COAL AGE

Established 1911—McGraw-Hill Publishing Company, Inc.

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

SYDNEY A. HALE, *Editor*

December, 1936

West Virginia Coal & Coke

A SINGLE outstanding achievement may secure an individual's place in history for all time. If that contribution is in the field of commercial endeavor, he even may be fortunate enough to make it support his material future and the future of his children's children. But a business institution that seeks to produce something more substantial than yellowing memories of yesterday's glories is not so happily circumstanced.

TECHNICAL DEVELOPMENTS are so swiftly paced that the industrial plant which was truly the last word in 1930 may be obsolete in 1936. Modernization is a moving parade, not a colorful study in still life. Obsolescence starts with the whirring of the first new machine; changing trends in consumer markets take their toll of plant location and product preference. Nothing in business is changeless except change itself.

HOW MANAGEMENT which appreciates the significance of technical improvements and shifting markets goes about to attack the problems thus created in a highly competitive industry is exemplified in the rehabilitation program of West Virginia Coal & Coke Corporation in recent years. More spectacular programs possibly might be named, but none more persistent. West Virginia management has moved steadily to the attainment of one modernization objective after another. As a result, although present wages are the highest and hours the shortest in the history of the company, mine costs per ton are less than they were ten years ago.

NO PHASE of operations has been untouched in this modernization drive. Initial efforts were expended in improving general conditions underground and on the surface for hand loading. When readjustments in competitive wage levels throughout the industry made further mechanization desirable, careful study was devoted to mechanical loading. Early this year the company installed its first units; today it is making increasing use of mobile loaders and conveyors.

GOOD HOUSEKEEPING looms large in the program. Management is convinced that one of the most effective methods it can employ to keep equipment in good working order is to keep each piece of machinery as nearly spotless as operating conditions will permit. The paint brush is freely applied; frequent inspection and overhauling are part of the maintenance routine. Good housekeeping and good neighbors also are made a part of the mining community creed: mine and store managers must live on company property so that their interest in living conditions there is personal as well as official.

FOR THESE REASONS and others which appear in the pages that follow, the methods and accomplishments of West Virginia Coal & Coke Corporation have been selected as the theme of this issue—*Coal Age's* Sixteenth Annual Model Mining Number.

JOHN C. COSGROVE, *President, West Virginia Coal & Coke Corporation*

YESTERDAY AND TODAY

+ In West Virginia Coal & Coke History

THE STORY of what is now the West Virginia Coal & Coke Corporation and its subsidiaries begins in Barbour, Braxton and Randolph counties in the days when the late Henry Gassaway Davis and the late Stephen Blaine Elkins were commanding figures in the mining industry of the Mountain State. Operations in the central West Virginia field had been started by the Davis-Elkins interests several years before the close of the last century. Some of these properties later became the nucleus around which the West Virginia Coal & Coke Co.—immediate predecessor of the present mining company—was built. The West Virginia Coal & Coke Co., however, did not appear upon the scene until 1917 and did not enter the southern field, which is now the major source of West Virginia Coal & Coke Corporation tonnage, until 1925.

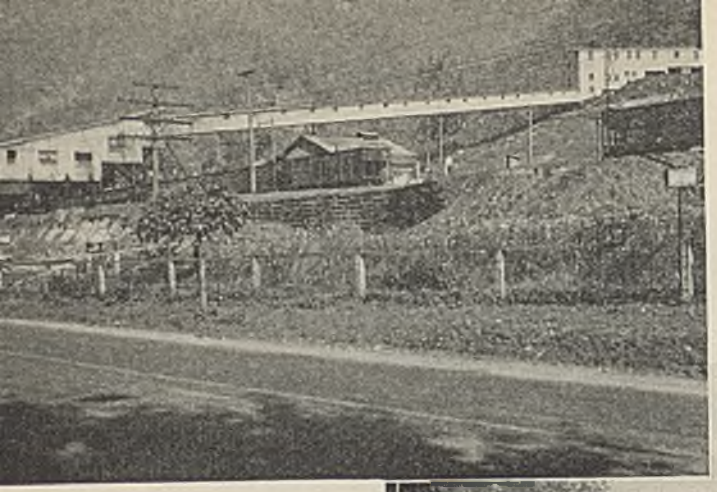
Charles D. Norton, one-time secretary to President Taft, was the moving spirit in organizing the West Virginia Coal & Coke Co. to take over certain mines then owned by the Davis Colliery Co. and coal acreage held by the Coal & Coke Ry. E. D. Kenna and John L. Kemmerer also played active parts in the negotiations, and Mr. Kemmerer was elected president of the new company. Eight mines—most of them small producers and some of them nearing exhaustion—and approximately 120,000 acres of coal lands were involved in the transaction. Today the list in that area—now known as the Elkins division of the West Virginia Coal & Coke Corporation—has been reduced to three mines, one of which is a coaling station. The oldest of the three active operations, the Junior mine, which was opened in 1889, was the first commercial mine opened west of Thomas in this field.

Extension of activities into Logan County was preceded by a consolidation of the southern operations of the Hutchinson coal interests and the Main Island Creek Coal Co. This consolidation, effected in 1924, included Rich Creek Coal Co., Logan Mining Co., Empire Fuel Co. and the Oakland Coal Co. When the West Virginia Coal & Coke Co. assumed control of the consolidated properties on Jan. 1, 1925, it took possession of fourteen operating mines in Logan County and two in Fayette County. Nine of these mines, including Glen Ferris, in Fayette County, had been part of the Hutchinson string; the other six had been Main Island Creek Coal Co. mines. Today the West Virginia Coal & Coke Corporation operates only six mines in Logan County and the Fayette County mines are completely out of the picture.

With the consolidation of the southern and northern-central properties,

Operating Headquarters West Virginia Coal & Coke Corporation Omar, W. Va.

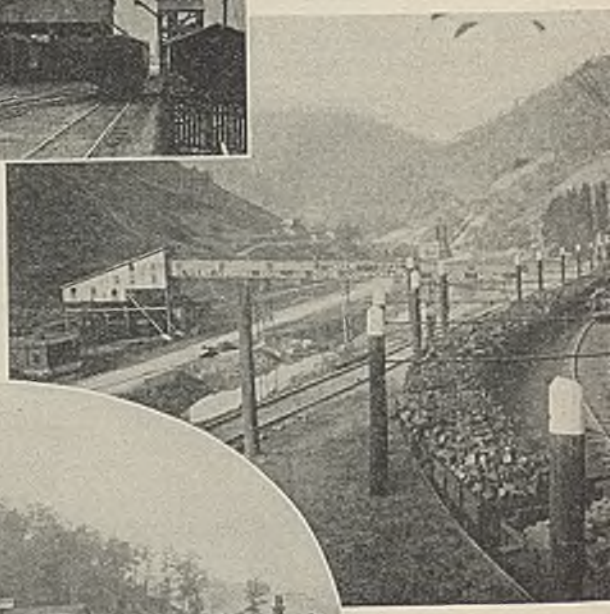
Stirrat No. 15



Earling

Omar No. 4

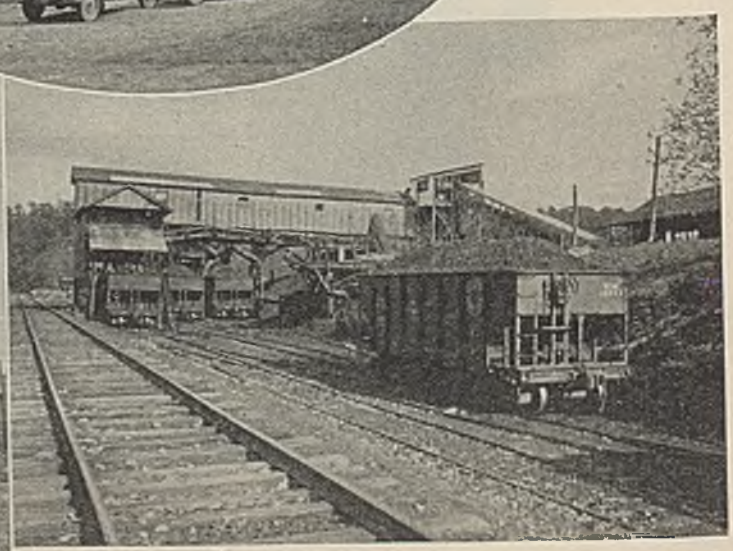
Omar No. 5



Micco No. 3

Rossmore

Norton



C. E. Hutchinson became president of the West Virginia Coal & Coke Co. One of the early acts of his brief régime was the acquisition of the river transportation interests which now are operated as The Ohio River Co. The initial steps in this expansion were the purchase of the interest in the river loading facilities of the Philadelphia & Cleveland Coal Co. at Huntington, W. Va., and Addyston, near Cincinnati, Ohio, and the purchase of steel towboats and barges. Today, The Ohio River Co. is one of the largest shippers on the inland waterways, moving approximately 1,500,000 tons of coal annually as a private carrier. Loading docks are maintained at Huntington and unloading facilities at Cincinnati and Addyston, Ohio. The transportation equipment includes four towboats and 100 steel barges with capacities of from 1,000 to 1,500 tons.

Cosgrove Enters Scene

Upon the death of Mr. Hutchinson in 1926, W. M. Wilshire was elected president of the coal company. He was succeeded the following year by John C. Cosgrove, who was then operating properties in central Pennsylvania and southern Illinois. By that time, however, the coal-mining industry was in the trough of the 1923-1929 internal liquidation, which reduced the number of active commercial operations from 9,331 to 6,047 mines and the average value per ton f.o.b. mines from $2.68 to $1.78. Coal companies in all parts of the country were feeling the pinch of the industry's own private depression. Many operations with bonded indebtedness began to find that the fixed interest charges which had been absorbed without difficulty during more prosperous years were now a heavy handicap in the competitive struggle.

That was the situation which confronted the West Virginia Coal & Coke Co. When the company was formed in 1917 it had been capitalized at $11,167,700—all stock. With its expansion into the southern fields, the capitalization had been increased to $29,884,000; this total included $10,000,000 of 5 per cent bonded indebtedness. Under the competitive conditions then existing, the new management felt that a reorganization of the capital structure was necessary to protect the interests of the company and to enable it to launch upon the modernization program essential to the maintenance of its position in the industry. Friendly receivership proceedings, therefore, were started late in 1927; the properties were sold to a committee of bondholders in July, 1929, and reorganized as the West Virginia Coal & Coke Corporation, capitalized at $8,586,000, including $2,000,000 5-per-cent bonds. Mr. Cosgrove, who, along with Lee Ott and Gohen C. Arnold as co-receivers, had guided the company through the receivership, was elected president of the new corporation.

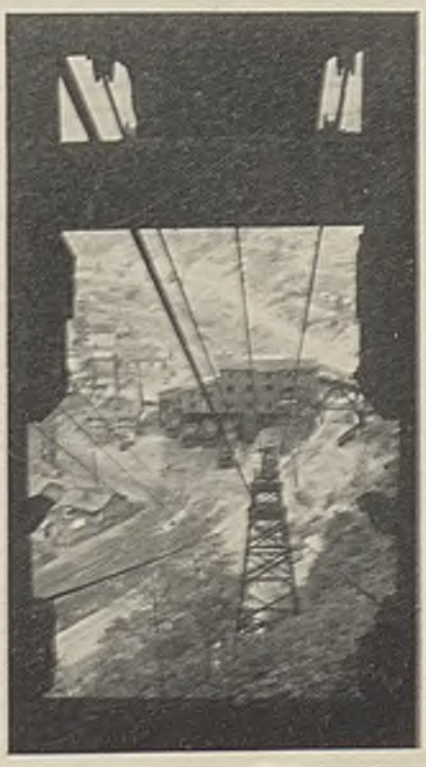
As told in more detail in the articles which follow, since the reorganization the West Virginia Coal & Coke Corporation has invested approximately $1,800,000 in capital improvements at the mines and in the mining communities under its control. These expenditures have affected all phases of operation. At the same time they have sharply reduced the number of active mines; instead of the 23 it had on the roster shortly before completion of the reorganization of the company, the total now is only nine. Some of the missing fourteen have been worked out and abandoned; in one case—the Lyburn operation of the old Rich Creek Coal Co.—the property was resold; two mines not now active are on the reserve list for future reopening.

Table I—Daily Mine Capacity and Recoverable Reserve

Mine	Daily Capacity Tons	Recoverable Tonnage*
Logan Division		
Earling	1,000	2,840,000
Rossmore	1,600	3,800,000
Mieco No. 3	1,000	3,800,000
Omar No. 4	1,400	5,400,000
Omar No. 5	3,000	33,000,000
Stirrat No. 15	†	18,000,000
Stirrat No. 19	4,000	16,000,000
Elkins Division		
Junior	1,000	1,600,000
Norton	1,500	16,200,000
Bower No. 12	200	210,000

* As of Oct. 1, 1936. † Not operating at present.

Tramway tower timbers frame Rossmore tipple in the valley below



Capacity Increased

Concentration has not been effected at the cost of tonnage. Many of the abandoned mines were small operations, opened in the days when a multiplicity of operations rather than a few high-capacity mines were considered an asset during periods of car shortage. With the exception of the coaling-station mine in the Elkins division, none of the present operations is rated under 1,000 tons per day; back in 1928, mines with a daily capacity of 600 tons or less predominated. Moreover, several of the larger mines now produce more in a seven-hour shift than they did when the daily hours were longer. In short, the combination of concentration and modernization gives the company a greater effective capacity with fewer mines than it had in the earlier days with a larger number of smaller operations.

Looking to the future, present reserves of recoverable coal controlled by the West Virginia Coal & Coke Corporation are estimated at over 100,000,000 tons. At the present rate of exhaustion, this would mean an average life of 35 to 40 years for the mines now operating. And, of course, this reserve can be augmented, if advisible, by new purchases and leases. Most of the present tonnage is held under leasehold. Present daily capacity of the mines now operating and the reserve available to each mine are shown in Table I. With the exception of Earling, all of the Logan division mines are operating in the Island Creek seam; Earling is working the Eagle, or No. 2 Gas, coal. Junior and Norton are mining the Kittanning bed; Bower No. 12 is working Pittsburgh seam coal.

MANAGEMENT

+West Virginia Coal & Coke

COORDINATION always is a major function of management. Unless the activities of each department of a business or industry are properly synchronized with those of every other department, the chances for successful operation of the enterprise as a whole are materially lessened. The more complex or highly departmentalized an organization grows the greater becomes the need for effective coordination. In these days of stiff competition, both between units in the same industry and between different industries battling for a common market, a keen appreciation of the advantages of modernization in theory and a realistic approach to the practical application of modernization principles also are vital in sound management policies.

The problem of coordination in the West Virginia Coal & Coke organization is not only one of interdepartmental activities but also of interorganization functions. Four separate corporate units are combined in the set-up. The parent organization is West Virginia Coal & Coke Corporation, which is directly responsible for the operation of the mining properties in Logan, Barbour, Braxton and Randolph counties, West Virginia. Sales are handled through The West Virginia Coal & Coke Corporation, exclusive sub-agent for the mining company under Appalachian Coals, Inc. A third corporation—the Junior Mercantile Co.—controls the operation of the stores; river transportation, in which the West Virginia Coal & Coke group plays a big part, falls under the jurisdiction of The Ohio River Co., another wholly owned subsidiary. Executive offices for the group are located in Cincinnati, Ohio; Johnstown, Pa., and New York City. Mine operating headquarters are at Omar, W. Va.

As will be seen from the executive organization chart of West Virginia Coal & Coke Corporation and its subsidiaries (Fig. 1), the first step in the attack upon the problem of coordination is from the top. All four units in the group have the same president, secretary-treasurer, assistant to the president and comptroller. A common board of directors also acts for the entire group of companies in determining major policies. In addition, each unit operating head makes a weekly letter report to the president, discussing the highlights, as the writer sees them, for the week just closed. Generally speaking, these letters are not technical dissertations but purely informal communications. In this way and through frequent staff meetings and personal visits of executive officers to the mines and sales offices, the groundwork is laid for a common understanding of mutual problems and a coordinated attack upon their solution.

Technically, the organization plan under which West Virginia Coal & Coke Corporation and its affiliates operate is a line-and-staff combination. On the line side, the head of each department or division of the companies is given definite authority over the functioning of his unit—and is held responsible for the results achieved. These unit heads in turn constitute the president's staff officers. Interdivisional problems and the best methods of cooperating in and coordinating the work of the different units are discussed by this staff, which holds frequent meetings. The same staff idea is carried down through the individual units. In other words, the manager of mines holds meetings with his mine superin-

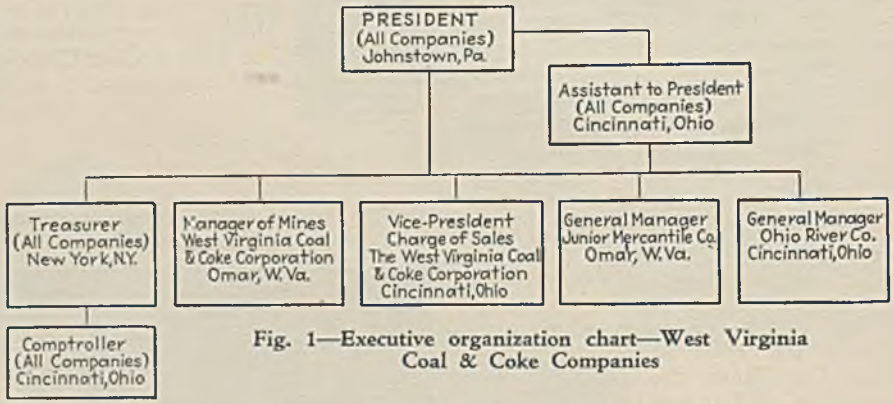


Fig. 1—Executive organization chart—West Virginia Coal & Coke Companies

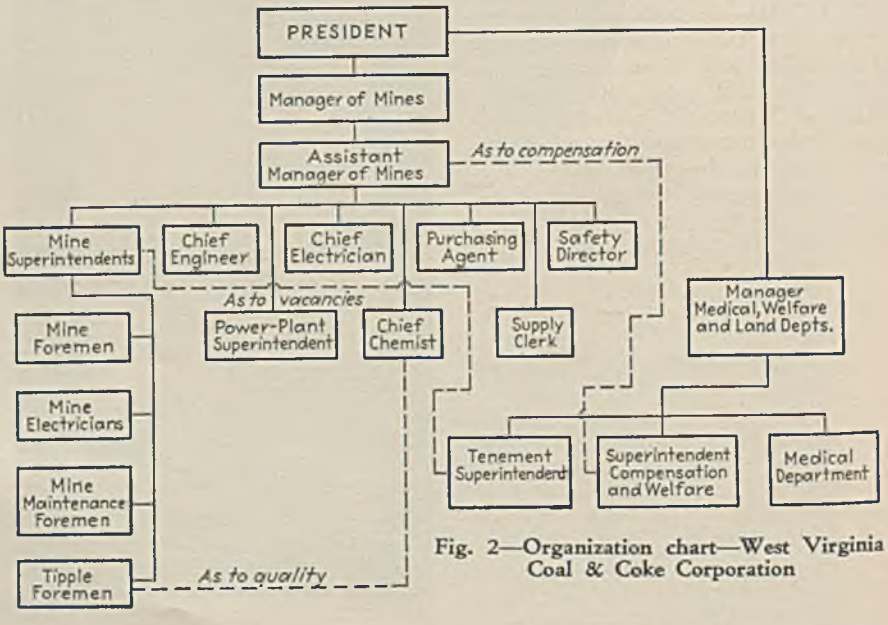


Fig. 2—Organization chart—West Virginia Coal & Coke Corporation

tendents and technical advisers and the superintendents of each operation hold meetings with their foremen and assistant foremen.

Although definite and specific spheres of authority are part of the management philosophy, this does not mean that the activities or authority of any one unit necessarily must be confined to narrow limits. For example, as is shown in the organization chart of West Virginia Coal & Coke Corporation as a mining operation (Fig 2), definite provision may be made for using the personnel and facilities of one of the four companies for work under the direct control of another unit. Thus the rental and maintenance of houses are under the supervision of a housing superintendent, who also is an employee of the Junior Mercantile Co. and reports not only to the general manager of that company but also keeps each mine superintendent in the Logan division advised as to the number of vacant houses in each mining community, the rooms available and the rentals. Maintenance of roads and streets also comes under the jurisdiction of the tenement department.

Planning Committee Created

Since the mining company has a direct interest in housing, stores and community welfare, an interunit planning committee has been created to pass upon all non-mining developments, such as roads, buildings and the location of stores in the mining communities. The operating unit is represented on the planning committee by the manager of mines, the stores division (Junior Mercantile Co.) by its general manager, and the executive department by the assistant to the president. If the project meets the approval of this committee, it then is submitted through the president to the board of directors for final decision and authorization or disapproval. Other proposals for major improvements originate within the particular unit affected and are submitted by the unit head to the president for recommendation to the directors.

Under the West Virginia Coal & Coke plan of organization, direct responsibility for the operation of mines and preparation plants and for the maintenance of equipment is placed upon the mine superintendent. In the case of preparation plants, however, his responsibility is limited to physical operation; questions of chemical control, grading and quality are in the bailiwick of the chief chemist. Tipple foremen, therefore, report to the mine superintendent on matters involving the actual mechanical operation of the plant and confer with the chief chemist either in the presence of or without the superintendent on matters where the character of the coal loaded out is at issue.

Form No. W 478 No._____

WEST VIRGINIA COAL & COKE CORPORATION

MINE 193

APPROPRIATION FOR

LOCATION

WORK TO BE COMMENCED PROBABLE DATE OF COMPLETION

ESTIMATED COST (SEE OTHER SIDE)

ADDITIONAL LAND \$
CONTRACT \$
MATERIAL TO BE PURCHASED \$
MATERIAL ON HAND \$
LABOR \$
OTHER EXPENDITURES \$
TOTAL \$
LESS CREDIT FOR \$
ESTIMATED COST \$

NECESSITY FOR PROPOSED EXPENDITURES (STATE PROBABLE ECONOMY IN OPERATION OR OTHER BENEFITS TO BE DERIVED)

RECOMMENDED BY

TITLE TITLE

APPROVED MANAGER OF MINES

THE COST OF THIS WORK IS TO BE CHARGED AS FOLLOWS:

CAPITAL ACCOUNT \$
DEFERRED EXPENSE PAYABLE OUT OF INCOME \$
CURRENT EXPENSE { REPAIRS AND RENEWALS \$ / OR / PROVING AND DEVELOPING \$
TOTAL \$

COMPTROLLER

AUTHORIZED:

193 PRESIDENT

Fig. 3—Requests for appropriations are made on this form

Mine electricians and maintenance men also report to the mine superintendent, who is in charge of the mine repair shops.

The central repair shop at Omar, where armatures are wound and major repair work is done, is under the supervision of the chief electrician. This official also is responsible for the installation of electrical equipment and the maintenance of the high-tension electrical system. Another important function devolving upon him is the enforcement of electrical standards. House wiring and the trucking of mine materials and supplies, too, are under the chief electrician's wing. While it is the general policy of the company to keep mine-supply inventories at a minimum, the markets are closely watched so that advantage may be taken of opportunities for favorable purchases of materials. As a result, neither the purchasing agent nor the supply clerk is plagued with idle time.

Formulation of engineering standards; the design and supervision of the installation of underground, surface, shop and electrical systems; study of mining methods; time studies; surveying and forecasting are among the major responsibilities of the chief engineer and his assistants. Planning and estimating the costs and advantages of capital additions and betterments also come within the scope of the duties of the engineering department. Time studies usually are made for one of these three purposes:

1. As a guide to improvements in operating methods and equipment.
2. As a basis for planning on the adoption of new methods or equipment.
3. As a means of checking and maintaining the efficiency of certain specific equipment.

Such studies are made on both underground and surface operations. Power studies sometimes are carried on si-

WITH THE OFFICIAL FAMILY

A. H. CRANE
Secretary-Treasurer

LEE OTT
Manager of Mines

R. C. FITZGERALD
Vice-President in Charge of Sales

S. C. POHE
General Manager, Junior Mercantile Co.

MYERS G. LOWMAN
Assistant to the President

C. E. ARMSTRONG
Comptroller

H. J. TAYLOR
Assistant to the Comptroller

multaneously with the time studies.

In projecting mine developments, forecasts showing the territory to be worked are made for a 200-day period. This period also is used in budgeting proposed capital expenditures on an annual basis. When an improvement or expansion project is being seriously considered by mining-department headquarters, detailed figures on the estimated cost of the project are worked out by the engineering department. If the proposal is approved by the manager of mines, its salient features are embodied in an appropriation request (see Fig 3) for submission to the board of directors. In some cases, this request form is accompanied by a separate engineering report covering the plans in complete detail.

Whether approval of the project by the board also carries with it a specific authorization of funds to cover the complete estimated cost is dependent upon the nature of the project, its urgency and the time element involved. Quite frequently, for example, the proposal does not go into full details as to specific equipment to be purchased or may cover projects which contemplate varying but continuing expenditures over a period of several months, or even years. In such cases, specific equipment and plant appropriations are authorized from time to time under the general project approval.

How Costs Are Allocated

Provision is made for the allocation of costs to 41 sub-accounts on the monthly mine-cost statement. Mining costs are subdivided into: (1) Machine cutting, (2) mechanical mining, (3) machine mining, (4) pick mining, (5) extra (slate) mining costs, (6) other extra costs directly chargeable to mining, and (7) contract mining. A second cost-distribution group covers: (1) Timbering, (2) deadwork (slate and refuse), (3) drainage, and (4) ventilation. Haulage costs are subdivided into: (1) Animal haulage gathering, (2) motor haulage gathering, (3) conveyor haulage gathering, (4) motors, (5) tracks, (6) wiring and bonding, and (7) belt gathering. Costs for tipple and tipple tracks to dump are separately allocated.

Maintenance and repair costs are broken down into costs for the maintenance and repair of: (1) Loading machines, (2) mining machines, (3) locomotives, (4) mine cars, (5) mine tracks and wires, (6) drainage equipment, (7) tipple equipment, (8) ventilation equipment, (9) substations and power lines, (10) outside miscellaneous equipment, (11) railroad sidings, (12) mine buildings, and (13) power-plant equipment. The final group of allocations covers: (1) Mine shops, (2) purchased power, (3) power produced by the company, (4) superintendence, (5) mine office, (6) stable, (7) miscellaneous, and (8) miners' safety lamps.

Labor and supply costs for each sub-account are separately allocated and the figures reduced to a per-ton basis. The mine-cost sheet showing these allocations, with comparisons of the corresponding costs per ton for the preceding month, for the same month in the preceding year and for the current year to date, is given to each superintendent. This same statement also gives similar comparative data on tonnage produced and the number of days worked. In addition, total premiums paid for compensation insurance for the month and for the year to date and estimated losses for the same period and the costs per ton for these items, are included in the cost statement. The extent to which this cost information is passed on to the individual mine foreman is left to the discretion of the superintendent.

Table I—Major Expenditures in the Modernization Program of the West Virginia Coal & Coke Corporation, Logan Division Mines*

Electrification	
New substations; rebuilding and relocating old substations:	
Omar No. 5	$35,000
Omar No. 4	9,000
Stirrat No. 19	42,000
Micco No. 3	7,500
Rossmore	8,900
Earling	12,500
Sectionalizing breakers, all mines	16,100
Total	$131,000
Haulage	
New cars (1,050)	$207,500
Timken bearings (650 sets)	35,750
10-ton locomotive (No. 19)	6,900
Tandem locomotive, No. 19 (assembled by company)	10,000
Two tandem locomotives, No. 5 (assembled by company)	15,500
Main haulage tracks, No. 5, No. 19, Micco No. 3	36,000
Rock tunnel, No. 5	13,500
Total	$325,150
Cutting and Drilling	
Four slabbing machines, No. 5	$20,000
Five arewall cutters, No. 19	48,600
Three 56-A track-mounted drills, No. 5	12,000
Total	$80,600
Ventilation	
Fan and air shaft, No. 19	$30,000
Fan, No. 15 (closed at present)	17,000
Fan, No. 5	17,000
Fan, No. 4 (9-ft. Aerovane)	5,000
Total	$69,000
Pumping and Drainage	
Underground pumping station, including ditching and pipe; Rossmore	$9,000
1,500-g.p.m. pumping station, Rossmore	6,000
Borehole and 500-g.p.m. pumping station, No. 5	8,000
Borehole and 500-g.p.m. pumping station, No. 19	6,000
Drainage tunnel, No. 19	14,000
Drainage tunnel, No. 5	20,000
Drainage tunnel, Micco No. 3	4,000
Total	$67,000
Maintenance and Repairs	
Steel repair shop, No. 5	$15,000
Steel repair shop, No. 19	12,000
Total	$27,000
Preparation	
New dump and mine-run conveyor, No. 19	$12,000
New rotary dump, No. 5	5,000
Rebuilding tipple, No. 5	80,000
Air-cleaning plant and additions, No. 5	75,000
Dedusting and stoker-coal plant, No. 4	17,000
Tipple, Micco No. 3	40,000
Nut-coal washer, Earling	15,000
Total	$244,000
Refuse Disposal	
Aerial tramway, No. 5	$55,000
Aerial tramway, Rossmore	10,000
Slate-larry installation, No. 19	16,000
Hillside slate dump, Micco No. 3	4,000
Hillside slate dump, Rossmore	4,000
Hillside slate dump, Earling	4,000
Total	$93,000
Mechanization of Loading	
Mother and room conveyors and loaders, No. 19	$60,000
Four mobile loaders, No. 5	45,000
Total	$105,000
Grand total	$1,141,750

* Exclusive of central power plant at Omar serving all Logan division mines. Certain minor expenditures also are omitted from the above tabulation, even though in the aggregate they represent a substantial item.

Planning for Low Costs

Modernization of methods and equipment, supplemented by concentration of operations at a minimum number of mines where conditions favor a high production of good-quality coal at a low cost, is a major principle in the operating philosophy of the West Virginia Coal & Coke Corporation. Application of this principle is exemplified in developments in the Logan division, where major expenditures at the mines for modernization, exclusive of a central power plant at Omar, have reached a total of $1,141,750 in the past six years, and where the number of active operating properties has been reduced one-half in the past ten years without hampering ability to meet available demands.

Thirteen mines were in operation in the Logan division in 1927, in which year the total output was 2,868,192 tons. In 1935, with six mines working, the production totaled 2,048,195 tons. The total for the present year, with the same number of operations, is expected to exceed 2,500,000 tons. In nine months of 1935 and all of 1936, 7-hour shifts were worked, as compared with a much longer schedule in 1927 and succeeding years up to June 1, 1933, when an 8-hour day went into effect for all employees.

In embarking on its modernization program, two major principles were adopted: (1) A thorough analysis of the cost and probable benefit of each major improvement and (2) utilization, as far as possible, of existing equipment with the necessary revisions to make it conform to present-day standards. The latter was particularly true of substation equipment and mine locomotives. Purchases were confined to equipment which was not already available or which could not be rebuilt

in accordance with the new standards, such as fans, track material, pumps, substation control equipment, rock dumps and refuse-disposal machinery, sectionalizing circuit breakers, trolley supplies, mine cars and bearings, certain cutting and drilling equipment, preparation equipment, loading machines and conveyors, etc. Additional investments cover driving haulage and water tunnels, sinking an air shaft, and other construction jobs, including new repair shops at two mines.

It was not until about 1930 that large-scale modernization investments began. The present management, which began in 1928, was occupied during the 1928-1929 interval in a general survey of properties to determine the steps which should be taken and the probable cost and benefits. Major expenditures since 1930, with the exception of the power plant, are listed in Table I.

The results of this modernization and concentration program are reflected in the fact that mine operating cost in the first nine months of 1936 was still less than for the year 1927, although wages were higher and hours per shift were lower, as indicated graphically in Fig. 4. With 1927 as the base, mine-operating cost dropped year by year until 1932, at which time it was 56.1 per cent of the 1927 figure. The decrease in 1928 and 1929, which was made in the face of higher wage levels, particularly in the latter year, was largely due to the initiation of the closing-down program affecting high-cost low-tonnage properties.

Beginning in 1930, the effects of the modernization campaign began to make themselves felt and, together with a steady decline in wage rates, drove mine cost down to the 1932 low. In the meantime, and particularly from 1928 on, the average tonnage per man-shift increased. At first, this increase was largely due to the practice of loading on idle days plus the adoption of the clean-up system, with modernization later helping along through better service to the loader and higher efficiency in other departments.

The year 1933 marked the first reversal in the previous trend, bringing to an end the period of wage decreases and also the practice, particularly in the case of loaders, of working a variable but generally long shift per day. On June 1 of that year a general wage increase was promulgated in practically all the southern fields, and in addition a flat eight-hour day for all men was voted by the operators' association in Logan County. On Oct. 1, the first Appalachian agreement, continuing the eight-hour day and carrying still higher wage rates, went into effect. As a result of these factors, 1933 operating cost at the Logan division mines of the West Virginia Coal & Coke Corporation rose to 63.7 per cent of the 1927 figure, while average tonnage per man-shift suffered a sharp drop.

Further wage increases in 1934 and 1935 and the inauguration of the seven-hour day in the latter year have been reflected in further increases in mine operating cost. It will be noted, however, that average tonnage per man-shift (Fig. 5) did not decline anywhere near in proportion to the cut in working time and that it has shown a substantial increase since the institution of mechanical loading at two mines in the division in 1936. As a result, the rise in operating cost this year has been only moderate, thus proving the wisdom of expenditures to increase efficiency and thus maintain operating productivity.

Omar Inn and Clubhouse

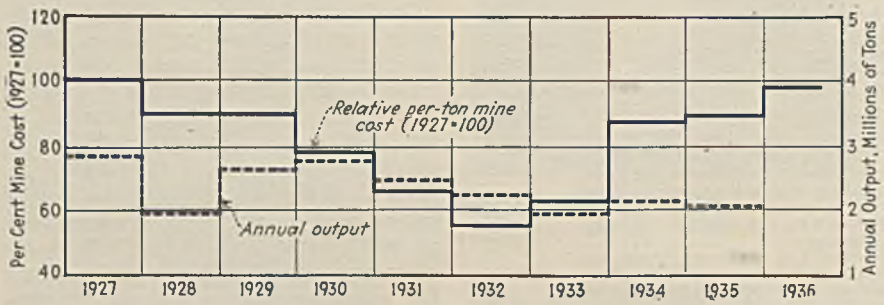
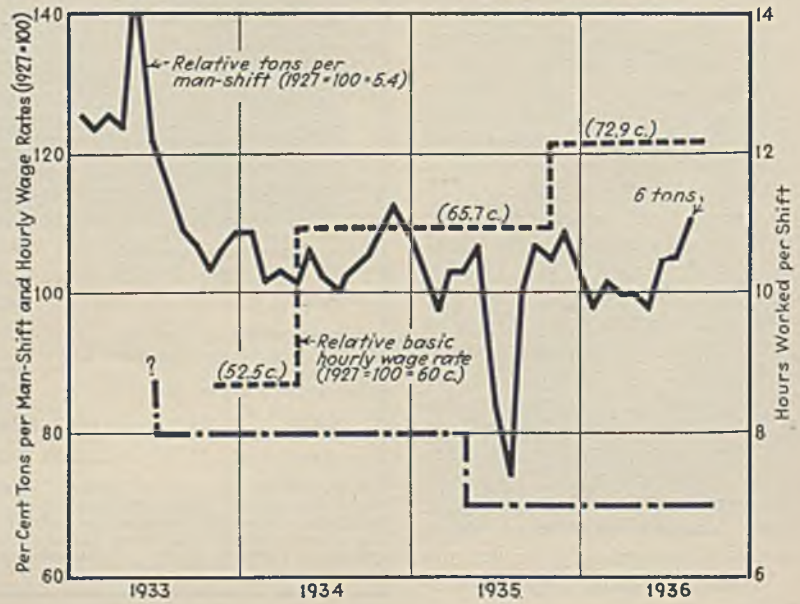


Fig. 4—Ten years in mine costs at West Virginia Coal & Coke operations: 1927 costs = 100

Fig. 5—How hourly wage rates, hours per shift and tonnage per man-shift have fared since 1933 at West Virginia Coal & Coke



MINING METHODS

+ West Virginia Coal & Coke Corporation

MINES of the West Virginia Coal & Coke Corporation present a wide variety of seam formations, and consequently a number of face-preparation methods have been adopted to take care of various parting conditions. Both bench and full-seam systems are employed, and both the block and room-and-pillar development plans are used. But in all cases the general practice is first to advance entries to the limit and then start driving rooms as fast as needed and mine the pillars on the retreat.

Active mines in the Elkins division comprise Norton, Junior and Bower No. 12, in Randolph, Barbour and Braxton counties, West Virginia. Bower No. 12 mine is operated solely as a coaling station. About 6½ ft. of the Upper, Middle and Lower Kittanning seams, which are separated by relatively thin partings, is extracted at Norton, where about 15 in. of coal normally is left in the top, except where it comes down in pillar sections. At Junior, the Lower and Middle Kittanning seams are mined. These are separated from the upper seam, 6 to 12 in. thick, by 6 to 24 in. or more of unconsolidated draw rock, which requires constant watching and careful timbering. Bower No. 12 works the Pittsburgh seam, averaging 4 ft. in thickness.

Coal Divided Into Blocks

Development at Norton and Junior is based on driving main, cross and room entries. Room entries are advanced either to the boundary or the outcrops, as the case may be, before rooms are started and robbed back on the retreat. Rooms are driven 18 to 20 ft. wide on 50-ft. centers. The general practice is to divide the coal up into blocks of six places each by driving pairs of rooms on the advance. These blocks are recovered by driving and pillaring in groups of three rooms. One such group is first driven in a block, and when they are up and pillar extraction is begun, the other three are started.

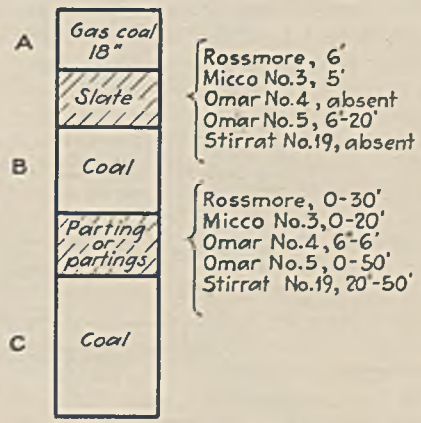
Light cover (not over 125 ft.) and an easily broken though good roof make it possible to mine pillars at random at Norton, although lines reaching across several room entries are established where possible. At Junior, on the other hand, where the cover runs up to 250 ft. and where a very hard sulphur-bearing rock occurs above the Upper Kittanning, regular pillar lines and careful mining are necessary to avoid squeezes. Pillars at both mines are brought back, as a rule, open-ended.

Three Jeffrey 29C track-mounted machines with 6½-ft. bars cut the average daily output of 1,500 tons at Norton. As noted above, the cut is made about 15 in. down from the top. In shooting the cut, three holes are drilled over the 8-in. slate band occurring 15 in. up from the bottom and shot with pellet powder. The tight corner is shot first, as experience has shown that when the center hole is fired first the only effect, as a rule, is to spring the two 1-in. slate partings in the top part of the portion mined, leaving both rib shots tight. By shooting the tight corner, the extra force necessary is confined to a limited quantity of coal, and with this out of the way, the center and opposite rib shots have an opportunity to push the rest of the cut over, this reducing the quantity of powder and, consequently, the shattering effect. The coal below the 8-in. slate band is shot separately with two rib holes. Hand drilling by the miner is the practice.

At Junior, which is about 70 per cent pillar work, two Goodman 12-AA and two Sullivan CE machines with 6-ft. bars are employed, cutting in about 14 in. of coal under the 8-in. slate parting. As a rule the coal falls even in solid work after it is cut. Consequently, practically no shooting is done on pillars, and a hole on one side with possibly a pop shot in the other suffices as a rule in solid work.

In the Logan division, comprising the Earling, Rossmore, Micco No. 3, Omar No. 4, Omar No. 5 and Stirrat No. 19 mines, with a combined average daily output of 12,000 tons, both the block and room-and-pillar systems of mining are employed. Hand loading is the rule at all operations except Omar No. 5, now partly and later to be completely mechanized with mobile loaders, and Stirrat No. 19, where one mobile loader-conveyor transportation unit is in operation and additional installations are contemplated when the necessary experience has been obtained. In addition, conveyors until recently used in driving water tunnels are scheduled to go into the Micco No. 3 mine.

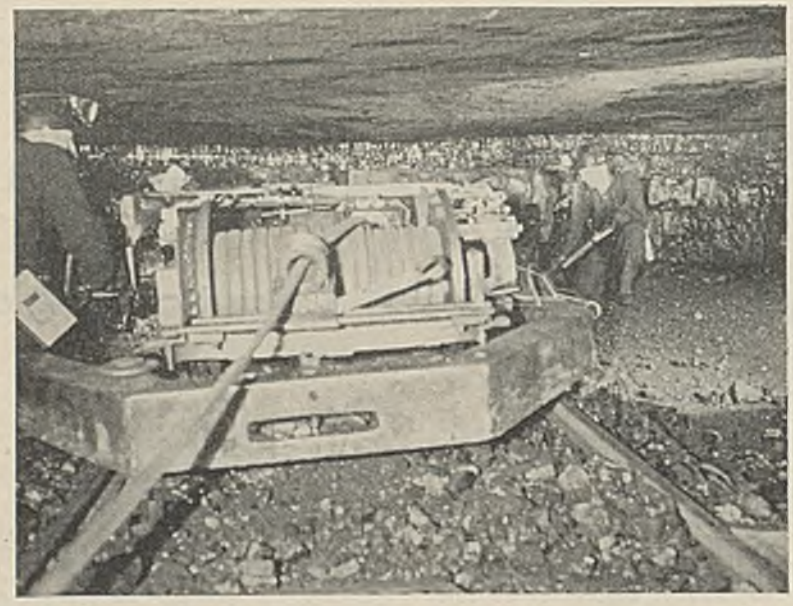
Fig. 1—Generalized section of the Island Creek seam, showing portions mined in the Logan division, West Virginia Coal & Coke Corporation



Mining schedule
Rossmore - B+C or C (parting over 24")
Micco No.3 - B+C or C (parting over 24")
Omar No.4 - A+B+C (coal with parting over 24" left to No.15 mine, extracting A+B)
Omar No.5 - B+C (where parting exceeds 24" coal is not worked at present time)
Stirrat No.19 - A+B

Seam Conditions Vary

With the exception of the Earling mine, mining Eagle coal averaging 54 in. in thickness, all Logan division operations are in the Island Creek seam. The Island Creek bed over the area mined by the West Virginia Coal & Coke Corporation presents a wide variety of parting and splitting conditions with consequent influence on mining systems and cutting methods. Depending upon parting or splitting conditions and also upon whether the divider between the bed proper and the overlying gas-coal stratum is present or absent,



Track-mounted cutting machines are in the majority at Logan division mines, of which an example is this bottom-cutting unit in low coal at Stirrat No. 19

either the full seam, with or without the gas coal, may be worked, or the bottom or top benches only may be mined, in the case of the top bench with or without the gas coal. Fig. 1 shows a generalized section of the Island Creek seam and gas coal and indicates the portions mined at each of the five operations.

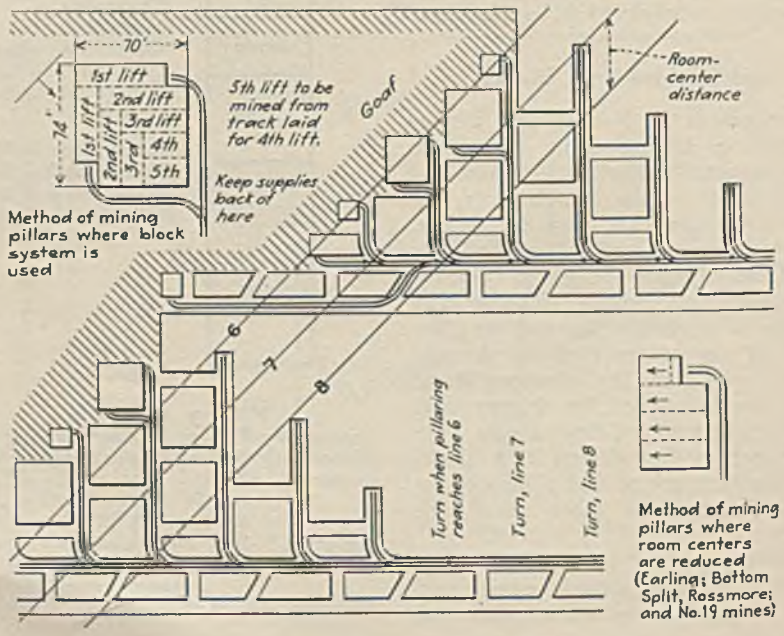
Under the Logan division working plan, the coal usually is divided into panels by main, flat and cross headings, generally at right angles to each other. Room entries are turned off the flat headings and generally parallel the main and cross headings which, with the flat headings (see also Fig. 2, p. 558), form the panels. Retreat operation is the rule within the panels, although exceptions are made at times to meet special conditions. Room entries are driven to the limits before development of rooms and extraction of pillars is begun, although a pair of rooms may be driven at intervals between adjacent room entries to assist ventilation and provide cut-off roads for use when the pillar line is established.

When the first room entry is driven up, rooms are started, and as soon as they are completed the pillars are brought back. By the time the first rooms are completed and the pillars are drawn on the first room entry to be driven in a panel, the next entry has been driven up and the rooms developed to the meeting point, thus permitting extension of the pillar line from one entry to the next and so on. As the pillar line advances, new rooms are started and driven up in accordance with the plan shown in Fig. 2. Section foremen are furnished with large-scale blueprints of their sections, on which guide lines similar to Lines 6, 7 and 8 in Fig. 2 are drawn. The distance between these lines, measured parallel to the sight lines of the rooms, is exactly the room-center distance. When the pillar line advances from one line to the next a new room is started, this relation obtaining where either the block or room-and-pillar system is employed. Thus room driving and pillaring are synchronized to eliminate idle places.

Except at Earling and in the low-coal sections at Rossmore, Micco No. 3 and Stirrat No. 19, rooms usually are driven on 90-ft. centers with the exception of new work at Omar No. 5 on 80-ft. centers, with crosscuts on 90- or 100-ft. centers, making square or approximately square pillars, except for certain half-length pillars resulting from staggering of crosscuts in adjacent places, which is done by driving the first crosscut one-half the usual center distance. These blocks are mined out by taking lifts across two sides, as indicated in Fig. 2. Where the room centers are reduced to 70 ft. in the room-and-pillar system used in low coal, the pillars are mined out by taking lifts across the end. The reduced centers were adopted because roof conditions in these particular operations are such that greater centers would make it difficult to go across the pillar before trouble was encountered.

Rooms usually are necked on a curve to facilitate haulage, and in both rooms and secondary haulways space is left on one side by carrying one rail under the sight line for gobbing unsalable cuttings, slate and other refuse back of the timbers. Loading out occasionally is necessary in other places to take care of an excess—usually small—sometimes encountered. Sights are taken every other cut at the maximum to insure conformity with standards for width and direction of driving. In a few instances where conditions permit, rooms and secondary entries are widened to provide additional gob space. And further, where the quantity of refuse in rooms or secondary haulways is too great to be gobbed in the allotted space, special permission is accorded upon approval of the engineering department for disposal on the opposite side of the place. Standards for minimum timbering, gob storage, track and switch location, room centers and widths, as well as brushing in headings

Fig. 2—General plan of driving rooms and mining pillars applying both where the block system, shown here, and the room-and-pillar system are used, Logan division. Blocks are recovered by taking lifts across the two sides; rectangular pillars by taking lifts across the ends



where the coal is low, are given in Figs. 3 to 7.

Face operations at Logan division mines vary widely in accordance with seam and roof conditions at the various operations. At Earling mine, the seam is cut under a boney streak in the top, approximately 10 in. in thickness, with Jeffrey 29B arcwalls. Thus it is possible to eliminate this material, which is left in place, except where it falls on pillars, thus also protecting the roof, which is fair to poor in quality. Three holes are drilled in the bottom and the coal is shot with Red H permissible powder.

At the Rossmore mine, where the parting is less than 24 in., the full seam is taken. Cutting is done with Goodman 12-AA shortwall machines, and the seam is mined in two benches. In the first step, the bottom bench is drilled with three holes straight in under the parting, and then is shot with pellet powder and loaded out. Next, pop shots are placed in the parting when and where necessary, after which it is gobbed. The final operation (Fig. 8) is shooting the top bench with three holes and loading it out, whereupon the place is ready for a new cut. Where

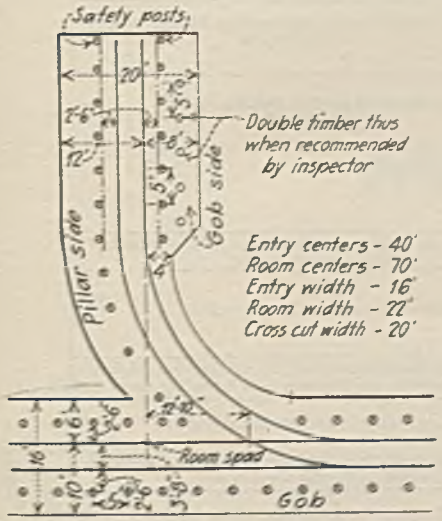


Fig. 3—Standard room and entry, Earling

the parting exceeds 24 in., only the bottom bench is mined with three holes under the divider, which is a fairly hard and tough slate, making, in general, a good roof.

Micco No. 3 mine also presents conditions under which both the full seam and the bottom bench, respectively, are taken. In mining the full seam where the parting or partings are thick, the place is cut immediately under the parting by a 29B machine. Three holes are drilled in the bottom, charged with pellet powder and the coal is shot and loaded. Next, the parting is broken down with a hole drilled directly over the top and gobbed, ending, as a rule, operations on the first day. That night, the place is cut again (Fig. 8), and the next day the loader takes the top bench from the previous cut and the bottom bench from the new cut. On the third day, the miner takes down the parting and gobs it and breaks down the top bench with three holes loaded with pellet powder. Loading of the top bench completes the work on the third day, whereupon the place is left squared up in preparation for a renewal of the cycle. Under this system, coal always is available for loading. Safety posts are set under the parting or top bench while mining the bottom bench.

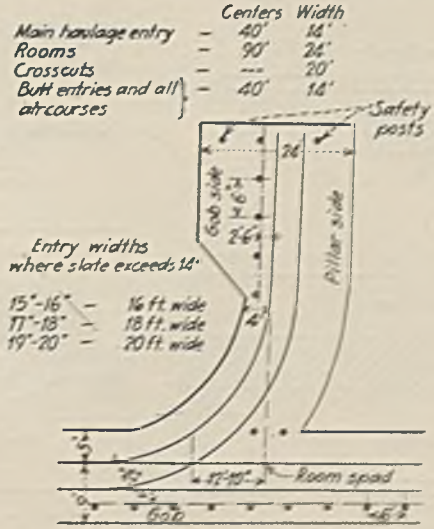


Fig. 4—Standard room and entry, Rossmore

Where the parting is thin, another variation of the bench-mining system is used. Under this plan (Fig. 8), the cut is placed under the parting as before, after which the top bench and the parting are shot down together. The coal then is loaded off the parting, which is taken out and gobbed. Finally, the bottom bench is shot and loaded. Fig. 8 also shows an example of face working at Micco No. 3 where the height is insufficient to accommodate mine cars. As before, the cut is made under the parting, here multiple in nature. The bottom bench then is shot up and loaded, after which two holes are drilled in the thin-coal streak just above the shale member of the parting series. After the shale is broken down it is gobbed, leaving the hard white rock under the top coal in place as the roof.

At Omar No. 4 mine, the divider between the main Island Creek seam and the gas coal is absent. Separate mining of the gas coal is the general rule, however. Average thickness of the parting, of the multiple type, is 17 to 18 in.; where it exceeds 24 in., the coal is allotted to Stirrat No. 15 mine, not now in operation but which mined only the top bench. Cuts are made just over the bottom bench (Fig. 8) in a 3-in. streak of slate, a 2-in. streak of

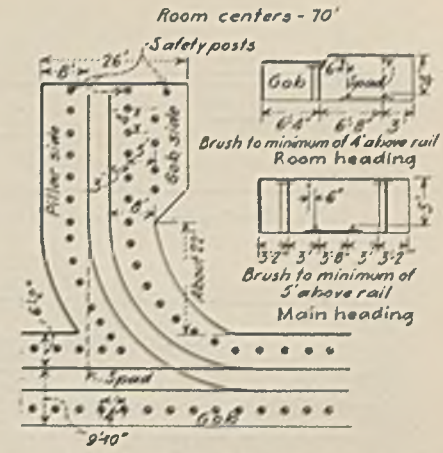


Fig. 5—Standard room and entry, low coal, Rossmore

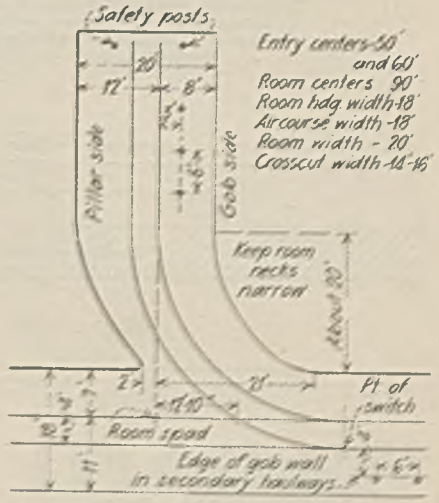


Fig. 6—Standard room and entry, Micco No. 3 and Omar Nos. 4 and 5

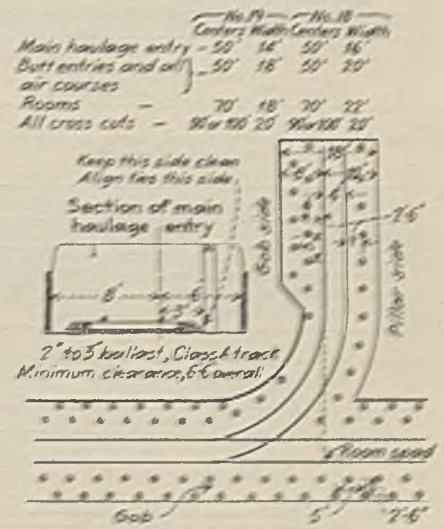
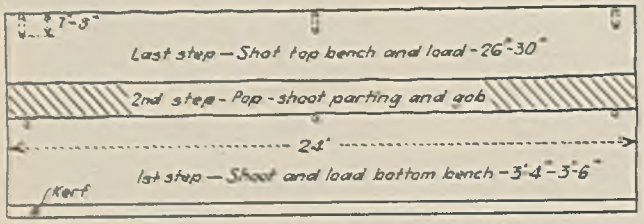


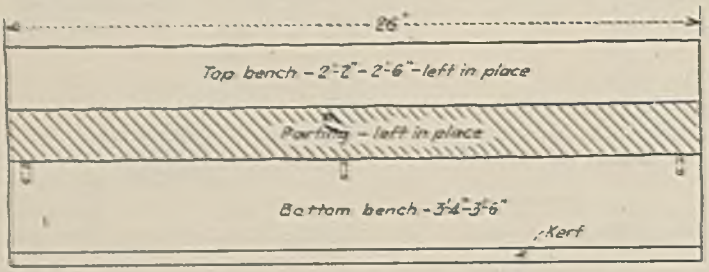
Fig. 7—Standard room and entry, Stirrat No. 19

coal and a 1-in. slate band constituting the bottom section of the parting. In all places, both solid work and also in pillars where the coal stays up, the first operation is removing the cuttings and the remainder of the parting, which

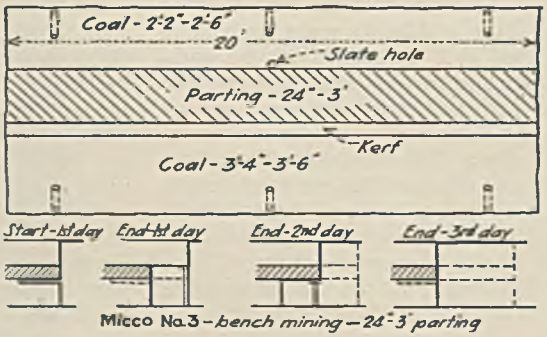
Earling mine – Full seam – top cutting



Rossmore mine – Full seam – parting 24" or less
In some cases, usually where parting is thin, the entire seam is shot down from the top and the refuse material separated during loading

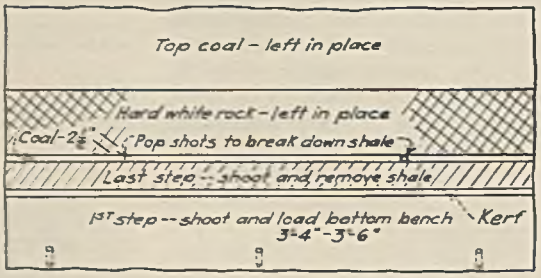


Rossmore mine – Bottom bench – parting 2'-1" or more

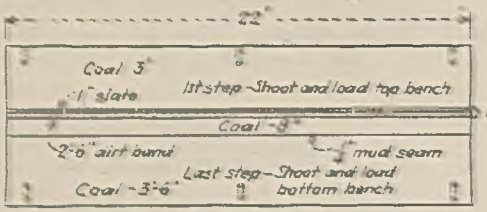


Micco No. 3 – bench mining – 24"-3" parting

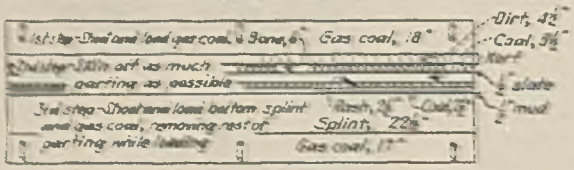
Micco No. 3 – Mining where parting is thin, using shooting plan sketched above, with exception of the slate hole



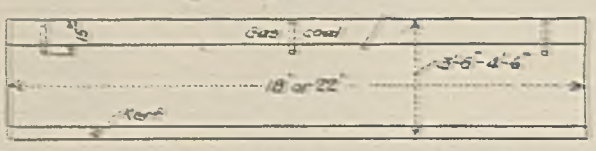
Micco No. 3 – Working bottom bench without car height



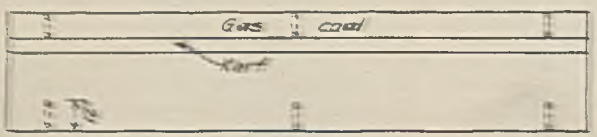
Cmar No. 5 – Bench mining, hand-loading sections, thin impurity bands



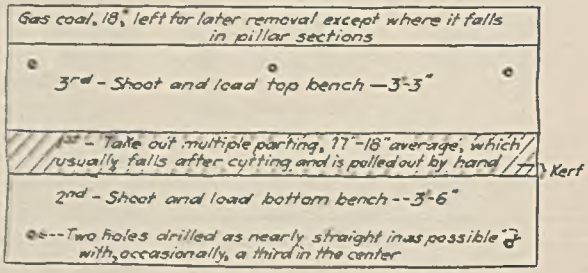
Cmar No. 5 – Bench mining, hand-loading sections, heavy impurity bands



Stirrat No. 19 – Bottom cutting – hand-loading sections



Stirrat No. 19 – Cutting under gas seam – hand loading sections



Cmar No. 4 mine – Full seam, solid work; on pillars, above process is reversed

Fig. 8—Face preparation and loading plans at Logan division mines

usually breaks down of its own accord. Otherwise, it is pop-shot. As a rule, it is possible in a room to gob all but about one car of the parting material and cuttings.

In solid work, the next step after parting removal is drilling the bottom bench with two—sometimes three—holes as nearly straight in as possible in a softer layer of coal in the bottom of the seam. These are loaded with pellet powder, and after shooting the coal is loaded. Next, the top bench is drilled with three holes under the gas layer, also as nearly straight in as possible, but in any event not into the gas coal. The top bench under the gas coal then is shot and loaded. In pillar sections, the above process is reversed and the top bench is taken first after the parting is removed.

Normally, the gas coal is left up until orders warrant its recovery, except where it comes with the top bench in pillar sections. It is broken down with pop shots and loaded separately, but in any event it must not be taken down

any closer than 15 ft. of the face. At Omar No. 4, as at other mines of the company in the Island Creek seam, should gas coal be mixed with the regular loadings it is picked out on the tipple, mixed with the separately loaded gas coal and shipped as a low-grade steam fuel. Every effort, however, is made to keep this grade out of the regular output by the system outlined above, concentrating rather on loading it separately in the mine as required and preparing it separately on the surface.

In the hand-loading sections at Omar No. 5, cutting also is done in the parting. At this mine, no territory carrying a parting over 24 in. is worked at the present time. Two examples of cutting and face operation at No. 5 are given in Fig. 8. In one case, the parting consists of a 1-in. slate band above a dirt seam varying from 2 to 6 in. The cut is made with a 29B machine to take out all the dirt seam. The cuttings are gobbed, after which the top bench is drilled with three holes, shot with pellet powder with electric squibs or permissible powder and electric detonators and loaded. Next the bottom bench is shot with three holes and loaded. In other sections (see example, Fig. 8) the parting, usually multiple in character, thickens. In this case, the dirt band and such other of the parting as may be included is cut out just under the top coal, which then is shot with three holes and loaded. Next, as much of the remaining parting material as possible is skinned off without shooting. The remainder is shot up with the bottom bench and removed during loading.

Cutting practice at Stirrat No. 19 mine originally was predicated on separate mining of the gas coal, which comes down on the top of Island Creek Upper Split worked at this operation. Consequently, cutting was first done under the gas coal with 29B machines. This still is the practice where these machines are used at No. 19, in which case the bottom bench (Fig. 8) is shot with three holes charged with pellet powder and loaded. Under the original system, the next step was to blast down the gas coal and load it into separate cars, which were segregated and run through the tipple at one time. At present, however, both the top and bottom benches are shot in series and the two kinds of coal are loaded together, as it has been found more feasible and equally satisfactory to pick out the gas type on the tipple. This viewpoint has been reflected in later mining-machine installations, which are of the 29L bottom-cutting type. Where these are used, the coal is broken down with three holes started below the gas layer and angled to the top. Taking the gas coal at the same time as the rest of the bed, as distinguished from No. 4 practice, is necessary to secure car height.

Standard-kerf cutter bars with lengths of 7 and 9 ft. are used at all Logan division mines of the West Virginia Coal & Coke Corporation. Except in mechanized sections, hand drilling by the miner is the universal practice. Cleaning of the face is a major item in mining practice, and at mines where cutting in the parting is the practice, all material must be raked out and gobbed and the face and floor swept clean before any coal is shot. Where cutting is done in the coal either just above or just below the parting, kerfs must be cleaned out, not only as a means of removing any refuse material resulting from accidental cutting in the parting but also to facilitate shooting with less powder. Cuttings must be examined to see if they contain refuse, and if so they are gobbed.

MECHANICAL LOADING

+ West Virginia Coal & Coke Corporation

WITHIN the past year, partial mechanization of loading has been undertaken at two mines in the Logan division of the West Virginia Coal & Coke Corporation. At the Stirrat No. 19 mine, a complete mobile loading-conveyor transportation unit went into service in May, 1936. Three Joy 11-BU and one Whaley No. 3 size "Automat" loaders have gone in at Omar No. 5 mine since Jan. 28, 1936, the latest on Sept. 24. Present plans call for completely equipping this mine with mobile loaders. In addition, chain-and-flight-type conveying equipment used until October in driving water tunnels will be introduced into the bottom split of the Island Creek seam at Micco No. 3 mine.

The No. 19 conveyor-loader unit is employed in an Island Creek Upper Split territory with a thickness of approximately 42 in. A fairly good slate top and a slate bottom characterize this section. Equipment consists of three Joy, Jr., loaders, of which two are in use; four 300-ft. Joy chain-and-flight room-conveyor units, each with 20-ft. face conveyor; two 300-ft. chain-and-flight heading conveyors; one 50-ft. chain-and-flight cross conveyor; one 1,632-ft. Joy-M. & C. belt conveyor with Goodyear 26-in. 5-ply 28-oz. stacker-type belt with ¼-in. rubber face and 1/32-in. rubber back; four Goodman 12-AA shortwall cutters with 7-ft. bars and four Jeffrey and Little Giant one-man coal drills. With the exception of the belt (20 hp.) and the face conveyors (5 hp. each), all the conveyors are driven by 15-hp. motors. Cost of the conveyors and loaders was $60,000.

To develop the working territory, two headings 20 ft. wide were driven up on 50-ft. centers, using the two loading machines and the heading and cross conveyors and the belt conveyor —extended in 204-ft. sections. As the headings were advanced, rooms on 68-ft. centers were necked two cuts deep to make room for setting up the drive sections of the room conveyors on the retreat. A supply track was laid in one heading (Fig. 1) and the belt was installed on a transit line in the center of the other heading. In future installations, to facilitate delivery of supplies, it is planned to place the belt and the supply track in the same heading.

At the outby end of the belt conveyor a pot hole was shot in the roof to permit elevating the belt discharge the proper distance over the sidetrack. Cars are pulled past the end of the belt by a special Brown-Fayro hoist with slow-speed load rope and quick-return tail rope. Empty trips thrown in at the head of the sidetrack are coupled to the cars already in the place. Loads are taken off at the foot

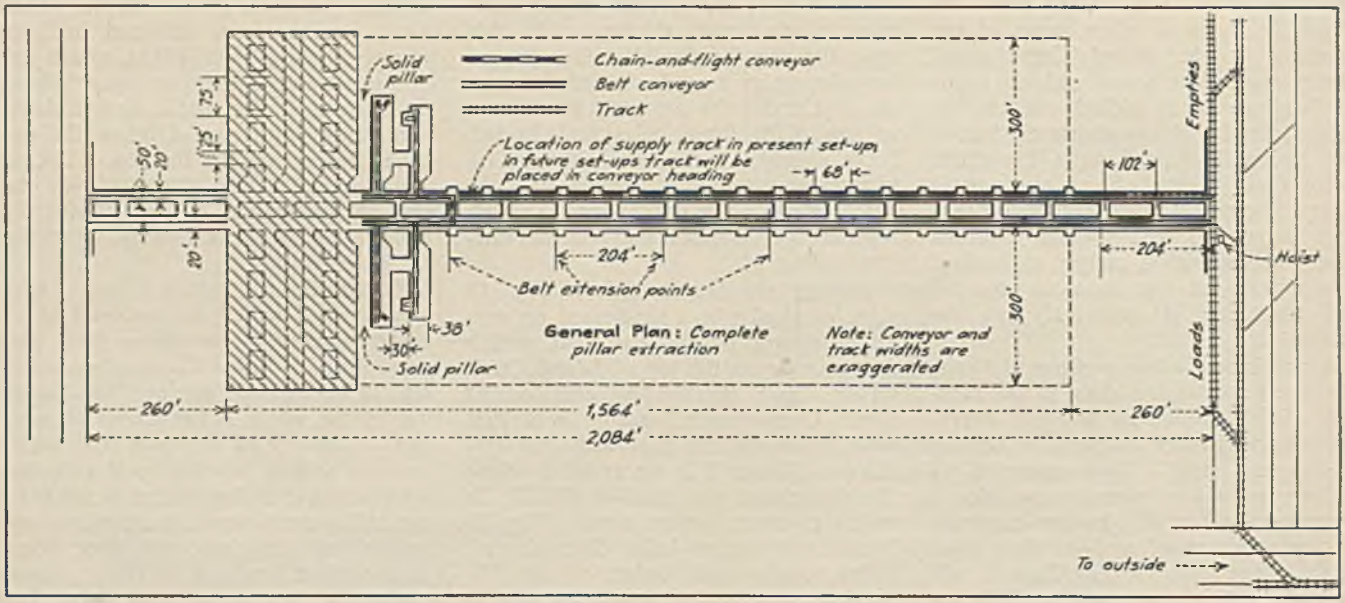


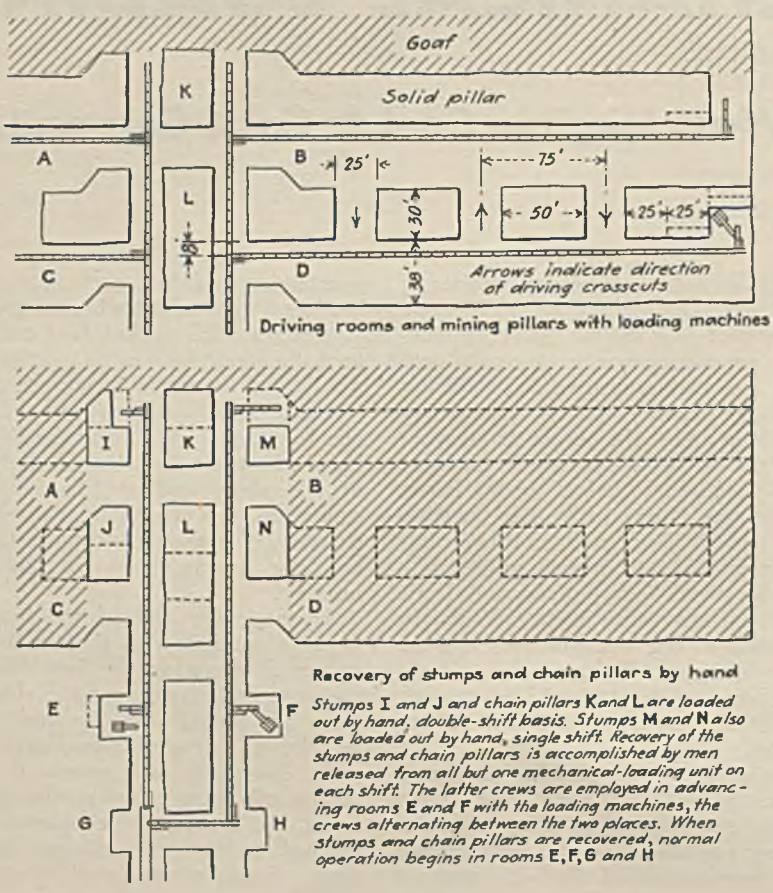
Fig. 1—General mining plan, mobile loader-conveyor transportation section, Stirrat No. 19 mine

of the siding. The hoist is operated from a pushbuttom station at the car trimmer's position. A roller-suspended transfer chute moved back and forth on angle-iron tracks by the trimmer prevents spillage while moving up the trip to bring an empty car under the belt discharge.

Extraction is based on driving two rooms up together on each side of the entry and then robbing back the pillars. Rooms under the present system are driven 38 ft. wide, leaving 30-ft. pillars. The pillar next to the goaf is left solid until the two rooms are driven up, whereupon both pillars are pulled back to the heading stumps. As operations in the room next to the solid pillar are kept slightly in advance, both room pillars normally finish at the same time, although one is pierced by 25-ft.-wide crosscuts on the advance. Conveyors are placed 8 ft. from the rib next to the goaf and the rooms are widened in the opposite direction.

Each pair of rooms is driven and the pillars removed by one loading machine and auxiliary equipment working two shifts per day. Stumps and chain pillars, however, are mined by hand as indicated in Fig. 2. During this phase of the operations, one loading crew on each shift is engaged in advancing one room on each side of the entry, alternating between the two places. Thus, enough headway is gained in these two places to compensate for the extra coal to be mined from the solid pillars left between the rooms and the goaf. Meanwhile, the other loading crews mine the room stumps and chain pillars in accordance with the schedule set forth in Fig. 2, using the face and heading conveyors. When extraction of these pillars is completed, the crews return to their regular duties and start the normal cycle of operations in the new rooms.

Fig. 2—Details of room development and stump-and-chain-pillar recovery with mobile loaders and conveyor transportation, Stirrat No. 19 mine



Crews Comprise 13-15 Men

The crew for a loading unit in a pair of rooms consists of one loader operator, one helper, two machinemen (who also drill and shoot), and one panman (who also sets timbers). When pillars are being mined, an extra man is employed on timbering. A similar crew is employed in the pair of rooms on the opposite side of the entry. In addition, a mechanic, a car trimmer and a foreman are present on each shift. Thus, the standard crew on a shift, determined by time studies, consists of thirteen men while driving rooms and fifteen men while pulling pillars. Responsibility for operations on both shifts is placed in the hands of a general foreman, making the total

force for an entire day of two shifts 27 men while driving rooms and 31 men while bringing back the pillars.

The operating cycle is based on alternate loading and preparation in two places, the loading machine travelling back and forth through the crosscuts. Each place, however, has its own cutting machine and drill. After loading is completed in a place, the machine men cut, drill and bugdust. Four holes are drilled in a 38-ft. place, starting down about 10 in. at the front of the cut and angling up to the top at the back. These holes are loaded with an average of nine sticks of Red E permissible powder. Meanwhile the pan-man adds a 6-ft. section to the room conveyor and sets the necessary timbers with assistance from the cutting crew. Normally, two rows of single props are set on each side of the conveyor line. The place then is shot, using electric detonators, whereupon it is ready to load. The loader operator and helper set any additional timbers required during loading.

Preparation and loading require approximately equal times. At the end of October, the installation was regularly accounting for 480 tons or more per day of four machine-shifts with seasoning of the crews and revisions indicated by experience still going on. The goal is an average of 6000 tons in four machine-shifts. One belt shortening at the end of October required 32 man-shifts. Movement of the chain-and-flight units is a part of the regular work, using the loading machines to pull sections about.

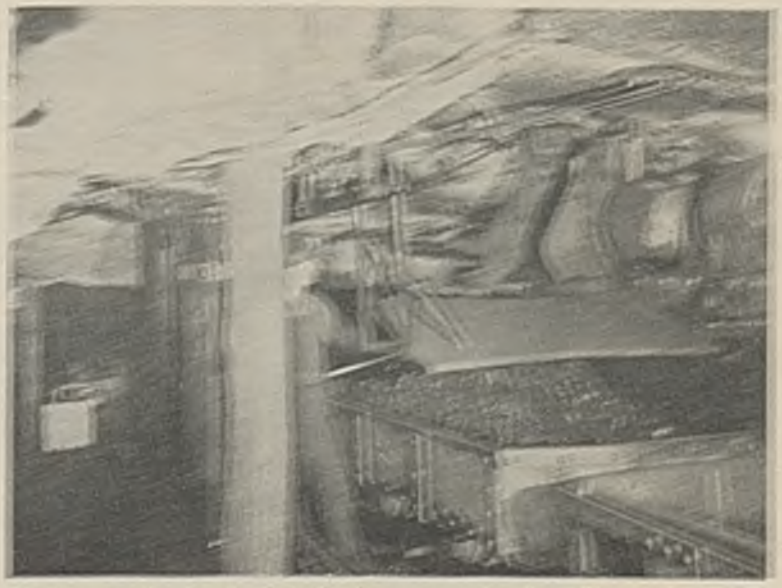
Mobile Loaders Used in No. 5

As compared with the No. 19 conveyor-loader section, the full Island Creek seam is worked in the mobile-loader sections in Omar No. 5 mine. Thickness generally ranges from about 6 to 7½ ft. This thickness, however, includes a parting or series of partings separated by thin layers of coal and constituting as much as one-third of the seam. This parting, or partings, must be removed before the coal is loaded and consequently double or triple cutting is an integral part of the mining cycle.

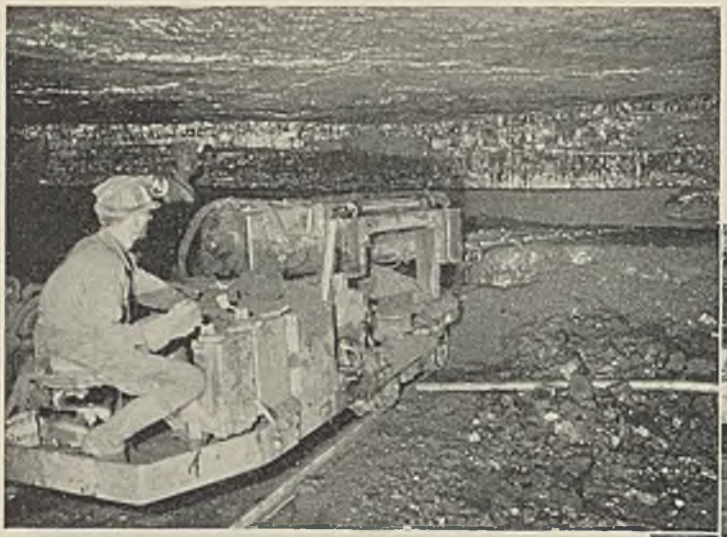
No. 1 loading unit, as indicated above, went into operation on Jan. 28; No. 2, April 25; No. 3, June 5; No. 4 (Whaley "Automat"), Sept. 24. Double-shift operation with the No. 3 machine started Aug. 12; with No. 2, Sept. 9. No. 1 loading machine is at present employed in loading coal one shift in driving the Piney Mains. On the second shift, this unit is used to load or gob the material cut out by the mining machine. No. 4 for the present is operated single shift loading in headings in 1st North Mains off the Piney Mains. Other major equipment in use in the mechanical-loading sections includes four 12A-AA Good-

Cutting and drilling in a loader-conveyor place, Stirrat No. 19

Mobile loader starting on a fresh cut in the loader-conveyor section, Stirrat No. 19

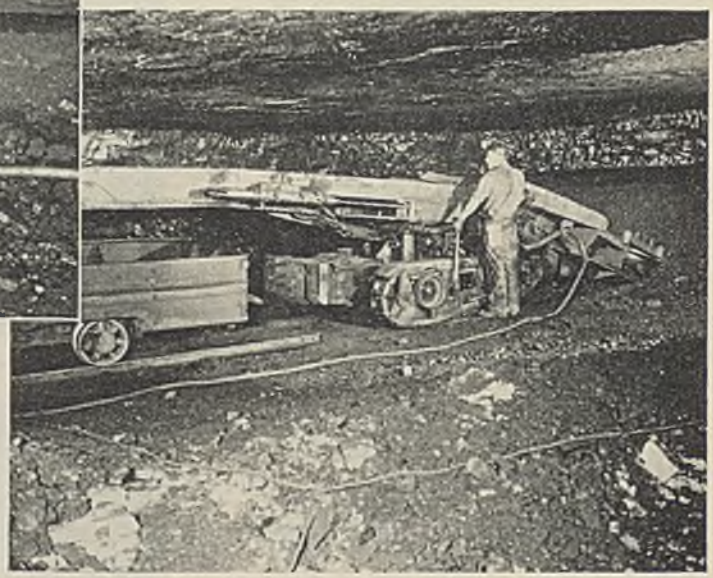


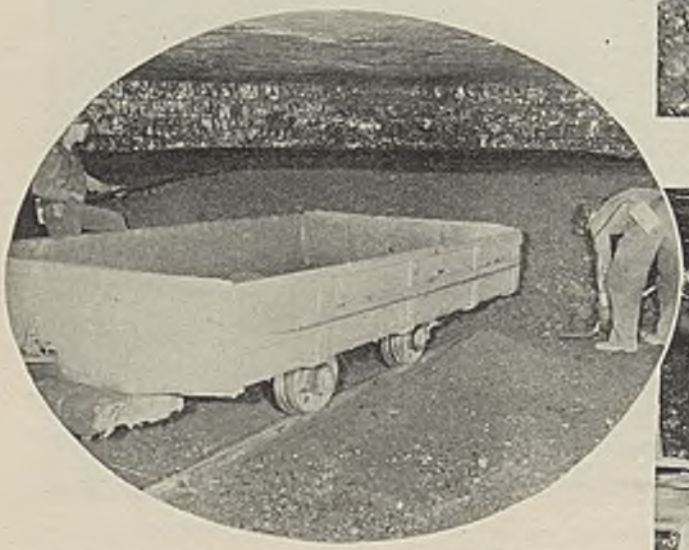
Discharge end of main belt, loader-conveyor section, Stirrat No. 19. A transfer chute carries the coal from one car to the next while the trip is being moved by the hoist at the left



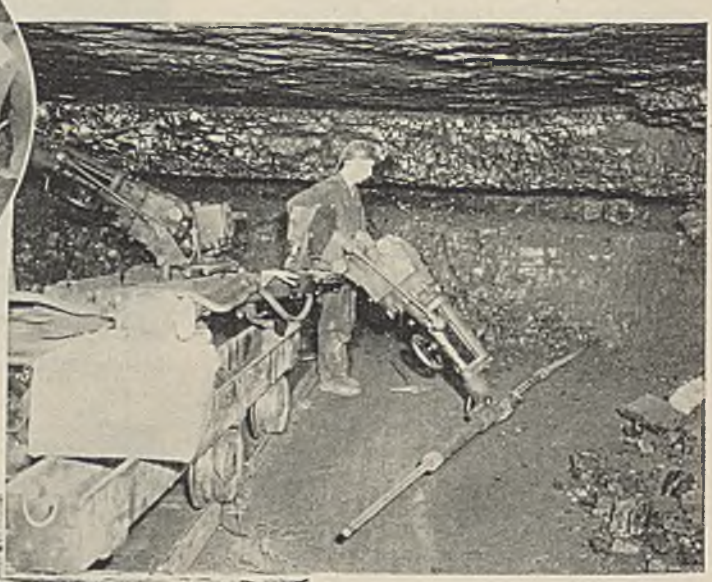
Slabbing machine making the first of three cuts to remove parting in the Piney Mains mobile-loader section, Omar No. 5 mine

Loading cuttings into a car in a Piney Mains place for disposal on the surface





Hand "slating" in a room neck in the mobile-loader section where the parting is double cut. The cuttings usually are gobbed but, as here, where room is not available, they are loaded out



Track-mounted double-spindle drilling machines bore the shotholes in the mobile-loader sections in Omar No. 5

Development loader starting a fresh cut in a slant in an Omar No. 5 mechanized section

man slabbers and three Jeffrey 56-A double-spindle track-mounted drills, in addition to the necessary locomotives and one portable drill on each section for emergency use, pop shots, etc.

Where the loading machines (Nos. 2 and 3) are employed in driving rooms and mining pillars, the standard mining plan shown in Fig. 2, p. 548, is followed. The machines, however, work one shift in rooms and pillars on one entry, as, for example, the upper entry in the above-mentioned Fig. 2, and then on the next loading shift move into the rooms and pillars on the adjacent entry. Thus, loading is spread over two entries, each providing a maximum of fourteen to sixteen possible loading places, the loader alternating back and forth. This plan gives ample opportunity for preparing the places, an operation that is scheduled to cover two shifts' time.

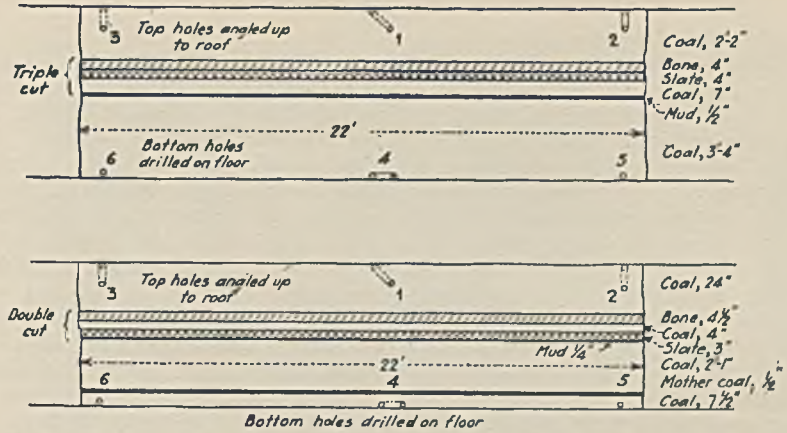


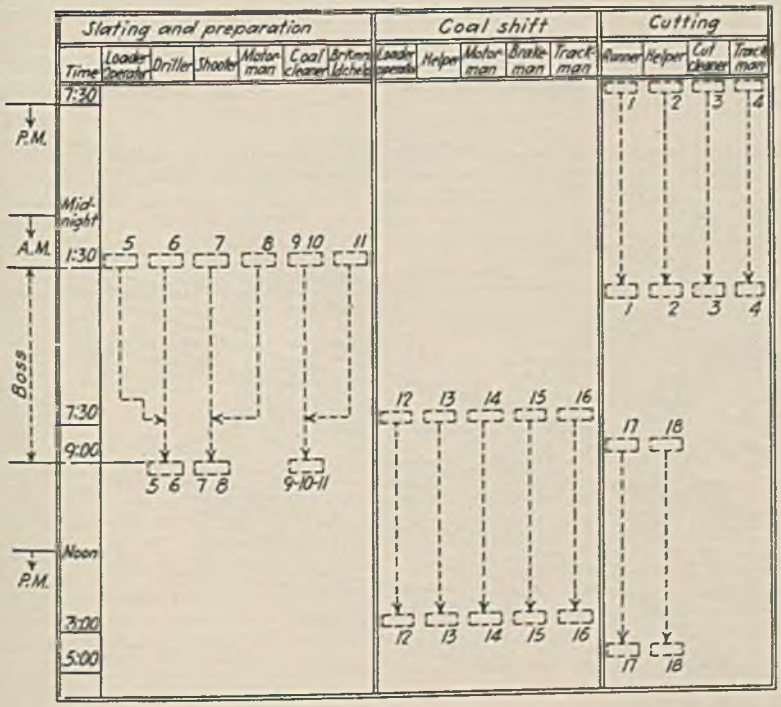
Fig. 4—Above, cutting and drilling plan in the mobile-loader section, Omar No. 5, where triple cutting is required; below, plan in same mine where only double cutting is necessary

Operations Cover 21½ Hours

Standard crews, determined as at No. 19 by time studies, comprise eighteen men, exclusive of the foreman. Such a crew normally is able to take care of the most difficult section encountered, and in easier sections the total may be as low as fifteen or sixteen at times, including absentees, while the maximum in a few instances may run up to nineteen. The activities of a crew, including both loading and face preparation, are spread over a period of 21½ hours, with the various phases overlapping to prevent loss of time due to a lack of places in which to work. Fig. 3 is a reproduction of the working schedule for a crew of eighteen men driving entries in the Piney Mains, where the material cut out of the parting is handled by the loading machine.

Under this schedule, the loading shift starts at 7:30 a.m., at which time, it will be noted, drilling and shooting on the "slating and preparation" shift are not quite completed. However, sufficient places ready for loading are available to permit the loading machine to start on coal. At 9:30 a.m., by which time two or three places have been loaded out, the first cutting crew comes on, working, with a half-hour lunch period, until 5 p.m. At 7:30 p.m., the second cutting crew, together with a cut cleaner and trackman, come on to finish the cutting, using the same machine, and start the preparation of the faces. These men finish work at 3 a.m., 1½ hours after the slating and preparation shift begins. The Joy operator on the slating and preparation shift with the motor crew immediately begins loading the parting out of the places with the cleaned cuts, and by the time these are finished additional ones have been prepared. Meantime, the driller and shooter start their work. Loading or gobbing of the parting is completed by 7:30 a.m., at which time the machine is turned over to the coal loading crew, while the operator and motor crew turn to with the cut cleaner, driller and shooter to finish the preparation work in the remaining places. By coming on duty at 1:30 a.m. the foreman is able to give most of his time to slating and preparation—the most important operations—and also can start the coal shift and check the work on the cutting shifts.

Fig. 3—Working schedule for the No. 1 mobile-loader unit in Piney Mains, Omar No. 5 mine, where parting material is handled by the loading machine



After loading is completed, the first operation in a place in the Piney Mains is laying up the track to permit the slabbing machine to cut. Three cuts are made as indicated in Fig. 4. The cut cleaner, who usually accompanies the machine, then rakes the remaining material out of the cut, after which the temporary track is pulled out from under the refuse by the cutting machine. The trackman then comes in and finishes the job of getting the rails and ties back so that the loading machine can work in the place. This completes operations on the cutting shift.

Loader Handles Cuttings

On the slating and preparation shift, the loading machine picks up the cuttings and either gobs them or loads them into mine cars, as conditions dictate. Then the face is swept with a broom and the bottom is cleaned up to eliminate the possibility of any of the cuttings getting into the coal. The place is drilled as shown in Fig. 4, using three holes in the top and three in the bottom. The holes are loaded with permissible powder and are fired

with electric detonators, after which the place is ready for the loading machine. Careful stemming and shooting usually are required, as the coal generally is burned to both the top and bottom rock.

In the sections where hand slating is the practice, the same relation between the cutting, slating and preparation, and coal shifts is maintained, except that conditions usually are such that only one cutting crew is necessary. As handling of the cuttings by the loading machine is eliminated, the Joy operator and motor crew are unnecessary, although this gain is partly offset by the fact that hand slating requires more labor. In addition, in room-and-pillar sections one or two tonnage men are employed in recovering stumps on the coal shift, and timbers must be set, particularly on pillars. On this basis, the crew will comprise sixteen to eighteen men.

With hand slating, operations in a place begin with laying the track up to permit cutting. Two cuts, placed as indicated in Fig. 4, usually are all that are required in these sections. Two slate men then come into the place, clean out the kerf, shovel the cuttings into the gob or load them out if room is not available in the place, and then sweep the face and clean up the floor. The place then is drilled and shot, whereupon it is ready for the loading machine. In connection with the organization of mechanical-loading crews, it should be noted that they are set up with the understanding that if any member finishes his particular work before the end of the shift he is to help out in any other capacity where his services may be required, with the idea that all work allocated to a shift must be completed within the allotted time.

Machines are serviced during the loading shift by a 6-ton gathering locomotive, and, to facilitate car-changing, turnouts and changing tracks are laid in each crosscut as the place advances. As a further step in reducing changing time, the present mine cars are being built up $6\frac{5}{8}$ in. to increase capacity.

All loading units installed in No. 5 mine to date have been placed in sections where the conditions are most adverse. Subsequent machines will go in territories where more favorable conditions are present and particularly where only single cutting will be necessary to remove the parting. Seasoning of crews is yet to be completed for all units and further improvements in practice are expected when fuller experience has been gained, but on Oct. 7 a total of 1,615 tons was produced in six coal-loading shifts with an expenditure of 104 man-shifts, which included all labor involved in delivering the coal to the sidetrack. Eventually, an average of 100 cars per machine-shift is expected.

TRANSPORTATION

+ West Virginia Coal & Coke Corporation

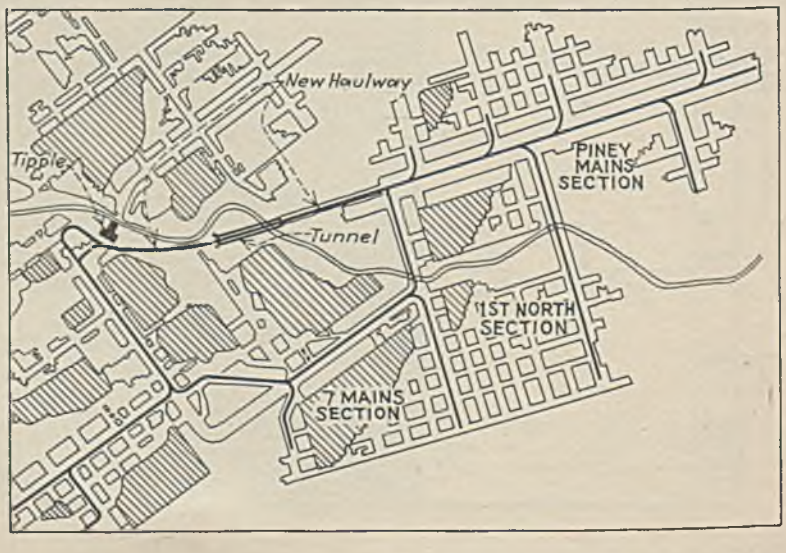
TRANSPORTATION, a major factor in the operation of any mine, takes on added importance at the Logan division operations of the West Virginia Coal & Coke Corporation, where natural conditions dictate in general the use of $2\frac{1}{2}$- to 4-ton cars, meaning that a larger number must be handled for the same tonnage, and where, as a result of a long producing history, average main hauls range from 4,500 to 9,100 ft. The importance of efficient transportation in the Logan division operating picture is evidenced by the fact that major improvements in this department in the last six years to maintain or increase output and reduce cost have reached a total of $325,000.

Measures involving a sizable financial outlay include: new mine cars and anti-friction bearings; the construction of tandem haulage locomotives; replacement of main-line tracks with new tracks incorporating heavier rail and treated ties; and construction of new haulways both inside and on the surface to reduce tramming distances, in addition to improvements in auxiliary and related activities directed toward better design to reduce upkeep cost, improved maintenance practices, adequate power supply, etc.

Main hauls at the Norton and Junior mines, which, with Bower No. 12 coaling station (200 tons per day), comprise the Elkins division, are respectively 2 and $1\frac{1}{2}$ miles. These and other main routes are laid with 45-lb. steel and No. 3 turnouts. Two 10-ton General Electric locomotives pull the average daily output of 1,500 tons at Norton, while two similar units account for Junior's production of 1,000 tons.

Gathering at Norton is performed

Fig. 1—Main-haulage routes at Omar No. 5, showing new construction to cut distance to the Piney Mains section one mile

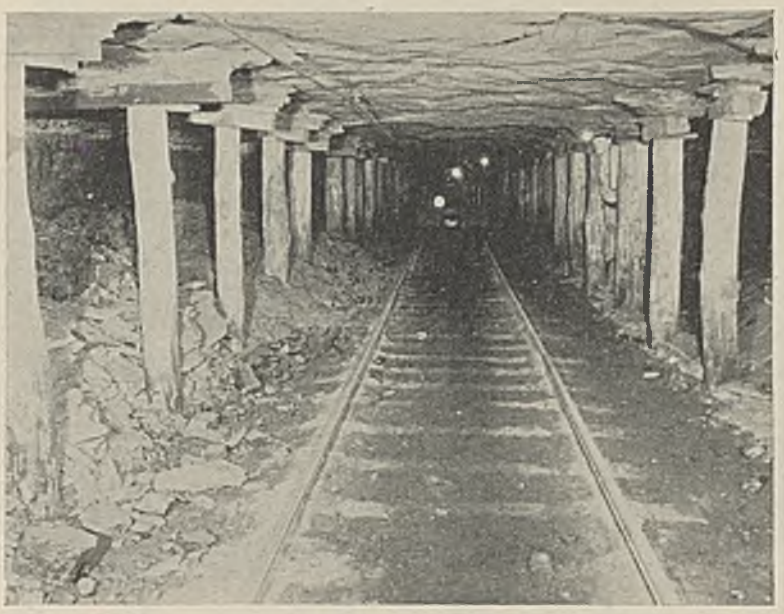


by three Goodman 2600R 5-ton locomotives, four General Electric 6-ton locomotives and four horses. Two similar Goodman machines, one 6-ton Baldwin-Westinghouse locomotive and seven horses are used at Junior. Rooms are laid with 20-lb. rail on steel ties.

Reflecting the fact that 6½ ft. of coal is taken at Norton, 400 single-flare wood cars with a height of 50 in. and a capacity of 2.8 tons are in service. Of this total, 125 are equipped with Timken and Whitney Wonder bearings. Junior cars, as the coal averages only about 5 ft., are 10 in. lower, with a capacity of 2.5 tons. A total of 212 of the double-flare type are in service, 101 equipped with Timken bearings. Swinging endgates are standard t both operations.

That the measures taken to improve transportation in the Logan division have gotten results is indicated by the fact that while the average number of gathering and haulage locomotives in use in the first nine months of this year (72) is 30 per cent greater than in 1931 and the average number of cars supplied a loader per shift (3.35) is 28 per cent less, reflecting a progressive reduction in hours of work, accompanied by a substantial rise in wage rates, total haulage cost, including track and wire, is only 14.3 per cent higher (18.5c. per ton in the first nine months of 1936, excluding conveyor transportation, against 16.1c. per ton in 1931). Cost of locomotive maintenance and repairs to Oct. 1 this year was 2.7c. per ton, against 3.9c. in 1931 and 4.6c. in 1928; cars, 1.5c., compared with 2.5 and 2c.; and track and wire; 2.9c., against 2.6 and 3.8c., respectively.

As a guide in the construction of haulage roads, three classes of track have been established for the Logan division mines. Class A track consists of 60- (some 75-) and 45-lb. rail, the former for long-lived main haulways and the latter for shorter-lived flat and cross entries, or any place where, although traffic is not heavy, a haulage locomotive must operate off the main line. With 60- and 75-lb. rail, 6x8-in.



60-lb. rail on creosoted ties distinguishes main-haulage construction practice at Micco No. 3 and other Logan division mines

ties either 6 or 6½ ft. long, depending upon whether the gage is 44 in. (Earling and Rossmore) or 48 in. (at the other mines), are used. Ties 5x7 in. in section are installed under 45-lb. rail. Creosoted ties have been adopted for late main-haulage installations, and a proper subgrade is built up and the track ballasted.

Standards call for sixteen ties per 30-ft. rail, with staggered joints and fishplates on the inside and angle bars on the outside. No. 4 turnouts with cast-manganese-steel frogs, parallel-throw switch stands and spring connecting rods are standard, although some turnouts with Nos. 3½ or 3 frogs have been installed in tracks at the tipples. Ties are aligned on the clearance side, which is kept clean, and trolley wires, positioned 6 in. outside the outer edge of the ball of the rail, must be kept at least 5 ft. above the rail, this standard governing brushing in low coal.

"Class B" is the designation given all room-entry and similar track, consisting of 20- or 30-lb. rail on 3x5- or 4x6-in. ties, eighteen ties per 30-ft. rail. West Virginia No. 2 turnouts with plain ground-throw switches are standard. Cast-manganese-steel frogs are employed invariably. Full-length fish plates are required. Class C, or room, track differs from Class B only in that it is laid with steel ties. Steel-tie turnouts are laid with regular West Virginia ties except for four special ties under the switches. In Class B and C track, one rail usually is carried under the sight line of the place (see also Figs. 3 to 7, p. 549) to provide space on one side for gob storage. Where top must be taken in room headings, minimum height of the wire above the rail is 4 ft. Rooms usually are necked on a curve to facilitate equipment travel.

Wood ties, unless otherwise specified, must be cut from sound oak and must be free of decay, red heart and other defects. Thickness tolerance is ¼ in. under or ¾ in. over; length, 1 in. under or 2 in. over. Ties must be straight, well hewn or sawn on four sides and cut square at the end. Bottom and top must be parallel and the bark removed in the case of the hewn

Table I—Major Features, Mine-Car Equipment, Logan Division

	Earling		Rossmore		Micco No. 3,	Omar No. 4,	Omar No. 5,	Stirrat No. 19,
	Wood	Composite	Wood	Composite	Wood	Wood	Composite	Composite
No. cars in use	259	100 (a)	189	200 (a)	325	348	670 (a)	736 (a)
Type	Endgate		Solid		Endgate	Endgate	Solid	Endgate
Length, over all, ft.-in.	10–1	11–1¼	10–1	11–1¼	11–5	11–5	11–7 (b)	12–6
Length, inside, ft.-in.	8–5½	9–7¼	8–5½	9–7¼	9–6	9–6	9–11 (b)	10–10
Width, inside, ft.-in.	5–0	5–8	5–0	5–8	5–10	5–10	6–4 (b)	6–8
Height over rail, in.	35¼	30	35¼	30	37.32	37,32	31 (b,c)	27
Wheel diameter, in. (d)	14	14	14	14	14	14	14	14
Type of bearings	Plain	Anti-friction (e)	Anti-friction (e)	Anti-friction (e)	Anti-friction (e)	Anti-friction (e)	Anti-friction (e)	Anti-friction (e)
Capacity, level full, cu. ft.	68	79	68	79	97	97	95 (b)	84
Track gage, in.	44		44		48	48	48	48
Average mine output, tons	1,000		1,600		1,000	1,400	3,000	4,000

(a) All composite cars are of Brown-Fayro manufacture, with the exception of 160 completely rebuilt Hockensmith cars at Omar No. 5. (b) Applies only to new Brown-Fayro cars. (c) All cars at Omar No. 5 now being built up 6⅜ in. (d) New composite cars are equipped with "semi-steel" wheels. (e) All anti-friction bearings are Timken with the exception of 100 cars with Tyson bearings at No. 19.

Note: With a few exceptions all Brown-Fayro composite cars are equipped with shoe-type brakes.

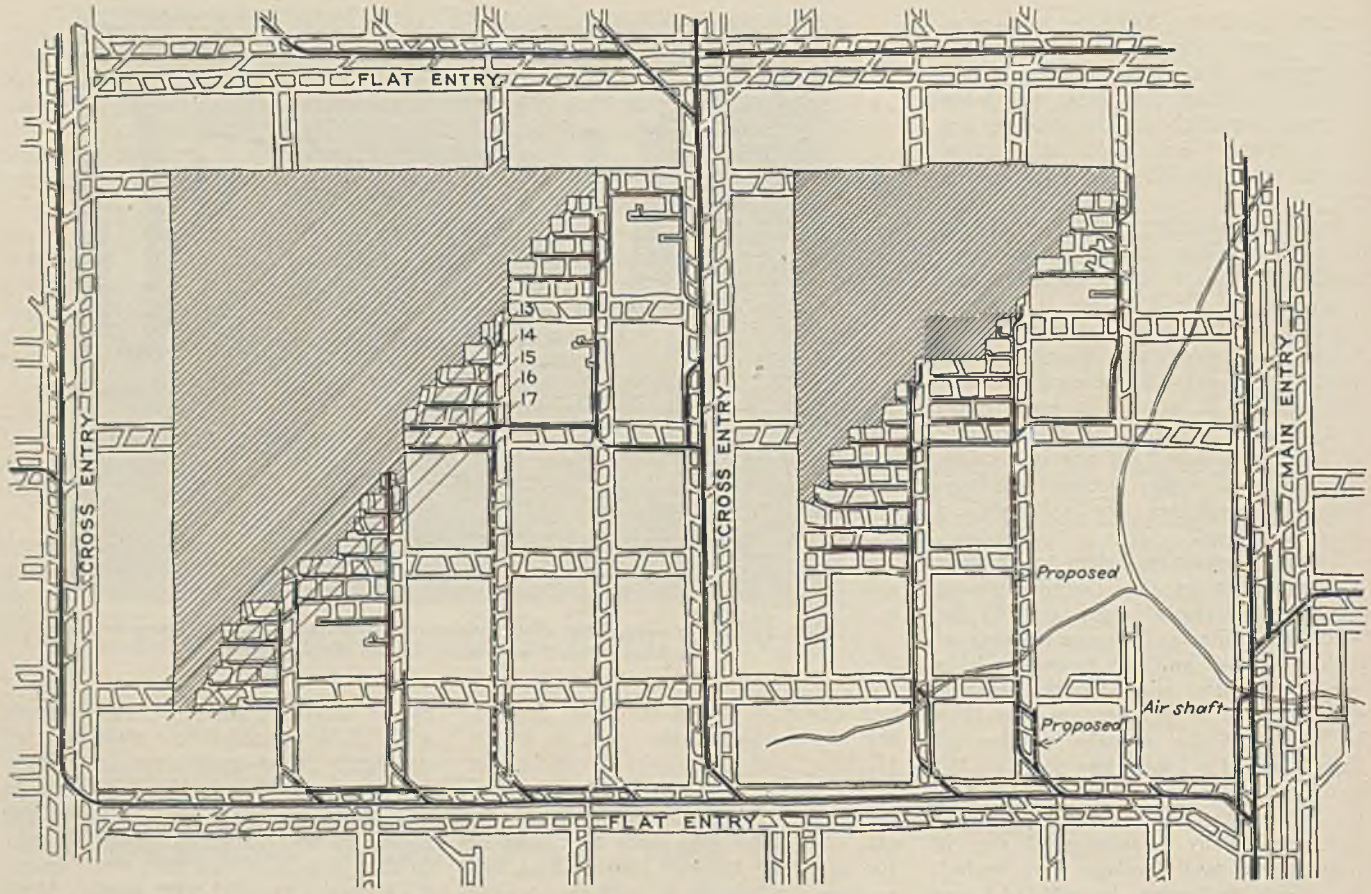


Fig. 2—Typical room-and-pillar working section, Logan division, showing main, secondary and room tracks and location of sidetracks

type. The difference in thickness at the two ends or side must not exceed ½ in.

In addition to much reconstruction of track in existing haulways, the years 1930–32 were marked by the construction of cut-off roads at Omar No. 5 and Stirrat No. 19 mines. At No. 5, a 7x12-ft. rock tunnel 900 ft. long on a 3-per-cent grade against the loads was driven to shorten the haul one mile (Fig. 1). The work was done by the company and segmental steel sheathing (Commercial Shearing & Stamping Co.) supported on concrete side walls was used where the roof was bad. At No. 19 mine, a new outside haul was constructed to shorten the distance to the tipple three-quarters of a mile, as compared with the old underground route. Main haulage tracks at Nos. 5 and 19 and also at Micco No. 3 were relaid with 60-lb. steel on creosoted ties using gravel and slag ballast, which standard has been followed in major construction at all operations since that time. Cost of the creosoted ties at Nos. 5 and 19 at the time of installation was $1.45 each, against 45c. for the old, slightly smaller, untreated ties, and the ultimate expected saving at the end of sixteen years was $3.40 per tie. To date, a substantial portion of the creosoted ties have been in service six years without a single removal due to decay. In addition to their part in speeding up haulage, the track improvements also have resulted in a substantial decrease in maintenance cost, as noted above.

In recent main-haul construction at Micco No. 3 mine, what appeared to be costly clean-up jobs were avoided by using the fallen material as a subgrade. The most feasible routes for the new tracks were through old headings, where much of the 3 to 4 ft. of slate between the seam and the overlying gas coal had fallen. To escape the cost of loading out this material, it was decided to slide as much of it as possible into the crosscuts and break up and level down most of the remainder for a roadbed, using the rest for ballast. Very little shooting was necessary. Where the divider was still up, it was taken down, leaving the gas coal, which makes an excellent roof, in place. Access to the new tracks is provided by short sections on slight upward grades. The savings over loading out the fallen material, with the extra shooting that would have been involved, more than defrayed the cost of the rails, ties and fittings in the new track and the labor required to lay it.

One of the principal features in the modernization of haulage roads was the construction of sidetracks convenient to the working sections. A typical section, with main, secondary and room haulage and sidetracks is reproduced in Fig. 2. In general, sidetracks are constructed in the mouths of room entries and are moved as often as the advancement of pillar lines makes it necessary, with the object of keeping the maximum haul of any gathering locomotive less than 1,800 ft. in the absence of special conditions. Supplementary sidetracks are built on flat and cross headings to facilitate gathering

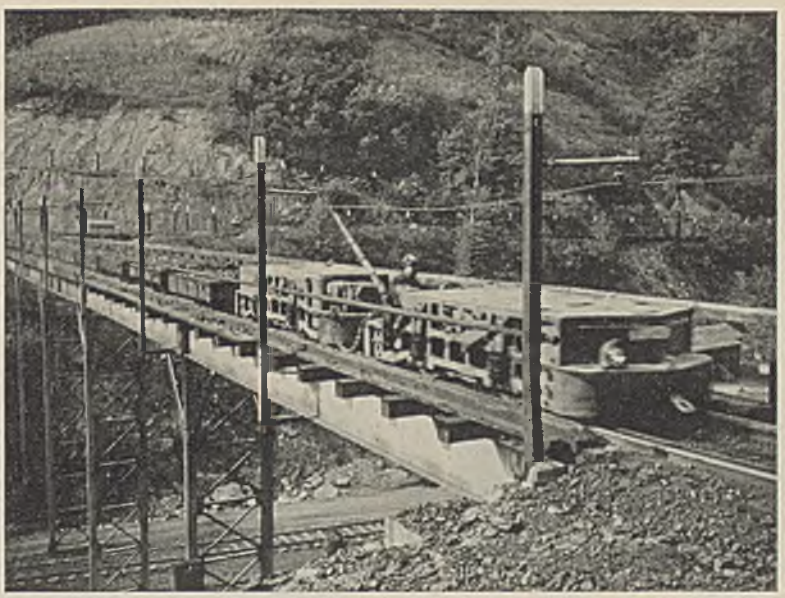
Table II—Main-Haulage Locomotives, Tramming Distances and Trip Sizes, Logan Division

	Locomotives				Avg. Length Main Haul, Feet	Grades vs. Loads	Maximum No. Cars Per Trip	Avg. Daily Output, Tons
	No.	Make	Type	Weight				
Earling	2	Gen. Elec.	Single	10	6,500	Against	25	1,000
Rossmore	2	Goodman	Single	13	4,500	Against	30	1,600
Micco No. 3	1	Westinghouse	Single	10	6,000	Favor	25	1,000
Omar No. 4	2	Goodman	Single	13	9,100	Favor	30	1,400
Omar No. 5	2	Westinghouse	Tandem	20	7,800	Against	25	3,000
	2	Goodman	Single	13				
	1	Westinghouse	Single	10				
Stirrat No. 19	2	Westinghouse	Tandem	20	5,800	Favor	30	4,000
	2	Westinghouse	Single	10				

during development and also when any room entry reaches the stage where the usual sidetrack is cut off and storage space elsewhere is required. Additional sidings also are constructed elsewhere if convenience and elimination of interruptions make them desirable.

Better rolling stock is another factor in the transportation gains made in late years at Logan division mines. In addition to 650 sets of anti-friction bearings for cars retained in service, a total of 1,050 new Brown-Fayro composite-type steel and wood cars have been purchased since 1930 at a cost of $207,500. Adding in the cost of the bearings ($37,750) brings the total major expenditures for mine-car equipment up to $245,250, exclusive of the cost of rebuilding many of the original cars that could be salvaged. Including new, old and rebuilt cars, a total of 2,827 are in service in the six Logan division mines, which produce an average of 12,000 tons per day. All but 259 of these cars are equipped with anti-friction bearings (Timken, 2,568; Tyson, 100). The major features of the various types are summarized in Table I.

Steel hood plates are used in the new composite-type cars to allow the wheels to be set up into the bottom and thus reduce the height over the rail, which varies from 27 to 31 in., giving level-fall capacities ranging from 79 to 95 cu.ft. To reduce changing time after mobile loaders, Omar No. 5 cars are being built up 6§ in. Wood cars which have been retained at some operations are 32 to 35¼ in. over the rail. Capacities vary from 68 to 97 cu.ft. "Semi-steel" wheels 14 in. in diameter and shoe-type metal brakes were installed on the composite equipment, with the exception of a few late units without brakes. Double-web wheels, which reduce the possibility of flat spots, have been installed on a number of cars in late years. Forged links are widely used to facilitate coupling and eliminate breakage. As noted above, one result of the revision of mine-car equipment has been a substantial decrease in the cost of maintenance and repairs.



Tandem locomotives, similar to this unit pulling a 30-car trip across a bridge, are used at Omar No. 5 and Stirrat No. 19 mines

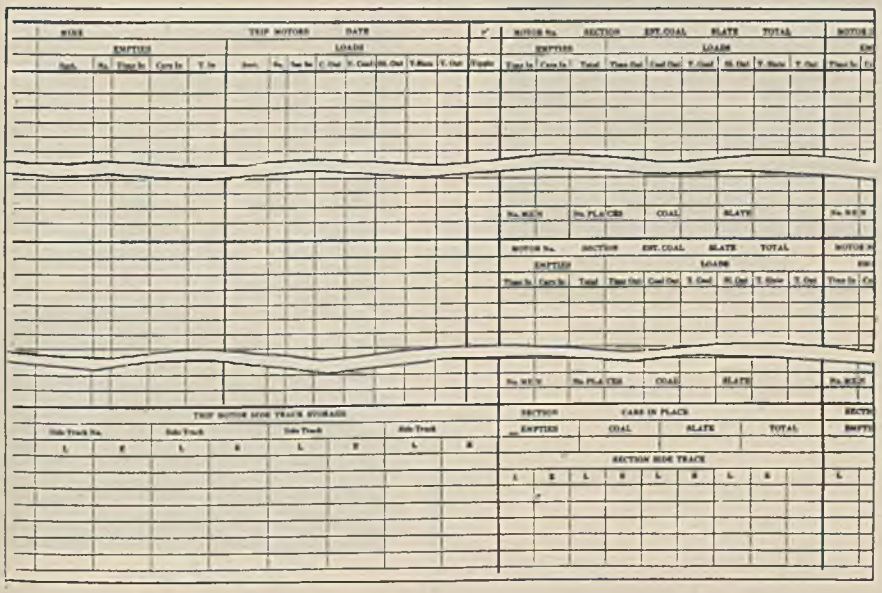
Six-ton Jeffrey cable-reel gathering locomotives are in the majority at Logan division mines, supplemented by General Electric 4-, 5- and 6-ton and Goodman Class 2600R 5-ton units. The list at the end of October, some of which are used for supply service, was: Jeffrey—6 tons, 45; General Electric—4 tons, 2; 5 tons, 7; 6 tons, 2; Goodman, 5 tons, 7. Haulage locomotives are listed in Table II, along with their duties.

In addition to a new 10-ton locomotive for Stirrat No. 19, two tandem units have been installed at the same operation since 1930, plus two other tandem units at Omar No. 5. These tandem units were assembled from 10-ton single locomotives in the company's shops to secure the advantages of the extra haulage capacity provided by a tandem job as compared with two single locomotives. All other locomotives, both gathering and main-line, have been rebuilt to make them conform with modern standards. This rebuilding included changing the Jeffrey and Goodman gathering locomotives from 6-7 to 4 m.p.h. in accordance with general practice at the present time, thus reducing power peaks while gathering the same or a greater number of cars in an equal time. In addition to higher efficiency, locomotive reconstruction has resulted in a decrease in cost of maintenance and repairs.

Dispatcher control by telephone is in effect at all Logan division mines, supplemented in a few instances by blocks as a safety measure. The dispatcher in each case controls the movement of all trips, including man and material trips, as well as any track-mounted equipment (cutters, drills, loaders, etc.) which finds it necessary to come out on the main line, working from the control sheet reproduced in part in Fig. 3. This control sheet also includes spaces for other information useful from the supervision or record standpoint. Maximum main-line trip sizes have been prescribed for each mine to keep down power peaks and reduce wear and tear on locomotives and cars as well as breakage of couplings, etc.

In common with an increasing number of other coal-mining operations, the West Virginia Coal & Coke Corporation also employs conveyor transportation in its Logan division. For details see article beginning p. 551.

Fig. 3—Dispatcher control sheet adopted for Logan division mines in 1931



WITH THE OPERATING DEPARTMENT

JOHN C. LOWRY, JR.
Assistant Manager of Mines

W. W. BREWER
Superintendent, Rossmore Mine

J. T. FALLON
Superintendent, Omar No. 4 Mine

C. W. MOORE
Power Plant Superintendent

JOSEPH HOYLMAN
Superintendent, Micco No. 3 Mine

W. J. HINES
Superintendent, Omar No. 5 Mine

H. D. BOWKER
Chief Chemist

WEST VIRGINIA COAL & COKE CORPORATION

THOMAS A. STROUP
Chief Engineer

EDWARD JONES
Superintendent, Earling Mine

L. KNAPP
Purchasing Agent

SCOTT WILSON
Superintendent, Norton and Junior

T. J. STEELE
Superintendent, Stirrat No. 19 Mine

J. R. BUTCHER
Chief Electrician

A. H. WHITT
Assistant Chief Engineer

PREPARATION

+ West Virginia Coal & Coke Corporation

PREPARATION practices at the mines of the West Virginia Coal & Coke Corporation are based on the policy that the operating department must arrange to produce what the sales department sells. Consequently, maximum flexibility in screening and mixing are stressed. Hand picking is employed to supplement the work of the miner, with mechanical-cleaning equipment where conditions warrant its use. Research to ascertain possible betterments is coupled with regular sampling as a means of controlling the quality of the product. Special equipment has been installed for shipping dedusted nut-and-slack and dustless-treated stoker coal.

Partings of both the single and multiple types characterize the coal worked at most of the operations of the company, and consequently mining operations have been arranged with the object of eliminating the major portion of the impurities at the face (see pp. 547-551) by cutting, bench mining, etc., leaving to the surface plants, with one or two exceptions involving special equipment, only the tasks of polishing off the work of the miner and separating the product into the proper sizes. Included in the work of the surface plants in the Logan division is making a separation of the classes of coal produced at these mines.

The Elkins division comprises the Norton and Junior mines in Randolph and Barbour counties, West Virginia, respectively, and Bower No. 12, operated as a cooling station, in Braxton County. Both Norton and Junior, producing a byproduct, domestic and steam coal, are equipped to ship hand-picked and boom-loaded lump, egg and nut, in addition to slack and hand-picked mine-run, made by recombining the primary sizes in mixing equipment. Usual specifications are: lump, 4-, 2-, and 1-in.; egg, 4x2½-in.; nut, 2½x1-in.; slack, 2½- and 1-in.

Gravity screens are employed at Junior, while at Norton, lump, egg and slack are produced on shaker screens with round-hole plates. Lump is picked on an apron-type picking table-loading boom and egg on a rescreening-type grate-bar table and boom. Slack is loaded over a conveyor belt directly from the shaker if only three grades are being made. When nut is to be shipped, the slack is chuted to a 3x6-ft. Fairmont "Bronco" vibrating screen. The size over the screen, or nut, passes to a grate-bar picking conveyor, from which it is carried up to a 50-ton bin over the slack track above the tipple. Coal through the vibrator follows the usual path over the belt to the slack car. Use of the storage bin permits loading the nut and the slack on the same track at the same time. A reversible mixing conveyor, arranged to take lump and egg from the booms, permits loading any combination of primary sizes on the slack or lump tracks. The same results are obtained at Junior, although somewhat different equipment is used.

Omar No. 5 preparation plant, with the aerial tramway and refuse dump in the background

In conformity with the general practice in the field, Logan division preparation plants of the West Virginia Coal & Coke Corporation are, with some exceptions, equipped to ship lump, egg and nut-and-slack sizes, in addition to nut at some operations and cleaned mine-run. All tipples also are equipped to ship separately the small percentage of coal of a different character which occurs with the regular coal. At Earling, which produces gas and byproduct fuel, approximately 5 per cent of the total is shipped as splint (steam coal). "Gas" coal, which is sold as a low-grade steam fuel, is the different grade at all other Logan division operations.

While two apron-type picking tables and three loading tracks enable Earling to ship the standard sizes, it normally, however, loads only ⅜-in. lump and slack, with splint as a separate grade on a separate track. Under the present loading schedule, the feed is separated into 1¼-in. nut-and-slack and lump. The latter is run to the two tables, where the splint and any refuse is picked out. The splint is placed on the top strand of a cross conveyor, which carries it to an 18x18-in. Jeffrey

single-roll crusher adjustable to crush to a maximum range of 6 to 1¼ in. The bottom strand of the conveyor carries the splint back to the loading track.

Slack from the main shaker is passed over a 4x8-ft. Link-Belt PD vibrating screen, where it is separated into 1¼x⅜-in. nut and ⅜-in. slack. The latter is chuted to the slack car, while the nut is elevated to a Wilmot-Simplex jig with a capacity of 50 tons per hour. Cost of the jig installation, made late in 1932, was $15,000. Earling coal normally is easy to clean, but the fireclay encountered in the mine is concentrated in the nut size, making washing desirable. The washed nut, when ⅜-in. lump is being loaded, is conveyed to the common loading point for the two picking tables, where it joins the 1¼-in. hand-picked lump. By proper manipulation of the equipment, Earling can ship washed nut alone, nut-and-slack with the nut fraction washed or mine-run made up of ⅜-in. slack, washed nut and hand-picked 1¼-in. lump.

Lip Screens Used

Equipment at the Rossmore plant includes shaker screens, two picking table-loading booms and auxiliary picking equipment for shipping hand-picked lump, egg and nut, with nut-and-slack or slack and gas coal as the residual sizes. Mixing equipment permits loading hand-picked mine-run or any other combination of the primary sizes. Degradation screens for the lump, egg and nut are installed in the discharge chutes to the picking tables, an auxiliary conveyor taking the fines back to the slack track. The shaker at Rossmore, as at all other Logan division operations, is equipped with lip screens.

At Micco No. 3, three primary sizes are loaded. The shaker screen also separates out nut, and both egg and nut are picked on the same unit, the respective chutes from the screen discharging onto opposite sides of the apron-type table with division plates through the middle, thus separating the two sizes. A divider at the end of the table diverts the nut to a cross conveyor leading to the nut-and-slack car, where the nut is combined with the slack. Bar screens at the ends of the tables remove degradation from the lump and egg before they go onto the loading booms. This degradation is conveyed back to the nut-and-slack track. Hand-picked mine-run or any other combinations of the primary sizes can be made on a mixing conveyor. Micco No. 3 preparation plant was completed in 1932.

A double-deck gravity screen and two grate-bar-type rescreening picking table-loading booms are used at Stirrat No. 19 to make lump, egg and nut-and-slack. By removing the upper screen bars, thus eliminating the egg separation, it is possible to load 2-in. lump over one boom. Gas coal at No. 19, in conformity with general practice, is picked out and loaded separately. Tipple refuse, which consists of the small percentage of bone loaded out, including any coal lumps containing bone, is run to railroad cars for consumption in the central power plant of the company near Omar.

In addition to a mixing conveyor for any combination of the primary sizes, the Omar No. 4 preparation plant is equipped with a shaker screen and grate-bar picking table-loading booms for lump and egg, as well as a vibrating-screen plant put in operation in 1935 for making stoker coal and dedusted slack or nut-and-slack. The latter plant, which cost $17,000, includes Viking equipment for dustproofing the stoker size by the "hot-vapor" oil process and receives nut-and-slack from the main shaker. A Hocking Valley chute-type magnet is installed on the upper end of the main shaker to remove tramp iron, with a second unit in the chute used for loading stoker or dedusted nut-and-slack. Gas coal is picked out and loaded separately.

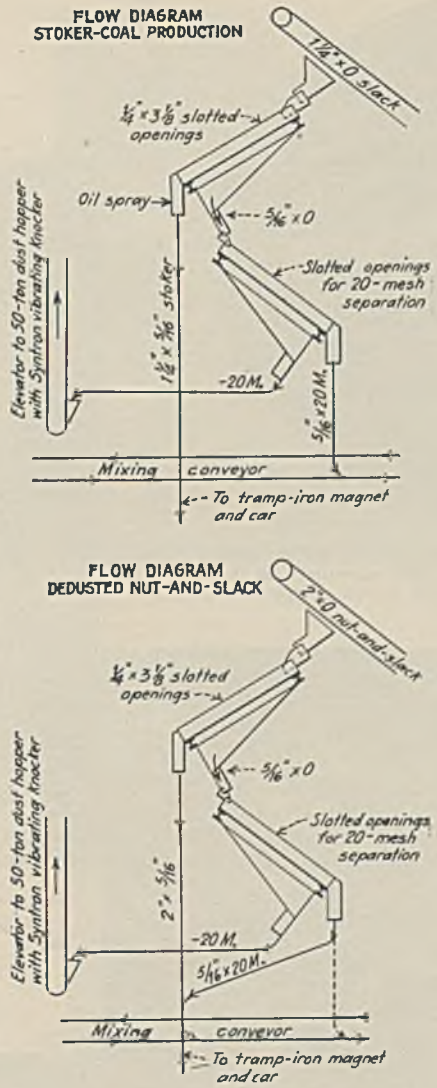


Fig. 1 — Diagrammatic arrangement of equipment in stoker coal and dedusting plant at Omar No. 4 mine, showing (above) flow of material when making stoker coal and (below) when making dedusted nut-and-slack

Stoker coal can be made at No. 4 only at times when nut-and-slack is not being shipped. Under the No. 4 marketing plan, however, this limitation seldom hampers production of the stoker size, as this plant normally ships mine-run made by recombining the primary sizes, after hand-picking, in a mixing conveyor. The mine-run goes to river-loading points at Cincinnati and Addyston, Ohio, where it is again screened and reconsigned or diverted to the company's wholesale yards at these points. Fairly large tonnages also are shipped from Micco No. 3 to Cincinnati and Addyston, with occasional lots from other plants, in addition to some lots of sized coal. Thus, when No. 4 is shipping mine-run, stoker coal can be made at any time by bleeding the slack from which this size is taken off the main shaker.

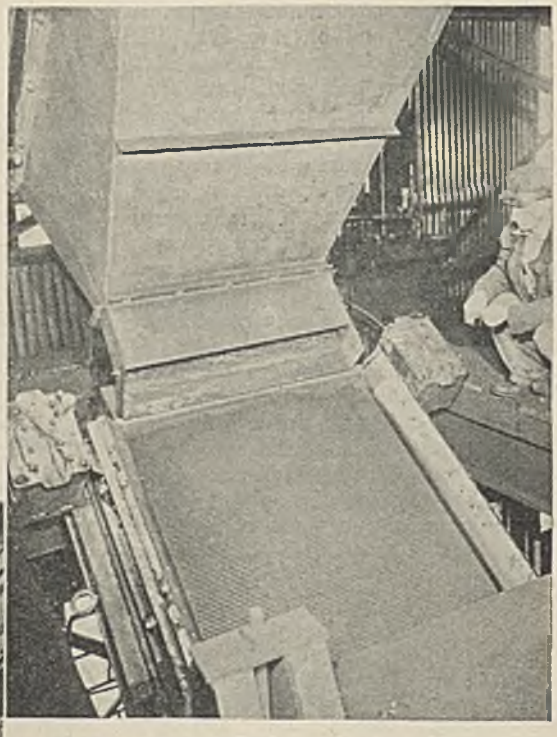
Stoker Coal Oil Treated

Stoker specifications are based on screening it through a 1¼-in. round-hole screen and over a ¼x3⅛-in. slotted cloth, the primary separation taking place on the main shaker and the secondary on a vibrating screen. The resultant is a 1¼x$\frac{5}{16}$-in. stoker coal, which is sprayed with hot oil vapor as it comes off the lower end of the vibrator. Average treatment is 3 qt. of oil per ton. Finally, the coal passes over the magnet on its way to the car. The minus $\frac{5}{16}$-in. slack is dedusted on a second vibrator, producing a $\frac{5}{16}$-in.x20-mesh product, which is run to the mixing conveyor for recombination with the mine-run. Provision is now being made for loading this size from the mixing conveyor on the egg track. Dust removed on the second screen is elevated to a 50-ton hopper with a Syntron knocker, from which it is hauled away and wasted.

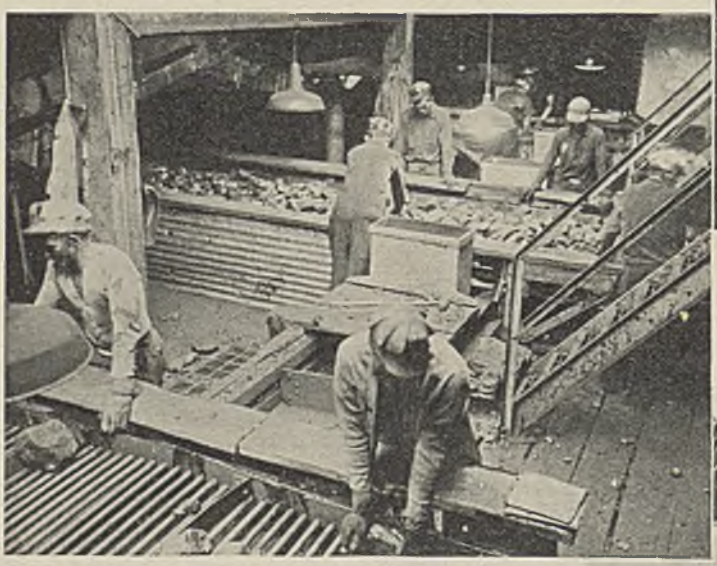
Capacity of the dedusting plant is 120 tons per hour. Equipment consists of two 4x8-ft. Type 400 Tyler electric vibrating screens in series, the second taking the minus $\frac{5}{16}$-in. coal from the first and doing the actual dedusting. When loading dedusted nut-and-slack, the oversize from the upper screen, which includes everything from $\frac{5}{16}$-in. up to the upper limit of the nut-and-slack being treated, is recombined with the $\frac{5}{16}$-in. x 20-mesh fraction in the chute leading to the car, or both sizes can be run to the mixing conveyor. The vibrators are preceded by a surge hopper, from which the coal feeds out by gravity through a retarding gate.

The upper vibrator is equipped with

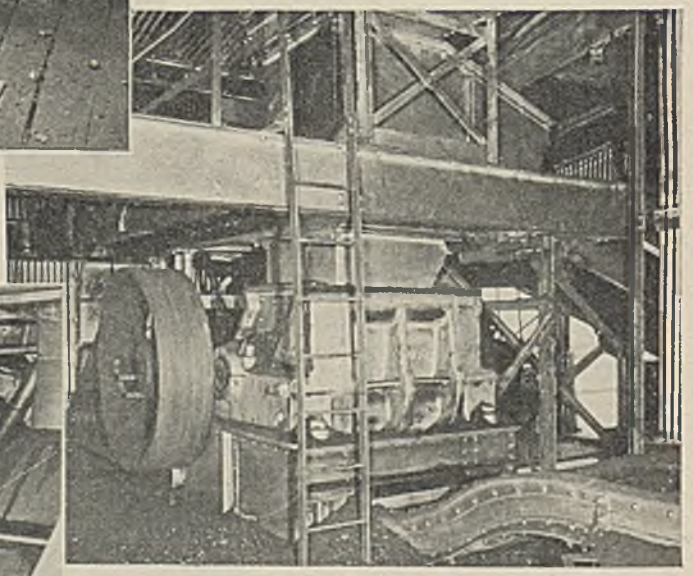
Typical of preparation in the Elkins division are these lump and egg tables in Norton plant. A third table elsewhere in the plant is used to clean nut



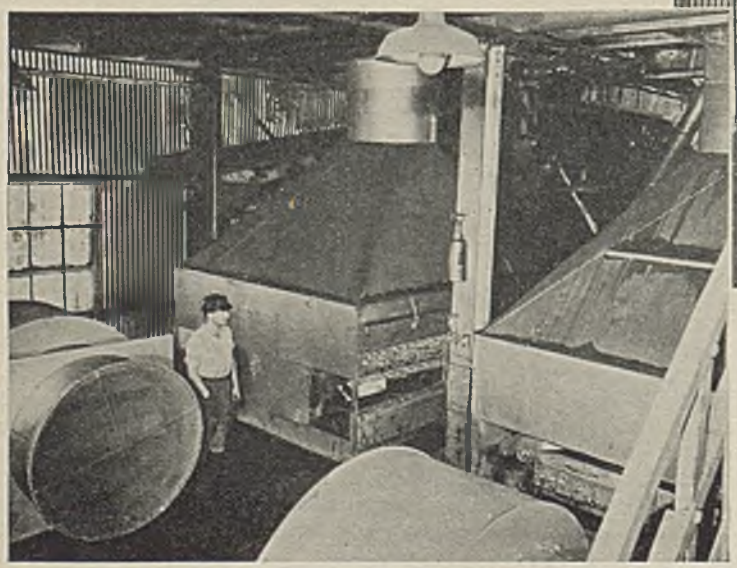
Stoker-coal preparation and dedusting are done on two vibrating screens at Omar No. 4. The heater for the oil-spraying system appears in the right rear



Picking is done on grate-bar-type rescreening picking table-loading booms at No. 5. Gas coal is thrown into the cross conveyor running beneath the tables



Single-roll gas-coal crusher at Omar No. 5. After crushing, the coal is separated into two sizes and hand-picked and air-cleaned



Slack at Omar No. 5 is cleaned in two pneumatic separators

Tyrod cloth. The lower vibrator (Fig. 1) carries a No. 2374 special Ton-Cap cloth with slotted openings for 20-mesh separation backed up by a ½-in. square-mesh cloth. Initial operation of the lower screen revealed that with the usual side-tensioning equipment early splitting of the cloth resulted. To overcome this, special end-tensioning equipment was installed, with some increase in cloth life. As a further measure, the ½-in. square-mesh backing cloth was installed, using the original side-tensioning units. As a result, screen-cloth life has been increased from two to sixteen weeks. In addition, the whipping action of the backing cloth makes the action of the screening cloth much livelier, increasing screening efficiency and reducing blinding.

By using a vibrating screen as the dedusting medium, heavier dust particles high in ash and sulphur are removed from the dedusted coal. The slotted openings also permit the passage of long slivers of impure material. Mother coal, which appears at No. 4 and breaks down into dust in the nut-and-slack, with consequent lowering of the fusion temperature of the ash, also is eliminated by dedusting, along with calcite, another No. 4 impurity. By dedusting, the ash-fusion temperature of the nut-and-slack is raised 150 deg. F., which was the major objective of the installation.

Fines Air-Cleaned at No. 5

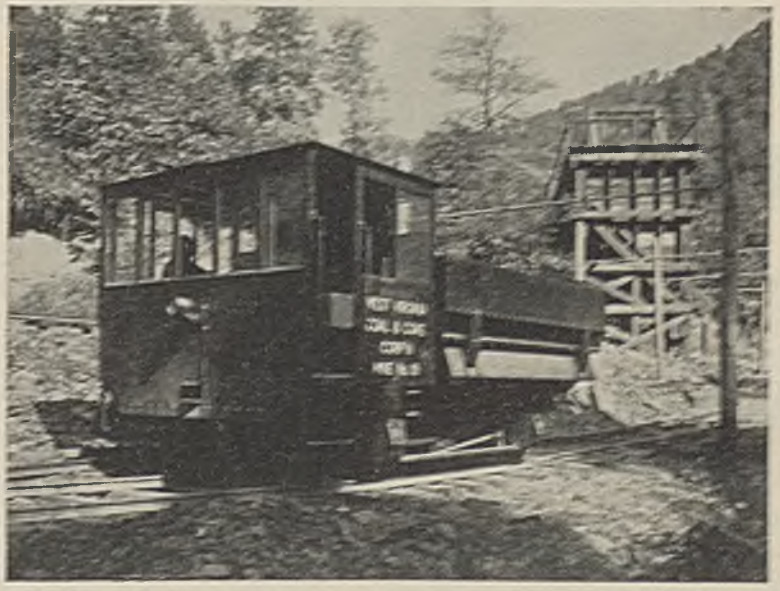
As a result of extensive revisions in the past six years involving a total expenditure of $155,000, the Omar No. 5 plant now is equipped to make the following primary sizes: lump, 5x2½- and 2½x2-in. egg, and 2-in. nut-and-slack. The lump and egg sizes are hand-picked on grate-bar-type rescreening picking table-loading booms. One of these units was installed in the middle of 1935 to permit shipment of the second egg size, and at the same time the picking sections of the other unit were lengthened 13 ft.

Nut-and-slack at No. 5 is prepared by hand-picking part and cleaning the rest on two 72x144-in. Type R American pneumatic separators. The first of these separators was installed in June, 1931, and the second coincident with the boom changes and tipple reconstruction noted above. Because of its character, the impurities at No. 5, which include a mud seam, tend to concentrate in the fines, dictating the installation of mechanical-cleaning equipment not only from the standpoint of ash reduction to a predetermined level but also a means of shipping a product that will be uniform at all times. A mixing conveyor permits the shipment of cleaned mine-run or any other desired combination of sizes.

The separators at No. 5 are preceded by a 5x14-ft. Style B Allis-Chalmers vibrating screen with 1x2½-in. clear openings. This screen receives the 2-in. nut-and-slack from the main shaker screen and also the crushed gas coal picked out on the three tables. This gas coal is thrown on the top strand of a cross conveyor which discharges into a 36x36-in. Jeffrey single-roll crusher, where it is reduced to minus 1½-in. Another crusher will be installed at the end of the mixing conveyor to permit breaking any or all screened sizes down to nut-and-slack when desired. The 1½-in. material through the screen cloth on the vibrator goes by a series of conveyors to surge bins, from which it is fed onto the two pneumatic separators. The oversize is hand picked. Cleaned coal from the separators joins the hand-picked nut in the collecting conveyor, middlings are recirculated and refuse is carried to the main refuse conveyor leading to the aerial-tramway loading station.

Control of quality of coal produced in the Logan division is placed in the hands of a chief chemist and his staff, who determines what a normal product should be and then samples and analyzes to see that shipments show no more than the normal deviations, particularly on the wrong side, from the standard. Lump, egg and nut are sampled at regular intervals to detect any unusual variations from the mean. Nut-and-slack or slack samples are taken once each week at each mine for proximate analysis, sulphur, B.t.u. and fusion temperature of ash. Such samples, two in number, cover a day's shipments, one for the morning and one for the afternoon. Research into

Hillside dump at Micco No. 3 in action on mine rock



This 12-cu.yd. three-way-dumping lorry now handles mine rock dumped into the bin at the right at Stirrat No. 19 mine

the possibilities of improving existing sizes or making new ones is another task of the chief chemist, his findings being used as a basis for the determination of what changes in methods or equipment must be made or what new installations must be made.

Preparation-plant refuse is hauled or trucked away from storage pockets at Earling, Micco No. 3 and Omar No. 4 mines. Stirrat No. 19 tipple refuse, as stated above, goes to the central power plant in railroad cars. At Rossmore, an Interstate aerial tramway with a capacity of 10 tons per hour disposes of plant refuse to a point 1,500 distant. One man runs the unit.

A B. & B. aerial tramway with a capacity of 50 tons per hour was installed at Omar No. 5 in 1931 at a cost of $55,000 to replace the previous system of dumping from mine cars on land within 3,000 ft. of the tipple at a cost of 15c. per ton of refuse or 1.5c. per ton of coal. The distance to the dumping ground is 2,000 ft., and the tramway handles both mine rock and preparation-plant refuse. Operation of the tramway, which requires one man, as compared with about ten under the previous system, immediately cut the cost of disposal to 3.9c. per ton of refuse or 0.3c. per ton of coal.

In contradistinction to practice at No. 5, mine rock is handled separately at all other Logan division mines. A Kanawha hillside dump was installed on the other side of the mountain from the Earling preparation plant over five years ago at a cost of $4,000. As at Omar No. 5 and other properties, this step was made desirable by inauguration of a clean-up program, with consequent increase in the output of refuse material. With the methods previously in use, cost of disposal at Earling was 30c. per car. The hillside dump cut this to 17c.

Similar hillside dumps since have been installed at Rossmore (opposite side of the mountain from the preparation plant) and Micco No. 3 (near the drift mouth.) A motorized Atlas two-way-dumping larry is used at Omar No. 4.

With considerable brushing, as well as normal clean-up activities incident to operation, disposal of mine rock at Stirrat No. 19 has lately been facilitated by the installation of a Differential three-way dumping standard-gage larry with a capacity of 12 cu.yd. With a two-axle chassis and driven by two 51-hp. d.c. motors, the larry has the following dimensions: over-all length, 19 ft. 2 in.; width, 10 ft. 5 in.; maximum height, 9 ft. 4 in. Speed with a 16-ton load is 12 m.p.h. on a 1-per-cent grade and 6.2 m.p.h. on an 8-per-cent grade. Cost of the installation, which is expected to decrease disposal cost from 1.2c. per ton of material and 0.3c. per ton of coal to 0.6c. per ton of refuse and 0.15c. per ton of coal, was $16,000.

ELECTRIFICATION

+ West Virginia Coal & Coke Corporation

WITH a new power plant proving an excellent investment in the Logan division, with all principal functions electrified, including part of the coal loading, with standards set up for new construction, with new ideas in substation design and with power requirements forecast for the lives of the mines, the West Virginia Coal & Coke Corporation follows a program of fitting electrification to both present and future requirements of its properties. Although "power use" is kept foremost and "power saving" is a secondary consideration, total consumption in the Logan division averages less than 6 kw.-hr. per ton of coal shipped.

Some years ago when power for the Logan division was being purchased, 6,600-volt transmission lines were built to incorporate central metering at Omar. The principal object was to obtain a lower rate, but the change was designed to fit in with a proposal to build a refuse-coal power plant at Omar to supply the mines in the division. This plant went into operation in February, 1935.

In an article describing the plant (*Coal Age*, September, 1935, p. 365), an official of the company authorized a statement that the savings would return the investment in four to five years. This has proved conservative. In the last fourteen months the savings have averaged $7,400 per month and during the most favorable of those months the saving was $9,691.78. Practically no fuel charge is made against power-plant operation because if not burned in the plant the refuse would be a liability from the standpoint of disposal.

The plant contains two 2,300-volt turbo-generators operating at 215 lb. pressure and 100 deg. of superheat. One generator (General Electric) is rated at 3,000-kw. and the other (Westinghouse) is rated at 4,000 kw. Boiler-room equipment consists of two Union Iron Works Type N water-tube boilers, each with 5,000 sq.ft. of heating surface and equipped with three-unit spreader-type Firite stokers. Condenser circulating water is cooled in a forced-draft tower. Practically all of the fuel is picking-table refuse which is shipped 5 miles by railroad from Stirrat No. 19 mine or trucked from the other mines and is crushed to 1½ in. at the power plant.

Table I—Electric Power Data, Logan Division, January-September, 1936

(Average kilowatt-hours per ton, 5.84)

	15-Minute Demand, Kw.	Energy Used, Kw.-Hr.	Coal Shipped, Tons
January	3,168	1,032,000	183,003
February	3,240	1,123,200	218,864
March	3,000	921,600	158,574
April	3,000	1,137,600	203,911
May	3,120	964,800	138,708
June	2,856	979,200	152,073
July	2,928	926,400	131,589
August	3,072	1,104,000	207,400
September	3,264	1,022,400	181,340
Totals	.....	9,211,200	1,579,462

Fifteen-minute maximum demands usually exceed 3,000 kw. each month and the energy total often runs over 1,000,000 kw.-hr. In February, when the output of the mines was 218,864 tons the maximum demand was 3,240 kw. and the energy total was 1,123,200 kw.-hr.

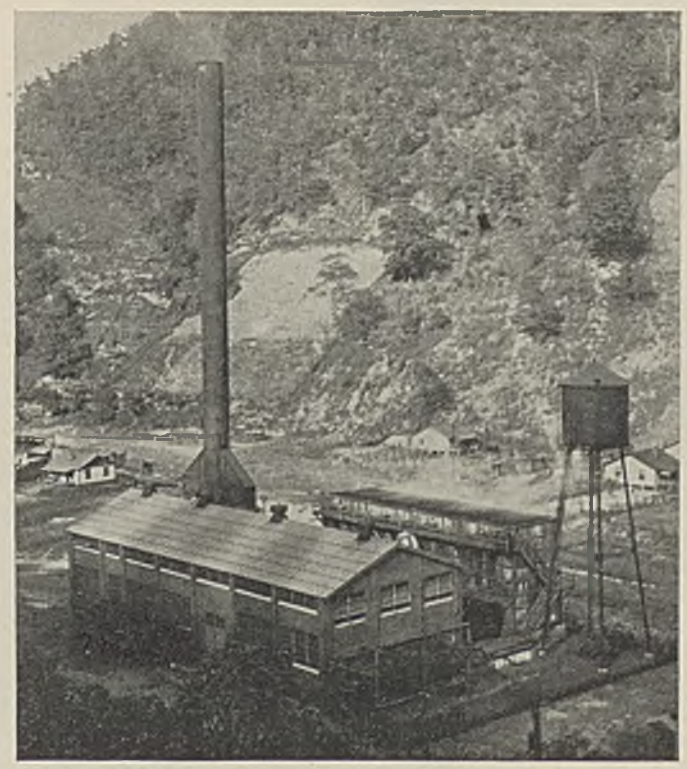
At the power plant the output is stepped up to 6,600 volts for main line transmission. The farthest mine, Earling, is approximately 7 miles away. Total footage of 6,600-volt line is 92,800 and the standard construction is wood poles with wood crossarms. Also classed as main line is 9,900-ft. of 2,300-volt circuits. Tenement supply lines, another item in 2,300-volt transmission, total 14,250 ft. Parkway cable conducting 2,300-volt power along main headings to inside substations totals approximately 23,500 ft.

Transformer banks of capacity greater than 75 kva. and serving such loads as tipples are arranged with horn gap switches which are used to disconnect the transformer primaries from the line when not in use. These were installed as a means of saving energy and improving power factor with purchased power, but even with mine-made power they are opened during the idle hours.

Direct-current substation capacity totals 3,750 kw. and comprises twelve synchronous converters and eight synchronous motor-generator sets, all 275-volt. These twenty units are in sixteen substations, nine of which are outside and seven underground. Nine of the twenty units are equipped with full-automatic controls and eleven with controls of the manual-starting type.

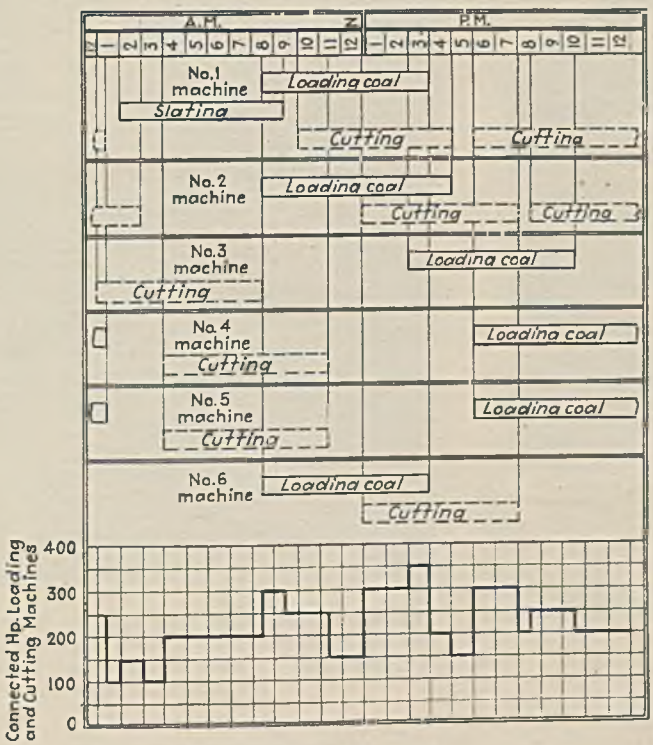
The two full-automatic substations most recently installed underground have inclosed a.c. starting units comprising auto-transformer, oil switch and contactors. Another innovation applied to these substations is forced ventilation by filtered air (p. 593). Under this plan the air enters the substation room through ducts opening under the machine base and leaves the room by a small window in one wall. The one door of the room is of solid construction.

Lead-covered armored cable is the standard for boreholes feeding 2,300 volts to underground substations and a.c. pumps. For these services size No. 2 generally is used. The insulation is 6/64x2/64-in. varnished cambric designed for 3,000 volts. Borehole depths are for the most part between 100 and 200 ft. Parkway cables which are used along mine entries are lead-covered and are protected from mechanical injury by jute, flat-band steel armor and jute. The cable is laid on the floor near the rib and is covered with loose rock. Track crossings are effected by cutting a trench 18 in. deep in the mine bottom, putting the cable into it and covering the whole with concrete.



The Logan division central power plant, put into use in 1935, burns refuse coal and is saving over $7,000 per month

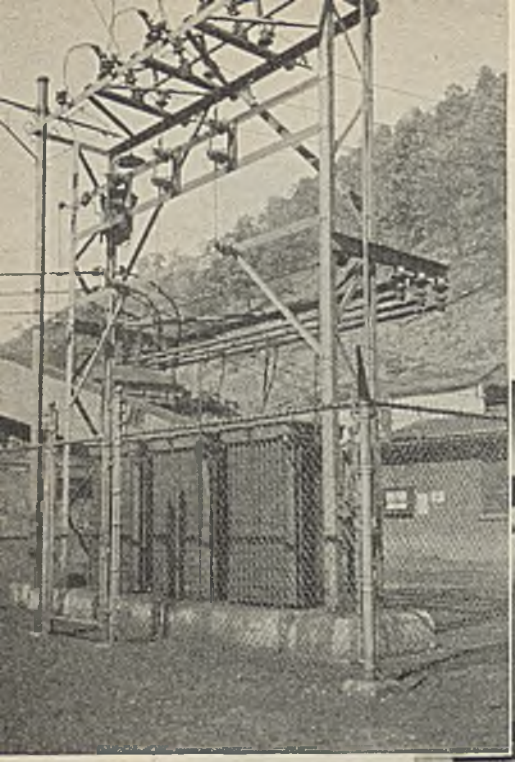
Fig. 1—Operating schedule covering six coal-loading and one "slating" shift with mobile loaders at Omar No. 5 mine. Four loaders are in use, one loading coal one shift and refuse cut out of the seam the second; two, working two shifts loading coal; and one, loading coal one shift in development work



Direct-current distribution is characterized by liberal use of heavy copper. Main-haulage trolley wire and a large percentage of the section wire is 350,000-circ.mil and for the most part is paralleled by 500,000-circ.mil feeder supported by Ohio Brass combination hangers. Circuits are sectionalized by automatic breakers of General Electric and Westinghouse manufacture. A total of fifteen breakers are used in the six mines.

No. 4/0 arcweld bonds used on the 60-lb. main-line steel are of two types: the copper-terminal short U-bond placed beneath the rail and the steel terminal long bond of conventional type spanning the angle bars. At present the short bond is favored for most conditions.

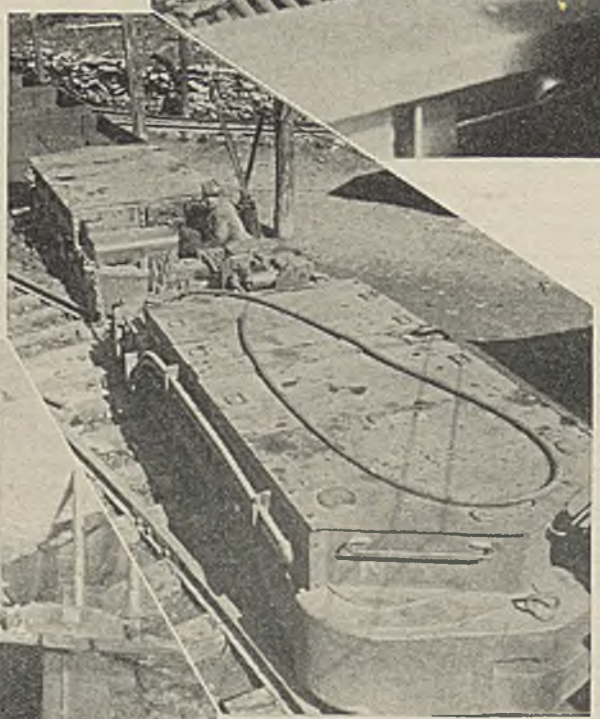
For locomotive trailing cables (size No. 2 single-conductor is used) Duracord weave protection is favored for all except wet sections, where all-rubber cables give better service. The latter type, but of duplex construction, is used exclusively on mining machines. For this service No. 2 is the size generally used. The Jeffrey Type 29L mounted cutters at Stirrat No. 19 mine

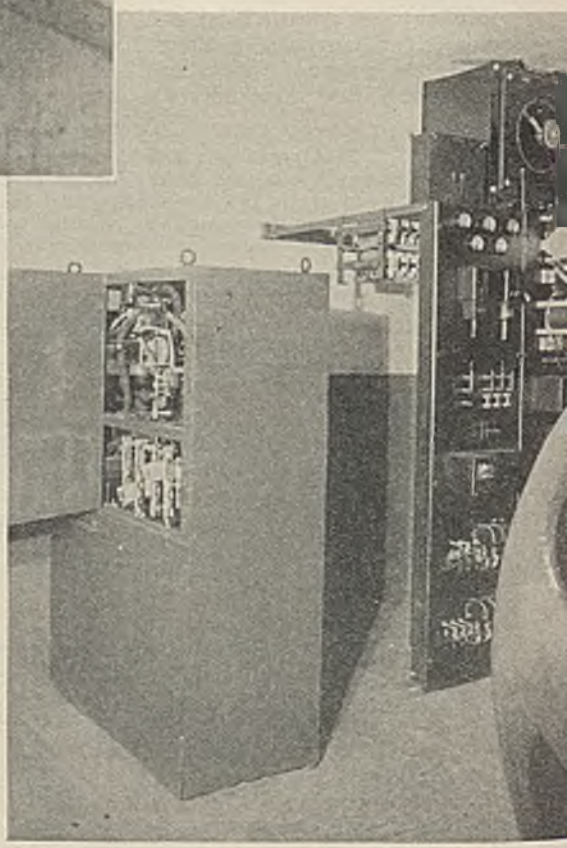


-gap switches for disconnecting these 150-kva. 2,300/220-volt power trans-rs supplying the tipple and cleaning at Omar No. 5 mine are typical of transformer stations supplying station-ary motors

Lead-sheathed wire armored cable feeding 2,300-v power through a 126-ft. borehole to a 5,000-ft. parkw cable which extends to the new Pine Creek undergrou substation of No. 5 mine

250-watt high-intensity mercury vapor lamps at the discharge ends of two picking tables in No. 5 tipple assure a thorough final inspection and picking

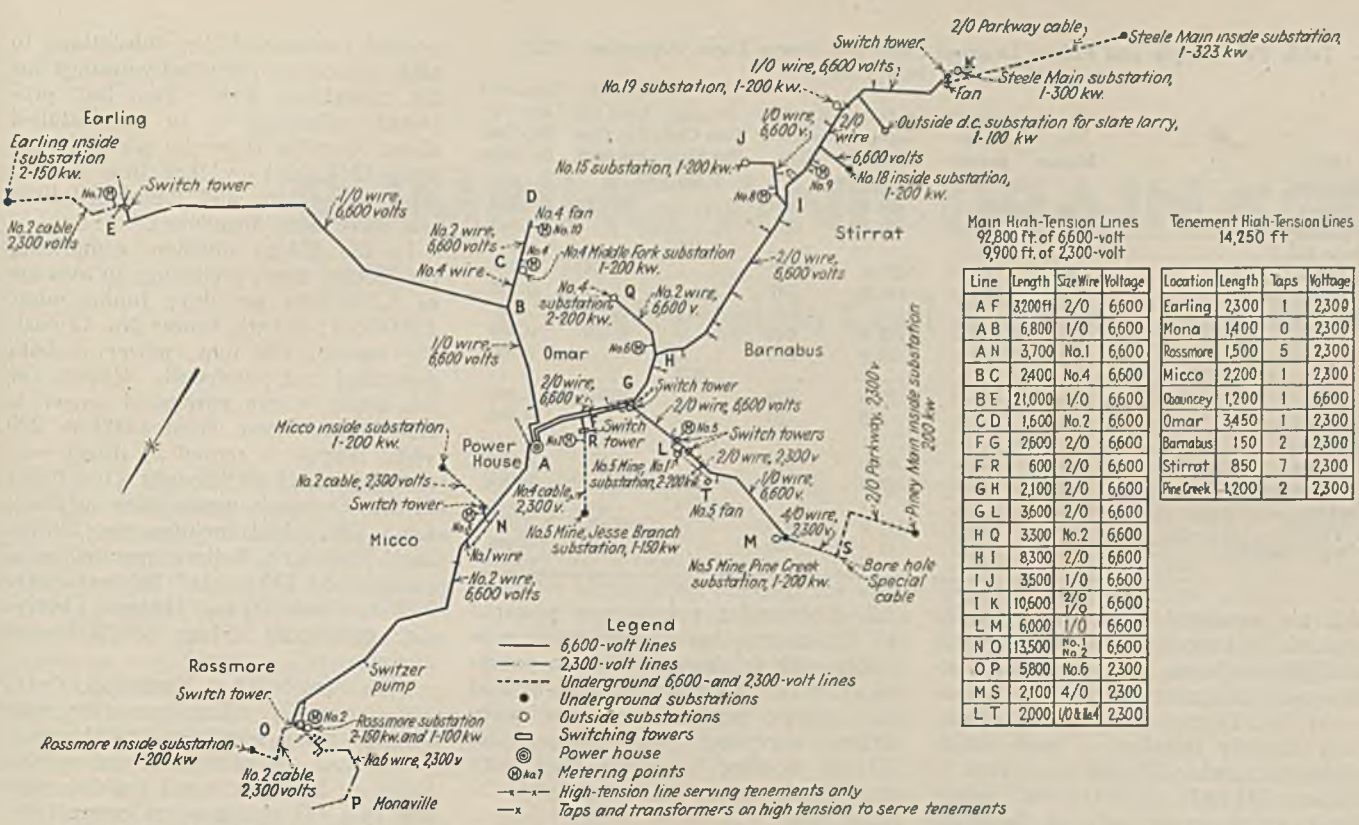




This 20-ton tandem low-vein loco-motive at Stirrat No. 19 mine, equipped with air brakes and semi-magnetic control, is typical of the complete rebuilding and moderniza-tion of locomotive equipment

The steel cabinet (with door open to show equipment) this full-automatic control for a 300-kw. motor genera in Stirrat No. 19 mine underground substation conta the 2,300-volt apparatus

Typical of the fifteen automatic



Main High-Tension Lines
92,800 ft. of 6,600-volt
9,900 ft. of 2,300-volt

Line	Length	Size Wire	Voltage
A F	3,200 ft	2/0	6,600
A B	6,800	1/0	6,600
A N	3,700	No.1	6,600
B C	2,400	No.4	6,600
B E	21,000	1/0	6,600
C D	1,600	No.2	6,600
F G	2,600	2/0	6,600
F R	600	2/0	6,600
G H	2,100	2/0	6,600
G L	3,600	2/0	6,600
H Q	3,300	No.2	6,600
H I	8,300	2/0	6,600
I J	3,500	1/0	6,600
I K	10,600	2/0 1/0	6,600
L M	6,000	1/0	6,600
N O	13,500	No.1 No.2	6,600
O P	5,800	No.6	2,300
M S	2,100	4/0	2,300
L T	2,000	1/0 & No.4	2,300

Tenement High-Tension Lines
14,250 ft

Location	Length	Taps	Voltage
Earling	2,300	1	2,300
Mona	1,400	0	2,300
Rossmore	1,500	5	2,300
Micco	2,200	1	2,300
Quaucey	1,200	1	6,600
Omar	3,450	1	2,300
Barnabus	150	2	2,300
Stirrat	850	7	2,300
Pine Creek	1,200	2	2,300

Fig. 2—6,600-volt and 2,300-volt power lines in the Logan division of the West Virginia Coal & Coke Corporation

Table II—Direct-Current Substations (All 275-Volt), Logan Division

Mine	Number of Units	Size, Each Unit, Kw.	Total Kw.	Type of Unit	Make of Unit	Type of Control	Make of Control
Stirrat No. 19	2	200	400	Conv.	G.E.	Manual	.....
	1	300	300	Conv.	G.E.	Full-Auto.	W.
	1	300	300	M-G	Al.-Ch.	Full-Auto.	G.E.
	2	100	100	Conv.	G.E.	Manual	.....
Omar No. 5	1	200	400	Conv.	G.E.	Manual	.....
	1	200	200	M-G	G.E.	Full-Auto.	W.
	1	150	150	M-G	Al.-Ch.	Full-Auto.	G.E.
	1	200	200	M-G	Ridg.	Full-Auto.	G.E.
Omar No. 4	2	200	400	Conv.	G.E.	Manual	.....
	1	200	200	Conv.	G.E.	Full-Auto.	W.
Micco No. 3	1	200	200	Conv.	G.E.	Full-Auto.	W.
Rossmore	2	150	300	M-G	G.E.	Full-Auto.	W.
	1	100	100	Conv.	G.E.	Manual	.....
	1	200	200	Conv.	G.E.	Manual	.....
Earling	2	150	300	M-G	G.E	Full-Auto.	W.
Total	20	.....	3,750	.....	.....	.....	.....

Conv.— Synchronous converter
M-G.— Motor generator
G.E.— General Electric
W.— Westinghouse
Al.-Ch.— Allis-Chalmers
Ridg.— Ridgway

Table III—Summary of Connected Loads at Each Mine, Logan Division

			D. C. Substations		Miscellaneous		Total	
Mine	Tipple, Hp.	Refuse Disposal, Hp.	Hp.	Hp. Per Ton of Shift Capacity	Hp.	Hp. Per Ton of Shift Capacity	Hp.	Hp. Per Ton of Shift Capacity
Stirrat No. 19	107.5	107.0	1,370	0.410	55.0	0.016	1,540.0	0.461
Omar No. 5	665.0	125.0	1,270	0.492	100.0	0.039	2,160.0	0.835
Omar No. 4	320.0	70.0	536	0.302	25.0	0.014	988.0	0.556
Micco No. 3	92.5	7.5	268	0.277	35.0	0.036	465.5	0.478
Rossmore	127.5	17.5	806	0.532	137.5	0.091	1,088.5	0.718
Earling	170.0	7.5	403	0.400	60.0	0.060	640.5	0.603
Total	1,482.5	334.5	4,653	0.415	412.5	0.037	6,882.5	0.615

and the 124-AA Goodman units at Omar No. 5 mine, however, are now undergoing cable-reel changes to accommodate size No. 1 cable.

Seventy-nine locomotives, 47 mining machines and seven mobile loaders make up the bulk of the d.c. load. In Omar No. 5 mine, where three Joy 11BU loaders and one Whaley "Automat" are used and where loading, cutting and face preparation are spread over three shifts, operation of the loaders and cutters has been scheduled as in Fig. 1 to avoid unnecessary d.c. demand peaks, thus conserving substation capacity, improving voltage and reducing power loss.

Of the 79 locomotives, 16 are used in main haulage and 63 (cable-reel type) are employed in gathering. Forty-five of the latter are Jeffrey 6-ton units and the balance includes Goodman, General Electric and Westinghouse types of 4 to 6 tons in weight. Although most of the locomotives are old units, practically all have been rebuilt to incorporate latest improvements. For instance, the Jeffrey cable-reel locomotives have been equipped with new Jeffrey Type 37F ground-potential controllers and line contactors. Rolled-steel wheels are being applied to all locomotives, and most of the gathering units have been changed from 6-7 m.p.h. to 4 m.p.h.

Eight Westinghouse 10-ton locomotives were completely rebuilt to make four 20-ton tandem units. Two of these operate at Stirrat No. 19 mine and the other two at Omar No. 5 mine.

Table IV—Tipple and Refuse Disposal Load and Power Data, September, 1936, Logan Division Mines

Mine	No. Motors	Connected Horsepower	Actual Load, Hp.	Kw.-Hr. Used Per Shift	Average Tons Coal Per Shift	Kw.-Hr. Used Per Ton Coal Per Shift	Connected Hp. Per Ton Coal Per Shift
Stirrat No. 19	..	.....	.....	.....	3,344	.....	.....
Tipple	14	107.5	96.0	454	.....	0.136	0.032
Refuse disposal	1	107.0	107.0	319	.....	.....	0.032
Omar No. 5	..	.....	.....	.....	2,587	.....	.....
Tipple	36	665.0	470.0	2,139	.....	0.826	0.257
Refuse disposal	6	125.0	121.0	787	.....	.....	0.048
Omar No. 4	..	.....	.....	.....	1,178	.....	.....
Tipple	23	320.0	189.0	644	.....	0.362	0.180
Refuse disposal	1	70.0	70.0	209	.....	.....	0.039
Micco No. 3	..	.....	.....	.....	973	.....	.....
Tipple	9	92.5	75.0	372	.....	0.382	0.095
Refuse disposal	1	7.5	7.5	20	.....	.....	0.008
Rossmore	..	.....	.....	.....	1,514	.....	.....
Tipple	7	127.5	84.9	328	.....	0.217	0.084
Refuse disposal	2	17.5	17.5	76	.....	.....	0.012
Earling	..	.....	.....	.....	1,004	.....	.....
Tipple	11	170.0	117.0	474	.....	0.473	0.169
Refuse disposal	1	7.5	7.5	20	.....	.....	0.008

All are equipped with semi-magnetic controls and air brakes. One new 10-ton Westinghouse locomotive has electro-pneumatic controls and air brakes.

At No. 19 mine one outside substation recently installed is used exclusively to furnish 275-volt d.c. power to a new 324-cu.ft. "Differential" refuse larry which works only on the night off-peak power period. This machine is driven by two Westinghouse motors with Type 907C armatures and 907H fields. It is equipped for dynamic braking in addition to the regular hand and air brakes. Dumping to either side or at the end is effected by a single air cylinder under the center of the body.

Stationary a.c. motors are practically all 220-volt. An Allis-Chalmers two-speed 100-hp. motor on a new fan at No. 19 mine operates on 440 volts and a Westinghouse 50-hp. 2,300-volt motor drives a new pump in No. 5 mine. All other mine pumps are powered by d.c. motors but a program is now under way to change all main pumps to a.c. drive. V-belts have been applied to a large percentage of stationary drives, excepting mine pumps, and Kritzer floating bases are used with the V-belt drives on several of the mine fans.

Power factor of the day load on the power plant runs 90 to 93 per cent and of the night load 80 to 85 per cent. To maintain the day power factor that near to unity without capacitors or synchronous-motor drives (excepting the eight substation motor generators) care is exercised not to use oversized induction motors.

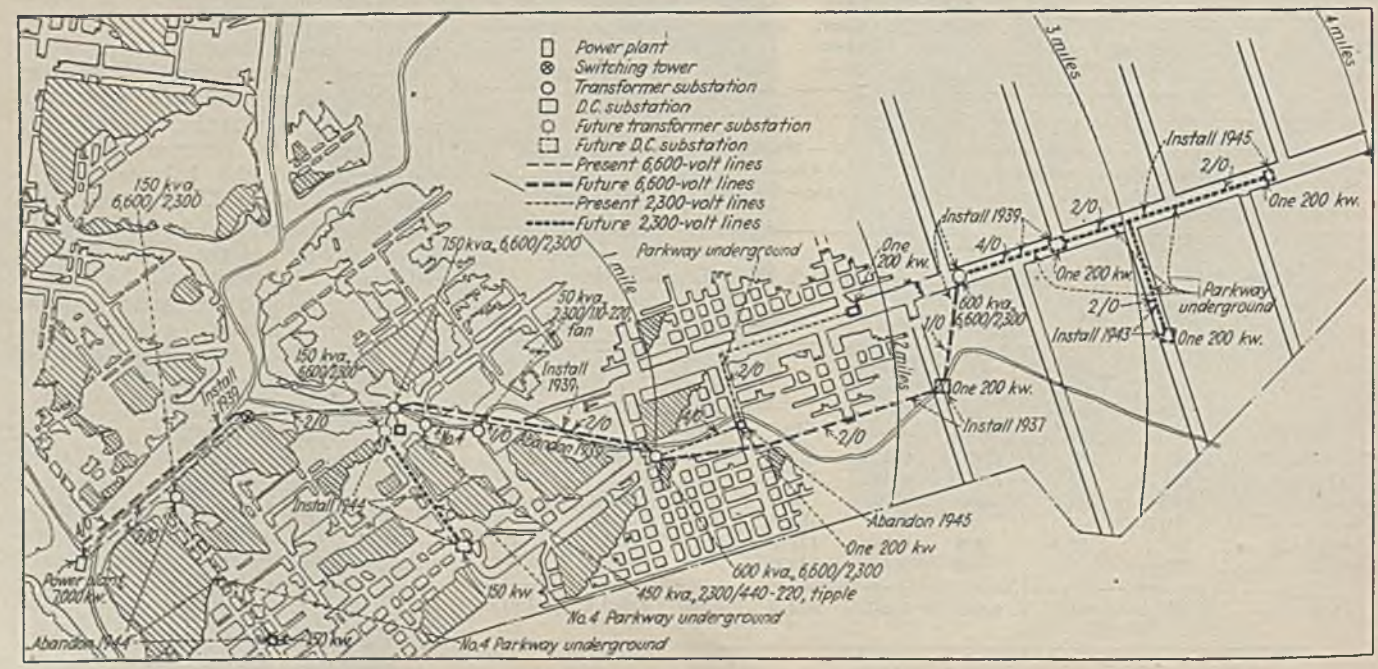
For Omar No. 5 mine, a large operation and one having the largest remaining acreage, a plan has been prepared showing all changes and new installations of transmission lines, underground cables and d.c. substations to take care of the projected workings for the remaining life. The last projected substation is to be installed about 3¼ miles from the portal in the year 1945, and by that time several other substations and their feed lines will have been abandoned.

In the Elkins division, comprising the Norton mine, producing an average of 1,500 tons per day; Junior mine, 1,000 tons; and the Bower No. 12 coaling station, 200 tons, power is both generated and purchased. Except for the tipple, where purchased power is transformed down from 4,000 to 220 volts, Norton is served by direct current generated at 575 volts (full load) in the company's power plant at Coalton. This plant includes six 150-hp. hand-fired h.r.t. boilers operated at a pressure of 110 to 115 lb. per square inch and two 200-kw. General Electric d.c. generators driven by Ballwood engines.

Maximum cover at Norton is 125 ft., and power is taken into the mine through three boreholes put down at points near the centers of the various loads. A 500,000-circ.mil braided cable and two 4/0 return wires connect the power plant with the first borehole. Four 4/0 wires are run from the first to the second borehole, with two 4/0 wires from the second to the third borehole.

Power to operate the Junior mine is purchased at 4,000 volts. D.c. current for underground operation is furnished by two 100-kw. 275-volt converters at the drift mouth, about 1½ miles from the working territories. The converters are operated in series to provide a voltage of 550. Trolley-wire size is 6/0.

Fig. 3—Power forecast for the remaining life of Omar No. 5 mine



PUMPING AND DRAINAGE

+ West Virginia Coal & Coke Corporation

NOT without the expenditure of considerable money has the drainage problem at the Logan division mines of the West Virginia Coal & Coke Corporation been reduced from a major to a minor problem. Since 1928 a total of $67,000 has been spent on new drainage projects at the six operations. Of this amount, $29,000 was spent for pumping stations and $38,000 for drainage tunnels. Rossmore mine, however, cannot be drained by tunnels and the combined capacity of its main pumping stations is now 5,100 g.p.m.

Five of the six mines are in the vicinity of Omar, where the Island Creek seam outcrops along the deeper hollows and was opened originally by twenty small mines which rapidly worked out the crop hill-point sections. Four of the present mines represent for the most part consolidations of those early operations. Rossmore, however, lies in the bottom of a syncline with abandoned operations of other companies on either slope and one of the corporation's pumping stations is installed in another property in order to catch the water before it runs into Rossmore.

Earling mine, which is several miles distant from the principal group, is in the Eagle seam, which outcrops above tipple level. With the exception of Rossmore, reached by a short slope, all are drift operations. The coal measures have a general pitch of 1½ per cent and, generally speaking, the grades favor drainage.

Tunnel Eliminates Pumps

A 2,200-ft. rock tunnel completed at Omar No. 5 mine in January, 1936, at a cost of $20,000 (conveyor equipment depreciation and repairs included) replaced a main pumping station which was inadequate to cope with the peak drainage in winter months. An unusual feature of this tunnel, which is roughly 5½x12 ft. in section, is its adverse grade of approximately 1 per cent. Consequently, it is at all times filled with water. This plan was adopted because it was feasible to follow the underlying Alma seam, averaging 2 ft. in thickness, and thus reduce driving cost.

The coal derived in driving the tunnel was wasted with the 3- to 4-ft. stratum of top shale taken at the same time up to a strong slate and sandstone top which required no timbering. The driving, carried on from the outcrop, was the first task of a set of new Jeffrey and Goodman chain-flight room conveyors purchased for use in Micco No. 3 mine.

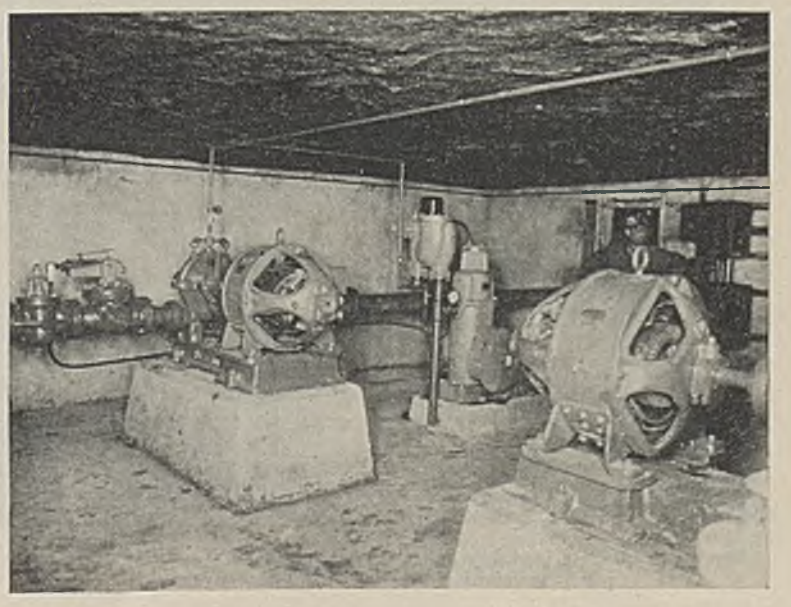
At its inner end the tunnel taps the Island Creek seam workings by a 4x6-ft. slope driven 60 ft. up at an angle of 45 deg. At its top a concrete trap was constructed to seal the air from that upper portion of the slope not normally filled with water; this with the idea that there will be less disintegration of the rock strata. Over a million gallons of water was drained from the mine into the tunnel before the latter filled to a point where flow to the outside began.

Future workings in Omar No. 5 mine will be to the dip and the work in one particular section is being rushed so that it will form a sump from which water draining from a distance of 16,000 ft. will be removed by a 200-ft. deep-well turbine pump to be installed within the next two years. This section is at a point where a diagonal barrier pillar under light cover at a creek intersects the property boundary. Water from workings to be advanced beyond this proposed sump will be pumped back into it in the future.

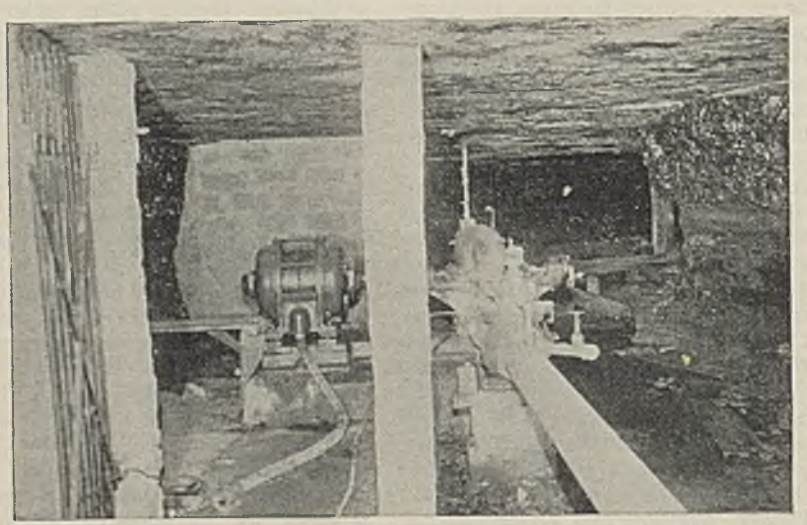
Two main pumping stations are now in use in No. 5 mine. The most recent, installed a year ago, consists of one Goyne 500-g.p.m. single-stage centrifugal pump driven by a General Electric 50-hp. 2,300-volt induction motor with inclosed controller. A partition wall of cinder-concrete blocks erected between the motor and pump forms a safety room for the motor and controller. This station is the first one of the corporation to be driven by 2,300-volt alternating current.

Another station built five years ago contains two 300-g.p.m. Hazleton centrifugals and a priming pump of the same make. It is now planned to replace the original 50-hp. Westing-

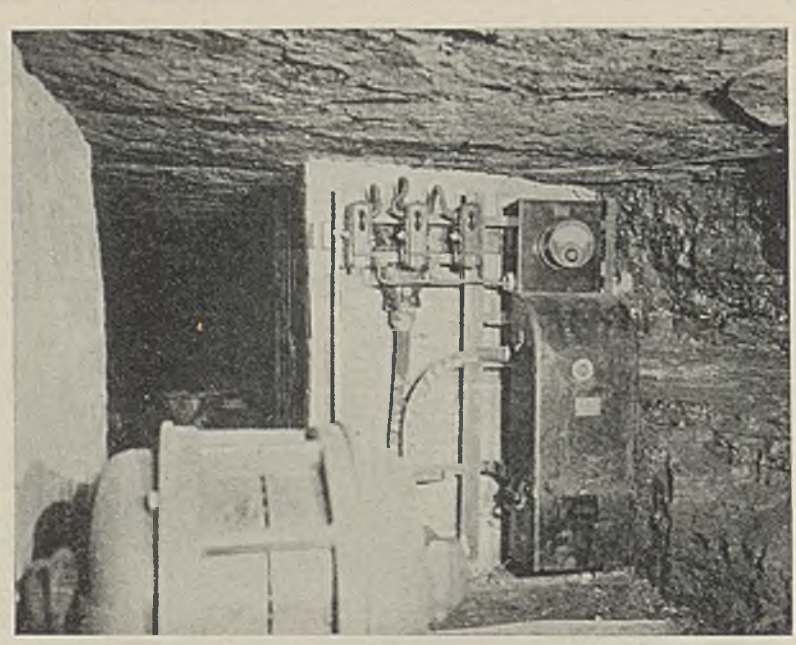
This station in Omar No. 5 mine, consisting of two 300-g.p.m. 125-ft. head centrifugal pumps with priming pump, is scheduled for an early change from d.c. to 2,300-volts a.c.



6-in. cast-iron pipe line, No. 5 mine, typical of recent line installations in this and the Rossmore operations, where the water is acid



This new 500-g.p.m. pump and 50-hp. 2,300-volt induction motor in Omar No. 5 mine represents the start of a projected change to 2,300 volts for all main pumps. The pump is set outside the motor and control room



Motor, disconnects, Parkway cable and starting compensator of the new pump installation in No. 5 mine shown above

house d.c. motors on these pumps with 2,300-volt induction motors.

Within the last month, there was completed at Stirrat No. 19 mine a 1,451-ft. drainage tunnel which displaced two 500-g.p.m. centrifugal pumps. This tunnel, which cost $14,000, follows a lower seam on an adverse grade. It was driven by chain-and-flight conveyors and taps the sump by a 45-deg. slope. The job was similar to the tunnel at No. 5 except that at No. 19 the coal was saved by conveying it direct to railroad cars. A $4,000 tunnel at Micco No. 3 mine relieved that operation of pumps discharging to the outside.

Two main pumping stations in Rossmore mine are full-automatic in operation. One contains Hazleton equipment consisting of one 1,000- and one 500-g.p.m. centrifugal pump and a reciprocating primer. Suction head is 6 to 10 ft. and the total head is 125 ft. The discharge is through a 10-in. Wyckoff wood line to a drift opening. The other full-automatic station contains one 1,000-g.p.m. Hazleton pump and one 900-g.p.m. Allis-Chalmers pump.

Four other Rossmore stations pump to the outside. Two are equipped with Hazleton 500-g.p.m. units, one with a Deming-Mueller 500-g.p.m. pump and the fourth with an Advance 500-g.p.m. unit. All Rossmore pumps are driven by d.c. motors and the ratings of those on the main pumps range from 7½ to 60 hp.

Earling mine has one main station pumping to the outside. Equipment consists of a De Laval 350-g.p.m. centrifugal, a 5x6-in. Austin and a Deming triplex.

Intermediate Pumps Used

The latest installation in Rossmore mine is a 1,500-g.p.m. intermediate station which cost $6,000. The total head is 100 ft. and the drive is a 50-hp. Westinghouse Type SK motor. This is the only intermediate pump in Rossmore mine. Completing the list of intermediate pumps at all of the mines are the following: Omar No. 5 mine, one 500-g.p.m. Deming-Mueller, one Ingersoll-Rand (4-in. suction, 3-in. discharge) and one Austin 6x8-in. piston pump; Micco No. 3, one Advance, 500-g.p.m.; and Earling, one Ingersoll-Rand, 250-g.p.m.

Austin reciprocating pumps make up the greater part of gathering equipment. Sizes generally used are 4x5 to 6x8 in. Direct-current motors are used exclusively and these are spur-

◆

gear connected. Installations are made and maintained according to standard plans furnished by the engineering department. A few each of the following other makes of gathering pumps are in use: Deming, Fairmont, Viking, Dravo-Doyle and Aldrich.

Only at Earling is the mine water put to any use. Here it is utilized in a jig washer and for domestic supply. The latter comes from a restricted section and is aerated and chlorinated before use. Deep wells for domestic supply are impractical at Earling because salt water is encountered in the measures below the Eagle seam.

Only in the Rossmore and Omar No. 5 mines is the water sufficiently acid to result in troublesome corrosion of ordinary metals. Recent pipe installations inside the mines have consisted principally of Simplex cast-iron pipe. Centrifugal pumps are all-bronze construction and the reciprocating pumps have bronze fittings.

Seals Reduce Acidity

At Omar Nos. 4 and 5 mines the crop hill-point sections which were worked out by the early mining in the district have been sealed with government and State funds to reduce acidity of the water draining to Island Creek. In addition to the usual seals and traps at the crop holes this project of necessity included the building of seals inside of the mines to shut off the mine ventilation current from these worked-out areas.

In the Elkins division, which includes the Norton, Junior and Bower No. 12 mines, no pumping is done at Junior, while at Norton a program of ditching has been carried out over the last six years and upon completion will eliminate all but 750 g.p.m. of actual pumping capacity for about six hours a day. Ditching to date aggregates one mile and included driving a drainage opening to the outcrop. Maximum depth of cut in ditching was 9 ft. Before inauguration of the ditching program three main pumps (900, 750 and 500 g.p.m.) and a number of 2-in. gathering pumps were kept busy 24 hours per day and 7 days per week. Pipe destruction from acid water also was a substantial item. On the basis of ditching to date, only the 900- and 750-g.p.m. pumps are operated and these only 6 hours per day. Eventually, the 900-g.p.m. unit will be taken out of service, leaving only the 750-g.p.m. pump to operate about 6 hours per day.

◆

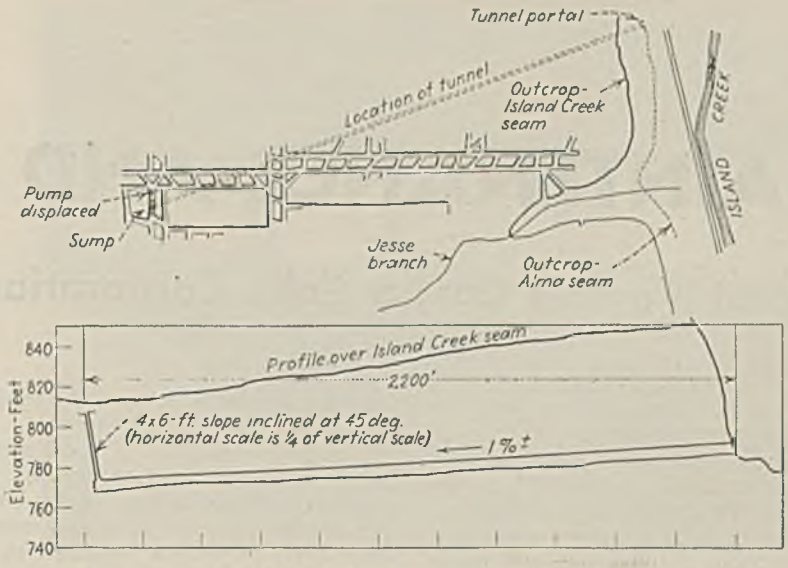


Fig. 1—General plan of the Omar No. 5 drainage-tunnel project

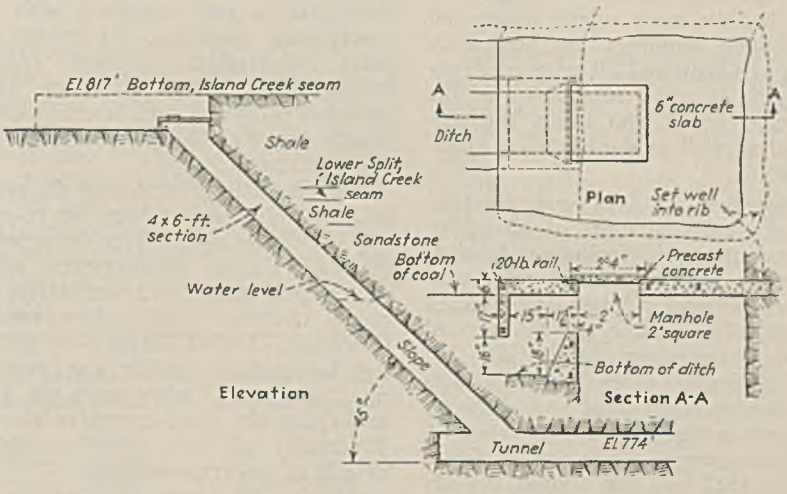


Fig. 2—Showing how inby end of No. 5 drainage tunnel was connected with the Island Creek seam by a 45-deg. slope and (upper right) details of concrete seal installed at the top of a similar slope to the Stirrat No. 19 drainage tunnel

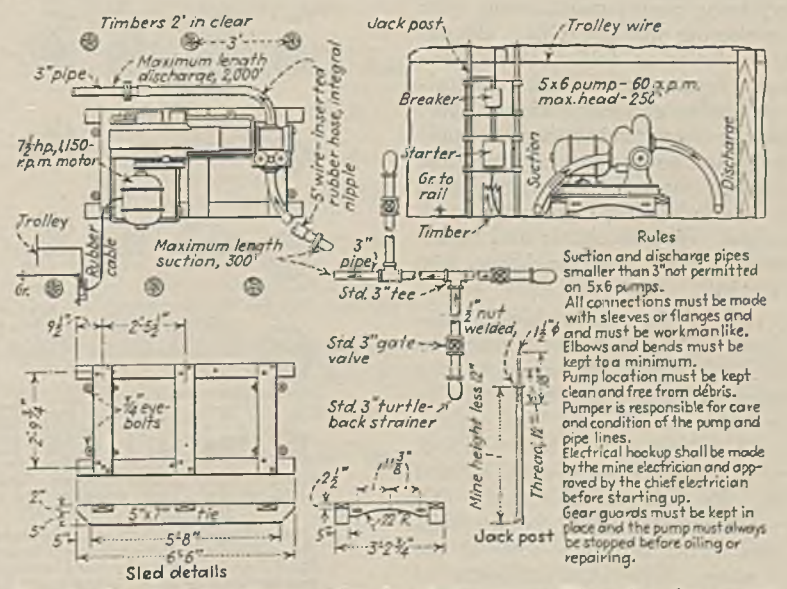


Fig. 3—Standard installation plan for 5x6 pump. The plan for a 4x5 unit is identical, except that capacity, head and motor size and size of lines and fittings are correspondingly reduced

MAINTENANCE AND SUPPLIES

+ West Virginia Coal & Coke Corporation

EFFICIENT maintenance of equipment is possible only when the proper repair parts and supplies are available without delay. At the West Virginia Coal & Coke Corporation's Logan division mines, the two functions maintenance and handling supplies are under different heads, both reporting to the manager of mines, but the main supply house and central shop buildings are adjacently located at Omar and all truck delivery of supplies is under supervision of the chief electrician, who heads the mechanical as well as the electrical maintenance.

During the last five years the total labor and material costs of all equipment maintenance, including lubrication, mine cars, mine tracks, mine wiring and railroad sidings, have varied between 9.1 and 11.7c. per ton of coal shipped. Including lubrication but excluding the last three items, the totals per year for mechanical and electrical equipment proper have run between 5.6 and 7.3c. per ton. The lowest figure was for 1935 and the highest for the first nine months of 1936. Additional equipment, including conveyors and loading machines, had some bearing on the increase this year.

Thirty-two men constituting the force reporting to the chief electrician have duties as follows: one, central-shop foreman; fifteen, central-shop mechanics and electricians; four, maintenance of substations, tipple machinery and so on; three, power-line crew; two, tenement wiring; four, regular truck drivers; one, relief truck driver; one, truck mechanic and night-shift truck driver; one, timekeeper and office clerk.

The central shop is within a hundred yards of the tipple of Omar No. 4 mine. Trucking distances to the other five mines are approximately as follows: Stirrat No. 19, five miles; Omar No. 5, two miles; Micco No. 3. two miles; Rossmore, five miles, and Earling, 25 miles. Practically all repairs requiring machine tools, special tools and extra skill are done at the central shop. The superintendent of each mine, however, is held responsible for the maintenance of his mining equipment and therefore has control over the amount of work to be sent to the central shop.

The chief electrician is a consultant in so far as operation of most of the mining equipment is concerned. Ordinarily he makes inspections and recommendations only when requested to do so by the local superintendent or the manager of mines. Also the chief electrician is not concerned with the power-plant operation, but instead the chief power-plant engineer reports directly to the manager of mines. Construction plans and certain maintenance standards are made up by the engineering department.

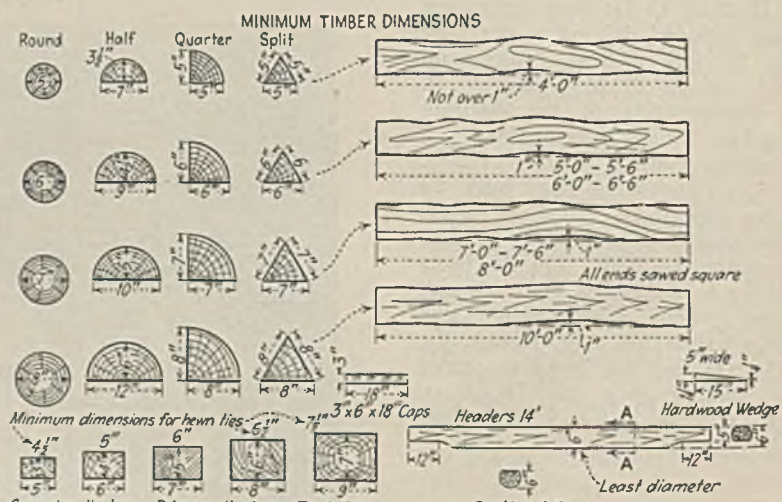
An outstanding feature of the maintenance practices has been the rebuilding of old equipments to incorporate every available improvement which will reduce delays, increase safety, improve operation and reduce maintenance cost. The 45 Jeffrey 6-ton gathering locomotives, which are, for the most part, ten or more years old, have undergone the most extensive change. Practically all have been completely rebuilt to modern standards.

As now equipped these locomotives have SKF ball bearings on the commutator end and Norma-Hoffmann roller bearings on the pinion end of armatures. Cable reels have been turned around and porcelain guide insulators and asbestos-lined clutch sprockets have been installed. Controls have been replaced with the Jeffrey 37F ground-potential type and cast-iron grids with steel strip resistances. Rolled-steel wheels are used instead of cores and tires and twelve of the locomotives have been changed to slow speed (4 m.p.h.) for operation over difficult grades.

Eight 10-ton locomotives have been completely rebuilt into four 20-ton tandem units. When rebuilt these were equipped with semi-magnetic controls, air brakes, air sanding and many other available improvements. Journal and axle bearings were not altered from the original bronze bushing type. Helical gears are used on most of the main haulage locomotives.

All armature winding is done in the central shop at Omar and asbestos coils are used on the cutting machines and main haulage locomotives. Factory-

Fig. 1—Specifications for mine posts, caps, wedges, headers and ties



MINE-TIE SPECIFICATIONS

Ties shall be cut from sound oak, unless otherwise ordered. They shall be free from any defects with no decay or red heart. They shall be not more than ¼" under or ½" over in thickness, nor 1" under or 2" over in length. Ties shall be straight, well hewn or sawn on four sides and cut square at the ends. Bottom and top parallel with bark removed. The difference in thickness at the two ends or sides shall not exceed ½".

SPECIFICATIONS

Only sound hardwoods such as oak, maple, hickory, ash, locust, gum, chestnut, shall be used. They shall be of good quality and of minimum dimensions with no signs of decay.

Standard Tie Lengths

Earling & Rossmore	6'-0"
All other mines	8'-6"
Railroad ties	8'-6"

made coils are used for all motors with the exception of a few small ones of the a.c. type. Connection wires and cables of the asbestos-insulated type are used on all locomotives, cutters and loading machines.

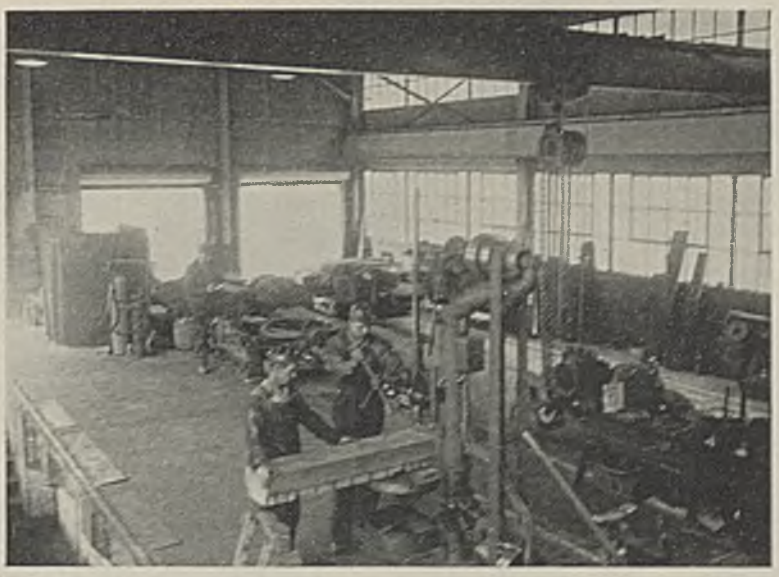
Three years ago the installation of rolled-steel wheels was begun. Some of these are purchased with extra thick treads so they can be handed down to smaller locomotives after several turnings. Filling worn treads by arc welding is not practiced.

All mining-machine bits are sharpened in the central shop and the process consists of repointing in a Sullivan roller sharpener and quenching by submersion in a soap solution. Cutter-bar rebuilding is another mining-machine repair item which is concentrated in the central shop. Cutter chains are not completely rebuilt but are scrapped after they become badly worn. Periodic overhauling of the mining machines usually is done at the mine, but when transfers are made from one mine to another, the machines are routed to the central shop for a rebuilding. Frames of all of the old 29B arcwall machines were completely rebuilt and strengthened at the central shop. Many jobs such as overhauling gear-unit assemblies are regularly sent to this Omar shop.

Cars Have Roller Bearings

More than 90 per cent of the mine cars are equipped with roller bearings (principally Timken) and replenishment of the lubricant at six-month intervals is done with an Alemite electric gun sent from mine to mine. A steel car with wood three-plank center bottom is the standard but a number of wood cars also are in use. As a rule when the bottom planks are renewed or renewals are made on wood cars, the wood is brush-treated after installation with a creosote oil. At Omar No. 5 mine the acid water definitely shortens the lives of the steel sheets, and at this time, renewal side-bottom sheets with wheel hoods are being installed on many cars. Maintenance costs of all mine cars average approximately 1½c. per ton of coal shipped.

Local repair shops are located on the outside at all mines. They are of liberal dimensions and contain repair pits and bridge cranes. A few years ago $15,000 was spent on a new steel-frame steel-sheathed shop at No. 5 mine. Dimensions are 40x120-ft. and through the center is a low partition separating the blacksmithing and car-repairing work from the locomotive and machine repairing. And more recently $12,000 was expended to build a 35x80-ft. shop of the same construction at No. 19 mine to replace a shop destroyed by fire. The building has a 16x20-ft. extension for the blacksmith work in connection with car repairing.



Machine and locomotive repair room in the new steel shop building at Stirrat No. 19 mine

Regular inspection is the first line of defense in maintenance. Many major equipment items are inspected once a day and others once a week. Taking Omar No. 4 mine as an illustration, the schedule calls for two inspections of the main fan every 24 hours, bi-daily inspections of 13-ton main-haulage locomotives and weekly inspections of the Jeffrey 6-ton gathering locomotives.

Table I—Anti-friction bearings and armatures upon which they are interchangeable

SKF Ball Bearings	Norma-Hoffmann Roller Bearings	Type of Electric Motor
308	R-340	Commutator end gear end 2306 Armature
309	R-345	Commutator end 2B-B Bit Armature
411	R-455	Gear end 2B-B Bit Armature (Plain)
414	R-470	Gear end MB 85 Armature
411	R-455	Commutator
417	R-555	Gear end West. 907-C Armature
412	R-465	Commutator end West. 907-C Armature
415	R-500	Gear end Gen. Elec. H.M. 809 and 711 Armature
414	R-470	Commutator end G.E. H.M. 809 and 711 Armature
412	R-465	Gear end Goodman 12-Ton 2B-A Armature
414	R-470	Commutator end Good. 12 Ton 2B-A Armature
411 Coneside		Gear end G.E. H.M. 826 Armature
408	R-445	Commutator end G.E. H.M. 826 Armature
412 Coneside		Gear end G.E. H.M. 803 Armature
411	R-455	Commutator end G.E. H.M. 803 Armature (PL)
408	R-440	Gear end G.E. H.M.-1022 Armature (Plain)
308	R-340	Commutator end G.E. H.M.-1022 (Plain)
311	R-355	Wagner Elec. 5 and 7½ Hp. A. C. Motor Adapter
214		Center Bearing for 22 A DA Armature
414		Gear end 22 DA Adapter
412		Commutating end 22 DA Armature
1615		No. 4 Mine Fans Adapter Type
1611		No. 4 Mine Fans Adapter Type

Compressed air is used extensively for cleaning electrical equipment. The Ingersoll-Rand 6x3½x4-in. air-cooled compressor in the shop at Omar No. 5 mine feeds to a receiver and piping system which extends to the tipple, lamp house and aerial tram-drive house. A convenient arrangement of outlets provides hose connections for blowing out all of the stationary motors.

The central shop is equipped with a full line of portable electrical testing instruments suited to checking mining equipment. These include the following: Esterline graphic a.c. and d.c. wattmeter, Bristol graphic d.c. ammeter, General Electric indicating a.c. and d.c. voltmeter, Biddle megger, Roller-Smith ohmmeter, General Electric indicating wattmeter and ammeter, General Electric indicating power-factor meter, General Electric millivoltmeter and a Sangamo totalizing d.c. wattmeter.

The supply clerk in charge of the central warehouse reports directly to the manager of mines and is responsible for maintaining the necessary stock of regularly used items. No inventory stock is maintained at any mine. The few emergency repair parts kept at each mine are charged directly to operation when they leave the Omar supply house.

Only some materials which come by carload lot are shipped directly to the mine. These include rail, locomotive sand, rock dust, certain building materials and in some cases mine-car repair parts. All other parts and materials are stocked at the warehouse and delivered to the mines by truck. Perpetual inventories are maintained on cards attached to the individual warehouse bins and also on cards on file in the comptroller's offices of the corporation at Cincinnati.

At the left is the main supply house and at the right the central shop at Omar

old 6-ton cable-reel locomotive being com-
ely rebuilt to modern standards in the Omar
No. 5 shop

he hose on top of this haulage locomotive
connected to the air-brake receiver and is
used for regular and frequent cleaning

Transformer substations and
power lines are built to engi
department specifications and are
tained by a line crew working
the central shop

Greasing cars with pressure gun at No. 19 mine

Car repairing is done under
favorable conditions in the
shop buildings

All bins are numbered and these numbers are the principal guide for the accounting at Cincinnati. A physical inventory is made every six months. Bin cards of active material are white and those of obsolete and practically inactive material are red.

Procedure in withdrawing material from stock is as follows: The mine superintendent makes out a supply-house requisition with three carbon copies. He keeps one carbon for his file and sends the original and other two carbons to the supply house. When the material is sent out, the supply house files one carbon copy, affixes the bin number to the original and sends it and one carbon to Cincinnati. The latter office keeps the original and, after adding the price to the carbon copy, returns it to the mine superintendent.

The purchasing agent of mine supplies is stationed at the Omar office and therefore is in close touch with the warehouse, operating, engineering and maintenance departments. In addition to the bin-card inventory the principal other record kept at the warehouse is a file of sheets of daily receipts of new material. One sheet has 27 lined spaces for entering under fifteen columns all particulars regarding the number of shipments. One or more sheets, as required, are used each day that any material is received.

Specifications are drawn up by the engineering department to cover certain materials such as mine ties and timbers. The mine superintendents are granted a reasonable latitude in specifying the general types of materials they think best suited to their conditions, but not so much that the equipment and supply salesmen find particular advantage in calling on them. The final say regarding a specification comes from the manager of mines.

As true with most other mine supplies, lubricants are shipped to the Omar supply house and from there are trucked to the mines as required. Gulf lubricants are purchased for No. 19 and Earling mines and Standard lubricants for the other four. Hulburt grease is used for certain special jobs at all mines.

Maintenance work in the Elkins division, comprising the Norton, Junior and Bower No. 12 mines, corresponds substantially in standard and methods with that in the Logan division. Heavy repair work and armature winding are done in central shops at the Coalton power plant, which are in charge of a chief electrician.

SAFETY

+West Virginia Coal & Coke Corporation

RELIANCE on the mine law, supplemented by a management code of rules approved by the chief of the West Virginia Department of Mines and directed toward conditions at its operating plants, is a major factor in the safety work of the West Virginia Coal & Coke Corporation. Supplementing this basic principle, the company follows a program of reducing physical, explosion and electrical hazards by keeping mines and equipment in good condition, installing guards where there is a possibility of injury, establishing standards for the conduct of mining and surface activities in a manner both safe and efficient, supplying an adequate quantity of ventilating air and rock-dusting.

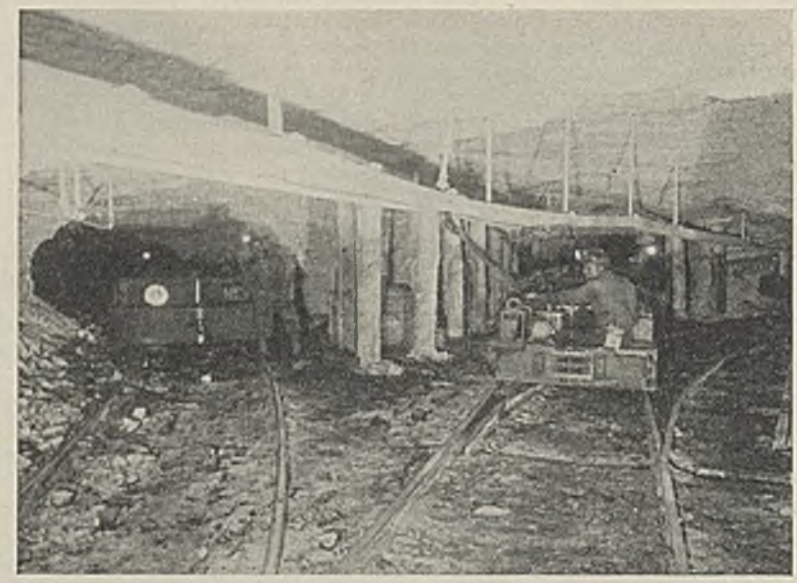
Use of safety clothing and proficiency in first-aid is stressed, the safety idea is kept constantly before employees and new men are examined before being hired to uncover physical defects that might impair their ability to work safely and efficiently. Edison electric cap lamps are used in all operations of the company, and, while they were adopted primarily as an adjunct to better working, they also contribute to injury prevention by providing adequate and unvarying light and also because of their inherent advantages in case gas is encountered, although gas is not a major hazard at West Virginia Coal & Coke mines.

Natural conditions and personnel characteristics pose a somewhat greater than normal problem at Logan division operations. Roof conditions vary from good through fair to bad, and low coal is worked in a number of cases, increasing the possibility of injury from falls off roof. In addition, the turnover in the labor force is approximately 50 per cent per year, reflecting in part seasonal employees, as well as the restlessness and desire for change characterizing a large part of the mine population in the field. In the Elkins division somewhat similar conditions obtain, with, however, a stable labor force as a favorable factor.

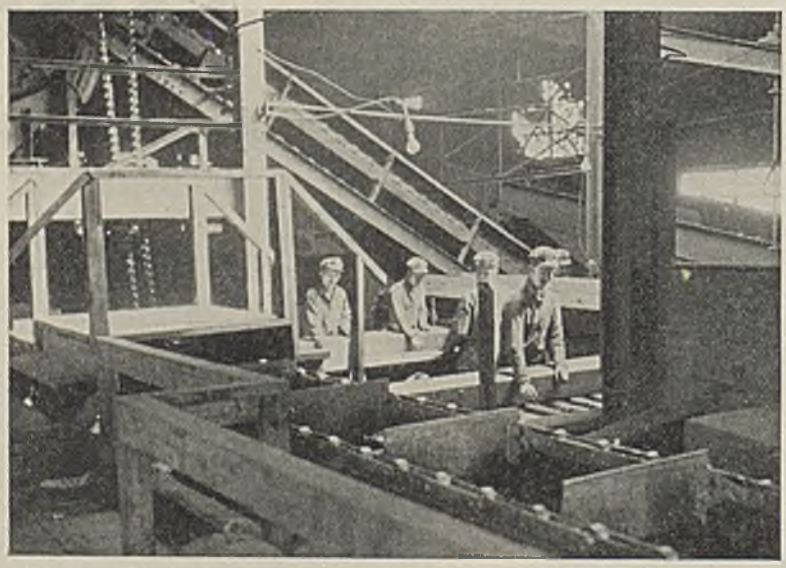
Safety at the West Virginia Coal & Coke operations is made a tripartite responsibility of the safety director, the engineering department, which establishes operating standards, and the operating personnel, whose task is to carry out the recommendations of the safety engineer, see that engineering standards are conformed with and generally give active assistance in the work of injury prevention. New men are required to receipt for a copy of the safety code, and stress is laid on proper supervision, personal instruction, written appeals, first-aid training and other educational media.

Rule 1 of the general list in the safety code is as follows: "Report all personal injuries, regardless of how slight they may be at the time of the injury, to the foreman in charge immediately, who in turn will report them to the superintendent." Second in the list is: "Report unsafe conditions and practices to your foreman." These injunctions are followed by a selected list of provisions, both general and applying specifically to various classes of employees. Loose clothing and gauntlet gloves are prohibited, along with working on power lines until the current has been shut off, the switch locked open and a warning sign posted; use of defective tools, horseplay, riding on trips without authorization or, when authorized, riding on the rear bumper or between cars, except for the brakeman, who is permitted to ride on the rear bumper. Unauthorized persons are forbidden to loaf around, tamper with or operate equipment, and guards and safety devices can be removed only with the permission of the foreman and must be replaced immediately. A ban on operation of equipment known to be dangerously defective is another provision included in the code.

Included in the section devoted to loaders is a provision that such men, upon entering their working place, shall examine the top, set a safety post or posts, set as many additional posts as are necessary to make the place safe, report any conditions that cannot be made safe to the foreman



Substantial guards protect men against contact with the trolley wire. The guarding program also includes all moving machinery and sources of electrical shock



Safety headgear use extends to tipples, shops and other surface plants

Regular rock-dusting reduces the explosion hazard

immediately and keep out of all dangerous places until they can be made safe. Roof conditions are the primary reason for these measures, and, to insure the maximum protection, timbering standards (p. 549) have been developed for each mine. These standards indicate the minimum rather than the maximum of timber to be set and by no means release the loader from the obligation to set as many more as may be required, or the foreman from seeing that such extra timbers are set. As a further safeguard, definite standards for size and condition of posts and timbers have been established, and sawed wedges and cap boards are provided.

All employees are expected to conduct themselves with due regard to roof conditions, but three classes—machinemen, tracklayers and timbermen, in addition to loaders—are singled out for special attention. When a cutting machine enters a place the helper is required to walk ahead to observe its condition. Trackmen are instructed to sound and examine the top for a space of at least 10 ft. before starting work at any spot. Timbermen are required to follow the engineering standards and are expected to set sufficient safety posts to make themselves safe before installing crossbars. When sharpening wedges, timbermen are instructed to hold them at the back and not on the top. Good housekeeping, involving clean places, precautions against scattering tools, timber and other materials and supplies are urged on all employees in general, and loaders, trackmen and timbermen in particular. Supplementing this injunction, the company follows a plan of regular track cleaning, search for and reclamation of materials, etc.

Powder Use Safeguarded

To safeguard handling of explosives, loaders must provide themselves with an approved powder bag and cap box. Not more than one shot can be fired at a time and only one kind of an explosive can be used in a hole. Clay and rock dust are used for stemming, and at Omar No. 5 mine special equipment (see p. 594) has been installed for the preparation of rock-dust dummies. In case of a misfire, a loader is not permitted to reenter the place until it has been inspected and found safe by the foreman, who must personally supervise the drilling and shooting of another hole. Waiting time is 15 minutes for electric detonators and 30 minutes for squibs.

To eliminate the hazards involved in keeping explosives in the home or in taking undue quantities into the mines, the method of distribution has been changed to sales at a magazine at each mine. Formerly, explosives were purchased at the company stores, with consequent inability to control their

handling by the miner. Now, magazines are built at the mines, and at stated times during the day an employee of the Junior Mercantile Co., operating the company's stores, visits each magazine to sell explosives, which are taken directly into the mine. Explosives are put up in packages of four sticks, which are sold as a unit in accordance with the man's requirements. As a guard against purchase of excessive quantities, individual purchase records are checked, and when quantities seem to be excessive, an investigation is made. Only one day's supply for the mine is kept at the magazine at any one time.

Flying switches, backpoling and reversal of trolley pole while the locomotive is in motion head the list of "Don'ts" for transportation men. Motormen are forbidden to leave a locomotive while it is in motion, except to safeguard themselves, and must remove the trolley from the wire at the end of the shift, unless a light is needed as a warning, and also take off the reverse lever. Brakemen must ride inside an empty car or on the rear bumper on loaded trips, must carry whistles and are responsible for displaying trip lights (Edison electric) on the rear of all main-line trips. Haulage men are required to close all doors and are forbidden to couple or uncouple cars from the inside of a curve or while standing on the bumpers or inside the rail. Loose or ragged clothing is forbidden, and brakemen must wear boots or leggings or tie their trouser legs inside their socks. Jackets or coats must be worn under overalls or tucked inside trousers. Gauntlet gloves, as previously stated, are forbidden.

Trip Length Regulated

Maximum length of trips and the movement of rolling stock are subject to dispatcher control. Rerailers or blocks only are used in retracking cars. When pipe, rails or other materials are hauled, an empty car is placed between the material car and the locomotive. Guiding sand onto the rail while the locomotive is in motion is prohibited. Haulagemen are expected to note the condition of the haulageways and report to the foreman or assistant any dangerous, unsafe or defective roof, track, switches, wire, bonds, etc. Where animal haulage is in effect, as in the Elkins division, drivers must accompany animals to and from the stables and use care in taking them under wire or along haulways. They must accompany the car to and from the working face and are forbidden the use of clubs and whips. Care in harnessing and reporting of defective harness or injuries to animals are enjoined on drivers.

All man-trips must be in charge of an official of the mine, who is held responsible for enforcement of the following: operation at a speed of not over 6 m.p.h.; not over eight men per car, who must sit opposite the wire; no getting on or off until the trip is completely at rest; no tools in cars with men; and no men in car next to the locomotive, which is reserved for tools and supplies.

As a further haulage safeguard, track standards have been established (see pp. 549 and 556) and trackmen are expected to observe them. Track construction also includes proper position of the trolley and feeder wire and the installation of guard boards at all places where men must cross. In this work, Ohio Brass combination hangers and guard-board clamps are used, with guard boards 6 in. in depth.

Men Must Stay on Machines

Leaving a cutting machine unattended, except when it is parked off the main line and the switch is lined against it, is forbidden. In gaseous mines the machine must be stopped at the last crosscut and the place examined and tested for gas before it is brought to the face. The bit chain must be securely locked before the machine is trammed on the main line, and the crew is forbidden to sit on the reel and switches must be lined against any place in which the machine is working.

In addition to other applicable rules enumerated above, electricians, repairmen and machinists are subject to the following: no loose clothing or gauntlet gloves; safety shoes and goggles at all times for shop men; caution in getting under cranes, chain blocks or jacks; stopping of all machinery before oiling, cleaning or making repairs; shielding of all electric welding, except bonding; covering of pits and manholes when not in use; no use of the hands in braking or brushing chips or shavings from drills, lathes and other moving tools or machines; inspection of poles for decay, as well as belts and spurs, before climbing; etc.

All Logan division mines are on the 100-per-cent safety-hat basis, including tipple, shop and other outside men. In the Elkins division, all underground employees wear safety headgear. Safety shoes, compulsory for shop men, are being introduced gradually in other departments by personal solicitation and example. Other protective equipment includes Comf-O respirators for rock-dusters.

All dry mines are rock-dusted regularly, using M-S-A and Little Giant low-pressure machines. The objectives, checked by regular sampling and analysis, is 50 per cent of inert material at all times. In addition to haulage entries, airways and other openings, rock-dusting is carried up the face of all working places on each regular application.

First-aid training is extended to all employees, and at times the number so trained has approached 100 per cent, although seasonal employees and the heavy turnover make accomplishment of this goal difficult. First-aid stations are established at strategic points in the mines and on the surface, and members of several specially trained first-aid teams at all operations always are on hand to supplement the work of other employees. Regular training is given by U.S. Bureau of Mines men.

Except for the door itself and the necessary framing, door installation involves the use of non-combustible cinder blocks, and provision is made to prevent contact of the wire with any part of the installation. Stoppings also are constructed of cinder blocks, and water barrels usually are stationed at all main-line doors.

Good dress for the safe miner—no loose clothing, trousers tucked into socks, safety shoes and headgear, and electric cap lamp

VENTILATION

+West Virginia Coal & Coke Corporation

TO MAKE SURE that ventilation will never act as a drag on mining progress and efficiency, periodic studies are made at the mines of the West Virginia Coal & Coke Corporation and steps are taken early to meet anticipated needs. New fans where mine life and load justify the investments, overcasts of tunnel-lining steel or of reinforced concrete, cinder-block stoppings close to the face of permanent headings, standard doors in fireproof settings, one-way air travel for the most part—all these combine to form ventilation systems which function with safety and efficiency.

Five of the six Logan division mines are drift operations and one, Rossmore, is reached by a short slope. Generally speaking, the coal lies not far from horizontal and outcrops along the deeper valleys, thus presenting some opportunity for using drift openings to shorten ventilation paths. Seam thicknesses range between 44 and 120 in. and the daily productions of the mines are between 1,000 and 4,000 tons.

The present ventilation set-up in the Logan division is largely the result of an improvement program started shortly after the first complete study made in 1927 and 1928. At that time, mine projections were made for some years in the future and the ventilation requirements were planned on that basis. A check study started in 1935 and still under way will form the basis for revisions to conform to new conditions, including introduction of loading machines and conveyors, the trend to thinner coal and the availability of improved ventilating equipment.

Only in Omar No. 5 mine is any explosive gas to be detected by Orsat analysis and that only after heavy pillar falls. Worked-out areas are bled rather than sealed, with the exception that in Micco No. 3 a section has been sealed as a part of a government and State project to reduce acidity of water draining from that section to the creek.

With the exception of Rossmore mine, all main haulways and underground d.c. substations are on the intake air. No booster fans are used and the only blowers are in Stirrat No. 19 mine, which, with tubing, are used in rooms and crosscuts in the mobile loader-conveyor section. Seldom are line brattices used in any of the mines. No. 19 mine has four primary splits and the balance of the mines have two. Regulators are used on secondary splits and these are installed as close as possible to the main returns. Except for a few small swinging-door regulators all are the sliding-door type.

Prior to 1931, permanent stoppings usually were built of mine rock with Portland cement mortar. However, a few were constructed of mine rock plastered with clay. Since 1931 all have been built of cinder-concrete blocks set with Portland cement mortar. On the main, flat and cross headings the permanent stoppings are built as close as possible to the face. Seldom are more than two or three temporary wood stoppings to be seen ahead of the permanent construction. Wood is used for secondary stoppings and cloth stoppings are used only in pillar sections and in advanced workings as temporary means of directing the air.

Four of the 21 overcasts in the six mines are built of tunnel-steel lining (Commercial Shearing & Stamping Co.) and the balance of concrete reinforced with bars or old rail. Two of the tunnel-steel type were built several years ago. They proved entirely satisfactory and that type of construction was repeated on two recent jobs. The standard method is to fill both sides of the overcasts to reduce turbulence and only a small amount of fill is required with the tunnel-steel shape.

Engineering department standards are set up in blueprint form to cover the common practices of inside layout and construction pertaining to ventilation. These include a plan for standard entry driving and temporary ventilation and also a detailed design for mine doors. Although the doors proper are of wood, they are termed "fireproof doors" by the men in the mines because cement blocks are used between the door frames and ribs, no brattice cloth is allowed and trolley hangers are spaced 2 ft. each side of the door to keep the wire from touching the door top and the sides of the header notch. Air locks are not used and only in the Earling mine are automatic doors (Canton) installed.

Omar No. 4, Micco No. 3, Rossmore and Earling mines are developed on the four-heading system. In Stirrat No. 19 mine the main entries are made up of six headings and the cross entries of four. In Omar No. 5 mine the old system was based on a four-head-

This tunnel-lining steel overcast on the Steele Mains, Stirrat No. 19 mine, is the fourth of that construction installed in the Logan division

ing entry, but in the new development the main entries include seven headings, three used for intake and four for return.

In the recent ventilation check, now nearly completed for all Logan division mines, the volume, relative humidity and temperature were determined on the intake and return of all primary and secondary splits and in some cases at the last place or face. Determination of humidity was primarily for checking the quantity of water leaving a place or section as a guide to the dryness of dust. In certain cases, however, undue changes in humidity led to the detection and stoppage of leaks.

At Stirrat No. 19 mine a 90-ft. air shaft was sunk in 1931 to accommodate a new fan. The sinking was accomplished by drilling a 19-in. borehole and then dropping the rock down this hole into a heading, where it was hand loaded into mine cars. Dimensions of the shaft are 14x16 ft. and approximately 35 ft. at the top is concrete-lined. A steel stairway is installed in the shaft so that it may be used as an escapeway.

Ample quantities of air per man rather than requirements based on gas dilution are the controlling factor in volumes pumped by the fans. Of the eight fans in use at the six mines, the main fan at Stirrat No. 19 handles the largest quantity: 172,000 c.f.m. at 2.25 in. water gage. This is one of three new fans which were installed following the ventilation study finished in 1928. It is an 8x4-ft. Jeffrey centrifugal with an Allis-Chalmers 100/45-hp. two-speed 440-volt linestart squirrel-cage motor mounted on a Kritzer floating base which maintains uniform tension on the Tex-rope drive (ten $1\frac{1}{2}$x$\frac{3}{4}$-in. V-belts).

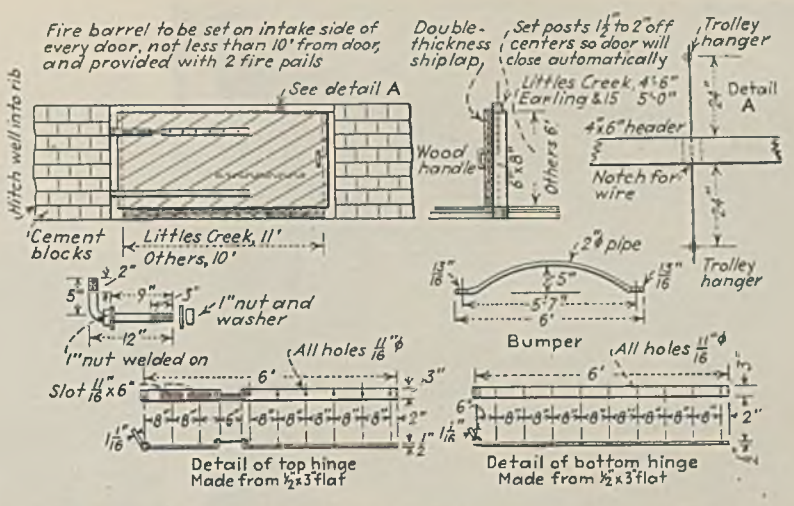


Fig. 1—Mine doors are built and installed according to this standard plan

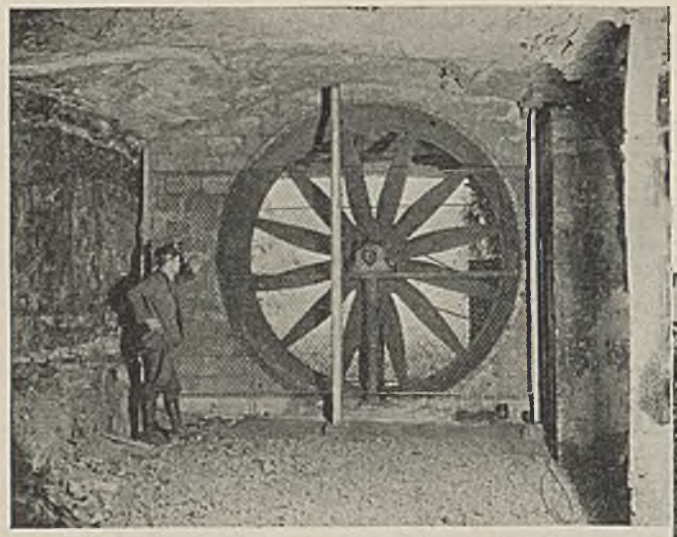
Mounted in the motor room is an E. C. & M. magnetic controller and this, together with a master controller at the drift mouth approximately a mile away, provides for remote starting and changing of speed. Normal speed of the motor is 870 r.p.m., but from 2 a.m. to 6 a.m. the motor is operated at 575 r.p.m., the fan delivering 83,000 c.f.m. The control cable between fan and master controller is of five-conductor, 550-volt rubber-insulated triple-braid weatherproof construction and is hung from a $\frac{5}{16}$-in. steel messenger wire carried on wood poles.

The control system is such that the motor does not restart automatically upon return of voltage. This arrangement was adopted because, from the standpoint of reduced strain on the drive, it is desirable to change the master controller, start the motor in the reduced-speed position and then switch to high speed. Colored lights in the master-controller box indicate op-

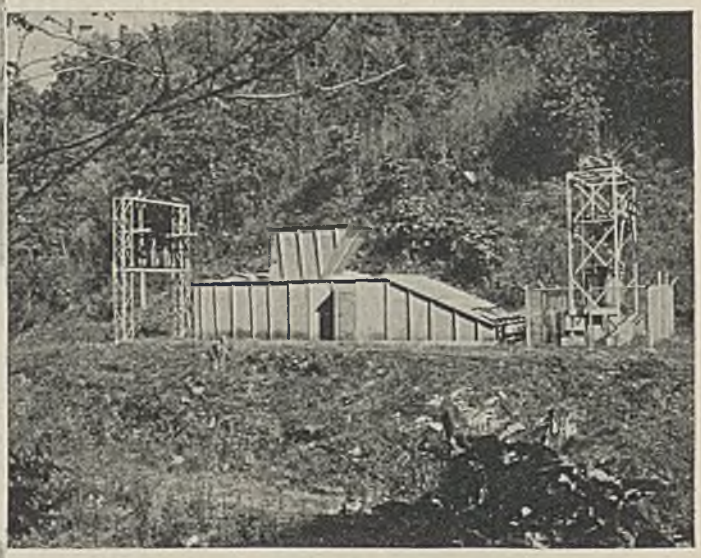
Table I—Mine Characteristics and Fan Data, Logan Division

Mine	Fan	Average Thickness of Coal, Inches	Longest Split, Miles	Primary Splits	Overcasts	Doors	Direction	Actual C.F.M.	Water Gage, Inches	Mine Equivalent Orifice, Sq.Ft.	Type Fan	Size Fan, Feet	Date of Test	Power Input, Kw.	Size Motor, Hp.	Efficiency,[1] Per Cent	Water Leaving Mine in Air, Gal. Per 24 Hours	Drive Connection
Stirratt No. 19	.....	44[3]	3.7	4	6	25	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
	Main Fan	...	..	..	..	..	Exhaust	172,200	2.25	44	Jeffrey centrifugal	8x4	Jan., 1936	99.3	100/45[2]	46	11,700 to 17,000	V-belts
	No. 18 Section Fan	...	...	...	..	..	Exhaust	38,700	0.45	22	Buckeye disk	6	Jan. 1936	12.1	15	18	2,650	Flat Belt
Omar No. 5	.....	82	5.8	2	6	45	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
	Main Fan.	...	...	...	..	..	Exhaust	84,560	0.90	25.6	Jeffrey centrifugal	10x4½	Nov. 1936	19.2	35	54.2	.....	Flat Belt
Omar No. 4	.....	124	2.6	2	1	15	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
	Main Fan.	...	...	...	..	..	Exhaust	93,694	0.76	....	Jeffrey Aerovane	9	Feb. 1935	.....	25	58.4	.....	V-belts
Micco No. 3	.....	78	2.7	2	1	7	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
	Main Fan.	...	...	..	..	..	Exhaust	60,588	1.52	18	Jeffrey centrifugal	5x3½	May, 1936	22.5	35	34.9	520	V-belts
Rossmore	.....	80	2.3	2	3	25	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
	Main Fan.	...	...	...	..	..	Blow	85,000	0.70	39	Robinson forward curve	6x4	April, 1934	39.6	50/16 ½[2]	18.7	.....	Flat Belt
	Second Fan	...	...	...	..	..	Exhaust	.....	....	....	Jeffrey Straitflo	6	.....	....	15	....	.....	V-belts
Earling	.....	50	2.5	2	4	19	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
	Main Fan.	...	...	...	..	..	Exhaust	99,600	1.80	....	Robinson forward curve	6x4	.....	49.1	60	44	13,012	V-belts

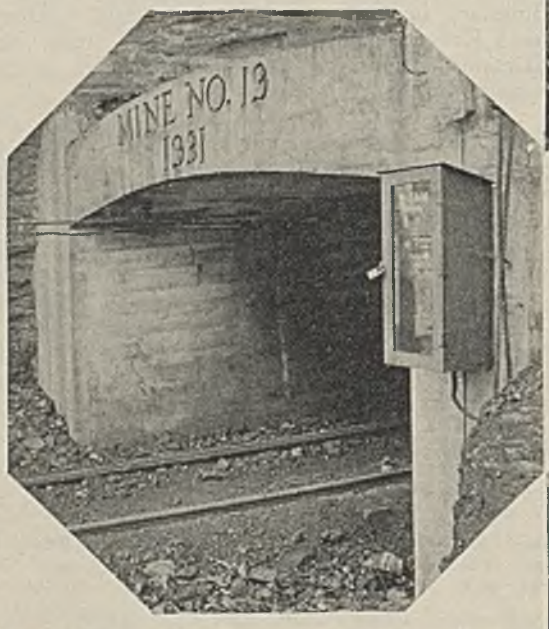
[1] Over-all mechanical efficiency of unit including motor, drive connection and fan. [2] Two-speed motor, tested at high speed. [3] Present workings; older sections are 52 in. or more.



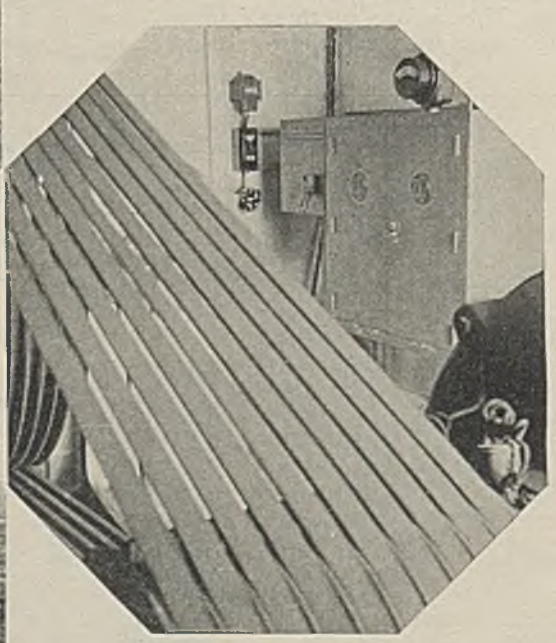
9-ft. propellor fan, Omar No. 4 mine, viewed from inside the mine. A door in the wall at the right opens into an airlock connecting with the motor room and outside



Stirrat No. 19 mine is ventilated by this reversible fan at the top of a 90-ft. air shaft. The fan is remotely controlled from the drift mouth a mile away



Starting and change of speed of the No. 19 fan, a mile away, is accomplished from the locked control box at the right of the portal



View in the motor room at No. 19 fan. In the foreground is the V-belt drive and in the background is the inclosed magnetic controller containing the switches for two-speed operation

Standard door plans specify cinder blocks between door frame and ribs, forbid use of brattice cloth and provide for securing the trolley wire to clear the wood parts

eration and speed position. Motor bearings are protected by Allis-Chalmers thermostats.

At the top of an 8x12x44-ft. concrete-lined air shaft at Omar No. 5 mine a new Jeffrey 10x4½-ft. fan was installed. It is powered temporarily by a Fairbanks-Morse 35-hp. 220-volt 865-r.p.m. squirrel-cage motor with long flat-belt drive connection. The fan has a capacity much greater than present requirements and later will be equipped with a larger motor and arranged for higher speed. These two new fans at No. 19 and No. 5 and a Robinson fan at Rossmore are the only three which are set at the tops of air shafts instead of at drift openings. The Rossmore airway consists of a 10x18-ft. slope and shaft; total length, 120 ft.

The newest fan is a Jeffrey 9-ft. Aerovane installed in 1934 at Omar No. 4 mine. Its rating is 110,000 c.f.m., 1-in. water gage, 465 r.p.m., 23.6 brake horsepower. It is now operating with an adjustment to deliver 93,000 c.f.m. at 0.76-in. water gage. The motor is a 25-hp. General Electric Type FTR (double-deck squirrel-cage) 220-volt 1,200-r.p.m. unit mounted on a Kritzer floating base and the drive connection is a Dayton multiple V-belt. This fan is installed 25 ft. inside a drift opening. In this position and with the frame wall hitched deep into the ribs there exists little chance for leakage compared to an installation on the outside requiring an exposed airway connecting the drift to a fan housing.

All fans are driven by induction motors of the squirrel-cage type, except at Micco No. 3, where a wound-rotor motor was installed because that type was available from surplus stock. Each main fan can be reversed in case of emergency. On the Aerovane, this would be done by turning the propeller blades 180 deg.

A new method of ventilating underground substations installed during the last two years has been adopted. It is based on the use of a small fan to blow filtered air into the substation room through ducts opening under the machine base. A detailed description appears on p. 593.

In the Elkins division, which comprises the Norton and Junior mines in Randolph and Barbour counties, and the Bower No. 12 coaling station, Braxton County, the Norton and Junior mines are served by two fans each. One 8-ft. disk fan driven by a 25-hp. motor and delivering 96,000 to 98,000 c.f.m. and a second 6-ft. disk unit are moved from time to time to bring them nearer the working sections at Norton. Both operate exhausting and, as the coal outcrops at all points, establishment of unidirectional air currents is facilitated, with most of the air following a short route through the working areas, while only the minimum quantity necessary is drawn through the much longer routes of the main haulageways. Water gage consequently is low, and the expensive stoppings that would be necessary were the air taken through a long closed circuit into the mine and back to the drift mouth are eliminated.

At Junior one 8-ft. disk fan located at the drift mouth and operated blowing takes care of a little over half the mine. It is driven by a 25-hp. motor. A second 6-ft. centrifugal fan takes care of the rest of the workings.

Since 1931, all permanent stoppings have been built of cinder-concrete blocks set with Portland cement mortar

Table II—Specimen Test, Omar No. 5 Fan.

Used Esterline-Angus kilowatt meter, trans. ratio 40:1.

Fan:

10x4½ ft. Jeffrey centrifugal, driven by a Fairbanks-Morse induction motor No. 55.501, 50 hp. reduced to 35 hp., 865 r.p.m., 3 ph., 60 cy., 220 volt.

Effective Time of Test:

8:15 to 8:45 a. m., 10-28-36

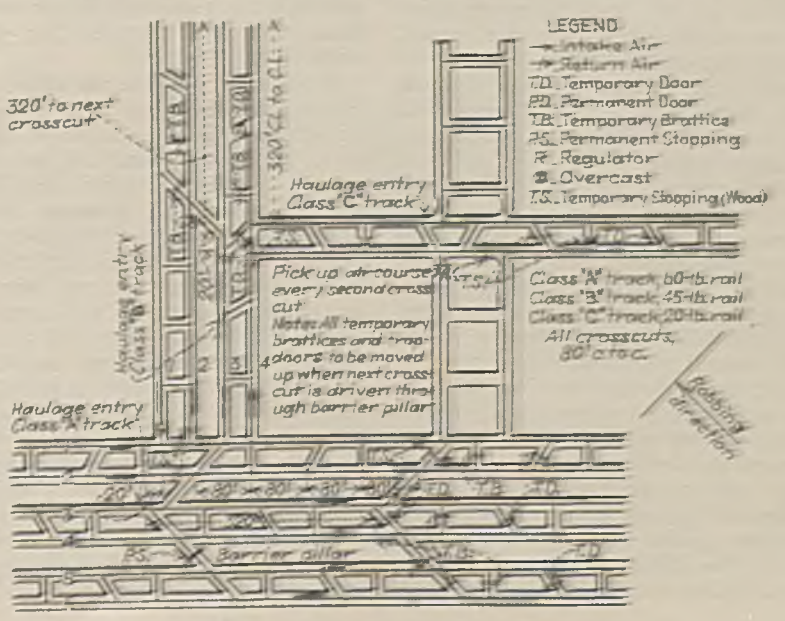
Motor Readings:

19.2 kw.—prevailing air density
25.75 hp. Power factor 88.

Air Readings:

Outside air, Bar. 29.22 In. Hg.
Relative humidity 89% @ 36°F.
Inside air, Bar. 29.63 In. Hg.
Relative humidity 98% @ 60°F.
Air density=0.07553 lb. per sq. ft.
Static pressure at prevailing air density=0.90 In. H2O
Static pressure at standard air density=0.8931 In. H2O
Area at gage=56 sq. ft.
Air speed at gage=1,510.0 f.p.m.
Volume=84,560 c.f.m.
Velocity pressure at gage=0.1425 in. H2O at std. air density.
Total pressure=0.8931 plus 0.1425=1.04 in. H2O std. air density.
Effective fan output=13.86 hp. on the air
Over-all unit eff.=54.2%
Mine equivalent orifice=25.60 sq.ft.
Volumetric capacity=245%
Manometric eff.=88%

Fig. 2—Standard entry driving and temporary ventilation plan



In the Omar store: left, partial view of men's furnishings, meat and grocery departments; right, a glimpse of the basement hardware and houseware section

INDUSTRIAL RELATIONS

+At West Virginia Coal & Coke Corporation

PROMOTION of the physical well-being of the workers and the communities in which they dwell dominates the industrial-relations program of the West Virginia Coal & Coke Corporation. Although opportunities for broadening the educational, social and cultural life of the miners and their families are accepted, many of the organized efforts of the company center upon some aspect of personal or community health. That was true even in the days prior to the autumn of 1933, when wage rates and working conditions in the Logan field first became a matter of union contract. One of the earliest steps in the program of the present management was the establishment of a welfare and medical department.

Last year, West Virginia Coal & Coke Corporation had 3,232 employees on its payrolls. This was an increase of approximately 10 per cent over the number employed in 1934. As is shown in Table I, most of these workers were native-born white Americans or Negroes. Reduced to its simplest terms, therefore, the industrial-relations problem of the corporation is one of providing housing, medical service, stores and general community facilities for this group and their families and for the employees of subsidiaries who are located at the mines. This problem is greatest in the Logan division, where there are approximately 10,000 people scattered through seven mining communities. Most of the company housing in the Elkins division is concentrated at Norton and this is small when compared with the provisions necessary at the southern operations.

All told, the company owns 1,769 rental units, of which more than 90 per cent are single-family dwellings. The three-room and four-room types are the most popular. Base rentals are $2.20 per room per month. Where a sink and commode are installed, there is an additional charge of $2.20 per month. A large number of the houses have running water. The usual roofing is heavy asphalt paper. Where it is necessary to replace existing flooring, hardwood now is used. Aluminum paint is standard for all company houses. The Logan division has approximately 1,600 rentable housing units and 99 per cent of these have been occupied for several years.

Rentals and maintenance of company houses and buildings are under the jurisdiction of the tenement department. This department also has charge of the domestic electrical distribution system, water and sewerage systems and the maintenance of highways and bridges. Water supply for the company towns all comes from deep wells or mountain springs; the supply for Omar, Earling, Stirrat and Barnabus (midway between Stirrat and Omar) is chlorinated. The water is tested regularly both by the company's own laboratory and by the State Department of Health, which has complimented the corporation on the water conditions maintained. As a safeguard against sickness from polluted water, the company prohibits tapping of private wells and springs by employees.

As part of its program for maintaining community standards, painting is done and other major improvements are made by towns instead of individual houses. The company has a lumber yard, paint shop, plumbing shop, and carpentry and woodworking shop—all fully equipped—at Omar. The tenement department staff includes a tenement superintendent, carpenter foreman, a paint foreman, a plumbing foreman and a general labor foreman. Each community has a resident general maintenance man who carries a small stock of minor items such as routine plumbing and carpenter supplies for small or emergency repairs. To avoid duplication and over-lapping of forces, it is customary for the mines to call upon the tenement-department carpenters to perform any carpentry jobs at the mines and for the tenement department to use mine electricians for electrical work. Employees of the tenement department, as well as all other departments, are members of the United Mine Workers.

Fire protection is provided by a truck manned by a volunteer crew and stationed at Omar. When engaged in fighting fires on company property, however, the members of this volunteer crew are paid the same wages they receive when working at their regular occupations.

The medical and welfare department of the company has been functioning since 1929. On the medical side the staff includes six doctors, three regular nurses and one special nurse doing field and special case work. Equipment of the medical offices at Omar includes a

portable X-ray and health lamps. Hospitalization is taken care of through contracts with two institutions at Logan which also handle compensation cases. The hospital service includes room, X-ray examinations, any kind of operation which may be necessary and all other regular hospital care for the patient. Where necessary, outside specialists will be called into consultation with the hospital staff.

The company medical director makes a practice of visiting hospitalized patients twice a week. The cost of the medical service, including the services of the company doctors, nurses, medicines and equipment, is $1 for single men and $2 for married men. Hospitalizatio nand operation fees are 80c., $1.10 and $1.30 per month. The married workers' fees entitle the men to the same medical service and hospitalization for dependent members of their families. The cost of drugs used also is included in these monthly charges.

Preventive Therapy Stressed

Much, too, has been accomplished in the field of preventive therapeutics and this work has highlighted the importance of sanitation. A campaign against certain diseases, such as dysentery and typhoid fever, which had become epidemic in parts of the southern West Virginia fields, was started in 1930. This campaign included a fight against flies, mosquitoes and other germ-carrying agents. During one year of this campaign, 5,000 sheets of fly paper were distributed. To the children in the company towns premiums were paid for high "kills." All stagnant pools were drained. A semi-weekly garbage-collection system was organized to clean up the surface around the dwellings and remove all refuse.

Special medicine is provided for each case of dysentery. For the past year a special nurse also has been employed to instruct mothers in child feeding, look after home sanitation and cooperate with the medical staff in dysentery cases. Suggestions are made on how to prepare food for children and the proper foods to be used. Specially prepared foods for babies also have been furnished by the department. In the period immediately preceding this campaign, which started in 1930, the death rate from dysentery alone averaged twelve adults and twenty children per annum; this year there were no adult deaths and only two child fatalities chargeable to that disease. No case of typhoid fever contracted in a West Virginia Coal & Coke Corporation town has occurred in the last five years.

Vaccine and other antitoxins for the prevention and cure of diphtheria, smallpox, common colds and other diseases also have been administered in these health campaigns. Some individual prenatal instruction has been given expectant mothers. A special drive on

Table I—Classification of West Virginia Coal & Coke Corporation Employees by Nationalities

	1934	1935
Native white	1,744	1,949
Negro	462	476
Austrian	10	.....
Bulgarian	1	.....
Croats	5	.....
German	13	36
Greek	2	.....
Horvat	1	.....
Hungarian	149	147
Irish	2	.....
Italian	59	79
Lithuanian	7	.....
Mexican	30	43
Polish	21	37
Portuguese	8	5
Rumanian	8	8
Russian	15	18
Serbian	3	.....
Slovak	5	.....
Spanish	11	.....
Turkish	1	.....
Unknown	2	.....

employee dental conditions resulted in over 1,000 free extraction cases in one year. The extraction was done after X-ray or other examinations had indicated the desirability or necessity of such work. These campaigns, it is felt, have been good business both from the standpoint of the general health of the community and in reducing compensation cases: a well worker usually is a safer worker.

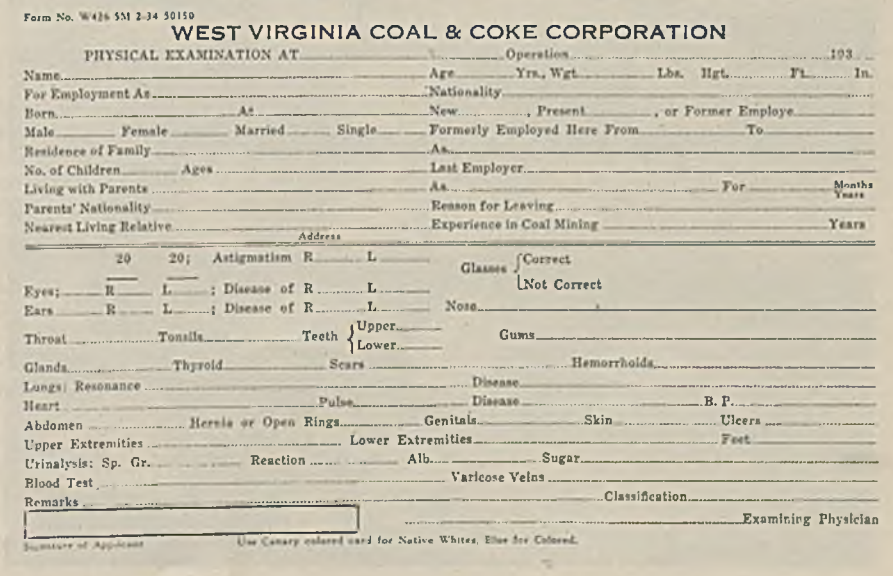
All applicants for employment at the mines must be examined by one of the company doctors and the results of that examination recorded on a card (see Fig. 1) which is signed by the examining physician and by the applicant. This card, with the doctor's recommendations as to employability, goes to the compensation bureau of the department. There are no periodic reexaminations of workers once they are on the payroll. Of course, where a worker has suffered a compensable injury, he is examined before he is permitted to return to work, to determine whether he can safely be reemployed. If he has suffered a permanent disability which incapacitates him for his previous occupation, an effort is made to provide employment in some occupation where that disability will not be a handicap to the man or a hazard to his fellow-workers.

Employees are encouraged to participate in a group insurance policy written by the Provident Life & Accident Insurance Co. This policy pays $100 in the case of death resulting from occupational accidental injuries, $500 for non-occupational accident or natural death; $125 to $500 for certain non-occupational accidents resulting in the loss of eyes or limbs; $8 weekly for a maximum of 40 consecutive weeks in the case of disability from accidents not covered by workmen's compensation and $8 weekly for periods ranging up to a maximum of 26 consecutive weeks in the case of disability resulting from illness.

The health-insurance features of the policy put a limit of eight weeks in any twelve consecutive months for payments due to disability from any chronic disease and four weeks for any non-confining sickness. No payments, however, are made in the case of disability resulting from venereal diseases. The policy also provides for the payment of funeral benefits ranging from $10 for a still-born infant to $75 for an adult dependent of the insured. Monthly premiums for participation in this policy are $1.50 and are borne wholly by the employee. Approximately 90 per cent of the workers have taken advantage of the group-insurance plan.

Workers who may be unfortunate enough to suffer compensable injuries are assisted in the preparation of their cases for presentation by the welfare department. "We are just as much concerned," remarked one West Virginia Coal & Coke Corporation executive, "in seeing that the men get a square deal in these cases as we are in safeguarding the interests of the company." The

Fig. 1—Physical Examination Record Card; the reverse side shows an outline of the bony structure of the body, with space for detailed history of illness and accidents


Form No. W426 SM 2-34 50150

WEST VIRGINIA COAL & COKE CORPORATION

PHYSICAL EXAMINATION AT ..... Operation ..... 193..

Name ..... Age ..... Yrs., Wgt. ..... Lbs. Hgt. ..... Ft. ..... In.

For Employment As ..... Nationality .....

Born ..... At ..... New ..... Present ..... or Former Employe .....

Male ..... Female ..... Married ..... Single ..... Formerly Employed Here From ..... To .....

Residence of Family ..... As .....

No. of Children ..... Ages ..... Last Employer .....

Living with Parents ..... As ..... For ..... Months Years

Parents' Nationality ..... Reason for Leaving .....

Nearest Living Relative ..... Experience in Coal Mining ..... Years

Address

20 20; Astigmatism R ..... L .....

Eyes; R ..... L ..... ; Disease of R ..... L ..... Glasses { Correct / Not Correct

Ears R ..... L ..... ; Disease of R ..... L ..... Nose .....

Throat ..... Tonsils ..... Teeth { Upper ..... / Lower ..... Gums .....

Glands ..... Thyroid ..... Scars ..... Hemorrhoids .....

Lungs: Resonance ..... Disease .....

Heart ..... Pulse ..... Disease ..... B. P. .....

Abdomen ..... Hernia or Open Rings ..... Genitals ..... Skin ..... Ulcers .....

Upper Extremities ..... Lower Extremities ..... Feet .....

Urinalysis: Sp. Gr. ..... Reaction ..... Alb. ..... Sugar .....

Blood Test ..... Varicose Veins .....

Remarks ..... Classification .....

Examining Physician

Signature of Applicant

Use Canary colored card for Native Whites, Blue for Colored.

P. S. Williams
Superintendent of Buildings

welfare department also endeavors to find supplemental employment, such as jobs on surface improvement and roads, for part-time mine workers. Where the conditions seem to warrant such help, direct financial aid may be given in emergency cases.

Management of company stores and related facilities is divorced from the operating department. All store activities are handled by the Junior Mercantile Co. The general manager of this subsidiary of the West Virginia Coal & Coke Corporation, who has his headquarters at Omar, reports directly to the president of the West Virginia group. Twenty-one units, including eleven general stores, are operated by the Junior Mercantile Co. Gross sales this year, it is estimated, will be between $1,900,000 and $2,000,000. The mercantile company employs approximately 150 people and the management staff includes a merchandising manager, credit manager, purchasing agent and store managers.

In addition to foodstuffs, these stores also handle furniture, refrigerators, radios, household utensils, clothing, hardware items and other merchandise for home making. It has three gas stations in the Logan division which do an aggregate volume of approximately 500,000 gal. of gasoline per year. Store buyers visit all the principal wholesale centers to keep in touch with new merchandise lines and make personal selections of goods to be sold through the company outlets. A recent innovation has been the establishment of a 5-and-10c. department on hardware and other small household items.

One of the eleven general stores is located outside of the mining field proper in Huntington, W. Va. This store, opened several months ago, also serves as a wholesale depot and as a buying center, particularly for the purchase of fresh fruits and vegetables, which are trucked to the stores in the mining communities in the Logan division of the West Virginia Coal & Coke Corporation. Although the stores also carry a full line of canned goods, miners and their families are encouraged to use more fresh fruits and vegetables, which are attractively displayed in open racks. Prices are checked semi-weekly with those quoted by the nearest chain stores.

The fact that the Huntington store, which is in direct competition with local independent and chain establishments, has been doing an increasing volume of business and the fact that the stores at the mines are drawing trade from people not resident in company towns and

J. T. Moore
Superintendent of Welfare

not employed by the company are offered as evidence that the Junior Mercantile Co. is running its establishments on a strictly competitive quality, price and service merchandising basis. Eliminating differences in cost of delivery, the mark-up in the Huntington store is practically the same as at the Junior Mercantile Co. stores in the mining region. Credit based on the opinions of the mine superintendent, payroll clerk and store manager at the stores is extended deserving miners during periods of reduced running time. Furniture, refrigerators and radios may be purchased on time payments, but quite a few furniture and appliance sales are made on a straight cash basis.

Recreational facilities for workers and their families include playgrounds for the children reasonably accessible to each company town, lighted tennis courts at Omar, a ball park with two grandstands and two bleachers and a moving-picture theater at Omar where first-run films are shown. The welfare department endeavors to make the communities holiday conscious by decorating the towns on Independence Day and Christmas. Company property has been leased or deeded for the erection of schools and the company cooperates in educational activities through the Parent Teachers Associations and directly with the county and State boards of education.

Social life is encouraged by the facilities provided for lodge and club meetings. The top floor of the Omar office building is used for meetings of such organizations. Omar boasts a women's club which is affiliated with the Federation of Woman's Clubs. As one important step in making sure that the supervisory force will take a keen personal interest in community living conditions and facilities, all mine and store managers must live on company property. The mining communities also are their home communities.

Fresh fruits and vegetables are displayed in open racks

MERCHANDISING

+West Virginia Coal & Coke Corporation

MONOPOLY is a stranger to the bituminous-coal industry. Even in those cases where geographic location or seam characteristics may give a particular mining district an edge in certain markets or with certain classes of consumers, each mine in that producing area is constantly battling with neighboring operations to increase its share of the business. Any successful merchandising program, therefore, must be framed with the competitive factors always very much in mind. The mine or company that wishes to maintain or improve its marketing position must be ready to meet its rivals on a competitive basis with respect to quality, price and service.

This competitive trinity, of course, is the common objective of all commercial operators. Whether that objective is reached and, equally important, the cost of attainment, however, are dependent upon the follow-through. Natural qualities may be enhanced by care in mining and by modern preparation methods. Service, unless planned with a real understanding of the buyer's needs, easily can become a burdensome expense which yields no adequate returns for the money spent. Prices can be—and too frequently are—established with little regard for actual production costs. While such subnormal prices many times are forced upon an operator by a competitive situation not of his own creating, there also are occasions when he initiates such prices because of a lack of proper appreciation of relative fuel values.

Balancing Competitive Factors

In marketing the output of the West Virginia Coal & Coke Corporation operations, management seeks to strike a nice balance between these three major competitive factors. Obviously, where there is no overbalancing advantage in either quality or service, the sales department cannot hope to move tonnage at prices above those named by competitors. But it seeks to protect what it considers a fair price structure by refusing to depreciate values in the general industrial markets with bids on public contracts which would undermine that structure. Moreover, as in the case of its specially prepared stoker coal, where the company feels that it has added a definite plus value to its product, it is insistent that that plus value thus created be reflected in the price levels.

Adherence to such policies, it is frankly admitted, sometimes may result in a temporary check upon an expansion in the volume of business or even in an actual diminution of tonnage. In the long run, however, it is believed that such a balancing of prices and quality redounds to the company's advantage. Such demonstrations of the seller's confidence in the value of his product help to establish comparable ideas of value in the minds of the purchasers. Where a company is marketing over 3,000,000 tons per annum in a highly competitive market and has a developed capacity for a materially larger output, consumer acceptance of this character is no small asset.

Sold Through Sub-agent

West Virginia Coal & Coke Corporation—the parent company—is a stockholder in Appalachian Coals, Inc. Like other operator-stockholders in that central district selling agency, the producing company actually sells its coal through an exclusive sub-agent which was organized to meet the requirements of the sales-agency set-up. This sub-agent is The West Virginia Coal & Coke Corporation, with headquarters at Cincinnati, Ohio, and branch offices at New York, Detroit, Mich., and Cleveland, Ohio. The Detroit and Cleveland offices, however, are looked upon more as service offices for the convenience of large consumers in those two cities and for the salesmen working those urban markets than as independent branch sales headquarters. With the exception of the men attached to the New York office, all salesmen report directly to Cincinnati.

The field work of these salesmen is supplemented and complemented by the various service divisions of the company. These service arms include the credit and traffic departments, combustion engineering service, sales promotion and a comparatively new unit known as the carbon and chemical division. The general accounting offices of the parent company and its three affiliates also are in Cincinnati. Immediate executive responsibility for the activities of The West Virginia Coal & Coke Corporation rests upon the vice-president in charge of sales at Cincinnati; he in turn reports to the president of the sales and allied companies. Sales department work is under the direct jurisdiction of a sales manager and an assistant sales manager.

All but one of the active mines of the Logan division of the operating company are working the Island Creek seam; at Earling, the Eagle, or No. 2 Gas, seam is mined. The Junior and Norton mines in the Elkins division are in the Kittanning bed; Bower, a railroad coaling station in this northern group, mines the Pittsburgh seam. These operations give the sales company a range of coals broad enough to serve all classes of high- and medium-volatile consumers. Approximately 25 per cent of the tonnage sold moves through retail channels for domestic users; the rest of the output is consumed by railroads, public utilities, by-product and metallurgical plants, and general industry.

Where Major Markets Lie

Analysis of distribution records shows that the major markets for all-rail coal from the Logan division mines are in Ohio, Indiana and Michigan. Some all-rail tonnage also moves into northern Illinois. Because of its association with The Ohio River Co.—transportation subsidiary of West Virginia Coal & Coke Corporation—the sales company is an important factor in serving communities on the Ohio River and contiguous thereto in northern Kentucky, southern, central and eastern Indiana and southern Ohio.

Lake business during the navigation season absorbs an important part of West Virginia Coal & Coke tonnage. Shipments are made to all lake ports both in the United States and Canada. Eastern and Southern markets are found in New England, New Jersey, Pennsylvania, Delaware, Maryland, the District of Columbia, Virginia, the Carolinas and Georgia. Most of the eastbound all-rail tonnage comes from the Elkins division; movement from mines in the Logan division to

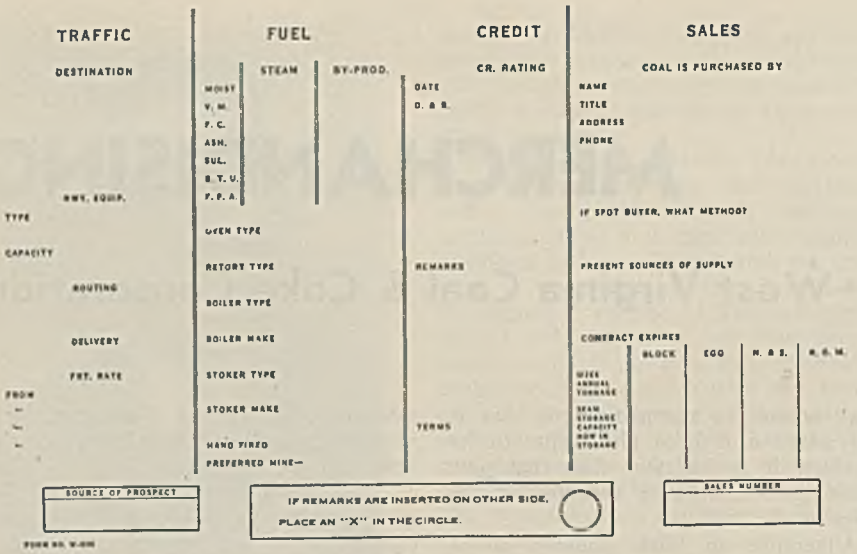


Fig. 1—Master record card for customers and prospects. The original card is 8x5 in.

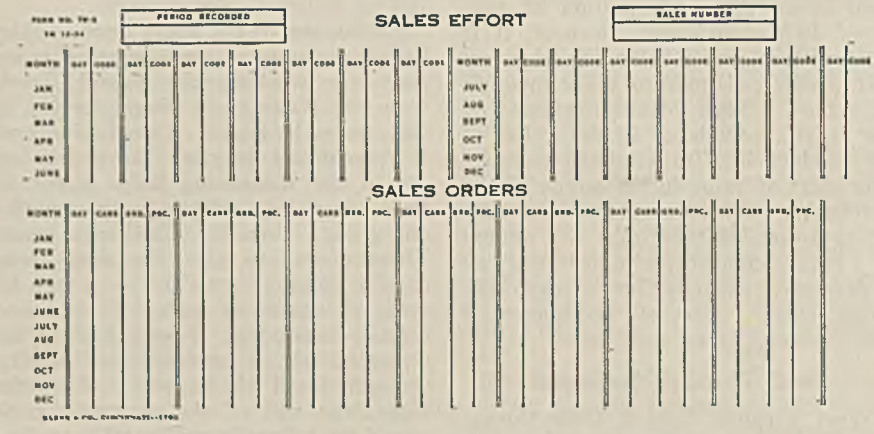


Fig. 2—Card record of calls and sales. The original card is 8x5 in.

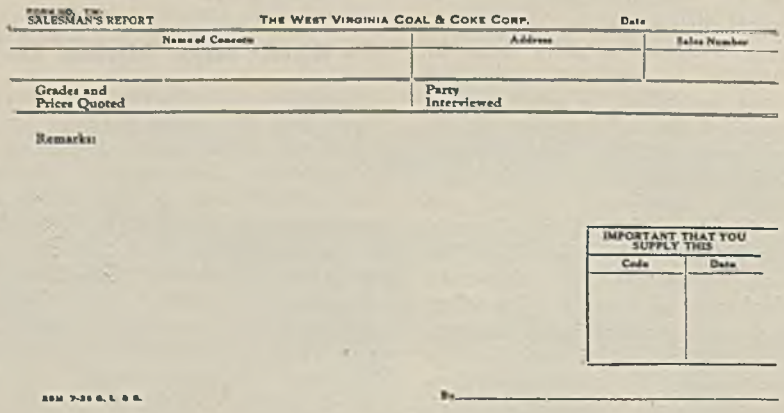


Fig. 3—Salesman's daily report form. The original is 6¼x4 in.

Eastern markets normally is via tidewater ports.

Markets so far flung and so varied offer an alluring invitation to more intensive cultivation. Under the persuasive influence of the natural desire of the producer to increase his tonnage, they also may be a subtle temptation to sell more widely than wisely. The West Virginia Coal & Coke Corporation has not been indifferent to the invitation; thanks, however, to a small but efficient credit department which works in close harmony with the salesmen, it has been able to withstand the temptation to expand volume by loading its books with poor credit risks. During the past twelve years the average loss ratio on an aggregate business of approximately $64,000,000 has been 0.00093 per cent! In other words, for every dollar of sales during that period, an average of less than one mill was written off in bad debts. At the bottom of the depression in 1932, the loss ratio was only 0.00391 per cent; for the first eleven months of last year, the ratio was 0.00014 per cent.

Two things are primarily responsible for this outstanding record: A continual check on customer credit performance and impressing each salesman with the fact that he has a direct interest and part in that performance. Credit ratings in the first instance are based upon Dun & Bradstreet and National Coal Credit Corporation reports, supplemented by information furnished by the salesman calling upon the particular prospect. In addition to the changes made from time to time because of later reports—such as notices of judgments, changes in ownership or financial structure, and failure to take care of accounts due other creditors—which affect the credit status of the customer, all ratings are reviewed quarterly by the credit department and, where necessary, are revised in the light of accumulated experience and customer performance.

Salesmen and Credits

In some cases where the credit agency reports are not wholly favorable, credit, nevertheless, will be extended upon the recommendation of the salesman. When this is done, however, the salesman knows that failure of such a customer to meet specified terms of payment is a mark against the soundness of his own judgment of what constitutes a good credit risk. One experience with a delinquent account in this category usually is enough for any salesman. To further weld credit and sales activities each salesman receives a monthly report of his sales and shipments against orders and a daily report of collections in his territory. If these reports show that an account is due, the salesman is not too coy to ask for a check; in fact, some salesmen prefer to collect the bulk of their accounts.

In order to have a comprehensive picture of the sales possibilities in the markets reached by coals sold by The West Virginia Coal & Coke Corporation individual record cards of customers and prospects are kept in the Cincinnati office. These cards (see Fig. 1) show the salient information with respect to fuel requirements, sources of supply, buying methods and type of combustion equipment. If coal is purchased on an analysis basis, the controlling limits with respect to moisture, volatile, fixed carbon, ash, sulphur, B.t.u. and ash-fusion point are recorded. Generally speaking, however, these data are recorded only for consumers of byproduct and metallurgical coals.

How closely the salesmen is combing his territory and how effective his efforts are are recorded on another card (see Fig. 2) covering calls and orders.

ON THE FIRING LINE IN SALES ACTIVITIES

Bleck & Steller

J. HOWARD MAGEE
Eastern Manager

E. H. PIERCE
Credit Manager

F. S. FITZGERALD
Sales Manager

T. R. WORKMAN
Combustion Engineer

C. B. GLEAVES
Special Representative

H. E. WEBSTER
Assistant Sales Manager

P. J. WILSON
Manager, Carbon and Chemical Division

H. C. Morrison
Traffic manager

The data transcribed on these record cards are drawn from report calls (see Fig. 3) made out by the salesman. Under the heading "Remarks" on the report form, the salesman notes all information, including changes in equipment at the plant of the customer or prospect, which may be helpful to Cincinnati headquarters in keeping its records up to date and in assisting the salesman to close a desirable piece of business.

Special weekly letters go out to the salesmen from the sales manager; these letters embody comments on current conditions and instruction and counsel to help the knights of the road in their work. Weekly reports of sales and shipments by grades also are furnished. The monthly summary of sales and shipments, mentioned in an earlier paragraph in the discussion of the work of the credit department, also gives the comparative record for the corresponding month of the preceding year. Unlike many companies, The West Virginia Coal & Coke Corporation does not make a practice of holding annual round-ups of the sales staff at some central point; instead, the policy is to have more frequent field meetings with smaller groups at some conveniently located point. Trips to the mines for individual salesmen or groups also are part of the educational program.

The combustion engineering service is centralized in Cincinnati. Where special conditions make it necessary, outside engineers and consultants sometimes are employed for a particular job; generally, however, problems involving this service are handled by an engineer who travels out of the main office. Inspection of coal going through the tipples to see that shipments conform to standards of quality and preparation is under the exclusive jurisdiction of the mining company. If the sales company receives a customer complaint on quality or preparation, however, that complaint is not only referred to the mining company but copies of all papers and reports on the subject also are sent to the president of both companies. In this way the sales, mining and executive departments all are tied in in the handling and adjustment of every complaint.

M. J. Walters
River division traffic manager

Except in the case of delays in transit or accidents en route, there is no occasion for tracing shipments under the system followed by the traffic department of the sales company. Car

A quick view of West Virginia Coal & Coke Corporation sales promotional literature

numbers and the customer to whom consigned are telephoned each day by the mines to the Cincinnati office and manifests are mailed out under first-class postage to the customers by 5 p.m. the same afternoon. Constant check on the movement of coal on the Ohio River by the transportation subsidiary of the West Virginia Coal & Coke Corporation is maintained by the river division of the traffic department.

The New York district sales office is in effect a self-contained unit performing all the service functions, except billing, incidental to the sale and movement of coal in the territory it covers. This territory — embracing New England, New York, New Jersey, Delaware, Maryland, northern West Virginia, eastern Pennsylvania and northern Virginia—offers the principal outlets for Elkins division mines. Because Norton and Junior coals have a fusion temperature around 3,000 deg. F., the smaller sizes are largely consumed by industrials on stokers and in pulverized-fuel units. Railroads are the chief buyers of lump and other large sizes in the summer months, with a smaller proportion going to hand-fired boiler plants. In the winter, some prepared coal also moves west for domestic purpose, but most of it is sold in and around Baltimore, the Valley of Virginia, Cumberland Valley and other southern territory as far north as Philadelphia. The New York staff plays a part in the sale of Logan division coals by contacting consumers with plants in the Middle West with headquarters in the East.

New sales possibilities in old markets and new markets and new uses are studied by special representatives of The West Virginia Coal & Coke Corporation. One of the most recent outgrowths of these activities has been the establishment of a carbon and chemical division of the company. This division, which is only a few months old, has undertaken the promotion of the marketing of sea coal—fine coal used for foundry facings. The company is now operating a pulverizing plant in Cincinnati to prepare this product for the foundry trade.

Direct-mail campaigns are the backbone of the sales promotion work. Coal catalogues and directories such as *Keystone Coal Buyers' Manual and Directory of Mines* also are employed regularly, but retail and industrial coal-trade media are used only sparingly. Class industrial publications have not been on the list in the past but may be considered in pushing the sale of a specialty product such as sea coal. While novelties are not barred from the sales promotion work, the company demands that anything distributed shall be distinctive, useful and, in so far as the coal-trade channels are concerned, unusual. Preparation of copy and mailing pieces is in the hands of Harry L. Adams, of Baer, Bigler, Van de Mark & Adams, a Cincinnati agency, who acts as advertising counsel.

Broadside campaigns are taboo. As officials of The West Virginia Coal & Coke Corporation visualize their sales problem they are dealing with four distinct groups of customers and prospects to whom, if the sales promotional work is to be effective, different appeals must be made. So their customer and prospect lists are broken down into: (1) all-rail industrial, (2) all-rail domestic, (3) river-division industrial, and (4) river-division domestic. In addition to advertising directed to the retail dealer, the company also prepares mailing pieces for the dealer to send to his own customers and prospects. These mailing pieces, with the dealer's imprint, are furnished without cost. No attempt is made by the company to have the dealer supply it with his customer and prospect lists; this mailing is left to the retailer.

Quality and individuality are slogans in the sales promotional activities. All direct-mailing pieces are sent out under first-class postage. In addition to the segregation of the lists into the four groups named, a complete set of addressed envelopes for each list is kept on hand. As a result, if a sudden change in market conditions makes it advisable to address a special message to any one of the four major groups, or even to a selected number of customers and prospects within any of these groups, the work can be set in motion with the minimum of delay.

A quick view of West Virginia Coal & Coke Corporation sales promotional literature

OPERATING IDEAS

From Production, Electrical and Mechanical Men

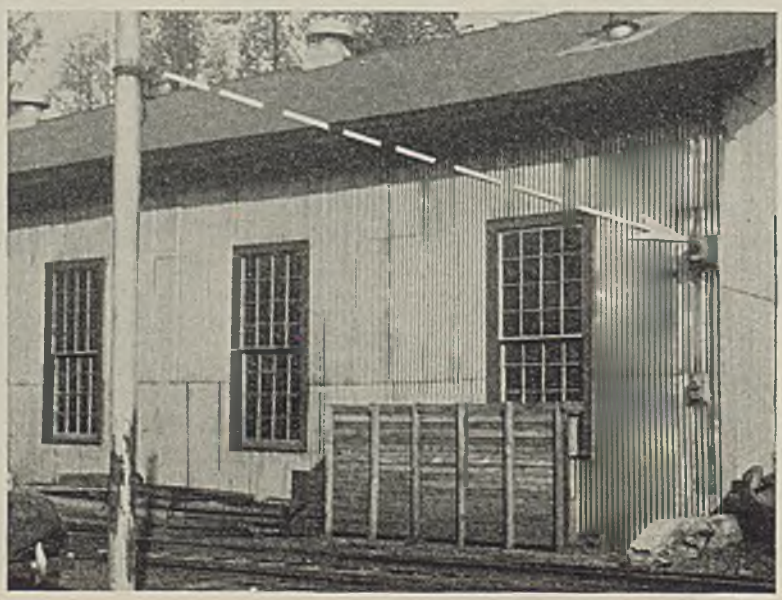
Electric Eye Sounds Warning Against Railroad Cars

An electric eye stands guard at the central shop of the West Virginia Coal & Coke Corporation, Omar, W. Va., and sounds a warning blast when a railroad car is about to pass the shop door on a track 15 ft. from the building. Omar No. 4 tipple is but a few hundred feet upgrade from the shop, and loaded cars are dropped down one by one by gravity to the storage tracks below the shop.

The light ray crosses the railroad track on a horizontal line 8 ft. above the top of the rail and is originated by a 21-cp. 6-volt automobile headlight bulb in a General Electric CR7500-B-1 focussing fixture mounted on a steel pole. The light-sensitive photo-electric tube is contained in a CR7500 outdoor-type relay mounted on the outside wall of the shop on the opposite side of the track.

The relay includes a PT-210 Pliatron amplifying tube to supply sufficient current to operate a magnetic switch in the horn circuit. The power source is a 110/6-volt transformer connected to the lighting circuit. Six years' experience has shown that the relay window must be effectively shaded from bright or reflected daylight and that the light source must be attached to a rigid pole if frequent adjustments are to be avoided.

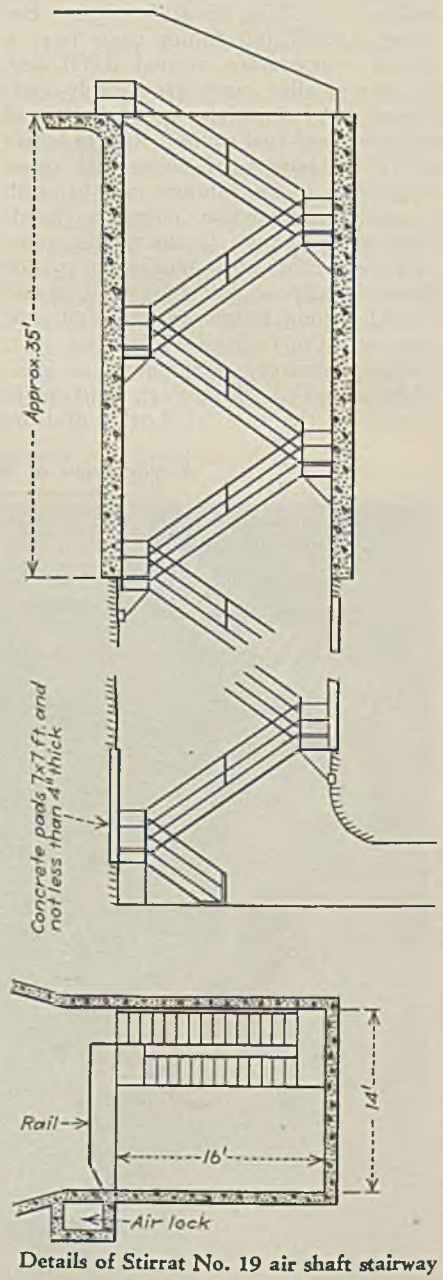
The broken line and arrow indicate the path and direction of the light beam, which, if blocked by a railroad car, causes the horn to blast forth a warning



Shaft Stairway Supported By Concrete Pads

An easy-walking stairway in a new 90-ft. air shaft at the Stirrat No. 19 mine of the West Virginia Coal & Coke Corporation is supported for two-thirds of the distance up from the bottom by concrete pads set in the rock walls. These pads support the weight of the structure and form smooth walls at the landings.

Dimensions of the pads are 7x7 ft. and the minimum thickness is 4 in. Anchors, or ties, between pads and shaft walls consist of 1-in. reinforcing bars extending 2 ft. into holes drilled in the rock strata. The shaft is lined with concrete for about 35 ft. down from the top, and the faces of the pads are plumb with the inside of the upper lining so that the stairway fastenings are all uniform. The stairway was fabricated in the company shop. Treads and landings are of non-skid interlocking grating.



Details of Stirrat No. 19 air shaft stairway

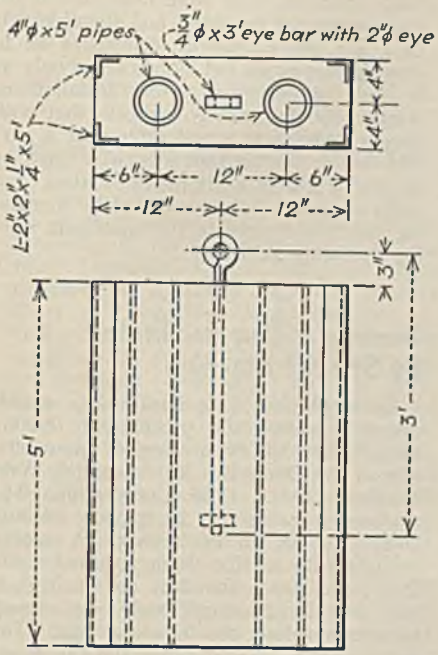


Fig. 1—Principal dimensions and details of counterweights

Weight of the individual counterweights is close to 1,500 lb., which was secured by using concrete to which as much scrap iron as possible was added to make the desired total. Four 2x2½-in. angles, one on each corner, constitute the major members of the frame in which the concrete is retained. Height of the counterweights is 5 ft.; width is 2 ft.; and thickness is 8 in.

Two lengths of 4-in. round pipe also were cast in each counterweight in the positions shown in Fig. 1, along with a ¾-in. eyebar 3 ft. long, including the 2-in. round eye. Guides for the counterweights were made of lengths of 3-in. pipe, which were passed through the 4-in. pipes in the counterweights when they were installed. At the bottom, the 3-in. guide pipes were fastened by flanges to steel baseplates, which in turn were bolted to concrete foundation blocks. Toe members welded on the upper end of each guide pipe permitted riveting them to the tipple frame. The two counterweights for each boom are installed side by side in the bay left between two bents in the steel framework of the plant. A wire rope passed around a block hooked into the eye in each counterweight permits the counterweights to move up and down along the guides.

Precast Counterweights Use Pipe Guides

Revisions recently made in the Omar No. 5 preparation plant of the West Virginia Coal & Coke Corporation included lengthening the picking sections of two picking table-loading booms and the addition of a third boom of the same type. As a part of this work all the booms were fitted with precast counterweights installed around pipe guides. Two such counterweights, one for each side, were installed on each boom.

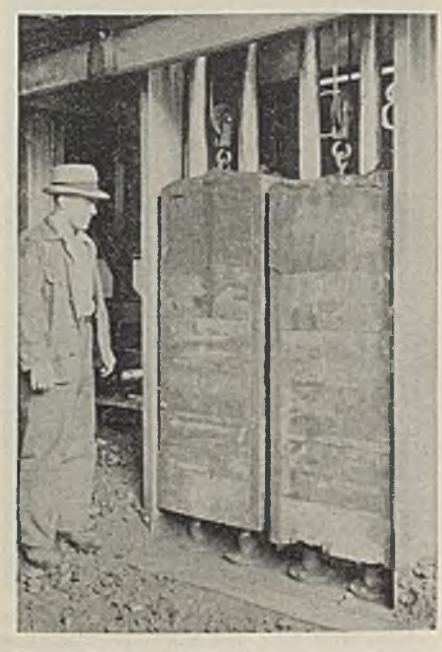


Fig. 2—A pair of counterweights in service at Omar No. 5 preparation plant

From Omar

• Operating Ideas in this month's section were originated by operating, electrical, mechanical and safety men at the mines of the West Virginia Coal & Coke Corporation, to which this issue, the Sixteenth Annual Model Mining Number of Coal Age, is devoted. Like forward-looking men at other well-run operations, the West Virginia Coal & Coke personnel stresses the development of cost-cutting and efficiency-promoting ideas, such as those set out in this department this month. From Omar, however, we move on to other issues and other mining operations throughout the country, presenting month by month selected items designed to help mining men attain the desired results. And, as usual, we solicit your assistance in the form of new ideas which you have developed to smooth operation. Send them in, together with a sketch or photograph if it will help to make them clearer. For each acceptable idea Coal Age will pay $5 or more.

★ ★

Air Filters and Blowers Condition Air For Underground Substations

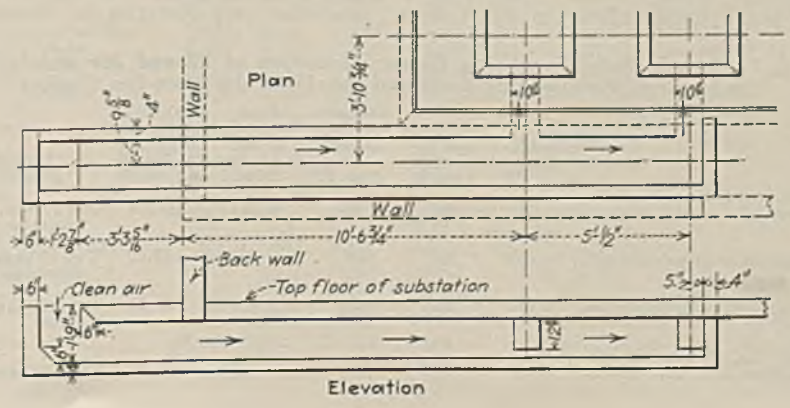
TO SECURE more efficient cooling of underground substation machines and to reduce the mine dust accumulated on the machines and on control equipment, the West Virginia Coal & Coke Corporation has adopted blower-current filtered-air ventilation for two underground full-automatic substations installed within the past twenty months. Comparative tests have indicated that the contemplated advantages of the new method warrant the design.

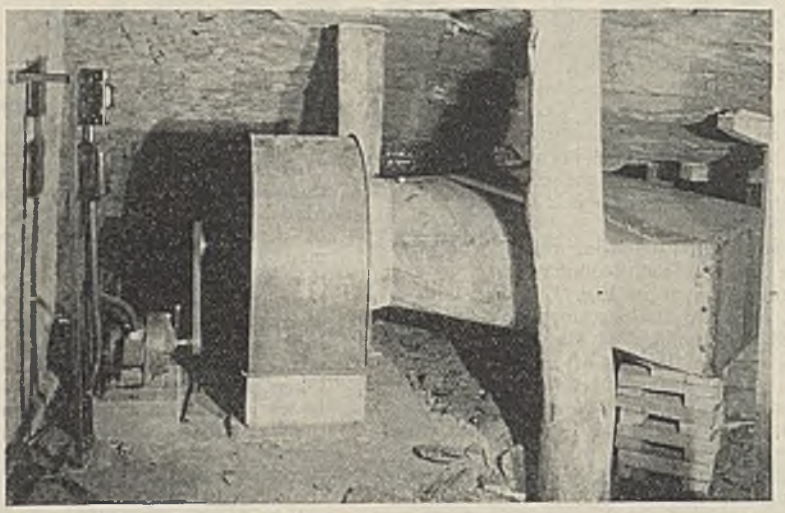
The substation room is built with but one door and that is of solid construction. The only wall opening is a 3x3-ft. window set close to the ceiling and covered only with bars. The intake airway is a 15x19½-in. concrete duct extending under the floor from an opening outside the wall to two 10x12-in. ducts opening into the pits under the motor and generator. The blower is outside the substation room.

Seven 20x20-in. "Renu-vent" American Air Filter Co. sections filled with steel wool cover the intake opening to the blower. The latter is a Type HSV size No. 2 ball-bearing unit made by the Clarage Fan Co. The rating is 745 r.p.m., 5,160 c.f.m. at ½-in. water gage, and its drive is an Allis-Chalmers 1½-hp. 440-volt squirrel-cage motor connected by Tex-rope. The flared intake housing connecting the filters to the blower is made of No. 20 gage galvanized steel, and over-all floor dimensions are approximately 10x6 ft.; the height is 20 in.

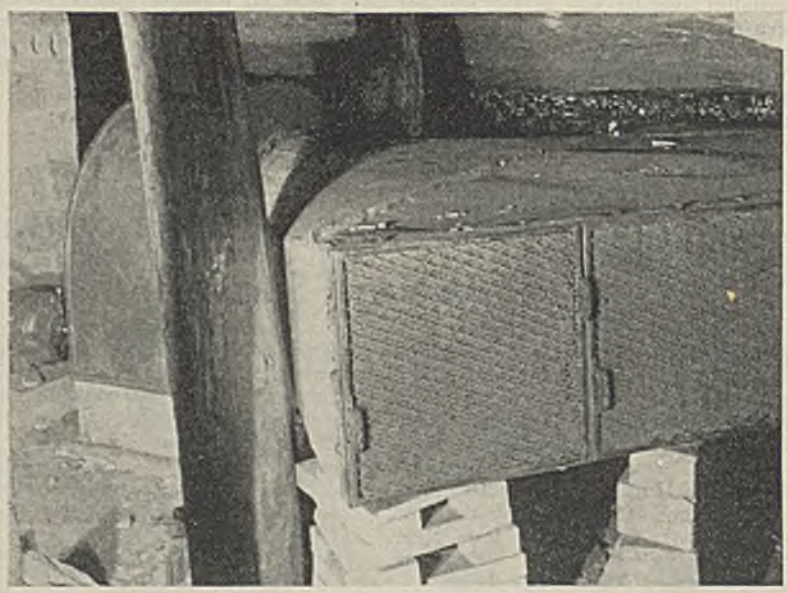
With this system, the stream of cool air entering the room is directed immediately under and against the machines where most

Fig. 1—Duct arrangement to motor and generator pits





The motor-driven blower is located outside the substation room and is mounted on top of a floor duct opening



The flared intake to the blower accommodates five filter sections which clean the air before it strikes the machines

needed and then contacts the control equipment which dissipates but little heat. In order to assure that the substation will not be started without the blower in operation, the automatic control of the motor generator is electrically interlocked with the blower starter.

A test on the ventilation in one of these filtered-air substations showed that the total heat picked up by the air current amounted to 367 B.t.u. per hour per kilowatt of capacity. As compared to that figure, 122 B.t.u. was the highest quantity found by three tests on non-blower substations (see accompanying table). Although all of the machines were operating at normal day loads when the tests were made, the actual loads were not recorded, and therefore the data are not considered conclusive as to exact performance but rather serve only as a guide to design of future installations. Apparently the tests do indicate that with blower ventilation considerable heat is carried out by the air that otherwise must be dissipated through the floor, ceiling and walls or would be accumulated by increasing the temperature of the equipment during operating shifts.

Table I—Tests in Substation Using Blower Ventilation of Filtered Air and in Three Substations Ventilated by Unfiltered Air From the Main-Fan Current

	Circulation, C. F. M.	Temperature Intake Air, Deg. F.	Temperature Discharge Air, Deg. F.	Heat Picked Up by Air, B.t.u. Per Min.	Heat Picked Up by Air, B.t.u. Per Hr. Per Kw. of Capacity	Units in Substation
Omar No. 5 filtered-air substation	3,360	60	83	1,224	367.00	One 200-kw. motor-generator
Earling mine-air substation	1,072	62	107	610	122.00	Two 150-kw. motor-generators
Roesmore mine-air substation.	1,943	64	76	307	92.18	One 200-kw. converter
Stirrat No. 19 mine-air substation	467	53	95	326	97.80	One 300-kw. converter

Dummy Filling Facilitated By Special Machine

By employing rock dust and a special filling machine, the process of dummy manufacture has been speeded up materially at the Omar No. 5 mine of the West Virginia Coal & Coke Corporation. The machine consists of a hopper holding about 150 lb. of rock dust. A worm, brought into service when required by a foot pedal, feeds the dust out through a tube just large enough and long enough to accommodate the tamping bag. The bag is slipped over the tube and the worm is started. As the rock dust is fed into the bag it is pushed back off the tube, and when full the worm is stopped.

The machine, patented by H. S. Gay, Gay Coal & Coke Co., and manufactured by the Guyan Machine Co., can produce 2¾x18-in. dummies at the rate of 100 per hour at No. 5. "Seal-Tite" tamping bags are used.

Above—general view of dummy-filling machine, with tube and worm protruding at the lower right; below—filling a tamping bag

WORD FROM THE FIELD

Massed Legal Attack on TVA Upheld by Court

The right of nineteen Southern utility companies to make a mass attack on the entire Tennessee Valley Authority power program was upheld in the U. S. District Court at Cookeville, Tenn., on Nov. 7. Acting in a case brought by the power companies to test the constitutionality of the program (*Coal Age*, July, p. 299), Judge John J. Gore denied a motion by TVA counsel for dismissal of the suit.

It was alleged by TVA, in the motion for dismissal, that some of the nineteen power companies have not been affected by the government agency's power project. Those companies which have been affected, attorneys for TVA argued, have been affected differently and should file separate suits. The court, however, held that while the utilities may be interested in the outcome of the case in varying degrees, all are seeking the same relief: a court order holding some or all of the TVA power activities to be either unconstitutional or in excess of the TVA act.

The power companies have asked a temporary injunction to halt any expansion of the TVA power program pending a final decision in the suit, which will be carried to the Supreme Court. Judge Gore indicated that the case would be brought to a hearing on its merits promptly.

In ruling that all phases of the TVA power program could be brought under scrutiny of the court in a single suit, the court said the utilities properly contend that the directors of TVA are "engaged in carrying out a single program, plan or conspiracy the execution of which will irreparably injure, if it does not totally destroy, the property and business of each of the complainants." Contrary to the arguments by TVA counsel, he held that the bill filed by the utilities charged "many specific acts, done and threatened to be done," which had caused or would cause injury.

Berry Invites Employers To Labor Parley

George L. Berry, Coordinator for Industrial Cooperation, invited business and industrial leaders on Nov. 9 to attend a conference in the Federal Auditorium, Washington, D. C., Dec. 10–11, to discuss new industrial and labor legislation. Labor leaders already have indicated that they will attend the conference for "immediate action toward effectuating the legislative changes recommended last March by the Council for Industrial Progress," said Mr. Berry.

"We have secured in the past wholehearted and sympathetic support from that element of industry management which wishes to remove from our industrial life

unfair trade practices and unfair labor practices, the obstacles to peace, progress and stability," he continued. "With labor and management united in a vigorous campaign to formulate and press enactment of legislative proposals which have for their purpose the furtherance of economic security through stabilizing industry on a basis that will guard the public welfare, we can look forward to constructive accomplishments as the result of the council's method of approach to the problems."

Keeping Step with Coal Demand

Bituminous Production

Week Ended	1936 (1,000 Tons)	1935* (1,000 Tons)
Oct. 3	9,135	7,023
Oct. 10	9,573	8,413
Oct. 17	9,662	8,273
Oct. 24	9,762	8,305
Oct. 31	9,975	7,856
Nov. 7	9,369	7,919
Nov. 14	9,833	7,792
Total to Nov. 14	364,773	316,592†
Month of September	37,200	25,038
Month of October	42,935	37,768

Anthracite Production

Oct. 3	1,267	1,049
Oct. 10	1,035	1,213
Oct. 17	964	989
Oct. 24	795	781
Oct. 31	937	608
Nov. 7	841	554
Nov. 14	800	599
Total to Nov. 14	43,802	44,317
Month of September	3,764	4,172
Month of October	4,253	4,279

* Outputs in this column are for the weeks corresponding to those in 1936, although these weeks do not necessarily end on the same dates.

† Adjusted to make comparable number of working days in the two years.

Bituminous Coal Stocks

	(Thousands of Net Tons) Oct. 1 1936	Sept. 1 1936	Oct. 1 1935
Electric power utilities	5,933	5,744	6,581
Byproduct ovens	6,562	5,982	6,803
Steel and rolling mills	973	947	1,257
Railroads (Class 1)	4,963	4,304	6,518
Other industrials*	8,804	8,194	10,945
Total	27,235	25,171	32,104

Bituminous Coal Consumption

	(Thousands of Net Tons) Oct. 1 1936	Sept. 1 1936	Oct. 1 1935
Electric power utilities	3,654	3,662	2,807
Byproduct ovens	5,499	5,548	4,083
Steel and rolling mills	1,059	1,037	874
Railroads (Class 1)	6,782	6,546	6,037
Other industrials*	9,069	8,634	7,061
Total	26,063	25,427	20,862

* Includes beehive ovens, coal-gas retorts and cement mills.

I.C.C. Denies Rate Petition; Surcharge Case Reopened

In response to the petition of Class 1 railroads that sought a modification of certain outstanding orders so that they could file tariffs adjusting some rates by increasing or at least maintaining existing emergency surcharges on bituminous coal and coke throughout the country (November *Coal Age*, p. 521) the Interstate Commerce Commission on Nov. 19 denied the carriers' request. The Commission denied the petition without prejudice and ruled that the roads were entitled to a hearing. In order to grant the hearing the I. C. C. announced that it would reopen Ex Parte 115 and cancel its proceedings in Ex Parte 118.

The Commission announced in its order reopening Ex Parte 115 that it has done so for the purpose of giving consideration to the lawfulness and propriety of existing basic freight rates as proposed to be increased in the manner and the amounts indicated in the carriers' petition. Hearings to receive testimony from the roads in support of their request will open at Washington, D. C., on Jan. 6 before Commissioner Aitchison, and subsequent hearings will be announced later.

With the surcharges scheduled to expire on Dec. 31 next, the railroads filed a petition with the I. C. C. on Nov. 23 asking the Commission to permit the surcharges to remain in effect pending further investigation into the subject and 60 days after a decision. The National Coal Association and other coal interests have indicated that they will protest this petition.

Briefs opposing the petition of certain Class 1 railroads for a permanent increase in rates were filed with the Interstate Commerce Commission on Nov. 7 by the National Coal Association and jointly by the National Bituminous Coal Commission and Consumers' Counsel, and on Nov. 10 by the Anthracite Institute. In addition a number of local groups of coal producers in various areas filed individual answers in opposition to the proposed rate advances, and a joint brief was presented by 28 large oil companies.

Pointing out that many of the regular tariff rates have been prescribed by the Commerce Commission as maximum reasonable rates, the N.C.A. brief charges that the railroads' latest petition is only another effort to continue indefinitely the collection of the present surcharges on coal and coke. Reductions rather than increases should be the result of any reexamination of coal and coke rate levels, N.C.A. contends. "The rates on this important basic commodity have been maintained at close to the 1922–23 levels notwithstanding the substantial reductions which have occurred in unit operating costs of railroads. Coal and coke rates have not shared in these reductions of operating expense. On the other hand,

coal has contributed substantially to making these reductions possible through the marked decrease in prices for fuel coal and more efficient utilization of coal."

The Bituminous Coal Commission and Consumers' Counsel asserted that the petition of the railroads, if granted, would saddle a permanent rate increase amounting to at least $30,000,000 per year upon the depressed bituminous coal industry and bituminous consumers, much of which would go to certain opulent coal-carrying railroads, whereas "even temporary increases in rates at the present time would work irreparable injury to the industry."

The Anthracite Institute's reply, filed by Louis C. Madeira, 3d, executive director, asserts that unless the temporary emergency surcharges are discontinued on Dec. 31 and the basic rates restored, they will largely nullify the effect of the reduction of hard-coal prices at the mines and the intensive three-year merchandising campaign now being launched by that industry to recover lost business. "The rates of the petitioning carriers constitute very large components in the selling prices of anthracite," says the brief, "and therefore their proposal to increase the rates on anthracite is in direct conflict with the producers' three-year plan and with any plan that will conserve their revenues by arresting the loss of anthracite markets. Anthracite cannot continue to bear rates even as high as the present basic rates without a cumulating and ruinous loss of business to the industry and revenue to the carriers, resulting directly from high rate exactions."

In a protest filed in behalf of the National Retail Coal Merchants' Association, Joseph E. O'Toole, resident vice-president, Washington, D. C., contended that present rates are excessive and are causing unfair competitive inroads on coal from other fuels. He asserted that the rate increases asked by the carriers would yield millions of dollars to roads already in a prosperous condition now declaring increased dividends to stockholders.

Bootleg Coal Trucker Fined

Convicted on the charge of bringing stolen coal into New York City from the anthracite region of Pennsylvania, a truckman from Tamaqua was fined $25 in the Court of Special Sessions on Nov. 4. He was one of 23 coal-truck drivers arrested on such a charge and elected to plead guilty and pay the fine rather than spend ten days in the Tombs.

After Assistant District Attorney McDermott had agreed with Justices Perlman, Brady and McInerney on the amount of the fine the prosecutor said he would recommend a similar penalty for each of the remaining defendants when their cases were called. In the future, however, he said he would ask the court for a penitentiary sentence in every case.

Two days later, Magistrate Aurelio, in Tombs Court, held two truck drivers for the grand jury on felony charges on complaints that they had transported into the city "bootlegged coal" dug by otherwise unemployed miners. Counsel for the defendants contended the New York authorities had no right to arrest his clients, since the fourteen tons of coal on their trucks "had been taken openly" from deposits to which the Lehigh Valley R.R. and the Susquehanna Collieries Co. hold title, with no interference by the police employed by the two companies. Magistrate Aurelio characterized the bootlegging as stealing and scored the Pennsylvania police for failing to press criminal charges.

Coming Meetings

● New River Coal Operators' Association: annual meeting, Dec. 8, Mountainair Hotel, Mt. Hope, W. Va.

● Coal Mining Institute of America: annual meeting, Dec. 10 and 11, Fort Pitt Hotel, Pittsburgh, Pa.

● Indiana Coal Mining Institute: annual meeting, Dec. 12, Terre Haute, Ind.

● Anthracite Club of New York, Inc.: seventh annual banquet, Jan. 14, Hotel Astor, New York City.

● College of Mines, University of Washington: annual mining institute, Jan. 19-24, Seattle, Wash.

● American Institute of Mining and Metallurgical Engineers: annual meeting, Feb. 15-19, 29 West 39th St., New York City.

● Central Pennsylvania Coal Producers' Association: annual meeting, April 20, Altoona, Pa.

New Preparation Facilities

Black Heath Coal Co., Minersville, Pa.: contract closed with Wilmot Engineering Co. for addition to breaker consisting of Type A Wilmot-Simplex jig for chestnut coal, 15 tons per hour.

Coxe Bros. & Co., Inc., Drifton, Pa.: contract closed with Wilmot Engineering Co. for addition to breaker consisting of Type C. Wilmot jig for stove coal, 15 to 20 tons per hour.

East Bear Ridge Collieries Co., Mahanoy Plane, Pa.: contract closed with Wilmot Engineering Co. for addition to breaker consisting of two improved Wilmot Hydrotators complete with dewatering screens to prepare No. 1 buckwheat, 40 to 45 tons per hour, and rice, 30 to 35 tons per hour.

Island Creek Coal Co., Mine No. 7, Holden, W. Va.: contract closed with American Coal Cleaning Corporation for pneumatic coal cleaning plant including six American pneumatic separators and auxiliary equipment to clean 116 tons per hour of minus ¼-in. coal.

Lehigh Navigation Coal Co., Lansford colliery, Lansford, Pa.: contract closed with Deister Concentrator Co. for Deister-Overstrom "Diagonal-Deck" coal-washing equipment for barley, approximately 10 tons per hour.

Mead Smokeless Coal Co., Mine No. 4, Mead, W. Va.: contract closed with American Coal Cleaning Corporation for equipment for auxiliary screening plant, including two 4x10-ft. American "Anti-Gravity" screens, each with a capacity of 65 tons per hour, to screen ¾x0-in. coal at ¼ in., and one 65-ft.-long belt conveyor with a capacity of 65 tons per hour for conveying ¾x¼-in. pea to the railroad car.

Southern Coal & Coke Co., Boothton, Ala.: contract closed with Deister Concentrator Co. for Deister-Overstrom "Diagonal-Deck" coal-washing equipment to handle ¾x0-in. feed; capacity in terms of finished product, approximately 6½ tons per hour.

Twentieth Century Coal Corporation, Winslow, Ind.: contract closed with Deister Concentrator Co. for equipment for auxiliary screening plant for stoker coal, including heavy-duty Leahy NO-Blind" vibrating screen with capacity of 50 tons per hour making a separation at ¼ in.

Coal Mining Institute to Hold Two-Day Meeting

The 50th annual meeting of the Coal Mining Institute of America will be held Dec. 10-11 at the Fort Pitt Hotel, Pittsburgh, Pa. At the four sessions to be held the following papers will be presented: "Treated Timber Uses in Coal-Mine Operations," A. R. Joyce, district sales manager, Wood Preserving Corporation; "Studies of Roof Movement in the Pittsburgh District, Conducted by the U. S. Bureau of Mines," E. R. Maize, assistant mining engineer, U. S. Bureau of Mines; "Some Aspects of Settlement and Control of Strata Over Mined Areas," Dr. Helmut Landsberg, Pennsylvania State College; "The Most Essential Factors Introduced in Bituminous Mines in the Past 50 Years to Decrease the Hazards of Mining," A. R. Pollock, general manager, Ford Collieries Co.; "The Factors That Have Been Most Beneficial in Preventing Major Mine Disasters," P. J. Nairn, deputy secretary, bituminous division, Pennsylvania Department of Mines; "Fifty Years' Progress in Mechanization of Coal Mines," Carel Robinson, Kellys Creek Colliery Co.; "The Mine Official as a Teacher," E. A. Holbrook, dean, School of Engineering, University of Pittsburgh.

Question-box sessions will consider these problems: "How Should the Condition of Mine Air Be Determined and What Should Constitute a Gassy Mine?" chairman, W. R. Chedsey, professor of mining, Pennsylvania State College; "How Can We Educate Men and Officials to Properly Test and Protect Themselves Before Entering a Depleted or Toxic Atmosphere?" chairman, J. J. Forbes, supervising engineer, U. S. Bureau of Mines, Pittsburgh, Pa.; "Has Safety Increased With Mechanization of Mines?" chairman, T. F. McCarthy, general superintendent, Clearfield Bituminous Coal Corporation.

J. D. A. Morrow, president, Pittsburgh Coal Co., will make the principal address at the annual dinner, on Dec. 10, the chairman being G. S. McCaa, president of the institute. Dean Holbrook will be toastmaster.

O'Neill Heads New Coal Agency

Completion of organization of the United Eastern Coal Sales Corporation, formed for the purpose of marketing coals produced by the Rochester & Pittsburgh Coal Co., J. H. Weaver & Co. and Barnes & Tucker Co., has been announced by Charles O'Neill, president of the newly created agency. The organization will

market the output of 21 mines and a number of coke ovens with a total capacity of 50,000 tons daily. Other officers of the company are: C. E. Crafts, vice-president in charge of sales, and L. G. Ball, vice-president. Headquarters will be at 420 Lexington Ave., New York City, and other offices will be maintained in Philadelphia, Pa.; Rochester, Buffalo and Albany, N. Y., and Cleveland, Ohio.

Anthracite Week in Philly

Hard-coal producers and distributors, as well as manufacturers of and dealers in hard-coal burning equipment, had their innings in Philadelphia, Pa., during the week of Nov. 16, designated as Anthracite Week by Mayor Wilson. A large electric sign on the City Hall, special radio broadcasts and advertisements in the newspapers called attention to the observance. There also was a complete display of anthracite-burning equipment in a showroom at Broad and Brown Sts. Conspicuous among the exhibitors were manufacturers of stokers, boilers and heaters, including the following:

AGA Stove Co., American Radiator Co., Automatic Florozone Heating Co., Burnham Boiler Co., Cook Electric Co., Cooper & Cooper, Crane Co., Dickson & Eddy, Delaware, Lackawanna & Western Coal Co., Electric Furnace-Man, Fitzgibbons Boiler Co., Freed Heater Co., Heater Range, Hershey Foundry & Machine Co., Iron Fireman, International Boiler Co., Link-Belt Co., Mercoid Corporation, Minneapolis-Honeywell Regulator Co., G. B. Newton Coal Co., New York French Range Co., Richardson & Boynton, H. B. Smith Co., Spencer Heating Co. and Taco Heaters.

Three more anthracite shows on a scale comparable with that held in September at Springfield, Mass., in connection with the Eastern States Exposition, will be conducted by Anthracite Industries, Inc., during the year. Shows will be given in Boston, Mass.; Buffalo, N. Y., and Baltimore, Md. Through the cooperation of the Fuel Merchants Association of New Jersey, a show was put on for the benefit of retail coal men at the association's convention at Asbury Park, Nov. 12–13.

Silicosis Conference Planned

Committees appointed by the U. S. Department of Labor to study the various phases of the silicosis problem are to hold a joint meeting with the Secretary of Labor in Washington, D. C., on Dec. 15 and 16. The National Silicosis Conference has tentatively scheduled a meeting for Jan. 14 and 15, 1937.

Since the conference held last April, the committees have been endeavoring to compile the extensive data on the various questions pertaining to dust diseases and dust control that have been submitted. The committees include the following: Prevention of Silicosis Through Medical Control; Prevention of Silicosis Through Engineering Control; Regulatory and Administrative Phases of the Silicosis Problem; and Economic, Legal and Insurance Phases. Mining is represented on the last-named committee by Julian D. Conover, secretary, American Mining Congress.

Bit Treatment, Health and Merchandising Star at Illinois Institute Meeting

COSTS and performance data on hard-faced cutter bits, the importance of periodic health examinations of workers in reducing accident risks and the place of coal-burning equipment in the competitive marketing picture featured the program of the 44th annual meeting of the Illinois Mining Institute, held at the Hotel Abraham Lincoln, Springfield, Ill., Oct. 23. The institute also went on record as favoring cooperation between the Illinois State Geological Survey and the U. S. Bureau of Mines in the latter's hydrogenation investigations (*Coal Age*, October, 1936, p. 482). A distinctly optimistic view of the future outlook for the industry was voiced by the operating and sales executives present. The only somber note was struck by Charles F. Hosford, Jr., chairman, National Bituminous Coal Commission, who insisted that stabilization could not be achieved without government intervention and federal regulation.

Hard-facing mining-machine bits at the Wheelwright plant of the Inland Steel Co., declared John Parker, mine superintendent, has increased the quantity of coal cut per bit point from an average of 108.5 tons to 258.9 tons. This increase not only offsets the additional costs incurred in tipping the bits but also yields worthwhile savings in over-all bit costs. Bits are tipped with Borod. The Wheelwright mine operates in the No. 3 Elkhorn seam and the coal averages 44 in. in thickness. All cutting is done with shortwall bottom-type cutters. Bits are sharpened on a Sullivan roller-type machine.

Special Table Built

The natural-gas furnace and the double grinder which had been used with the former system of bit handling were made part of the new layout. A table upon which to mount the bits for tipping was built in the mine shop. This table, explained Mr. Parker, is 36 in. square and 27 in. high, with angles on the outer edge to hold the bits in the proper position for treatment. The table has a solid top so that the bits can be poured from the boxes onto it and is mounted on a ball bearing to permit easy turning by the bit sharpener. It has a capacity of 265 bits.

Wheelwright uses standard high-carbon bits measuring 1x$\frac{1}{2}$x$\frac{3}{4}$ in., with a face length of 1$\frac{1}{2}$ in. and a $\frac{3}{8}$-in. point. The bits have a clearance angle of 30 deg., a back-slope angle of 30 deg. and a side-slope angle of 7 deg. Badly worn or broken bits are placed in the furnace and approximately $\frac{3}{4}$ in. of the tip is brought to a bright-red heat. The bit is then placed in the bit machine and forged or rolled to the proper shape. Generally in rolling, said Mr. Parker, "fins" are formed along the edge. After these "fins" have been ground off, the bits are ready for tipping. No quenching bath is used; neither are the bits tempered. They are allowed to cool to room temperature before tipping by scattering them on the shop floor.

"If a bit sent out to be sharpened is one that has been tipped and is but slightly worn," continued Mr. Parker, "it is ground to the proper shape and is then ready for further service without heating or retipping. Our experience has indicated that a bit can be ground once after the original tipping before it is necessary to retip it. Of course, there are exceptions to this, as some bits are broken in service, and we have had some Borod tips break off—although that is an unusual occurrence." During the first year with hard-facing, the Wheelwright shop handled an average of 1,137 points per day; of this number, 583 were tipped and 554 points were reground. One pound of Borod will tip approximately 4,000 bits.

Substantial Savings Shown

Comparative costs and performance for the year ended June 30, 1936, with Borod tipping standard practice, and for the last twelve months prior to the adoption of this treatment, as given by Mr. Parker, are summarized in Table I. The cost figures show an actual saving of $1,039.39 in labor and material under present methods. "We must not, however," added Mr. Parker, "lose sight of the fact that, while there was an actual saving of $1,039.39 in the twelve-month period after we started hard-facing, we also produced 259,333 tons more coal. On a tonnage basis, the saving amounts to $1,888.74."

As a hint of the improvement which might be expected in mines working thicker seams, Mr. Parker reduced his performance figures to square feet of kerf per bit point. For the twelve months preceding the adoption of hard-facing, the average was 8.05 sq.ft. of kerf per bit point; for the first twelve months after the adoption of the present method of bit

Table I—Comparative Cost and Performance With Hard-Facing

	Twelve-Month Record Without Hard-Facing	Twelve-Month Record With Hard-Facing
Number of bits sent to mine from supply house	7,750	4,250
Total cost	$266.60	$146.20
Cost per bit	3.44c.	3.44c.
Days mine operated	223	245
Production for period (tons)	840,981	1,100,314
Number of bits sharpened	713,600	278,565
Average tonnage per bit point	108.5	258.9
Cost of bit sharpening:		
Labor per bit	0.349c.	0.380c.
Borod per bit	.....	0.0705c.
Other material*	.....	0.113c.
Total per bit	0.349c.	0.5635c.
Total cost of labor and materials	$2,488.86	$1,569.69

* Oxygen, acetylene and emery wheels.

treatment, the average was 26.98 sq.ft. of kerf per bit point. Great as the increase in tonnage per bit has been, Mr. Parker expressed the belief that "much greater improvement can be attained by experimental research. Bits that will cut a full shift or even two or three shifts without replacing are altogether possible."

Because of the large amount of rock drilling carried on at Wheelwright, some experimental work also has been done in hard-facing the detachable air-hammer drill tip. "During the first six month period of tipping these bits, we have purchased 95 per cent less bits than in the preceding six months. While that saving is partially offset by the necessary material and labor for reconditioning these tips, the reduction in total cost," concluded Mr. Parker, "is substantial."

Until the advent of mechanized loading, practically all cutting in the No. 5 coal in the Harrisburg field, said John H. Evans, superintendent, Wasson Coal Co., had been at the bottom of the seam. Since this was considered easy cutting "compared with other Illinois coals," very little attention was paid to cutting bits. With the introduction of loading machines, however, it was found advisable to cut at the top of the seam in order to remove the drawslate before shooting. This top proved very difficult to cut. Old-type bits would not stand up under the work and experiments with different types of steel for making bits did not give a satisfactory answer. Hard-facing materials then were considered and Borod adopted.

Solving Bit-Treatment Problems

Hard-facing, continued Mr. Evans, materially increased bit life as far as abrasion at the point was concerned, but "the bit bent so often that the efficiency was destroyed." When tempering was tried, "we went from bending to breaking, which was difficult to control. The question was then put up to a representative of E. F. Houghton & Co. and his suggestions were followed." The bits now are first formed by a Sullivan forming machine and allowed to cool. Borod is then applied to the tip, the bit is preheated to about 1,400 deg., then quenched in oil until cool, which makes it hard and brittle. The bits then are placed in a pot of draw salts which is heated to about 450 deg. to create the toughness "which controls the breaking and bending difficulty. So far we have found this to be the most satisfactory bit for our conditions."

Tests with old and new bits in bottom cutting, added Mr. Evans, showed that 619 bits of the old type were required to cut 342 ft., while the same footage was cut with only 106 of the new bits. Experience in southern Illinois, remarked H. A. Treadwell, general superintendent, Chicago, Wilmington & Franklin Coal Co., indicates that hard-surfacing reduces the number of bits needed approximately one-third. Much depended upon the care and skill with which the hard-facing was done, declared Mr. Evans, who took issue with the statement of Mr. Parker that the surfacing material "can be applied with an acetylene torch by an employee of average intelligence after very little instruction." Even skilled employees, he said, occasionally turn out poor jobs when they fail to exercise proper care in the work.

Although the bituminous coal industry has made commendable improvement in its accident record during the past quarter of a century, stated T. J. Thomas, president, Valier Coal Co., and retiring president of the institute, no slackening in the fight for safety can be countenanced. On the contrary, the battlefront should be extended. In doing this more attention should be given to the general health and physical abilities of the workmen so that men with physical defects may not be placed in positions where they can endanger the lives and limbs of their fellow employees. Periodic physical examinations are desirable in reaching this objective. Without them there is the risk of having men who are color blind or have other defects in vision engaged in such tasks as that of a motorman.

If a bad accident traceable to such a defect should occur in a mine under his control, said Mr. Thomas, he would feel that

W. J. Jenkins
President-Elect, Illinois Mining Institute

at least a moral responsibility for the injuries or fatalities which followed rested upon the management. The cooperation of both management and labor should be enlisted in the establishment of periodic physical examinations to eliminate possibilities of accidents arising from such causes. There was, of course, no thought of using such an examination system as a punitive measure but solely as a further means of protection for the workers themselves.

Preemployment examinations are part of the regular routine at Koppers mines, explained T. E. Lightfoot, director of safety, Koppers Coal Co. There is nothing hard-boiled about the system; men with one eye, one arm or a wooden leg may be accepted for employment at occupations where such defects will not be an undue handicap to the men in their work or constitute a hazard to fellow workers. Where it is necessary to reject an applicant, the company doctor explains sympathetically why it is not safe to accept the applicant for work in a coal mine. While the system of preemployment examinations was started when the West Virginia operations of the company were non-union, no trouble had been experienced in selling the idea to union officials after the first Appalachian agreement was signed.

Men employed in occupations which involve the safety and handling of other men, such as hoisting engineers and motormen, said Mr. Lightfoot, are reexamined every six months. If such reexamination discloses the development of defects or diseases which might endanger others, the men are placed in jobs where they will not be a menace to themselves and others. Where the disability is curable, effort is made to attempt a cure. Ordinarily applicants for employment are not rejected unconditionally if examination reveals a hernia, but are urged to take treatment for that defect. Mr. Lightfoot also urged that more attention be given to the eradication of syphilis. Age, he added, is no bar to employment, as many of the Koppers workers have passed the half-century mark and some miners still working have reached 75 years.

The resolution urging that the Illinois State Geological Survey cooperate with the U. S. Bureau of Mines to the end that Illinois coals may be tested in the hydrogenation work recently undertaken by the federal agency was offered by D. D. Wilcox, general superintendent, Superior Coal Co. Discussing the resolution, M. M. Leighton, chief of the State survey, pointed to the fact that the discovery of new oil pools in recent years had not kept pace with the production from existing wells. How long the present known oil reserves would last was a question. In any event, however, the oil and natural-gas industries must be looked upon as temporary industries. It seemed likely, in Dr. Leighton's opinion, that the country would begin to feel the pinch of a diminishing oil supply within the next ten or fifteen years.

Early Research Desirable

This made early research into the development of substitutes imperative. German and British experiments, continued Dr. Leighton, already have clearly demonstrated the commercial feasibility of using coal as a source of motor spirits. The early testing of Illinois coals to determine their reaction to the hydrogenation process is particularly desirable both because of the large supply of solid fuel available in the State and because of its location with respect to the Mid-Continent oil field and the markets normally served by that field. If Illinois coals are suitable for treatment under the hydrogenation process, a new and large future market for the product of the mines of the State will be opened up.

How the development and refinement of new coal-burning equipment and the rising public interest in air-conditioning are creating new opportunities and new problems for the solid-fuel industry held the stage at the afternoon session. Marc G. Bluth, executive secretary, Committee of Ten—Coal and Heating Industries, opened the discussion with a detailed review of some of the outstanding developments and problems. After he had concluded his formal presentation, several phases of the general situation were further expanded in answers to a running fire of questions from interested delegates.

While major emphasis was placed upon the small automatic coal stoker as providing "a new opportunity to forge ahead in the increasingly exciting battle for our share of the heating business," the small stoker is only part of the picture, declared

Mr. Bluth in summarizing the outlook. "Perhaps there is a place for the development of low-cost methods of producing smokeless fuels from bituminous coal. The tremendous market which air-conditioning is opening up will be helpful to the coal industry provided we will take advantage of these new opportunities. The modernization and building program presents a real challenge—with the new thought that it will be successfully met."

But, he warned, coal cannot expect to receive the advantages of these new developments without fighting for them. "There are others in these various industries who have a huge stake in this market and they are spending money to get their share of the business. The gas industry is already started upon a nation-wide advertising campaign to promote the use of gas for heating and other purposes. Stoker manufacturers will spend over $5,000,000 in consumer advertising in 1937. Organized groups of stoker manufacturers and dealers contemplate publicity and public relation campaigns nationally and locally next year. They are seeking more public acceptance of their products and, when they do this, coal will benefit."

The domestic stoker, Mr. Bluth pointed out, is less than twenty years old. It was pioneered on the Pacific Coast and encouraged there because Rocky Mountain coal producers were seeking a market for 2- and 1½-in. screenings. Since then the stoker has moved steadily eastward and with continued improvement in design and operation has found increasing public acceptance. Last year oil burners, despite a record season, outsold stokers in the ratio of only 3½ to 1; this year, the ratio will be cut to 2 to 1. The major markets for bituminous stokers are in Illinois, Wisconsin, Michigan, Ohio, Pennsylvania, Indiana, Iowa, Minnesota, Missouri and Nebraska; in 1935, these markets absorbed over 42 per cent of the total number of stokers—all ratings—sold. These sales were made to industries, commercial buildings, homes and apartments. "Wherever possible, stoker manufacturers and their sales outlets are attempting to convert oil and gas users back to coal."

Weak in New-Home Installations

Notwithstanding this record, however, the stoker has not made the impression on the new-home market that it should. In the case of 500 homes built in an Eastern city this year, said Mr. Bluth, only two were constructed so that coal could be used. Not a single stoker installation was made in 75 new dwellings in Detroit; there were only 25 coal-burning boilers and stoker installations in 600 homes built in Milwaukee the last two years and only one coal bin was specified in the construction of 117 houses erected this year in Madison, Wis. Yet last year over 1,000 oil burners—the majority as part of combined boiler-burner units—were installed in St. Paul, Minn. "The pitiful part of this story is that the initial investment a buyer makes in a combined unit for oil or gas is so high that he is very hard to convince that a change over to coal is the economical thing to do."

While it has been common practice to offer the small stoker as a "basic unit," that is a misnomer, asserted Mr. Bluth, because the stoker can be used only in connection with a heating or air-conditioning system. The performance of that system largely determines "what may be expected from the stoker." Fortunately, the stoker manufacturers are now taking steps to improve their competitive position in the battle of fuel-burning equipment by promoting combined units in which the stoker is an integral part of the heating or air-conditioning plant. The combination units not only offer the manufacturer "a new opportunity to present his equipment to the prospective buyer in a very favorable light but also offer the coal industry a new opportunity to cooperate with the stoker manufacturer and allied organizations in showing the public that coal is an automatic fuel, that it is clean, that it can be made dustless, and that an architect or a builder can offer his clients attractive equipment all in a single unit."

The poor showing made by coal in new-home building is striking proof both of

T. J. Thomas
Retiring President, Illinois Mining Institute

the importance of architects and builders and of the failure of the coal man and his allies to do a constructive selling job on these groups. Architects and builders, continued Mr. Bluth, also are selling their services in a competitive market and it is to their advantage to specify equipment which affords their clients the maximum of comfort, convenience, cleanliness, ease of operation and economy. The coal industry and its allies in the equipment field must shoulder the responsibility for driving home to the consumer the plain fact that coal is an ideal fuel when used with the proper equipment. Unless this is done, coal and coal-burning equipment will not profit from the new-home-building movement now so definitely under way.

Coal men who deliberately discourage stoker installations to protect their markets on the larger sizes of coal, declared the speaker, only smooth the path of the oil- and gas-burner salesmen. This is an automatic age in which everyone is interested in equipment which will eliminate labor and reduce costs. Those who have not recognized this plain fact "must discard their prejudices and tell their customers about this new equipment before they turn to competitive fuels." Moreover, it is well to remember that "every industry has grown as values and volumes have increased and costs have decreased." All available statistics show a definite national trend toward an increasing production of small sizes adapted to use in mechanically fired equipment.

This is particularly noticeable in Illinois and Indiana; between 1932 and 1934 production of commercial lump in Illinois dropped from 57.7 per cent to 41.5 per cent and the percentage of fine sizes jumped to 58.5 per cent of the total; during the same two years, the percentage of fine-coal output in Indiana rose from 46.0 to 65.5 per cent. Continuance of this trend, observed Mr. Bluth, "undoubtedly means that a readjustment eventually will be made in the price structure. The revenue from the sale of fine-coal sizes will automatically be increased to offset the declining revenue due to the decreased sale of coarse sizes which ordinarily command a higher price in the consuming markets." Shrewd stoker manufacturers are anticipating this development by shifting their major sales appeal from economy to convenience. Whatever readjustments are made, however, Mr. Bluth was convinced that a competitive balance in the price structure as between rival fuels would be maintained.

Sales Possibilities Pictured

Some idea of the possibilities inherent in the small stoker, said M. M. Soule, vice-president in charge of sales, United Electric Coal Cos., can be glimpsed from the record of certain other household equipment. Back in 1918, for example, only 67 Kelvinator refrigerator units were sold; eleven years later, sales hit 100,000 and last year the volume rose to 240,000. In 1935 there were over 1,000,000 electric refrigerators sold; this year, the industry expects to double that figure. Oil burners, too, did not hit their stride until some years after the first units were placed on the market.

Space heaters also offer a volume market as yet hardly tapped by coal, stated Mr. Bluth in response to a question from the floor. There is a demand for 150,000 to 250,000 units to replace old base-burner stoves and equipment of that character. If the coal industry could capture 100 per cent of the service-water-heating load, production would be increased approximately 17 per cent. Turning to the more technical side of the problem, Mr. Bluth explained that there still was much difference of opinion on sizing and the adaptability of specific stokers to individual coals. An organized effort to solve the sizing problem was now being made by Bituminous Coal Research, Inc., through the Battelle Memorial Institute laboratories; study also was being given to other phases of the combustion problem with small stokers.

Unless the coal industry itself can unite on a legislative program, said Mr. Hosford at the annual dinner, it must submit to a program written by others who may be less familiar with its problems. While desiring to see no radical change in the economic system, the speaker declared he was opposed to a "do nothing" policy. He did not believe the industry could save itself because the same forces that had demoralized it still were at work. Sectional and labor differences have kept the industry apart and prevented real coopera-

tion. Government control of business, he added, is not something that has been invented over night, but always has been recognized when the facts in a particular situation made its exercise necessary.

"Reasonable" efficiency in operation, he stated, cannot be opposed, but no industry has the right to throw 25 to 45 per cent of its employees out on the streets and to waste natural resources. With mechanization generally adopted, he feared that many properties which survived the depression would be forced out of business to the detriment of their owners and the workers employed. There must be some government control over free competition because if free competition leads to eventual monopoly, then the conditions are unsound.

Nearly fifty manufacturers were represented with exhibits at the meeting. The list included: Ahlberg Bearing Co.; American Brattice Cloth Co.; Atlas Powder Co.; Berry Bearing Co.; Broderick & Bascom Rope Co.; Bucyrus-Erie Co.; Central Mine Equipment Co.; Chicago Pneumatic Tool Co.; Duncan Foundry & Machine Co.; E. I. duPont deNemours & Co.; Egyptian Iron Works; Electric Railway Improvement Co.; Electric Storage Battery Co.; Evansville Electric & Manufacturing Co.; General Electric Co.; W. M. Hales Co.; Hardscog Manufacturing Co.; Hercules Powder Co.; Hulburt Oil & Grease Co.; International Shoe Co.; Keystone Lubricating Co.; Koppers-Rheolaveur Co.; A. Leschen & Sons Rope Co.; Link-Belt Co.; Macwhyte Co.; Mine Safety Appliances Co.; Modern Engineering Co.; National Electric Coil Co.; Ohio Brass Co.; Post-Glover Electric Co.; Frank Prox Co.; Robins Conveying Belt Co.; John A. Roebling's Sons Co.; Safety Mining Co.; Simplex Wire & Cable Co.; Geo. W. Snarr Co.; Socony-Vacuum Oil Co.; Southwest Bolt & Nut Co.; Stephens-Adamson Manufacturing Co.; Streeter-Amet Co.; Templeton, Kenly & Co.; United States Rubber Products, Inc.; Upson-Walton Co.; Watt Car & Wheel Co.; Westinghouse Electric & Manufacturing Co., and West Virginia Rail Co.

The Illinois State Geological Survey, U. S. Bureau of Mines and the University of Illinois also had exhibits.

Install Home Stoker Upstairs

The cellar was brought upstairs to a small room adjoining the kitchen and the latest in a coal-heating plant installed therein in a "model house" now open for inspection under the auspices of the Junior Chamber of Commerce in Birmingham, Ala. The "heat room" is sunk 3 ft. below the house floor surface.

The heating plant consists of a hot-air furnace with an automatic stoker which feeds the coal directly from the coal bin, eliminating all fuel handling by the home owner. The equipment also includes electric force fans which drive a constant stream of filtered warm air through the pipes in winter. In summer, however, the fans will supply filtered fresh air. The system also includes automatic humidifiers and provision is made for the addition of comfort cooling for summer at a later date. Room outlets are placed over the doors, so as not to take up needed floor or wall space. The furnace was furnished by Alabama Coals, Inc., composed of coal operators organized to further domestic coal consumption, and G. F. Wheelock Co., distributor of heating equipment, supplied the stoker.

Personal Notes

A. B. Aldridge, vice-president, Stith Coal Co., has been elected president of the Birmingham (Ala.) Kiwanis Club. He was unopposed for the office.

James S. Anderson, formerly district superintendent of the Madison Coal Corporation, has been appointed superintendent of the Saxton Coal Mining Co., Terre Haute, Ind., vice Samuel M. Cassidy, resigned.

R. S. Billadson has been appointed general superintendent of mines for the Black Diamond Coal Mining Co., with headquarters at Johns, Ala., succeeding Virgil Carlisle, resigned.

A. J. Boyle has been appointed superintendent of the Maiden Mine of the Kellys Creek Colliery Co., at Maidsville, Monongalia County, W. Va.

George W. Brown, formerly coal mine division engineer, Tennessee Coal, Iron & Railroad Co., has been appointed superintendent of the company's Edgewater mine, Ensley, Ala., vice Robert Flynn, transferred.

Cecil Campbell has been made section foreman at the Kaymoor mine of the New River & Pocahontas Consolidated Coal Co., in Fayette County, West Virginia.

★ ★

Illinois Leaders

W. J. Jenkins president, Consolidated Coal Co., St. Louis, Mo., was elected president of the Illinois Mining Institute at the 44th annual meeting of that organization held at Springfield, Ill., Oct. 23. H. H. Taylor, Jr., vice-president, Franklin County Coal Co., Chicago, was made vice-president, and B. E. Schonthal, B. E. Schonthal & Co.. Chicago, was again the choice for secretary-treasurer.

The personnel of the executive board for 1936-37 is as follows: R. L. Adams, inside general superintendent, Old Ben Coal Corporation, West Frankfort, Ill.; W. C. Argust, division superintendent, Peabody Coal Co., Taylorville; W. J. Austin, Hercules Powder Co., Chicago; C. F. Hamilton, vice-president, Binkley Coal Co., Chicago; C. T. Hayden, vice-president and general manager, Sahara Coal Co., Chicago; M. M. Leighton, chief, Illinois State Geological Survey, Springfield; James McSherry, director, Department of Mines and Minerals, Springfield; F. S. Pfahler, president, Superior Coal Co., Chicago; C. J. Sandoe, vice-president, Perry Coal Co., St. Louis; H. A. Treadwell, general superintendent, Chicago, Wilmington & Franklin Coal Co., Benton; T. J. Thomas, president, Valier Coal Co., Chicago, and W. P. Young, vice-president, Bell & Zoller Coal & Mining Co., Zeigler.

Virgil Carlisle, formerly general superintendent of mines for the Black Diamond Coal Mining Co., operating in Jefferson County, Alabama, has become general superintendent of mines for the Whitwell Smokeless Fuel Co., Whitwell, Tenn.

Roy Carson, traffic manager of Appalachian Coals, Inc., Cincinnati, Ohio, has resigned to accept a similar position with the Harlan, Hazard and Southern Appalachian Coal Associations, with headquarters in Louisville, Ky. Mr. Carson also held the latter post from 1924 to 1933. He will divide his time between Washington, D. C., and Louisville. H. M. Baker, assistant to Mr. Carson for a number of years, is now handling traffic matters for ACI.

Samuel M. Cassidy has resigned from the superintendency of the Saxton Coal Mining Co. operations in Vigo County, Indiana, to become superintendent of the Weirton Steel Co. mines near Uniontown, Pa.

Green Clendenin has been promoted to mine foreman at Nellis mine of the Nellis Coal Corporation, Boone County, West Virginia.

R. C. Estep has been appointed foreman of the Ingram Branch mine of the Elkhorn Piney Coal Mining Co., in Fayette County, West Virginia.

Robert Flynn, superintendent of Edgewater mine, Tennessee Coal, Iron & Railroad Co., at Ensley, Ala., has been transferred to the superintendency of the Wylam division of the company.

J. J. Foster has been made assistant to R. E. Salvati, general manager of the Island Creek Coal Co., Holden, W. Va.

G. W. Gibbs, general manager, Harwick Coal & Coke Co., following his appointment as chairman of the Mining Section of the National Safety Council, was elected by the board of directors to serve on the executive committee of the Council for the present fiscal year.

George B. Harrington, president, Chicago, Wilmington & Franklin Coal Co., Chicago, has been elected a director-at-large of the National Coal Association in succession to L. T. Dee, formerly vice-president, Lion Coal Corporation, Rock Springs, Wyo., who has severed his connection with the coal industry.

A. K. Hert, formerly shop foreman and supervisor of maintenance and repairs, has been appointed superintendent of the Talleydale mine, Snow Hill Coal Corporation, Terre Haute, Ind.

Cleve Holt has been appointed assistant foreman at Ridgeview mine of the Ridgeview Coal Co., Nellis, W. Va.

Henry Hope has been appointed assistant foreman of Stotesbury mine of the Koppers Coal Co., in Raleigh County, West Virginia.

Frank Jenkins has been made superintendent of Jamison Nos. 8 and 9 mines of the Jamison Coal & Coke Co., Farmington, W. Va.

CHARLES JONES has been made superintendent by the Manor Coal Co., Vindex, Carrett County, Maryland. He succeeds John G. Henderson, who has returned to Pennsylvania.

JOHN KANIA has been appointed section foreman at the Lochgelly mine of the New River Co., in Fayette County, West Virginia.

L. H. KEENEY has been made foreman at Brock No. 5 mine of the Continental Coal Co., Rivesville, W. Va.

J. B. KUHN has been appointed foreman at the Monarch mine of the Kanawha By-Product Coal Co., in Kanawha County, West Virginia.

SAMUEL LUTTRELL has been made safety inspector at the Stotesbury mine of the Koppers Coal Co., in Raleigh County, West Virginia.

JOHN MOORE has been appointed foreman at Brock No. 5 mine of the Continental Coal Co., Rivesville, W. Va.

ROBERT MUIR, of Wheelwright, and GEORGE BAKER, of Stone, have been appointed members of the examining board of the State Department of Mines and Minerals of Kentucky by Governor Chandler.

FLOYD R. POOL, general manager of the McNeil Coal Corporation, Denver Colo., has been elected a director of the United American Life Insurance Co., Denver.

WALTER POTTER has been made general mine foreman at Powellton No. 4 mine of the Elkhorn Piney Coal Mining Co., in Fayette County, West Virginia.

W. M. RICHARDSON has been made foreman at the Premier (W. Va.) mine of the Premier Pocahontas Collieries Co.

F. R. SCHOLL has been appointed general mine foreman by the Ridgeview Coal Co., operating in Boone County, West Virginia.

A. D. SISK has resigned his position with the State Department of Mines and Minerals of Kentucky as mine inspector in the Hazard field to become safety director for the Big Sandy-Elkhorn Coal Operators' Association with headquarters at Pikeville.

WILLIAM WADE has been made section foreman at Powellton No. 5 mine of the Elkhorn Piney Coal Mining Co., in Fayette County, West Virginia.

JEROME C. WHITE, formerly production engineer, Pittsburgh Coal Co., has been promoted to assistant production manager and placed in charge of Montour No. 4, Westland and Lindley mines. He is succeeded by W. R. CUTHBERT. H. R. WHEELER has been made assistant to the president.

J. B. WILSON has been appointed foreman at Minter No. 1 mine of the E. C. Minter Coal Co., Rhodell, W. Va.

DR. LOUIS E. YOUNG, vice-president, Pittsburgh Coal Co., has been nominated for a two-year term as director of the American Institute of Mining and Metallurgical Engineers.

Mining and Combustion Problems Animate A.I.M.E. Coal Division's Sessions

PROPELLER FANS, the most recent development in mine ventilation, method of mining a running coal seam, shaking conveyors in pitching seams, squeezing of mine pillars, formation of "coke trees" in domestic-stoker furnaces and the size and behavior of these trees with various types of coal, mathematical analysis of coal combustion, clinker reduction in domestic furnaces and determination of the smokiness of fuels, with two papers by prize winners, occupied the second day's session of the Coal Division of the American Institute of Mining and Metallurgical Engineers, held Oct. 22 in Pittsburgh, Pa. A report on the first day's session will be found in the November *Coal Age*, pp. 527–528.

Propeller-type fans, declared T. H. Troller, Daniel Guggenheim Airship Institute, Akron, Ohio, have the advantage that their blades can be put farther apart than those of a centrifugal blower or turbine, which, to furnish complete guidance of air, water or fluid, must be designed to come into near or actual contact with the fluid passing through them. With so many surfaces in centriiugal blowers or turbines, frictional losses are introduced (see Fig. 1). The modern "air foil" not only avoids the "shock losses" at front and rear edges of the rotor but acts on air particles at great distances from the surfaces in a manner that can be exactly computed. By a coordination of propellers and straightening vanes, the air flow loses

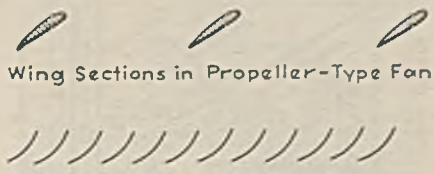


Fig. 1—Unrolled circular section through fans

its twist with minimum friction losses, the back flow near the center of the propeller, so detrimental to the efficiency of many of the earlier propeller fans, is avoided, and air can be delivered at high pressures and yet be discharged evenly. The efficiencies of good propeller fans, even though based on static pressure, range from 75 to 90 per cent. Should the equivalent orifice be changed more than 30 or 40 per cent, decreasing the efficiency by more than 10 per cent, the propeller alone need be changed, thereby restoring almost the original efficiency.

Noise is the propeller fan's only serious objection, asserted Dr. Troller; such fans must have a high top speed if they are to develop a suitable water gage. The highest pressure that a carefully designed propeller fan at present can deliver is 0.4 time the velocity head of the tip speed. The maximum pressure equals 0.2 c^2p where c equals tip speed and p, air density. Better fan characteristics can be obtained by holding the pressure to about 0.025 c^2p. Thus with 2 in. of water gage the tip speed would be 250 ft. per second, and with 10 in., 600 ft. per second.

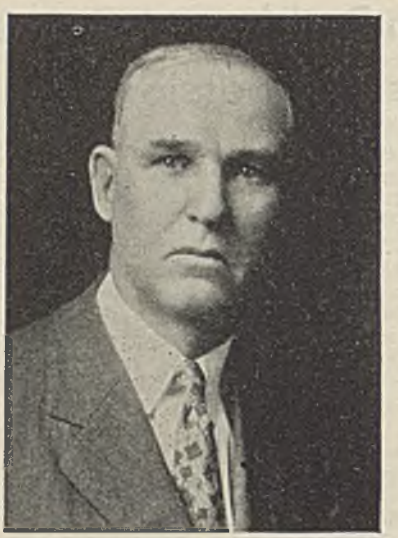
The noise intensity, according to the National Advisory Committee on Aeronautics, said Dr. Troller, is 100 decibels 32 ft. behind the propeller and 50 decibels 1,250 ft. behind it when using a propeller of about 9-ft. radius, turning at 1,800 r.p.m. with a tip speed of 910 ft. per second. An airplane at 18 ft. distance gives 120 decibels; an express train at 12 ft. distance, 100 decibels; a pneumatic drill, 80 decibels; busy London traffic, 70 decibels; ordinary conversation, 50 decibels. Any noise above 70 decibels is displeasing. A propeller fan, in a single stage, continued Dr. Troller, can deliver air at 10-in. water gage, and, where noise is not objectionable, up to 20-in. It has a flat efficiency curve with changing equivalent orifice, and its power input can be made to reach its peak near the efficiency maximum, which is the aim of the manufacturer, of course, in designing the fan. (A description of the Troller fan appeared in *Coal Age*, January, 1936, pp. 15-18.)

Though the setting of the fan over the shaft with its spindle vertical saves space, eliminates pressure losses and reduces noise, that disposition is undesirable because the fan is likely to be a total loss in an explosion, when greatly needed, and because the fan cannot be inspected and will be lubricated only with difficulty, declared M. B. Curley, Jeffrey Manufacturing Co. It has been the practice of his company to discourage this method of installation. At least one English fan is thus mounted, that unit, an Aerotor, being at the Dudley Pit of the Hartley mine. It has a 3-in. water gage and delivers 100,000 cu.ft. per minute.

Silencing the Fan

With directing vanes, noise and pressure loss can be reduced. One propeller fan is located in an urban area, stated M. J. Ankeny, associate mining engineer, U. S. Bureau of Mines, and the noise has been found objectionable. In consequence, the fan duct has been surrounded by a wood housing and the intermediate space has been filled with sand. This has eliminated much of the noise. To reduce pressure losses, Troller-type fans are now being made with a circular *évasé*, instead of the conical discharge which was originally used, declared Lee Barrett, Pittsburgh Coal Co. The wood propeller is now replaced by a hollow bronze unit.

A series of closely folded anticlines and synclines with many large overthrust faults has disturbed the coal seams at Carbonado mine of the Pacific Coast Coal Co., Carbonado, Wash., about as much as any coal bed in the world, declared R. W. Smith, chief engineer and manager of mines, Pacific Coast Coal Co., in a paper read by J. L. G. Weisser, Lehigh Navigation Coal Co. The seam has been so crushed that less than 2 per cent of the coal mined will pass over a 2-in. round-hole screen. Two-thirds of the coal going to the market slips through a ⅜-in. square mesh. The seams are mined by the "booming system," first introduced in 1925, and pitch from 50 to 90 deg.; they have excellent roof and floor and an average thickness of 9 ft. (This system was described in *Coal Age*, November, 1928,



Eugene McAuliffe
Retiring Chairman

pp. 663–664, but since that time changes have been made.)

Gangways are driven on a rising gradient of 0.75 per cent and, as they travel almost along the strike and the pitch is heavy, the roof is mostly of coal which is so weak as to need forepoling and the support of three-piece sets set on 6-ft. centers, tightly lagged against roof and rib. Chutes are driven, 8 ft. wide, straight up the pitch for about 450 ft. and timbered by four-piece sets, with a post at each rib and a center post, which latter is closely boarded so as to act as a brattice and to divide the opening into a manway and coal chute.

For ventilation, level crosscuts are driven through the pillar at 50-ft. intervals and across the coal chute at each crosscut two posts are placed with an 8-in. space between them to act as a grizzly and to prevent large niggerheads or large pieces of coal or rock from bounding down the pitch and breaking the loading chute. At each crosscut, also, a bulkhead and battery are constructed, and the coal and rock in their travel to the gangway are chuted from battery to battery.

In driving the chutes from one crosscut to the next, the miners work on top of the extracted coal but run out sufficient coal to leave them space at the face for operation. Coal is undercut by hand picks to a depth which exceeds the length of drillholes by 12 in. During the shift, shots are fired electrically one at a time with permissible firing batteries. Timber and other material are hoisted in the "graveyard shift" on a truck running on a track laid along the ladder of the manway.

After the chute is completed, to establish the booming system (see Fig. 2), small angle crosscutting chutes are driven on an inclination of 30 deg. through the pillar from a point 12 ft. above the battery, the first of these being driven at the topmost battery. About 12 ft. above this, a level doghole is driven to cut into the angle chute. When angle chute and doghole are completed, a grizzly is constructed at the lower end of the angle chute similar to that in the main chute. Miners working in the angle chute drill about fifteen holes into the coal face above them, the number of these holes depends on the ease with which the coal can be dislodged. These shots are fired electrically and all at the same time.

Coal thus loosened falls, runs down the angle crosscut to the grizzly, where the miners break it so that it will pass through. As soon as coal ceases to fall, the miners enter the angle crosscut through the doghole and drill the face above them a second time. In taking out the pillar lifts below the topmost crosscut, not only is the coal shot twice, as described, but men go up to the level crosscut at the end of the chute and shoot the coal downward, usually dropping most of the coal to the angle crosscut, whence it travels to the grizzly. In taking lower lifts not only are the two rounds shot but the round in the crosscut above is supplemented by shots in any coal that may remain above. The coal is let out of the battery until rock appears.

Recovery, declared Mr. Smith's paper, is 75 per cent of the seam, as against 90 per cent where rooms are timbered, but the saving in timber and labor more than offsets this loss. Moreover, the booming system gives greater safety. In eleven years, only one man has lost his life at this work, and this in the early experimental period.

Where the coal pitches are at 60 deg., said Mr. Weisser, the Lehigh Navigation Coal Co. also uses angle chutes. In the Panther Valley, the chute is left empty above the last crosscut; the men work on timber supports. The Carbonado mine, added Eugene McAuliffe, president, Union Pacific Coal Co., has much gas and

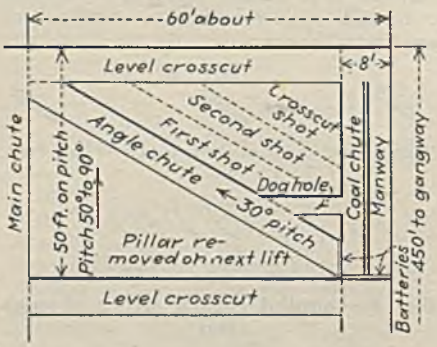


Fig. 2—Booming system of mining

the coal seam is moving; the successful extraction of such coal is most creditable to the management. R. D. Hall, engineering editor, *Coal Age*, said that the timber truck was being used to facilitate the placement of supplies in at least one anthracite operation. However, with this help, the men declare they should be paid for pushing the timber truck, which, they assert, introduces a new condition, yet one so far established that it cannot be abandoned.

No mechanical device to transport material satisfactorily to the working face in pitching seams has been devised, declared F. V. Hicks, superintendent, Union Pacific Coal Co., in a paper read by Mr. McAuliffe. Cost of installation and moving of such mechanisms usually offsets the advantage gained over manual handling. On gradients above 7 per cent, animals give unsatisfactory results, and a solution is being sought. With shaking conveyors, the Union Pacific, said Mr. McAuliffe, has driven 667 ft. with a single conveyor line.

Plastic deformation of pillars appears to have been demonstrated by strain gages in the Mona mine of the Arkwright Coal Co., Monongalia County, West Virginia, near Morgantown, declared H. P. Greenwald, supervising engineer, Experimental Mine, U. S. Bureau of Mines, presenting a paper by C. T. Holland which recorded work done under a fellowship granted by the School of Mines of West Virginia University. Mr. Holland had detected deformations which started while the pillar line was still at least 70 to 215 ft. distant; however, that line was not as definitive as was desirable, for the points of support were predicated on the uncertain assumption of the complete removal or crushing of certain small stumps in the drawing of pillars.

Most of the stations showed steady progressive deformation from the introduction to the removal of the strain gage. Some stations showed periods when deformation decreased, but none showed an increase in pillar thickness after installation of the strain instrument. The author declared that broad generalizations cannot be drawn; the results and conclusions apply only to this study.

Small Coal Stronger Than Large

Discussing the paper, Mr. Greenwald declared that there were a number of small beds between the Pittsburgh coal, in which the observations were made, and the main resistant stratum, the 53.5-ft. Sewickley sandstone; that measure might not be broken in caving but be supported by falls in the measures under it, leaving an overhang of perhaps 200 ft. The author had found that the average compressive strength for fourteen 3-in. coal cubes was 3,320 lb. per square inch, but it had been the experience in the Bureau of Mines that such small cubes gave values much higher than those for bigger samples. Some 54-in. cubes had so many fractures that only with difficulty could they be transported unbroken to the testing station. The first breaks exhibited in these big cubes were along the cleats, and occurred when the reduction in the thickness of the seam was 0.5 per cent of its cross-section, or, in a 6-ft. seam, about ⅜ in. The crushing of the coal itself occurred later. Breakage of underlying measures may support a flexible shale, declared J. W. Paul, consulting engineer, Pittsburgh, Pa., but does it support a sandstone? Sandstones, replied Mr. Greenwald, also bend and flow under strain, and thus may descend without breaking onto fallen material.

An early step in the Hudson Coal Co.'s most recent safety program, started early in 1930, declared J. D. Cooner, safety inspector, was to clean up its collieries thoroughly inside and out. Colliery superintendents were given a definite, but reasonable, time to do this. The clean-up was not only to remove hazards but to teach miners and the company men to gather up or replace material after finishing a job. It uncovered hundreds of dollars of unused material, some of it new. In each section, at least one location was provided for orderly storage of material awaiting use. To stimulate cleanliness, placards were posted naming the official or other employee responsible for the safety and cleanliness in that section, engine room, building, etc. Safety was discussed also at all the general manager's and the colliery superintendents' staff meetings, at

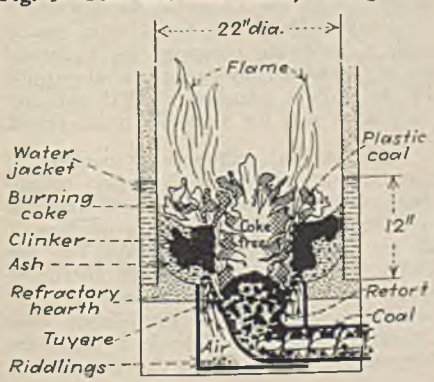
which recent injuries reflecting on the judgment and vigilance of officials were studied. Each colliery superintendent receives the various U. S. Bureau of Mines bulletins. Some of this literature is obtained for all the colliery officials, and the importance of such papers frequently is emphasized in a letter.

Each injury report made to the general manager, continued Mr. Cooner, must state whether the injured was wearing a safety hat, goggles, gloves and safety shoes. All inside men wear safety hats, most men wear gloves, but goggles and safety shoes are less frequently worn. Injuries by causes and number of disciplines enforced are duly recorded for each sectional foreman, and, when these records show both lack of safety and discipline, the section foreman has the matter brought forcibly to his attention.

At each sectional foreman's shanty is a placard showing number of working days since the last lost-time injury and the number of days for the previous best record. These figures, explained Mr. Cooner, are inserted by the use of detachable cards. Some foremen have a similar record for the entire mine, and the general manager has one covering the operations of the whole company. A McCaa lamp-testing cabinet, with three glass sides so that three men can use it at one time, is taken around from mine to mine so that everyone can demonstrate his ability to read a gas cap. Injured men have to go to the mine foreman to be interviewed before returning to work. The mine with the best frequency and severity rate in any quarter flies for three months an orange 6 x 10½-ft. flag with a green cross on a white circular background. From April to December, 1930, the frequency rate was 133.60 and the severity rate 6.16; from January to August, 1936, these were 66.49 and 5.34 respectively. Tons per fatality in 1929 were 129,121 and January to May in 1936 were 329,950.

Advertisements of domestic bituminous-coal stokers usually show an untroubled fuel bed, and the purchaser of such a stoker believes his equipment is not functioning properly when "coke trees" and other fuel-bed irregularities appear, as may be expected, especially with strongly caking coal. These, however, are normal conditions and do little harm, according to R. A. Sherman and E. R. Kaiser, fuel engineer and assistant fuel engineer, respectively, Battelle Memorial Institute. The coal on approaching the top of the retort becomes plastic, then cokes, and forms a coke tree, plug, spire or spar (see Figs. 3 and 4). If the coke is weak,

Fig. 3—Fuel bed with weakly caking coal



as with a weakly caking coal, it breaks into small masses which fall around the tree and form a somewhat regular bed. If the coke is hard, it builds a taller tree which lists to one side and falls regularly in that direction, forming a bed that is far from even. In either case the coke ultimately burns to a clinker resting on the fine ash which finds its way to the surrounding water jacket of the furnace and to the refractory hearth, so that the clinkers float, as it were, on the ash between the almost vertical coke tree and the water jacket and between the blazing coke and the hearth.

When the coal reaches the tuyeres, it begins to become plastic, because it receives air. This plasticity, said Messrs. Sherman and Kaiser, continues with the more strongly caking of coals to a point well above the tuyeres, and in any case is thicker near the vertical center line of the retort than at its edges. At the rear of the retort (to left of the illustrations) the finest of the coal is segregated, and, because the voids are small, the coke is stronger. Air cannot enter and burn this denser material, so that more of it is found at the rear of the retort, though this is sometimes compensated by making the tuyeres smaller in front.

During and immediately after the plastic stage, combustible volatile matter is

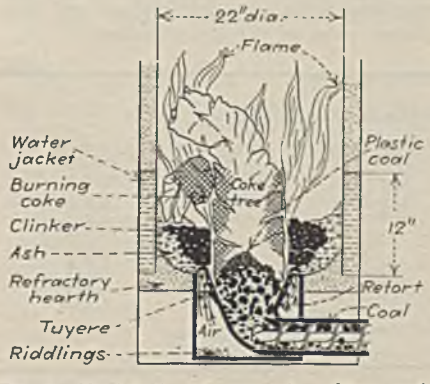


Fig. 4—Fuel bed with strongly caking coal

evolved rapidly. In the periods when coal is being fed, an ample supply of air is delivered from the tuyeres, the mixture is ignited and burns with little or no cracking of the hydrocarbons and thus with little liberation of free carbon as soot. Because the coke, unlike oven coke, is not restrained from expansion and is exposed to oxidation, the caking is so rapid that even high-oxygen coals, usually regarded as non-coking or free-burning, will coke in the underfeed stoker, but the cokes will vary in strength and porosity, depending on the characteristics and sizes of the coals.

Any increase in the air-coal ratio or in the weight of coke on the hearth decreases the height of the coke tree. Low heat-release rates, particularly "hold-fire operation," when coal is fed only for a few minutes at intervals of 30 minutes to an hour, tend to increase the size of the coke tree. Low-volatile coals, such as Pocahontas No. 3, swell considerably, declared the authors, but the coke breaks more readily. With strongly coking coal, the increase in combustible material may make removal of clinker more difficult and, following such removal, for one or two

J. B. Morrow,
Nominated for chairman

operating periods, the flue gases may contain a rather high percentage of carbon monoxide. In extreme cases, the plastic coal and coke may be so impenetrable that at the base of the coke column may be only a weak ring of flame, so that, when the coke tree topples, it may carry the fire with it, and the fire will go out. In other extreme cases of improper design of combustion chamber or incorrect installation of the stoker, the coke may fall out of the gas stream so that it cannot be burned; it may rise so far as to stop the outlet of the combustion chamber or push open the firing door.

Relatively free-burning coals do not make big coke trees, no matter how small the coal may be. Strongly coking semi-bituminous coals are so friable that fine coal is inevitable, but they make such weak coke trees that removal of fines is unnecessary, even if practicable. With high-volatile coals, the fines below 48- or 10-mesh or below ¼ or ⅜ in. should be removed, depending on the type of coal.

During the feeding periods of the stoker, no smoke is produced unless the air-coal ratio is too close to the theoretical value for combustion. When the stoker is shut off and little air enters the tuyeres, smoke is produced, increasing with decreased air-coal ratio and decreased coal size and depending on the type of coal. If two coals have the same volatile content, the coal having the more strongly caking characteristics will be more likely to smoke. Less smoke will be made in "off" periods if an excess of air is supplied in "on" periods. Even with the smokiest of coal, the smoke density exceeds that of Ringlemann's No. 3 chart only for short intervals, and this smoke probably will be diluted by the leakage of air which commonly exists in domestic-furnace equipment. Municipal smoke ordinances limit production of No. 3 smoke to six minutes per hour.

That the combustion in fuel beds might be predicted from mathematical formulas was suggested by M. A. Mayers, coal research laboratory, Carnegie Institute of Technology. The main difficulty, as he saw it, was to obtain the necessary data for thermal conductivity, solid-to-gas heat transfer, reaction rate, and ignition temperatures. The first could be determined possibly outside the fuel bed according to

the method of E. Terres and others. The heat-transfer coefficient of C. C. Furnas could hardly be extended to the temperatures and gas compositions required for fuel beds because of chemical reactions which vitiate results by absorbing or liberating heat.

Measurements of reaction-rate constants by methods now in use are wholly satisfactory. The ignition-point determination, however, is dependent on the apparatus in which it is made. The true significance of the ignition point is that at this temperature the rate of heat release by the combustion reaction is greater than the rate of heat loss by radiation by a quantity depending on the criterion used to recognize ignition. It is not a real discontinuity in the chemical behavior of the fuel and may vary with the apparatus used. The coefficient of heat transfer between the solids of the fuel bed and the air or gas stream, the thermal conductivity of the fuel bed, and the specific rate of the combustion reaction appear to depend almost entirely on the physical characteristics of the fuel bed and will be affected more by the size, size distribution and porosity of the fuel in bulk than by its chemical characteristics.

Commenting favorably on this attempt to devise a method of computing the action of the fuel bed, Percy Nicholls, U. S. Bureau of Mines, declared that it opened the possibility of plotting the trend of general relationships and the effect of changing any one of them, such as fuel size and combustibility of the coal. Such studies are in their initial stages, and few data are now available for determining the values of the coefficients for the actions observed. Mr. Mayer's paper, said Mr. Nicholls, emphasizes the need for more accurate information as to these coefficients. In itself, this will act as a guide and incentive to laboratory investigation.

To provide a method of determining the concentration of smoke a coal will produce, an electric muffle furnace, for the production of smoke from the fuel, has been provided with a tube in which light is absorbed by the smoke, a source of air supply, a means for drawing the smoke through the tube, a 15-watt bulb for a constant illumination, a photo-electric cell to measure the light transmitted through the smoke and a d'Arsonval galvanometer to measure the effect of such transmission electrically. This equipment is standardized, declared H. J. Piersol, Illinois Geological Survey, by the production of smoke from naphthalene (moth balls). For the coals tested, a straight-line relationship exists between volatile matter and smoke index. Table I shows the effect of the natural volatile content on the smoke index of the coal.

Estimation with a planimeter of the area of the smoke curve with smoke generated as ordinate and time as abscissa, said Mr. Nicholls, will lead to erratic results, as the ordinates are plotted logarithmically. Furthermore, as furnace factors are different from inherent characteristics, a coal may smoke more or less in the furnace than in the laboratory experiment made to determine its smokiness.

A paper by A. J. Johnson, Anthracite Institute, describing the relation of furnace design to the prevention of clinker, advocated a means of reducing furnace temperatures by having more, and more intimate, cooling surface in the body of the fire bed.

In the afternoon a meeting was held at the Cathedral of Learning, University of Pittsburgh, at which J. A. Bottomley, supervisor, coal preparation, Sahara Coal Co., Harrisburg, Ill., read a paper on scraper mining in the anthracite region, and William Bellano, Utah Copper Co., Bingham, Utah, on settlement of strata over mined areas, both authors being awarded prizes given by the Mine Safety Appliances Co. and the Goodman Manufacturing Co. Mr. McAuliffe presided and presented the checks. Where the coal is less than 200 ft. deep, declared Mr. Bellano, the surface subsides rapidly at first, but slows later, being finally 45 per cent of seam thickness. With 400 ft. of cover, the subsidence is more gradual and only 35 per cent of the coal thickness.

Table I—Volatile Matter and Smoke Indexes of Certain Coals

Source	Bed	Moisture as Received Per Cent	Volatile as Received Per Cent	Average Smoke Index
Will County.....	2	9.1	43.5	5,350
Washington County.	6	8.5	41.5	4,380
Will County*.....	2	..	..	4,220
Franklin County....	6	8.7	33.8	3,650
West Virginia.....	Jewell	1.4	22.5	2,720
West Virginia.....	Beckley	0.0	17.7	1,820
West Virginia.....	Beckley	0.7	16.2	1,770

* Same as other Will County coal but after three months' storage.

Other recipients of awards, not present, are James G. Gray, Hudson Coal Co., for an article on rock chutes, and A. S. Glance, Pottsville, Pa., for a printed communication on the use of the methane detector. Mr. McAuliffe had made the attendance of the two first prize winners possible by a grant for that purpose. G. O. Smith also spoke. At the banquet in the evening, J. T. Ryan, vice-president and general manager, Mine Safety Appliances Co., presided and the speakers were A. B. Parsons, secretary; Erskine Ramsay and H. N. Eavenson, directors of the institute.

Officials nominated to head the Coal Division, A.I.M.E., 1937 are: Chairman, J. B. Morrow, preparation manager, Pittsburgh Coal Co., Pittsburgh, Pa.; vice-chairman, Paul Weir, vice-president, Bell & Zoller Coal & Mining Co., Chicago; secretary, H. E. Nold, professor of mining engineering, Ohio State University, Columbus; executive committee, D. R. Mitchell, instructor, department of mining engineering, University of Illinois, Urbana; M. H. Fies, vice-president, De Bardeleben Coal Corporation, Birmingham, Ala.; J. C. Haddock, president and general manager, Haddock Mining Co., Wilkes-Barre, Pa.

Underwood & Underwood

The late James A. Gorman

Obituary

JAMES A. GORMAN, 58, umpire of the Anthracite Board of Conciliation in Pennsylvania since 1928, died Nov. 14 in a Miami Beach (Fla.) hospital of pneumonia. Previous to his selection as umpire of the board he had been its secretary since its creation in 1905. During his eight years' tenure as umpire his life was threatened by terrorists many times, but these threats, as well as warnings by postal inspectors against opening packages from unknown sources, only made him smile.

SIR NEWTON MOORE, 63, former Premier of Western Australia and ex-president of the Dominion Steel & Coal Corporation, of Canada, died Oct. 28 at a London (England) nursing home after an operation.

WILLIAM WALTERS, 77, superintendent of the Haddock Mining Co. anthracite operations in Schuylkill County, Pennsylvania, until his retirement eleven years ago, died Nov. 3 at Wilkes-Barre (Pa.) General Hospital, where he had been a patient for several months.

JAMES T. SKELLY, 59, vice-president and director, Hercules Powder Co., died Oct. 31 in Wilmington, Del., after an illness of six weeks. He had been vice-president of the company nearly 24 years and also was chairman of the finance committee and member of the executive committee. His commercial career began in 1892 with the Laflin & Rand Powder Co., with which, save for a short period with a hardware company, he continued to be associated following its absorption by the duPont company in 1903 until resigning to join the Hercules organization.

J. WADE BELL, 62, general manager of the Imperial Smokeless Coal Co., operating in Greenbrier County, West Virginia, died suddenly of heart disease on Nov. 6 at his home in Quinwood, W. Va. He had represented the Greenbrier district in wage conferences Washington, D. C.: was a member of the Bituminous Coal Producers' Board for District 7 under the Bituminous Coal Conservation Act of

1935 and was a director of the Smokeless Coal Statistical Bureau.

Clarence N. Orr, 54, superintendent of King No. 1 mine of the United States Fuel Co., at Hiawatha, Utah, was instantly killed Oct. 31 when his automobile overturned 10 miles south of Price, Utah. He had been active in coal mining all his professional life. In 1907 he became assistant superintendent of the Montana Coal & Coke Co., at Aldridge, Mont., returning in 1910 to West Virginia, where he was born, to become superintendent of a mine at Kingwood. He was appointed superintendent at Hiawatha in 1916.

Mgr. John J. Curran, 77, militant Catholic priest, nationally known as a friend of the anthracite miners, died Nov. 7 at Mercy Hospital, Wilkes-Barre, Pa., following two operations. Born in Luzerne County, Pennsylvania, he obtained a job as breaker boy at an early age, later becoming a mule driver and attending night classes to obtain an education. After his ordination he took an active part in civic affairs and was widely known for his liberal views. He came into nation-wide prominence in 1902, in connection with a long struggle between the United Mine Workers and the anthracite operators, persuading President Theodore Roosevelt to intervene and bring an end to the disastrous strike. At this time he became acquainted with the late John Mitchell.

John F. Palmer, executive secretary of the Baltimore (Md.) Coal Exchange, died Oct. 30 after a protracted illness. Early in his career he had been employed by the Pittsburgh Coal Co. and later by the New River Co. in West Virginia, subsequently serving for a number of years as secretary of the Upper Potomac Coal Operators' Association, with headquarters at Cumberland, Md.

A. F. Yarcho, 50, manager of the Osage Coal Co., near Ottawa, Ill., died Nov. 4 at his home in that city after a brief illness. He had formerly been sales agent in Missouri, Kansas and Nebraska for the Pittsburg & Midway Coal Mining Co., of which the Osage company is a subsidiary.

West Kentucky Pact Signed

A wage agreement between the Western Kentucky Coal Operators' Association and the Independent Miners' Union was signed Nov. 13 at Madisonville, Ky. Under the new pact, which becomes effective July 1 next, outside labor will receive from $3 to $4 for a 7-hour day; inside labor, $5.20; machine cutters, 8c. per ton; loaders, 38½c. per ton. The new rates represent increases of about 5 per cent. Approximately three thousand miners are affected.

Chaplin Collieries Mine Leased

Lease of the Chaplin Collieries Co. mine in Scotts Run, W. Va., to S. D. Brady, Jr., president of the Osage Coal Co., has been approved by Judge Baker. Mr. Brady is reported to have announced that the mine will resume operations soon with more than 300 men at work.

Gas Welding to Reduce Coal-Mine Costs Discussed at Oxyacetylene Meeting

OXYACETYLENE welding progress in the coal-mining industry has directly reflected the increased use of machinery for reducing cost, declared G. S. Jenkins, general superintendent, Consolidated Coal Co., Herrin, Ill., in a paper presented at the 37th annual meeting of the International Acetylene Association, St. Louis, Mo., Nov. 18-20. In Mr. Jenkins' absence, because of illness, his paper was read by C. C. Conway, chief electrician for the company, on Nov. 19.

Some fifteen years ago, said Mr. Jenkins, the average mine of any size probably possessed only one cutting blowpipe and perhaps one welding blowpipe. Probably one man was qualified to operate this equipment. Outside of the fact that a few more mines were added to the roster of oxyacetlyene equipment owners, little progress was made in the next five years. Since that time, however, rapid strides have been made. The major factor in this progress was the variation in wage rates between certain mining districts, which led operators in the high-wage fields to adopt the principle of mechanization as a means of lowering costs and thus preserving their ability to compete with lower-wage districts in common markets.

While mechanization of cutting, drilling, loading, hoisting, cleaning, etc., was reflected in a considerable saving in labor cost, it also required charging against such savings a considerable sum to take care of the necessary investments. Estimating roughly, such mechanization and modernization involve expenditures of some $200 per ton of daily capacity, or, in the case of a mine producing 1,000 tons per day, approximately $200,000. Furthermore, charging off this amount in some five or six years generally is the rule and the labor savings are expected to permit this and still show some saving to the operator in addition to interest on the investment.

Changes Force Shop Additions

"As readily may be imagined, this additional equipment made radical changes necessary in shop facilities. It meant the hiring of competent welders, machinists and repair men versed in the various processes already utilized by many industries. Practically all mines found their machine-shop facilities inadequate and were forced to enlarge them four or five times and secure the necessary personnel for operation." At a modern mechanized mine in Illinois, the present-day shop probably will include such equipment as lathes, planers, shapers, milling machines and cutting and welding equipment operated by a crew of eight to ten men.

"It will be noted that a major portion of the work consists of reclaiming parts of the mechanical equipment." Experience has shown that certain portions of replacement parts can be reclaimed by properly building them up and remachining them at a saving of 25 to 50 per cent of the original cost—a substantial item in view of the fact that material cost at a fully mechanized mine will run 20c. to 25c. per ton. While this material cannot all be reclaimed, even salvaging 10 per cent will represent a considerable figure in view of outputs of 3,000 to 5,000 tons daily or even twice that in some cases. Consequently, saving of $25 to $50 per day are readily possible by reclaiming such material as it is possible to rework.

In the case of a worn shaft, for example, which in all probability has been made of some alloy steel and varies in price from $10 to $200, the worn places are turned down, the shaft is built up oversize and then the weld is remachined to proper dimensions. After the shaft has been inspected and checked for fits and trueness it is placed in the storeroom with a tag on it giving the cost of reclamation so that when it is again installed the charge-out will be only the reclamation cost. Gears, gear cases, sprockets and similar items also lend themselves to such reclamation.

Reclaiming Frames Saves Money

Probably one of the largest savings is that resulting from the reclamation of main frames for large units of mining equipment. Were it not possible to weld these frames they would have to be replaced with new ones, involving not only the cost of new frames but also complete disassembly and reassembly of the machines. Labor and loss of use would aggregate even more than the cost of the castings. With the oxyacetylene process, the frame can be welded in place with a minimum of disassembling and loss of use. In a job of this kind, it is not uncommon to use some 50 lb. or more of bronze welding rod on a single casting. Although this quantity of rod, in addition to the gases, might appear prohibitive in cost, analysis discloses that it represents probably less than 5 per cent of the total that would be required in case a complete replacement were necessary.

"One of the outstanding applications developed in this industry has been the utilization of hard-surfacing materials." In addition to tipping cutter bits, hard-surfacing materials are used in practically all places where wear otherwise would be excessive. Examples are chain guides, shafting, machine tools, etc. And even in some places where rollers formerly were employed equipment is being fitted with shoes coated with hard-surfacing material giving a sliding instead of a rolling action with an increase in life of some 200 per cent without any appreciable rise in power consumpton.

In construction work the trend is toward buying the material and fabricating it on the job, representing a saving not only through the purchase of standard-size structural steel in carload lots but also in the increased speed of erection and comparative freedom from vibration in the completed structure. Assembly of pipe by welding results in a unit that is not only erected more speedily but at a lower cost. In installing pipe in a borehole the absence of sleeve joints permits a reduction of an inch or so in casing diame-

ter or, in case the pipe is being installed in an existing borehole, a corresponding increase in casing size.

"Another important use of oxyacetylene equipment is in bonding and welding rail joints underground." The relatively constant temperature eliminates the necessity for expansion joints and makes possible the use of a continuous rail and in turn the employment of a joint that will give a unit bond test when the rail is used as a return. This construction (*Coal Age*, July, 1936, p. 275) "has been used by the writer for several years with a saving of approximately 25 per cent in the cost of making a rail joint and an increase of several hundred per cent in the efficiency of the joint as an electrical conductor."

At modernly equipped properties, surface needs will be met by installation of a dual pipe-line system with outlets at convenient points to conduct oxyacetylene gases to the places of use. This means that when a cutting or welding job presents itself it is necessary only to connect into the nearest outlet, eliminating the usual cumbersome cylinder equipment. The saving from this alone more than offsets the cost of the lines, not to mention the saving in unit cost of generated acetylene over cylinder acetylene, estimated at 50 to 75 per cent.

The latest development in the use of oxyacetylene equipment is the cutting machine designed to effect a smooth cut in a minimum time with the least possible consumption of gas. One application is the manufacture of switch points, in which the rail is cut to the required length and given the correct bend. After this, five distinct cuts are necessary. To make these, a jig was constructed to utilize the cutting machine. With this equipment, one man is able to produce approximately 40 switch points in seven hours, against five points with the usual manufacturing method. The saving when used for such work alone will pay for the machine in ten to twenty days.

Alabama Operations Resume

Operations have been resumed at the Hamilton mine of the Tennessee Coal, Iron & Railroad Co., Pratt City, Ala., after being idle for several months.

The old Ensley (Ala.) byproduct coking plant of the Semet-Solvay Co., which has been closed for about three years, is being rehabilitated and will go back into operation as soon as practicable. There are 240 ovens at the plant.

Mine Blast Kills Four

Four miners were killed and a fifth probably fatally injured on Nov. 19 as a result of a cutting-machine explosion in the No. 1 mine of the Bates Coal Mining Co., Bates, Ark.

East Boston Colliery Resumes

The East Boston Coal Co., Kingston, Pa., which started producing anthracite in Civil War days, resumed operations during the first week of November. Approximately 500 men are employed normally.

Financial Reports

Consolidation Coal Co., Inc., and subsidiaries—Profit for nine months ended Sept. 30, $91,936 after interest on 5 per cent secured notes and loans, depletion and provision for federal income and excess profits taxes of subsidiary companies, but exclusive of federal income tax and surtax of parent company.

Crows Nest Pass Coal Co.—Net income for third quarter, $84,204 after depreciation and depletion, but before income tax, against $81,942 in preceding quarter and $97,568 in first quarter of this year.

M. A. Hanna Co. and subsidiaries—Net profit for third quarter, $614,419 after depreciation, interest, depletion and federal income taxes, against $474,054 in preceding quarter and $402,393 in third quarter of 1935.

Island Creek Coal Co. and subsidiaries—Net income for three months ended Sept. 30, $214,914, compared with $183,405 in preceding quarter and $168,791 in third quarter of 1935.

Lehigh Coal & Navigation Co.—Consolidated net income for twelve months ended Sept. 30, including company's proportion of undistributed earnings and losses of subsidiaries, $546,373 after interest, federal income taxes, depreciation, depletion and other charges. This compares with $367,220 for twelve months ended Sept. 30, 1935.

Lehigh Valley Coal Corporation—Net profit for nine months ended Sept. 30, $423,363 after depreciation, depletion, interest, federal income and State taxes, minority interest and other charges, which compares with $297,080 in the first nine months of 1935.

Pacific Coast Co. and subsidiaries—Net income for three months ended Sept. 30, $24,680, compared with net loss of $244,577 in the preceding quarter and $57,595 loss in third quarter of 1935.

Pennsylvania Coal & Coke Corporation—Including income from allied companies operated by virtue of Clearfield Bituminous Coal Corporation lease there was a loss for quarter ended Sept. 30 of $29,812 after ordinary taxes, depreciation and depletion but before federal income taxes. This compares with $71,805 loss in preceding quarter and revised loss of $83,265 in third quarter of 1935.

Philadelphia & Reading Coal & Iron Corporation and subsidiaries—Net loss for twelve months ended Sept. 30, $3,877,556 after depreciation, depletion, taxes, interest and other charges, compared with loss of $5,882,197 for twelve months ended Sept. 30, 1935.

Pittsburgh Terminal Coal Corporation—Net loss for September quarter, $59,173 after depletion, compared with $139,114 loss in preceding quarter and $139,043 loss in third quarter of 1935.

Pittston Co.—Consolidated net loss for nine months ended Sept. 30, $1,135,817 after provision for doubtful notes and accounts receivable, interest, depreciation, depletion, amortization, federal taxes, subsidiary dividends and other charges, compared with $1,848,844 loss a year previous.

Pond Creek Pocahontas Co.—Net income for quarter ended Sept. 30, $21,976, against net loss of $4,585 in preceding quarter and net income of $90,473 in third quarter of 1935.

Virginia Iron, Coal & Coke Co.—Net loss for September quarter, $8,029 after depletion and other charges, compared with $60,508 loss in preceding quarter and $36,283 loss in third quarter of 1935.

West Virginia Coal & Coke Corporation—Net loss for third quarter, $94,316, compared with $44,171 loss in preceding quarter and $21,803 loss in third quarter of 1935.

Solid Petrol From Coal Runs Truck

A 5-ton truck-or lorry, as our British cousins would term it—fully loaded, made the trip of 100 miles from Leicester to London on solid petrol made from coal. The saving on fuel was asserted to be 60 per cent, with a cruising range of approximately 200 miles from one charge of fuel. Solid petrol, which is produced by distillation, looks like fine coal.

Stoker Report Form Revised

A revised form for reporting statistics from stoker manufacturers as to unit sales for each month to the U. S. Bureau of the Census having been approved, the Committee of Ten—Coal and Heating Industries announces that the new form will become effective on Jan. 1 next. The new statistics to be disclosed are expected to be more valuable to the coal, stoker and allied industries, especially in determining more accurately the sales trend of small residential-size stokers in the bituminous and anthracite territories.

The chief revision is in regard to stokers in Class 1; instead of reporting residential units up to 100 lb. of coal per hour, the new form will show such units as having a capacity under 61 lb. per hour and will show sales of bituminous and anthracite burners separately. Class 2, for small apartment houses and general small commercial heating jobs, will be rated as having a capacity of 61 to 100 lb. of coal per hour; Class 3, for apartment-house and general small commercial heating jobs, will be rated at 101 to 300 lb. per hour; Class 4, for large commercial and small high-pressure (industrial) steam plants, will be rated at 301 to 1,200 lb. per hour; and Class 5, covering high-pressure steam plants (industrial sizes), will include everything from 1,201 lb. of coal per hour and over.

Miners Adopt Law Program To Protect Interests

A resolution directing its officers to ormulate a national and State legislative rogram to protect its members was dopted by the executive committee of he United Mine Workers at Washington, D. C., on Nov. 20. The resolution also alled upon the officers to join other labor, arm and progressive groups in a demand or a constitutional amendment, if necesary, to protect social and economic progess.

The resolution called for "national legislation for the stabilization of the bituminous and anthracite coal industry" as vell as uniform State legislation providng for: (1) A labor relations act compelling employers to permit their employees o organize their own unions and outlawng company unions; (2) an anti-injunction ct eliminating use of State courts to revent workers from organizing; (3) nprovement and extension of workmen's ompensation laws; (4) extension of the rinciples of the miners' certificate laws ow in effect at anthracite mines to the ituminous coal industry; (5) a law proibiting payment of compensation to heriffs or other peace officers by private orporations; (6) an act to protect the xercise of civil liberties from interference hrough local legislation or local officers; 7) elimination of the abuses of evictions y employers in labor disputes; (8) imination of unincorporated communities.

Fires Damage Coal Plants

A fire at the property of the Rock prings Coal Co., Superior, Wyo., on ct. 26 caused damage estimated at $150,-00. The blaze started in the tipple. The ant employs more than 100 men, none of hom was injured. John Lucas, president f the company, announced that work of ebuilding the structure would begin soon.

The headhouse of the Kentucky Jellico oal Co., at Kayjay, Knox County, Ky., as destroyed by fire of undetermined rigin on Nov. 4. Operations are exected to be at a standstill for 30 days.

Add New Features to Stokers

A new addition to the line of the Anchor tove & Range Co., New Albany, Ind., is e Anchor bin-feed Kolstoker, furnished either the draw conveyor or drive conyor type. In the first-named type the rew conveyor draws the coal from the n and conveys it under the floor through e feed tube to the burner. A reverse rew arrests the movement of the coal ward the stoker power unit and forces up through the burner to the fire. In e drive conveyor type the power unit of e stoker drives or pushes the coal from e bin toward the boiler instead of drawg it from the bin, the power unit being cated behind the bin.

New features have been added to its ie of stoker combustion controls by the enn Electric Switch Co., Des Moines, wa, including a patented trip-free bietal overload protective unit and built-in knife switch and fuse receptacle, in addition to the standard synchronous electric timer for maintaining proper combustion at all times, pilot relay, and transformer for supplying low-voltage current to the thermostat unit. The overload unit is wired into the internal circuit of the control and does not change external wiring in any way.

STOKER SALES SPURT

SALES of mechanical stokers in September last totaled 16,612, of which 15,040 were small residential-size units, according to statistics furnished the U. S. Bureau of the Census by 108 manufacturers. This compares with sales of 9,557 units in the preceding month and 9,919 in September, 1935. Figures for the first nine months of this year show that 52,220 units of all types and sizes were sold, compared with 29,221 in the corresponding period a year ago. Sales by classes in the first nine months of this year were as follows: residential (under 100 lb. of coal per hour), 46,417; apartment-house and small commercial heating jobs (100 to 200 lb. per hour), 2,549; general heating and small high-pressure steam plants (200 to 300 lb. per hour), 989; large commercial and high-pressure steam plants (over 300 lb. per hour), 2,265.

★ ★

Bruceton Mine 25 Years Old

Marking the 25th anniversary of the first Experimental Mine explosion, made on Oct. 30, 1911, another demonstration of coal-dust explosibility was given on Oct. 31 at the U. S. Bureau of Mines' Experimental Mine, Bruceton, Pa. The explosion was staged in the presence of several hundred persons, including State mine inspectors, mining engineers, and a group of miners and mine foremen who are taking educational courses under the Bureau's direction.

The program of tests was as follows: (1) discharge of blow-out shot of permissible explosive into Pittsburgh bed coal dust in gallery No. 1; (2) determination of heaving or propulsive strength of an explosive in the ballistic pendulum; (3) discharge of blow-out shot of black blasting powder into Pittsburgh bed coal dust in gallery No. 1; (4) ignition of Pittsburgh bed coal dust by dynamite, both in the open and in the mine; (5) ignition of Pittsburgh bed coal dust by an electric arc in the open; (6) inspection of preparations for event No. 8 in the mine; (7) extinguishing a fire (typifying a small mine fire) with rock dust and with water; (8) explosion of Pittsburgh bed coal dust in the mine initiated by an electric arc; fine coal dust on overhead shelves from portal inby for 450 ft.; ignition 275 ft. from the portal.

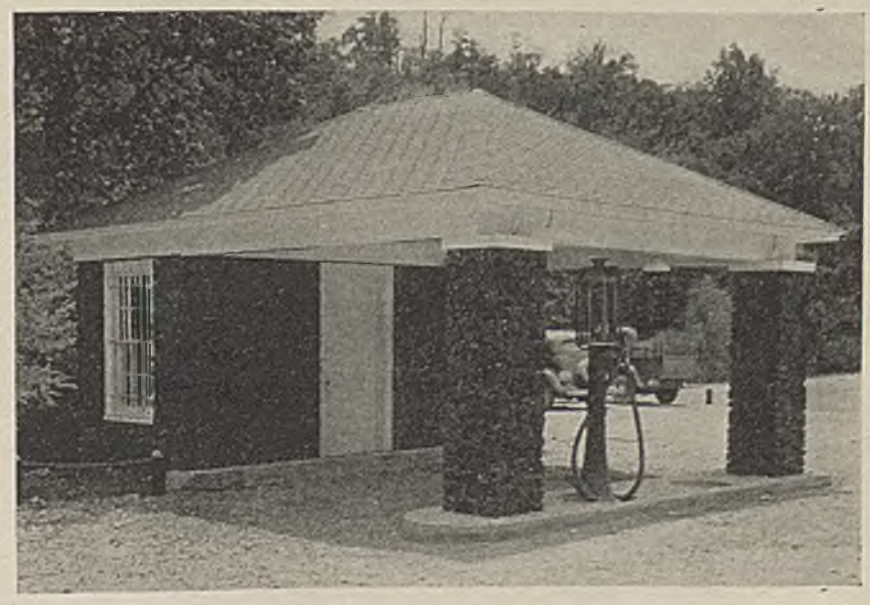
Charter New Company

S. D. Brady, Jr., president, Osage Coal Co., Morgantown, W. Va.; J. Z. Brady, vice-president, and W. H. Jenkins, purchasing agent of the same company, were granted a charter on Nov. 7 for the Premier Block Coal Co., Osage, Monongalia County. The new company is capitalized at $50,000.

Gas Station Built With Coal

A gasoline service station with walls constructed entirely of coal is now in operation at the Acmar (Ala.) plant of the Alabama Fuel & Iron Co., being run by the company for the convenience of its employees. It is the last of a series of improvements recently made at the Acmar operations. Alabama coal was used in building the station, and the coal bricks were so well washed that the walls are perfectly clean. The scheme was conceived by Prince DeBardeleben, sales manager of the company.

Miners refuel amid familiar surroundings



To Reopen Sunlight Mine

Steps to reopen the Sunlight mine, near Jasper, Ala., are being taken by the Sunlight Coal Co., which has been organized with headquarters there. This is a stripping operation in the Black Creek seam, which was operated by the I. O. Drewry Contracting Co. for some time, being closed down about two years ago. Officers of the new company are: G. J. G. Nicholson, president; William C. Osborn, vice-president; R. Veight, secretary-treasurer. Mr. Nicholson also is president of the Deepwater Black Creek Coal Co.

Black Betty Mine Resumes

Harry A. Bratton, president, Oak Hill Coal Co., Terre Haute, Ind., announced that the company's Black Betty mine, near New Goshen, would reopen on Nov. 7, after being idle since last March. The mine normally employs about 200 men.

Panther Creek No. 4 Reopens

No. 4 mine of Panther Creek Mines, Inc., Springfield, Ill., also known as the Old West mine, which had been closed since last March, when fire damaged the tipple, reopened on Nov. 2 with 400 men at work. A new tipple will be erected.

Industrial Notes

H. W. HARMAN, for many years head of the engineering and research departments of the Stearns Magnetic Mfg. Co., Milwaukee, Wis., has been transferred to the sales department in the capacity of sales engineer with supervision of the purchasing department. The company's name has been changed from the Magnetic Mfg. Co. and its plant has been enlarged to provide increased production facilities in the main fabricating and erecting departments.

WALTER P. SOUTHARD has joined the staff of the Trundle Engineering Co., Cleveland, Ohio, where he will handle special management and sales problems. His previous connections include four years with Ernst & Ernst; secretary-treasurer of the Baker-Rauling Co. for three years; vice-president and general manager, J. P. Burton Coal Co., twelve years, in addition to engaging in various sales, promotion and advertising enterprises.

C. F. BOLES, after thirteen years' experience with the Public Service Electric & Gas Co. of New Jersey in the design and construction of outdoor switching and substations, has joined the New York office of the Delta-Star Electric Co., of Chicago, as sales manager.

R. H. SONNEBORN has been named assistant manager of sales, pipe division, Republic Steel Corporation. Previous to joining Republic in January, 1936, he was associated with the Colorado Fuel & Iron Co., later entering the sales department of the Youngstown Sheet & Tube Co. Steel & Tubes, Inc., a subsidiary of Republic, announces the following appointments in its sales department: LEE M. HOGAN, former manager of advertising and sales promotion, has been named district sales manager at New York. IRVING WHITEHOUSE, former assistant manager, has been appointed manager of sales promotion. A. R. SMITH, who has been superintendent of the Elyria division, has been promoted to general manager of the division, vice A. E. Adams, retired.

BABCOCK & WILCOX CO. has appointed J. S. Allison, Jr., as Chicago district manager of its refractories sales department. Mr. Allison formerly was manager of the high-temperature insulation department, building products division, Armstrong Cork Products Co. BABCOCK & WILCOX TUBE Co. announces the appointment of W. W. Williams, formerly general sales manager, as general manager of the company and T. F. Thornton, formerly sales manager of the Detroit district, as general sales manager.

GEORGE H. BUCHER, vice-president, Westinghouse Electric & Manufacturing Co., has been appointed executive vice-president and hereafter will have his headquarters in Pittsburgh, Pa., instead of New York. DAVID S. YOUNGHOLM vice-president, Westinghouse Lamp Co., has been elected vice-president of Westinghouse Electric & Manufacturing Co., with headquarters in New York. JOHN W. WHITE, formerly managing director of the Compania Westinghouse Electric Internacional, with headquarters in Buenos Aires, Argentina, has been appointed general manager of the Westinghouse Electric International Co., with headquarters in New York.

LINK-BELT CO. announces the appointment of P. B. Engstrom as distributor of the company's crawler shovels, draglines and cranes, and locomotive cranes in southern California territory. His headquarters will be in Los Angeles. B. HOWARD MACNEAL has been transferred from Memphis, Tenn., to the company's Philadelphia office, when he will specialize in the sale of crawler and locomotive cranes to industrial concerns in the Philadelphia and New York areas.

HARNISCHFEGER CORPORATION, Milwaukee, Wis., has appointed Frederick Salditt as vice-president. During his thirteen years' connection with the company Mr. Salditt has worked in every department of the organization. In addition to his new duties, Mr. Salditt will continue to retain supervision of foreign operations.

PERMISSIBLE PLATES ISSUED

Two approvals of permissible equipment were issued by the U. S. Bureau of Mines in October, as follows:

Goodman Manufacturing Co.: Type E-10-76 shaker conveyor; 7½-hp. motor, 230 volts, d.c.; Approval 299; Oct. 22.

Joy Manufacturing Co.: Type 7-BU loading machine; 35-hp. motor, 220 volts, a.c.; Approval 309; Oct. 20.

★ ★

"Make Mine Egg"

An interesting and attractive bulletin entitled "Make Mine Egg," published by Appalachian Coals, Inc., Cincinnati, Ohio, lists seventeen reasons why householders should give more consideration to using this size. The folder suggests that "egg coal offers the greatest over-all value of any of the coal sizes." Intended for distribution by affiliated companies and authorized agents, the factual information in the brochure was prepared by the A.C.I. fuel engineering division.

Mine Fatality Rate Recedes

Coal-mine accidents caused the deaths of 92 bituminous and 10 anthracite miners in September last, according to reports furnished the U. S. Bureau of Mines by State mine inspectors. With a production of 36,772,000 tons, the bituminous death rate in September was 2.50 per million tons, compared with the revised figure of 2.71 in the preceding month, when 33,240,000 tons was mined, and 2.85 in September, 1935, in mining 24,944,000 tons. The anthracite fatality rate in September last was 2.66, based on an output of 3,764,000 tons, as against 7.45 in the preceding month, when 3,223,000 tons was produced, and 5.27 in September, 1935, when production was 4,172,000 tons. For the two industries combined, the death rate in September last was 2.52, compared with the revised figure of 3.13 in the preceding month and 3.19 in September, 1935.

Comparative fatality rates for the first nine months of 1935 and 1936, by causes, are given in the following table:

FATALITIES AND DEATH RATES AT UNITED STATES COAL MINES, BY CAUSES*

January–September, 1935 and 1936

	Bituminous				Anthracite				Total			
	Number killed		Killed per million tons		Number killed		Killed per million tons		Number killed		Killed per million tons	
	1935	1936	1935	1936	1935	1936	1935	1936	1935	1936	1935	1936
Falls of roof and coal	362	394	1.378	1.304	110	97	2.825	2.559	472	491	1.565	1.44
Haulage	145	116	.552	.384	21	17	.539	.448	166	133	.550	.391
Gas or dust explosions:												
Local explosions	11	15	.042	.049	9	11	.231	.290	20	26	.066	.076
Major explosions	9	18	.034	.060	13	5	.334	.132	22	23	.073	.068
Explosives	26	18	.099	.060	14	13	.359	.343	40	31	.133	.091
Electricity	27	26	.103	.086	1	6	.026	.158	28	32	.093	.094
Mining machines	19	11	.072	.036	1	....	.026	.....	20	11	.066	.033
Other machinery	2	9	.008	.030	....	2	.....	.053	2	11	.007	.033
Miscellaneous:												
Minor accidents	20	30	.076	.099	8	16	.205	.422	28	46	.093	.135
Major accidents	6	9	.023	.030	....	....	.....	.....	6	9	.020	.026
Shaft:												
Minor accidents	7	6	.027	.020	3	7	.077	.185	10	13	.033	.038
Major accidents	...	....	.....	.....	7	....	.180	.....	7	....	.023	.....
Stripping or open cut	3	7	.011	.023	7	7	.180	.185	10	14	.033	.041
Surface	29	24	.110	.079	23	12	.590	.316	52	36	.172	.106
Grand total	666	683	2.535	2.260	217	193	5.572	5.091	883	876	2.927	2.576

* All figures subject to revision.