station. A second model is the No. 1 pocket kit, slightly larger than the above. New unit kits, according to the company, incorporate a movement to make first-aid materials fool-proof. Each dressing or treatment is made up in the form of an individual unit, sterilized and sealed. Where conditions are unfavorable, the company also is prepared to supply the "All-Weather" kit in three sizes, ranging from the pocket type to one containing sufficient material for 10 men.

Timken Bearings Installed In Portable Drill

Lightness with power and a wide range of drilling requirements are features claimed for the $\frac{3}{8}$ -in., "Wodack," all-purpose, portable electric drill, manufactured by the Wodack Electric Tool Corporation, Chicago. It is powered by a General Electric motor for operation on current of 60 cycles or less, 110-125 or 220-250 volts as desired. Thrust loads are carried by Timken roller bearings and ball and roller bearings are used throughout.

According to the manufacturer, an oversize, double-pole trigger switch insures long life; hardened gears are assembled simply; grease compartments



"Wodack" All-Purpose Drill

are designed for long periods of operation, and correct ventilation is provided by an oversize fan for quick cooling during idle running. The stated capacity—according to kind of material and depth required—is $\frac{3}{8}$ -in. steel and 2-in. wood.

Smaller Cardox Shell

Recent improvements in the Cardox method of blasting coal, announced by the Safety Mining Co., Chicago, include a material reduction in the diameter of the shell and, as a result, the weight. The Cardox method involves the use of carbon dioxide to bring down the coal, giving, it is asserted, larger lumps, free from shatter cracks, with greater safety at the face.

Redesigning the shell is said by the company to have not only reduced weight and length, as mentioned above, but to have enabled the reduced size to yield approximately equal results. The old, or Type A, shell was roughly 4 in. in diameter, 39 in. long, and weighed about 85 lb. The new Type G shell is said to be about 3 in. in diameter, 34 in. long and to weigh, when fully loaded, about 40 lb. The capacity of the A shell is about 122 cu.in.; the G shell, 80 cu.in. Equal blasting effect with the new type is obtained by superheating the carbon dioxide charge at the moment of discharge. However, the company states that the temperature of the gas as released against the coal is below the ignition point of methane.

Other advantages detailed by the company are as follows: decreased cost of drilling as compared to the older type; easier placing of the tamping; simple and rugged design; reduced upkeep; elimination of likelihood of premature discharge; simplified firing plug; decreased number of parts.

Details of Type G Cardox Shell

