COAL AGE

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

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AUDIT AND FORECAST

BECAUSE coal is so intimately interwoven into the pattern of the industrial and social life of the nation, it was inevitable that mining in the last quarter of 1937 should experience an unfavorable reaction from the industrial recession which set in at that time. This reaction registered most strongly in a slowing up in production activities. It has neither changed fundamental objectives nor blurred realization of the necessity for unslackened progress toward their attainment.

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THESE objectives probably are as old as modern industry itself. The goal, simply stated, is a constantly improved product at a lower relative cost. Far-sighted observers were first impressed with the importance of these objectives when the industry emerged from the tonnage-at-any-price war days to face increasing competition from other sources of energy. Each year since has given sharper and more widespread appreciation of the fact that in no other way could the industry hope to maintain and expand its position.

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ENGINEERING progress toward these objectives during 1937 has been evident on all fronts. While, as the detailed summaries in the pages which follow will show, development has been largely one of intensification and refinement of movements initiated several years ago, some of these are such radical departures from previous practices that they may be truly called innovations. Laboratory and field both have contributed to these advances.

AMONG the most striking of these have been the progress in reducing car-changing time behind mobile loading machines and the developments in large truck and trailer transportation between strip pits and cleaning plants. Conveyor installations showed a substantial increase. While the number of new mobile units put into service last year was somewhat less than in 1936, tonnage mechanically loaded continued to climb and the day when an average of 30 tons per underground man-shift will be common does not seem far distant.

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NEW conceptions in design are making headway in preparation-plant construction. New types of equipment for cleaning the smaller sizes of coal and for drying are claiming increasing attention. With greater mechanization both above and below ground, interest in adequate power distribution and utilization is quickening; one result is the installation of more portable substations of the mercury-arc rectifier type. Operators who have improved their ventilation practices have been rewarded with some remarkable reductions in power costs.

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THE progress recorded in 1937 and the temper of the industry both point unerringly to further engineering and technical advances in the coming months. Such progress, frankly, can no longer be stymied by individual management preferences or prejudices. Competitive conditions leave no other road to success open.

COAL WIDENS OBJECTIVES

+ In Drive on the Economic Front

CLOSING a somewhat hectic year by tackling the problem of sales under government-approved price schedules and marketing regulations, the bituminous industry marked up an increase in output in spite of a drop in demand at the end of 1937 as a result of a recession in business activity. Other results of the year's developments, however, were not all of a character to bring comfort to soft-coal producers.

Federally sponsored competition, as a result of opposition from both within and without the industry, was marked by a reduction—in part only temporary—in intensity in 1937, but otherwise oil and natural gas made further gains while the industry's power to compete was further burdened by wage and freight-rate advances only in part compensated for by further economies in production. Offsetting these unfavorable factors, however, was the inauguration of the initial steps in a national promotional campaign to preserve soft-coal markets and develop new outlets, which was reinforced by an intensification of research activities.

Perhaps the outstanding event of 1937 was the third attempt in less than four years to regulate the operation of the bituminous industry under the aegis of a federal commission. Succeeding the NRA code (Oct. 2, 1933-May 27, 1935) and the Bituminous Coal Conservation Act of 1935 (Aug. 30, 1935-May 18, 1936) the Bituminous Coal Act of 1937 became a law on April 26. Passage of the act was preceded by attempts by the industry to prepare a regulatory measure of its own for submission to Congress, which came to an end amid wide differences of opinion at a meeting in New York, Feb. 4.

The National Bituminous Coal Commission, charged with the duty of administering the 1937 act, was sworn in on May 17, at which time representatives of the industry started hammering for early preparation and promulgation of price schedules. But the wish was not immediately father to the fulfillment, as classification and coordination squabbles delayed schedules for Districts 1 to 12, inclusive, until Dec. 16; District 13 until Dec. 27; and Districts 15 to 20, inclusive, and 22 and 23 until Jan. 3, 1938. Even then all was not smooth sailing, as a storm of protests from both producers and consumers broke about the Commission's ears, with the result that it immediately began granting modifications and concessions. (A more detailed analysis of the course of events under the act appears on pp. 82-83 of this issue.)

Soft Coal Up 1.4 Per Cent

Total bituminous output in 1937, according to preliminary estimates by the National Bituminous Coal Commission, was 440,265,000 tons, an increase of 6,195,000 tons, or 1.4 per cent, over the 1936 production of 434,070,000 tons. Additions to stocks in the hands of industrial consumers and retailers aggregated about 15,000,000 tons in 1937. Total lake shipments (cargo and fuel) were 45,246,236 tons, against 45,440,696 tons in 1936.

Railroad coal consumption (Fig. 5) rose about 1,711,000 tons last year, or about 2.1 per cent, while electric-power-utility consumption increased about 2,500,000 tons, or 6 per cent. Figures for both railroads and utilities include, of course, a certain proportion of anthracite. Coal used in the manufacture of pig iron went up about 9,500,000 tons, or 21.8 per cent, last year. In the same period, consumption by steel and rolling mills, coal-gas retorts, cement mills and "other industrials" rose about 12,200,000 tons, or 8 per cent.*

Pennsylvania anthracite ended 1937 with an 8.5 per cent loss in output. Excluding stolen coal, variously estimated at 2,500,000 to 4,000,000 tons, total legitimate output is estimated at 50,091,000 tons by the U.S. Bureau of Mines, a decrease of 4,679,000 tons from the 1936 total of 54,760,000 tons. A major factor in the decline was a lack of cold weather during the normal high-demand months, coupled with the business recession and pressure from competitive fuels. Anthracite producers also were busy during the year, along with the bituminous fraternity, in opposing federal competition, as well as in sponsoring legislation designed to put the brakes on oil and gas and imported coal by the imposition of taxes or duties. One blow to the industry in 1937, however, was negotiation of a trade agreement with Russia, viewed by hard-coal men as removing import restrictions on Soviet anthracite. Anthracite also was active in the field of freight rates and managed to secure adjustments in a number of cases.

The year was not uniformly unfavorable to the hard-coal industry, however, as there was some recession in bootleg activity, although an investigation of the problem by a State commission brought proposals for regulation of the industry much further into the public eye. Promotional work by Anthracite Industries, Inc., was carried on with added vigor and corresponding results, and hard coal also benefited from the shipment of around 9,000

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* It will be noted that on the basis of available data the indicated rise in bituminous consumption, plus additions to stock piles, was considerably in excess of the indicated rise in output on the basis of preliminary figures.

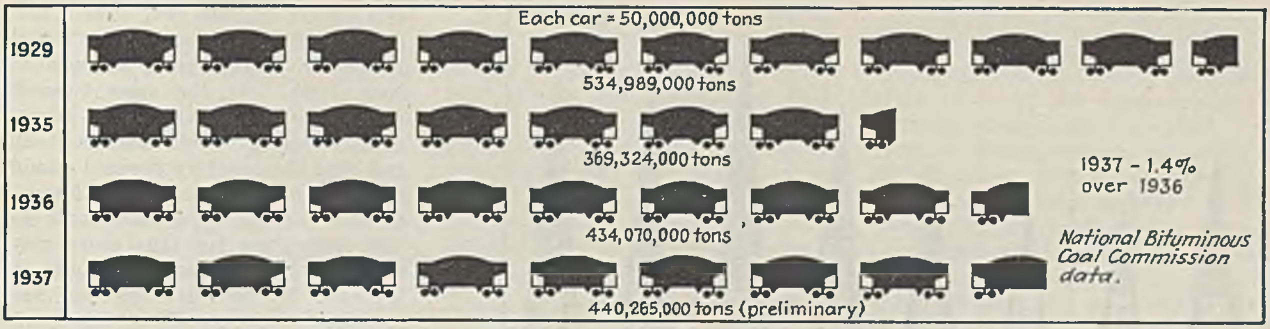


Fig. 1—Bituminous production increases 1.4 per cent in 1937

household stokers in 1937. Labor trouble was conspicuous by its absence. The industry changed to a seven-hour day and a five-day week on May 1, involving an increase in labor cost, inasmuch as daily, monthly and consideration rates remained the same. A further period of operation without the possibility of an interruption as a result of contract negotiations was assured in November when a joint committee of operators and miners agreed to extend the present agreement one year from April 30, 1938.

Stimulated by the public reaction following the airing of the stolen-coal situation by the operators in 1936, Governor Earle of Pennsylvania moved early in 1937 for an investigation. In a message to the Legislature on Jan. 5 he requested authorization to appoint a commission to study economic and social conditions in the hard-coal region; causes underlying the dislocation of the mining industries; the extent of illegal mining and its causes; methods by which economic and social conditions might be alleviated; and any other matters or affairs which the commission might consider germane in securing reliable data on conditions affecting the anthracite region and the industry. Meanwhile, authorities in consuming centers within reach of bootleg trucks continued studies of measures for arresting the inflow of stolen coal as a start in active campaigns lasting throughout the remainder of the year.

Following passage of the enabling legislation, Governor Earle named an Anthracite Coal Industry Commission of five on Feb. 10. The Commission started work with a tour of the region around Pottsville on March 4. Hearings later in the month brought out a series of suggestions for curing the ills of the hard-coal industry, including both State operation and State or federal regulation of the industry.

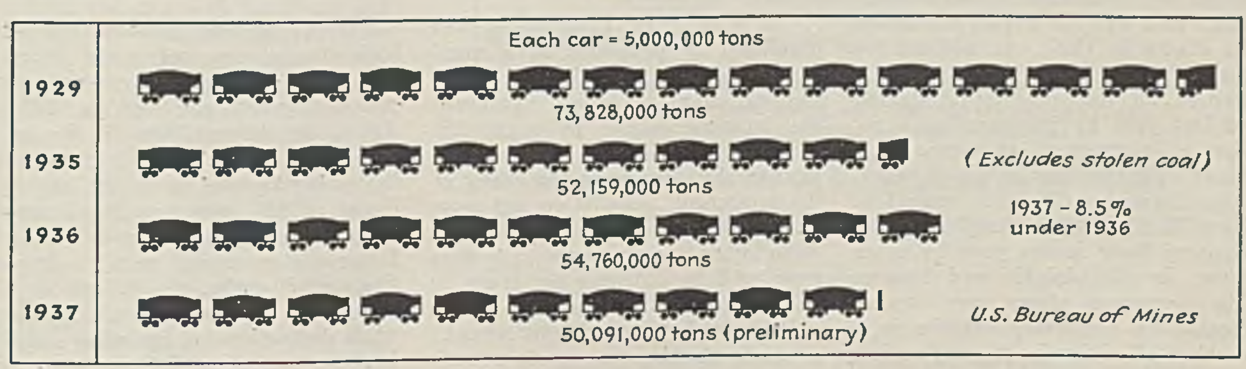
Agreeing on three major principles—inadvisability of stopping bootlegging with armed forces, a reduction of anthracite prices to meet competition, and lower freight rates—the Commission on May 17 offered three proposals for ending coal stealing. These were: creation of a State corporation to take over sufficient mining operations to produce an equivalent of the bootleg tonnage and employing up to 7,000 men, with a tax on present producers to finance acquisition of closed capacity; similar operation of closed collieries by a cooperative producer organization regulated by the State, without tax; and application of a modified Guffey act with additional direct and work relief and a strengthening of the laws against bootlegging. Meanwhile, proponents of federal regulation increased in number, and on July 15 Senator Guffey and Representative Boland, both of Pennsylvania, introduced a bill in Congress, almost identical with the bituminous act, to regulate anthracite. No action was taken, however.

Three additional commission reports were issued in September, one, on the marketing situation, urging unified action, while another, on anthracite lands, recommended that the State acquire control of anthracite reserves by purchase through the issuance of bonds. In the third report, covering the period 1936-37, the number of men engaged in the stolen-coal industry was stated to be 13,000, including 2,000 picking over culm and refuse piles, 1,300 in outlaw breakers and 2,700 in trucking. Production, said the report, was at the rate of 2,400,000 tons per year, bringing about $16,000,000 annually from the ultimate consumers.

With most of the spade work done, a round-table conference on the future of the industry was staged by Governor Earle at Harrisburg, Pa., Sept. 27. Operator representatives contented themselves with reiterating their contention that bootlegging must be eliminated, coupling this with a plea that the final plan should not unduly upset the industry. Representatives of other groups presented a wide variety of plans, including state-sponsored reopening of idle operations and state and federal regulation of the entire industry.

The Commission plumped squarely for State control at a meeting of representatives of operators and miners in Philadelphia, Oct. 15, this control to include, among other things, regulation of mine prices and costs, establishment of production quotas,

Fig. 2—Anthracite takes an 8.5-per cent loss in 1937



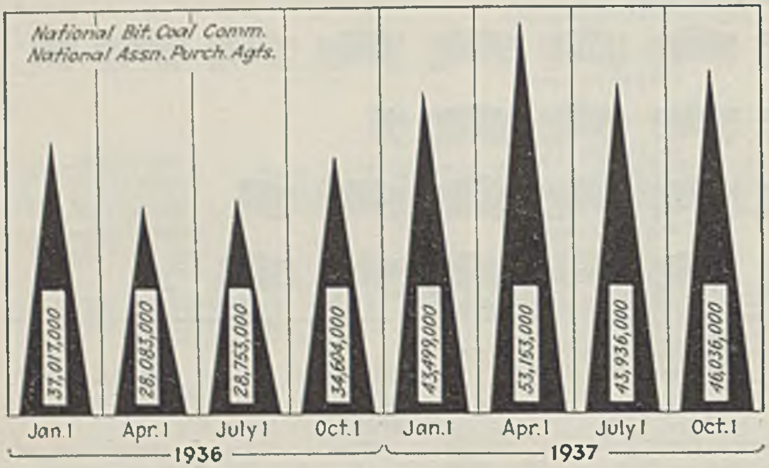


Fig. 3—Consumers' stocks show wide gains in 1937

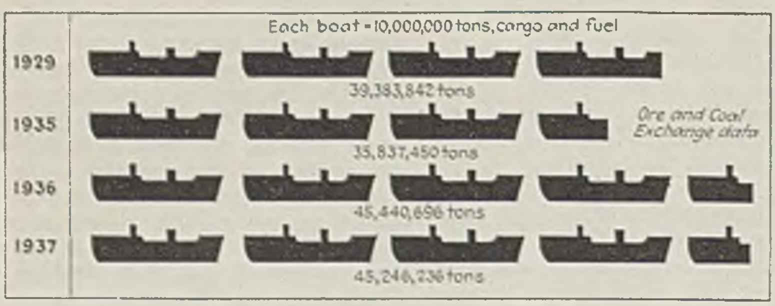


Fig. 4—Lake shipments approximately equal the 1936 total

formation of public producing and distributing corporations to reemploy bootleggers, and establishment of cooperative marketing and promotional agencies. Stabilizing legislation came still nearer as the result of a series of conferences in New York City Nov. 12 and 13, which resulted in the appointment of a committee of operators and miners for the purpose of conferring with federal and Pennsylvania State authorities on the question. The contract extension noted above also grew out of the conferences.

With a war chest of roughly $1,000,000 for the year, Anthracite Industries, Inc., organized in 1936 to coordinate the activities of anthracite producers and distributors, equipment manufacturers and allied industries, and also promote automatic heat with hard coal, intensified its efforts in 1937. In addition to the advertising and field work initiated in '36, the organization started off last year by inaugurating a series of permanent automatic heat shows in cooperation with equipment manufacturers. The first opened in New York in February, and was followed later in the year by other shows in Philadelphia and Boston. The permanent shows were supplemented by temporary exhibits in a number of cities in the anthracite-burning territory in connection with the National Home Shows held under the direction of the Federal Housing Administration.

Another early development was the taking over of control of the Anthracite Institute Laboratory at Primos, Pa., rechristened the Anthracite Industries Laboratory. This laboratory, up to Oct. 15, 1937, had granted approvals to 104 pieces of anthracite-burning equipment. In another early step, Anthracite Industries broadened its work in the spring to take in the field of hot-water heating, starting off with a test-ad campaign in a number of key cities and inviting the cooperation of allied industries. Plumbing and heating contractors, especially, were addressed through their trade papers.

The work of the organization was paralleled by programs by a number of individual producing organizations, many of which reinforced the hot-water drive in particular. Excellent cooperation was received from dealers and representatives of the equipment, installation and service industries, with the result that these interests early in the year were running 6 in. of space for every 10 in. by Anthracite Industries.

On Sept. 1, "Green Lights Ahead," a movie showing the past, present and future of the coal dealer and designed for exhibition to the retail fraternity, was given a preview in New York. At the same time it was announced that the fall advertising campaign would start Sept. 20 and that the territory covered would be enlarged to include Chicago. Further details of developments in 1937 and plans for the future may be found in an article by Louis C. Madeira, 3d, executive director, Anthracite Institute, p. 39 of this issue.

In bituminous markets, as well as in anthracite, competitive fuels again made progress in 1937, although gains were not so great as in 1936. This progress, however, was matched by increased promotional and research activity on the part of the soft-coal industry, including as an outstanding development the inauguration of a national promotional campaign early in the year. And in addition to battling substitutes on the consumer's doorstep, organizations representing producers, distributors, labor, equipment manufacturers and allied interests, as well as the public in mining regions, continued their efforts to bring these products under some measure of control in order to equalize coal's competitive power.

On the basis of eleven months' figures by the U.S. Bureau of Mines, consumption of gas oil, distillate fuels and residual fuel oils reached the record total of 435,000,000 bbl. in 1937. Consumption in 1936 was 410,641,000 bbl., of which nearly two-thirds was absorbed for heating, railroad use, bunkering and gas and electric-power production. Shipments of oil burners of all types, according to reports to the Bureau of the Census, were slightly less in 1937, however (Fig. 6). But consumption of oil for engine fuel by railroads (Fig. 5) rose about 9 per cent, against 2 per cent for coal. Electric-utility fuel-oil consumption, on the other hand, decreased about 1½ per cent, compared with a rise of 6 per cent on coal use.

Natural Gas Shows Rise

Natural-gas consumption, on the basis of sales reported to the American Gas Association, increased approximately 8½ per cent in 1937. Again, the largest item in the increase was a rise of 10.3 per cent in industrial sales, in which an increase of 10.1 per cent in electric-utility consumption (Fig. 5) was a factor. Commercial sales, a relatively small outlet, rose 6.5 per cent, according to association figures, while domestic sales, including house heating, rose about 5.4 per cent.

A further expansion in natural-gas use in 1938 is forecast by developments last year, of which the most important was the completion of a $12,000,000 construction program adding 40 per cent to the capacity of the Panhandle Eastern Pipe Line Co., which secures its gas in Texas. The major reason for the expansion was the fact that the Detroit Gas Co., which switched over to the natural product in 1936 and is served by Panhandle Eastern, expects a peak in the second year of operation equal to that originally contemplated for the fifth. While Detroit represents the major advance in the near future, natural-gas distributors planned expansions in other regions in 1938 also.

Competitive Control Sought

Control of oil and gas competition, as noted above, was sought in three major directions: taxing or regulatory legislation; research to improve the efficiency of coal utilization, as well as to develop new outlets; and promotion of satisfaction with coal heat on a national basis in addition to smaller-scale efforts. Legislation brought into the picture producers and distributors of coal (individually and through local and national associations), labor, allied equipment and service industries with a stake in coal's future and representatives of the public in certain mining fields. Research was epitomized by the work of the industry's own organization — Bituminous Coal Research, Inc.—supplemented by the work of other individuals, companies or organizations, while the major promotional effort of the year was initiated by the National Coal Association.

Higher excises on imported oil and a tax on all domestic fuel oil except that used in internal-combustion engines were before Congress in 1937, but failed of passage. The domestic tax was favored by the industry on the grounds of revenue and conservation of oil resources. On the natural-gas side, a regulatory bill was passed by the House and placed on the Senate calendar. Taking the stand that it neither advocated nor opposed the bill, the bituminous industry contended that if Congress moved into this field the proposed measure should be improved. Taxes on natural gas were sought by several State groups, such as the Illinois Reciprocal Trade Association, which backed measures offered in the Illinois Legislature early in the year for an impost of 5c. per 1,000 cu.ft. No action was taken, however.

In view of the growing importance of the household stoker, investigation of stoker problems was a major part of the 1937 program of Bituminous Coal Research, Inc. Dustless treatment of coal was another important study carried on in cooperation with oil companies and spray-equipment manufacturers. On the industrial side, work was conducted to ascertain the cause of and find a remedy for segregation of coal in power-house bunkers, and also determine how coal burns on a large underfeed stoker, with the Hell Gate station in New York City as the guinea pig in the latter investigation. Boiler design for automatic heating was another project undertaken in cooperation with stoker and boiler manufacturers. Hydrogenation studies were continued.

As originally set up, the program of Bituminous Coal Research, Inc., expires June 1, 1938. The year 1937, however, was marked by a striking increase in interest in the possibilities of research, which was reflected in the almost unanimous attention given to it at the meeting of the National Coal Association last October. Consequently, continuance and expansion of the industry-sponsored program may be expected. In addition to the work of Bituminous Coal Research, Inc., many other organizations carried on work of both a fundamental and practical nature, as indicated in the summary on p. 76 of this issue.

Interest in research was matched or exceeded by interest in the national promotional campaign initiated by the National Coal Association, the first of its kind in the bituminous industry. This campaign got under way about the middle of 1938 with an advertisement in *Small Homes* in cooperation with the Stoker Manufacturers' Association, supplemented by a pamphlet enlarging upon the ad for distribution to prospective home owners, those inter-

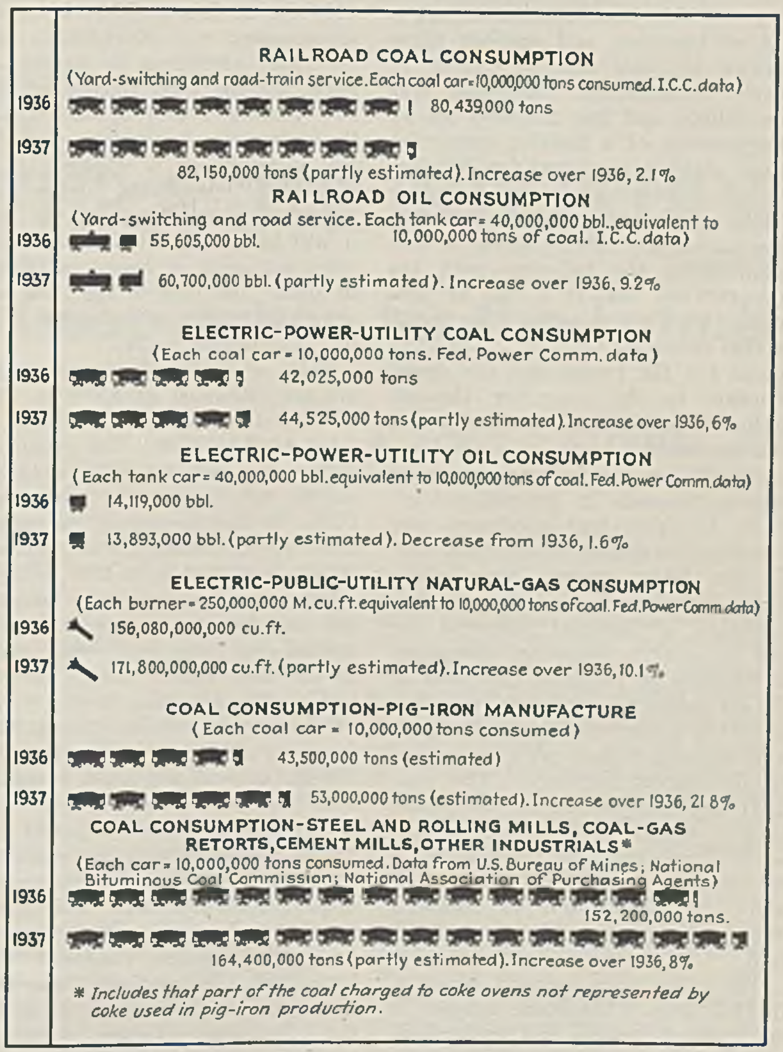


Fig. 5—Coal consumption rises in 1937; oil and gas gains are less marked

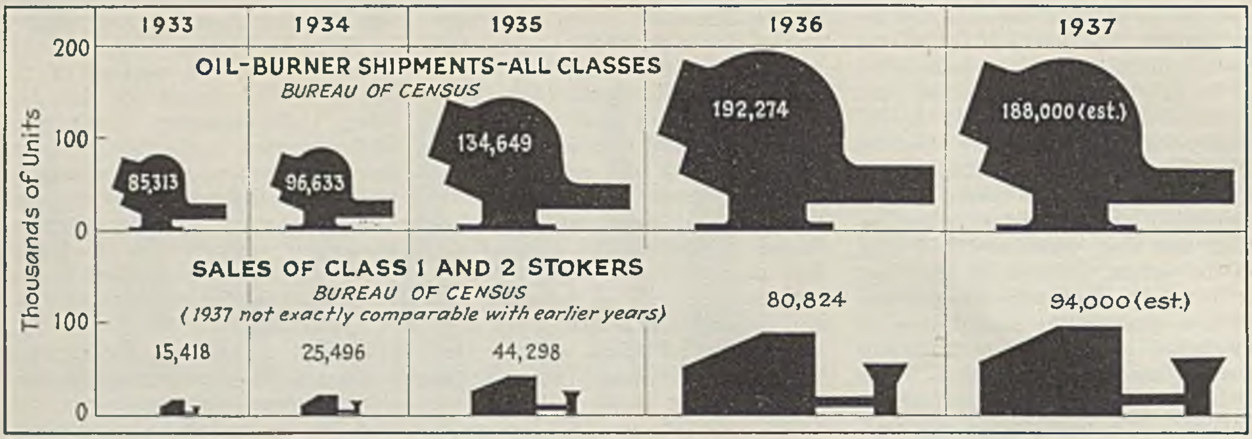


Fig. 6—Small stoker sales gain while oil-burner shipments decrease in 1937

ested in modernizing and builders. This effort was followed by an educational pamphlet for home owners, architects, engineers, builders and others, with a circulation of well over 200,000 by the end of the year.

The next step was the preparation and publication of a series of advertisements in the leading architectural and builders' magazines of the country, offering among other things a set of basement and coal-bin plans drawn to scale and applicable in home construction. Response was immediate, and was followed up by preparation of a booklet containing these plans in miniature for distribution to interested persons, including dealers and producers, the latter in accordance with the principle of first acquainting the industry with the program so that it would be prepared when the time came to create a real consumer demand. Tentative plans for the future call for direct appeals to the consumer through national publications, the radio and the movies.

Paralleling the industry program was an increase in promotional efforts by individual producers and operating or marketing organizations. In the latter group, Appalachian Coals, Inc., was a leader in the distribution of material prepared for the national promotional campaign, in addition to its usual functions of dissemination of engineering and application information through direct and indirect contact with consumers in its market territory. The year 1937 also was marked by the formation of another district sales agency —the Smokeless Coal Corporation— representing an annual output of about 25,000,000 tons of southern West Virginia-Virginia low-volatile coal.

The bituminous industry benefited in 1937 from a handsome increase in the sale of stokers and pulverized-coal firing units. Small domestic stokers again led the field, but developments during the year revealed a serious lag in installations in new homes, in which a boom is expected in the next few years. In existing homes, however, the coal stoker made excellent progress.

Sales of Classes 1 and 2 stokers (100 lb. or less per hour) reached an estimated total of 94,000 in 1937. In 1936, according to figures collected by the U.S. Bureau of Census, Classes 1 and 2 stokers (200 lb. or less per hour) totaled 80,824. As a result of a change in the method of classifying stoker units instituted at the first of the year, it will be noted that the two classes were not quite so broad in 1937 as in 1936. Included in the 1937 sales were about 9,000 anthracite and 79,000 bituminous units.

Sales of Classes 3, 4 and 5 stokers are estimated at 8,300 in 1937, whereas Classes 3 and 4 stokers totaled 4,507 in 1936. The groups, of course, are not strictly comparable in the two years, for the reason given in the preceding paragraph. Sales of all classes of stokers were 20 per cent higher in 1937, whereas oil-burner shipments were about 2 per cent less. New orders for pulverized-coal-firing equipment placed in the first eleven months of 1937 totaled 353, according to the Bureau of the Census, against 345 in 1936. Capacity of the 1937 units is 3,209,390 lb. of coal per hour, compared with 2,986,300 lb. in 1936.

Government-sponsored power programs competing with coal made less progress in 1937, while the coal industry, both anthracite and bituminous branches, and other interested and allied groups continued their opposition. In particular, the utilities prosecuted their fight against the Tennessee Valley Authority, which was initiated by Southern coal men in 1934. PWA grants for power projects also were held up by the utilities in 1937 through injunction proceedings, although the industry lost out in a court decision early in 1938.

In the van of federal proposals for power projects in 1937 was the Norris "Seven Sisters" bill for the creation of regional conservation and power authorities to blanket the country. No action was taken on this proposal, and developments at the end of the year indicated its eventual abandonment, although this conclusion is subject to change without notice. In addition to continued opposition to power-project proposals, the bituminous industry, through the National Coal Association, local groups and individuals, won a striking victory in Tennessee when it was successful in blocking TVA efforts to prevent the erection of a steam-power plant at Nashville, Tenn., to consume 100,000 tons of coal per year.

The Tennessee Valley Authority experienced hard sledding in 1937, what with attacks from the utilities and other opposition groups and reports of dissension among the directors over cooperation with utilities. The latter, in fact, was responsible early in 1938 for a proposal to investigate the authority by no less a person than Senator Norris, the father of the project. In spite of all this, however, TVA was able to extend its power service to additional communities and also to continue construction.

TVA started off the year under the handicap of an injunction against new construction or service to additional customers granted by the U.S. District Court for the Middle Tennessee District on Dec. 14, 1936. The injunction was the initial result of a suit by eighteen utility companies to test the constitutionality of the entire TVA program. The injunction was appealed by TVA counsel on Jan. 8, 1937, and was dissolved by the U.S. Circuit Court of Appeals, Covington, Ky., May 14, which sent the case back to the lower court for trial on the constitutionality question, in spite of TVA protests against this basis of action. Trial was started Nov. 15.

PWA loans and grants for the construction of power projects were upheld by the Supreme Court in a decision handed down Jan. 3, 1938, in the Alabama and Duke power company cases. This action was viewed by Secretary of the Interior Ickes, PWA administrator, as removing all stumbling blocks in the form of injunctions secured by utility companies in the path of 61 public-power projects costing $146,917,808 in 23 States.

Opposition from the bituminous industry and other interested groups failed to prevent a rise in freight rates on soft coal and coke granted by the Interstate Commerce Commission on Oct. 22 to go into effect Nov. 15. The bituminous increase, however, was limited to a period ending Dec. 31, 1938. Dissatisfied with this concession, the carriers on Nov. 5 filed a petition for an additional rate increase involving, in the case of bituminous coal, a further rise of 15 per cent with maximums of 10 and 15c. per ton. On anthracite, unaffected by the Oct. 22 decision, the railroads requested a 15 per cent increase also, with a maximum of 25c. per ton. Hearings on the petition started on Nov. 29.

Bituminous miners again benefited by an increase in wages as an outgrowth of the adoption of a new two-year agreement covering the Appalachian field, followed by supplemental agreements in other producing regions. In preparation for the negotiations, Appalachian operators proposed, among other things, a reversion to the 8-hour day with retention of the same daily wage scales. United Mine Workers demands, on the other hand, included a 6-hour shift; a wage increase of 50c. a day, with complementary increases in contract rates; time and a half for overtime; a guarantee of 200 days' employment or pay per year, two weeks' vacation with pay and creation of a joint commission to investigate mechanized-mining conditions and rates of pay.

As finally adopted, the Appalachian contract carried increases of 50c. in day rates (70c. for men engaged in mechanical mining and stripping), 10 per cent in yardage and deadwork rates, and 9c. in pick-mining rates, with corresponding hikes in other rates; time and one-half for overtime; and a mechanized-mining commission with modified duties as compared with the original union proposal. With the Appalachian agreement out of the way, other regions began the consummation of new contracts, although in some fields, notably the Middle West, difficulties were not ironed out until late in the year.

Following the adoption of the Appalachian agreement on April 2, the United Mine Workers embarked on a study of mechanical mining with respect to its effect on wages in anticipation of the deliberations of the mechanized-mining commission.

ANTHRACITE INDUSTRY

+ Builds on Cooperation for the Future

By LOUIS C. MADEIRA, 3d
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IN COMMON with other major industries in the United States, anthracite expects 1938 to be an eventful year. Not only may anthracite be affected by changes in the national economy but questions peculiar to itself may be answered in one way or another during the coming twelve months. But, whatever happens, anthracite must be mined, prepared, advertised and sold; new markets developed where possible and efficient methods followed in every detail of operation.

Because the industry as a whole is doing these things to the best of its ability, too much emphasis should not be placed on the uncertainties of legislation and regulation. There are evidences that labor and public officials have a much better understanding of the economic factors surrounding the industry than they had, say, two years ago. One evidence of this was the recent extension of the present wage agreement from April 30, 1938, to the same date in 1939 by the practically unanimous action of producers and labor.

What occurred in Canada during 1937 may well be indicative of what will occur in the domestic market in the near future. Canada, the only foreign market of consequence for Pennsylvania anthracite, took 3,203,000 tons of this fuel ten years ago. Then there was a strong drive made in the Dominion for fuels from the United Kingdom, a duty of 50c. a ton was imposed on non-British anthracite in 1932, a strong bid for space heating was made by natural-gas companies, and a year ago the embargo against the entry of Russian coal into Canada was removed.

In spite of these handicaps, Pennsylvania anthracite sales in Canada in 1937 were 20 per cent above the figure for 1936, and for the first calendar year since 1932 exceeded two million tons, the low point being 1,430,000 tons in 1933. This gain was accompanied by a substantial decline in the use of anthracite from the United Kingdom as well as in the use of coke for domestic heating. It was accomplished only by determined sales efforts on the part of the several companies and the cooperative efforts of the operators.

The same methods that are proving successful in Canada are being used to increase the domestic market, but with even more vigor. No better salesmen are to be found in any industry than those who staff the distributing organizations of the principal producing companies, and no better advertising talent can be found than is now engaged in promoting the use of anthracite. This work is literally carried to the furnace door of the consumer, showing him how to get the best heat and the most heat for the least money.

This is not a new program for the industry. It dates back at least as far as the immediate post-War period. But within the last year or two it has been reactivated, not only through the organization of Anthracite Industries, Inc., as a sales-promoting organization but also by many of the companies and dealers individually.

The competitive position of anthracite is still very keen. The use of fuel oil, coke, natural gas, bituminous coals and foreign anthracite for household-heating purposes made serious inroads in the anthracite market in the past fifteen years, but, due to a variety of causes, there is more than a hope that not only has this competition reached its peak but that much of the business lost to it may be regained.

Various guesses and estimates have been made as to the life of the present oil reserves, and many of them have been wide of the mark. But there can be no disputing the fact that they are being depleted rapidly and this is being reflected in the rising price of fuel oil. The increasing use of fuel oils for diesel engines and the naval supply requirements in the face of an augmented national defense program may be counted on to take an increasing quantity of oil products out of the country's heating market.

Competition Decline Expected

The use of coke for domestic purposes probably will show a decline in 1937, as it did in 1936, although the final figures are not yet available. As manufacturing increases, less coke is offered in the domestic market. Natural gas is a more uncertain factor in this field, but there seems a strong probability that legislation will be enacted to place this fuel on a more even basis with anthracite, not only for the revenue that might be derived from a tax but also because it is so largely a "laborless" fuel in comparison with solid fuels.

Anthracite, however, is not content to work only for the "status quo ante," for any industry must move forward as the world moves if it is to survive. Therefore, in the Primos (Pa.) laboratory, established by the Anthracite Institute and now maintained by Anthracite Industries; at the Mellon Institute, in Pittsburgh; and at Pennsylvania State College, reasearch and experiment are being

Louis C. Madeira 3d

carried on to widen the future of anthracite.

Anthrafilt (a fine size of anthracite) as a filtering agent was inaugurated a few years ago and now is being used in increasing quantities in municipal water-supply and sewage-disposal plants and in the chemical industries. Oklahoma City last year accepted this pure granulated Pennsylvania anthracite as a filtrant for its water supply after an exhaustive test of various other substances. St. Paul, Indianapolis, Monterey, Mexico, and Bethlehem, Pa., are among other cities where the same system is in operation.

The anthracite sold today by leading Pennsylvania producers contains less ash than ever before because of modern coal-cleaning equipment. But ash disposal still is a factor, and under the direction of Dr. H. J. Rose, Mellon Institute, a staff of chemists and engineers is studying various commercial uses that might be made of this residue. One important study is in connection with the use of ash for fertilization and soil conditioning in agriculture. The insulating, abrasive and heat-resisting properties of Pennsylvania-anthracite ash also are being studied by this group, which is known as the Anthracite Fellowship of Mellon Institute.

Anthracite a Major Industry

In the hills of eastern Pennsylvania, the source of anthracite, there is today an investment in excess of $400,000,000 in mines, breakers and associated equipment. The industry has an annual payroll of $150,000,000, a supply bill of not less than $30,000,000 and a tax bill of $13,000,000. Even with its present market, it is an industry of major importance in the economy of the eastern half of the United States, and with producers, dealers, equipment manufacturers and associated interests working together, its future is something to be reckoned with.

The foregoing view of the progress, plans and hopes of anthracite is, however, not the full picture, but only its brightest side. The problems of government regulation, "bootlegging," workmen's compensation and a long period of operation at a loss are facing it at the beginning of 1938. With a measure for government regulation pending in Congress, and with State regulation as a much-talked-of alternative, the operators may well wonder what form of "stabilization" the year will bring. That there should be some division of opinion in the industry on this subject is inevitable. There was a similar conflict of ideas in the bituminous industry over like proposals. But both inside and outside the operating group there seems to be a substantial majority that believes federal regulation would be preferable to State control, realizing at the same time that any form of regulation has undesirable features.

It is a noteworthy fact that the

COMMON CAUSE

NONE of the problems facing anthracite are insurmountable, and perhaps are no greater than those faced by other industries from time to time. Certainly there seems to be an increasing disposition on the part of those holding conflicting opinions to get together in a common cause. For the cause of anthracite is more than the cause of the operators and miners. It is the cause of the railroads to the extent of $108,000,000 in annual freight revenue. It is the cause of thousands of fuel merchants and their employees throughout the East. Finally, it is the cause of the great army of satisfied consumers who, in spite of the keenest competition of other combustibles, still pay $450,000,000 a year for Pennsylvania anthracite—"The Solid Fuel for Solid Comfort."

present agitation for some form of governmental "stabilization" of the industry grew out of the stolen, or "bootleg," coal situation in the southern anthracite field, where some five years ago unemployed miners and others discovered that they could take and market virgin coal from veins near the surface without interference from the constituted authorities of the State. Had these depredations been stopped when they were first started, and the unemployment problem met as it was in other communities, it is doubtful if today there would be any talk of government intervention to stabilize the industry. As it is, the problem of stolen coal has become only incidental to the various plans advanced for stabilization.

Mere assumption of control by federal or State government will not of itself stop bootlegging. It will still be necessary to take summary action of some kind. Unemployment at the mines will still be a problem, to be mitigated only as the use of anthracite is increased in the fuel-burning markets with consequent increase in activity in the mining region.

ANTHRACITE OPERATORS

+ Seek Solutions of Changing Problems

WITH both ends of the year unduly mild, and with bootlegging and overproduction depressing prices, the anthracite region in 1937 made no radical advances in methods. Though the main hope for any depressed industry is in reduced costs of operation and consequent retention and expansion of market, the employees in the anthracite mines steadily have opposed, as contrary to their best interests, any developments that would save labor.

Several new methods that promised well for the industry met only obstructive tactics; labor should realize that in pursuing its policy of increasing or stabilizing the quantity of labor needed to produce anthracite, it is actively promoting the market for laborless fuels. Many of these labor-saving devices would have resulted also in improved product and thus aided anthracite in putting up a strong fight against its rivals.

Hence, most of the underground mechanical improvements have related to speeding development, to transporting coal from places otherwise too low to be worked, to reducing the strain of mucking rock or to preventing by improvement of mining methods the loss of much of the thickest seams of coal. Improvements have been adopted for almost any reason other than reduction in labor cost, which is the principal incentive operating for betterment in most industries.

Reports for 1936 show that there was only one mobile-loading machine in the anthracite region in that year, 516 scrapers, 24 pit-car loaders, and 1,605 conveyor units; most of the latter were hand-loaded, but many were provided with duckbills for picking up the coal mechanically.

The Hudson Coal Co. has introduced a number of uphill shakers to load coal and rock in headings and rooms and is loading rock and coal with scrapers also. A great advantage of these uphill shakers is that the coal has to be raised but little in loading them, decreasing effort, and the coal is delivered to an entire trip, thus making it unnecessary to place the cars one by one in front of the conveyor and to remove them one by one for the placement of another car. With the uphill shaker a motorman can service several headings and can place more than one trip of cars on a single roadway. Hence, work can be concentrated and operation can follow promptly on the heels of development.

Uphill shaking at one time was believed to offer insurmountable difficulties, but careful research of manufacturers and the company has made it an accomplished fact. No longer is the forward impulse negatived by the backward. By putting carrier, lifting or radius legs under the lifting pans, the coal is actually lifted as it is being shaken. Suitable corrugations in the bottom of the pan assist in the movement of the coal uphill and are used also where no specific lifting section is provided but where the entire inclined string of pans lies on a relatively easy and even upgradient.

One company is using two shaker conveyors in tandem, each 400 ft. long and on an upgradient of 4 or 5 per cent; they discharge into mine cars on a road sunk below the coal seam. Coal is delivered to the conveyors by scrapers. In the movement of the coal uphill, much depends, of course, on the differential movement of the pans resulting from the design of the conveyor drive.

Another company drives its room gangways 600 ft. apart instead of the usual 300 ft. They are excavated full height for part of their length and of coal height for the rest of the way. Cars travel as far as the gangway is high, and conveyors are used in the low part of the heading. Chambers are driven both right and left; those that rise from gangway or heading are furnished with shaking conveyors and those that dip, with flight conveyors. Between them they transport the coal from the entire 600-ft. distance between the two gangways or headings.

Progress has been made in the anthracite region in the displacement of hoists by conveyors on inclined roads, or slopes. In this way the roadway need be driven of coal height only; coal can be brought to it by belts, flight conveyors, or shaker conveyors or by combinations of the three. Much coal thus has been mined that would otherwise have been obtained at such prohibitive cost as to have been beyond hope of recovery.

Thinner and thinner seams are being worked; seams which pitch so little that the coal will not slide or roll on the floor or on iron or galvanized sheets placed upon it and will have to be lifted into the mine car. Here mechanization is the only answer and, for this reason, shaking chutes and conveyors are found in most of the mines of the Northern region. A mine with nominal production will have in operation over 100 machines.

Driving its gangways irregularly on the water-level plan with a free-running gradient in favor of the load, the chambers of the Pompey Coal Co. are sometimes longer than the light shaking chutes it uses can satisfactorily handle; the lighter equipment is favored because it is more readily set up and because troughs thereby can be more easily extended. The troughs will work well up to 300 ft., but there is a need sometimes to extend them even to 670 ft. So a pull-back arrangement has been provided to help the trough up the pitch at the expense of the return stroke, which involves the trough in no difficulties. An oak car sill is placed horizontally and fixed at one end so that it will serve as a spring. The free end of the car sill is attached to a pan joint about 300 ft. from the drive by means of an adjustable take-up consisting of bolts and turnbuckle. When the trough goes downhill the "pull-back" is deflected by the down motion of the pan; when it goes uphill the car sill springs back into normal position and helps the trough up the hill. Another pull-back usually is needed if the trough length exceeds 500 ft.

Experiments already described with a new kerf cutter at the East Bear Ridge colliery, using overlapping drills instead of a cutter chain, have been continued. Still purely experimental, the machine has been sent back to the factory for redesign.

Stripping More Necessary

Unfortunately, development work and extensive rock work is being deferred because of the lack of cash, making stripping more and more obligatory and decreasing the output of operating mines. Stripping, with greater depth, is becoming less profitable, as is evidenced, perhaps, by the straitened condition of some of the contractors.

Haulage methods also are improving. In 1936 there were 322 storage-battery locomotives in service, of which 27 were of permissible type, 28 were strict combination units, where the battery is charged from the trolley wire when in operation, and 48 were of the type in which the battery is charged from a separate charging panel after the day's work is completed. The remaining 219 locomotives were of the straight storage-battery type of locomotive. During 1937, 310 storage-battery locomotives were in service. The numbers of permissible and combination locomotives were not changed, but the locomotives of straight storage-battery type decreased, largely due to many of the locomotives becoming obsolete and unfit for further use and needing replacement.

For decades anthracite mine cars were larger than those at bituminous mines, but the anthracite region recently has not responded to the progress in mine-car betterment as has the bituminous. However, obsolescence has advanced to such a point that there is now a definite trend to larger cars of better design, many being of all-welded steel construction. Consideration is being given to mine cars from alloy steel and to rust-resisting steel plates. In this connection the past work of the Lehigh Navigation Coal Co. should not be forgotten. Mine cars can be leased

from the builders as railroad cars have been for many years; the ownership is vested in the builder or in a financial house. Wire ropes with six strands of 21 wires instead of the accepted six strands of nineteen wires are being used on important hoists. More flexible ropes for scoop loaders are being furnished.

With the advent of the 7-hour day, motors have been provided to speed hoists and the cleaning capacity of breakers has been increased, as will be seen later. Double and triple shifting of working places is an accepted fact in mines where development is lagging.

Studies of the water problem are being made by mining engineers. Many mines are connected through the barrier pillars, so that when one mine is drowned, others are inundated also, as was demonstrated in the last serious flood. Operators in the Scranton region have agreed to take no coal beneath the Susquehanna River and those mining in the vicinity are keeping their workings a few hundred feet away.

In the offing is the maintenance of large pumping plants by the State to handle flood waters, but this has reached only the conjectural stage. The State of Pennsylvania pumped out the Kehoe Berge and Pittston operations and is now pumping out a bituminous mine, and ditching has been constructed by the Works Proggress Administration. The question therefore arises, Why not do the same regionally? for much of the water comes from abandoned mines opened by companies which no longer exist, to take care of their water, which now menaces other mining operations at lower levels. But naturally coal companies dread the admission of the State into mining operations, for, once it enters, it is almost sure later to seek entire possession.

With greater depth, timbering problems take a new aspect. The Philadelphia & Reading Coal & Iron Co., long a strong advocate of timber preservation, maintained its own impregnating plant, but as its mines got deeper it found the pressures were so great that the timbers broke before they rotted even when unpreserved, so they ceased to impregnate them.

Roof Support Extended

The Lehigh Navigation Coal Co. finds also that it is difficult to maintain timbering around the Mammoth seam and has made tests with concrete timbering. It also is using, but not for excessive pressure, wood impregnated along the natural sap channels under pressure rather than in an impregnating chamber; the new process resembles embalming in its method of application. During the year, the Hudson Coal Co. continued the introduction of steel arches for protection of underground roadways at important points where the life of the operation is eight years or more and where the deterioration of normal timber is rapid. Use of steel tunnel-liner plates also has been slightly extended at places having a greater life than seven years and where the strains of roof movement are likely not to be very heavy. Schaefer concrete lining is used for places with undue pressure.

Marvine colliery of the Hudson Coal Co. had at one time a small sump, not noticeably dirty, having little silt or gritty material. When the new pump room was constructed a much larger sump was provided and the impellers could be continued longer in service. This change has been ascribed to an improvement in the character of the water due to its lying dormant in a large pool or to the elimination of imprisoned air. It might be due to the falling of the heavier sulphates into the deeper water or to a different degree of ebb and flow that now less often uncovers pyritic roof, floors and ribs to oxidation and less often rises on the same to dissolve the ferrous sulphate thus formed. It would be interesting to get an explanation of the phenomenon, for it may have a bearing on corrosion problems at many sumps.

Preparation interest is running to fine sizes, and buckwheats Nos. 5 and 6, hitherto unknown and still somewhat undefined, are being produced. Some think they never may be definitely defined because different consumers have specifications of their own which they insist shall be filled. Buckwheat sizes belonging to the old range are not being produced in sufficient quantity; more and more activity is being manifested in the reclaiming of fine sizes from old dumps.

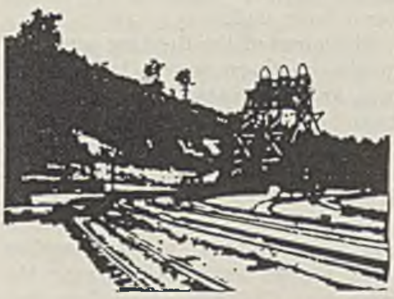
Closer Cleaning Required

These contain coal partly rejected in the past because they were near the borderline between clean coal and reject, or more often contained some of both. The cleaning of such coal, therefore, must be the more accurately performed. In coal fresh from the mine, much extra good coal is found, whereas with bank coal there is little but refuse and passable coal, though crushing may release some coal of high quality. As the percentage of sweetener coal is low, the cut between sink and float must be sharp and the specific gravity for separation should be a trifle lower than for newly mined coal to get a product of equally low average ash percentage.

Few breakers now make "broken" coal, and some have been built without facilities for making "egg" size, but this has been done by companies which could supply egg from other sources. Even these, in some cases, have found it necessary to provide later for the making of this size. Now it is beginning to be thought advisable in the designing of breakers to provide for the breaking of stove sizes, so much has public demand for the small coal been fostered by domestic stokers. The trend is inevitable and, on the whole, will not be unfortunate, for the fine sizes with stokers will give improved service and should sell at a higher price, but the rub is that at present they do not.

At the Cameron breaker, Shamokin, Pa., completed in January of last year by the Stevens Coal Co., the coal being mixed with rock and therefore hard to break, after picking and separation of broken-and-smaller is broken to that relatively large size. The buckwheats are taken, and then all the coal from pea to broken is cleaned in a Chance cone. The coal above stove is broken by stages, and the buckwheats are cleaned in two smaller cones. In this way only one crusher has to break uncleaned coal. The sand-water mixture at this breaker also escaping with coal at the upper cone is "cascaded" to the smaller cones, does duty again and goes to the settling tank. Another feature at Cameron breaker was the use of shaking screens in place of lip screens so as to produce a more perfectly sized product.

The Glen Lyon breaker of the Susquehanna Collieries Co., which came into operation after modernization in the fall of 1936, has three Menzies cones and a Hydrotator and makes no size larger than stove. It was found that with untreated mine water the coal had a greenish hue. At first the coal was sprayed on the



lip screens with spring water; then lime was used to neutralize and clean such mine effluent and finally a reservoir was provided so that the breaker could be operated with spring water. In general, the need for clean water to wash anthracite has been found imperative. The Lehigh Navigation Coal Co. recognized this some years back and provided a large reservoir.

After all, with abandoned strippings handy in small segregated basins already completely stripped or having mines no longer operating, favorable conditions exist for the formation of reservoirs. The Locust Mountain Coal Co. exhausted its mines at Shenandoah and started a large stripping that was not self-draining. In course of time, after exhaustion and abandonment, it filled with water and, to the surprise of many, right to use the water was purchased by a municipal water company, as it was found suitable for city use.

So long as the pyrite is covered by water it cannot be oxidized and so cannot create acid, as has been abundantly demonstrated. If the sloping sides of the basin are pyritic, the lowering of the water may permit of oxidation, and then the rising of the water or the fall of rain may dissolve the ferrous sulphate if it has not had time between whiles to oxidize to ferric sulphate which is insoluble in fresh water. Thus, acid may be carried into the reservoir.

It has been found that when fine coal is deposited in water over mine workings, the infiltrating water carries the coal into the fine cracks above the coal seam and effectually seals them, though the inflow of water, for a while, increases. Of course, no reservoirs, sealed or unsealed, can be tolerated above mines because of a possible breach resulting in an extensive mine cave. Hence, reservoirs should be provided in areas not being mined, but such places can be found in the anthracite region. Moreover, strippings where the coal is what the stripper would term "deep" or where the coal lies in a definite basin are not likely to develop a sudden rush of water such as occurs when a dam gives way. Old stripping trenches are being used for storing wet fines until such time that a suitable cleaning system is discovered and prices improve. A modification of the Hydrotator has been found to give good results in such cleaning.

Another feature in coal preparation has been improved lighting, which is exemplified also in the Glen Lyon breaker, though adopted in some others. The light from these lamps abounds in the green and yellow-green section of the spectrum to which the human eye is most sensitive, though this is mixed with violet rays. The lamps are Westinghouse 250- and 400-watt high-intensity mercury-vapor illuminators and have aluminum reflectors, Glassteel diffusers or symmetrical angle reflectors, according to the service required.

Cleaner Fine Coal Needed

It is generally conceded that the attempts being made to clean several sizes in one unit do not produce the cleanest grade of coal. As the industrial companies demand the cleanest product, for they desire to burn their coal at high rating and reduce it rapidly to ash to leave space on their grates for more coal, and as domestic consumers find a certain percentage of ash enables them to hold a fire longer than if the ash were absent, the fine coal should be cleaner than the coarse.

When, however, they are washed together, the coarser coal is the cleanest, which is not the most desirable result. Some companies have several cones washing the same group of sizes. It is easy to arrange these cones so that each will clean a smaller range of sizes and to operate each cone so that it will produce the quality of coal the market desires. In this way the coarser is washed at a greater density and much less coal is wasted. The domestic product can be made, if desired, of a specific weight equal to that of the finer sizes.

Some companies are beginning to burn the finest of coal. Some years back the Philadelphia & Reading Coal & Iron Co. put in a plant at Maple Hill. As stated in an earlier review, the Glen Alden put one in at Maxwell to burn buckwheat No. 4 and silt, and this year the Hudson Coal Co. has continued to change the settings of its boilers to burn silt instead of birdseye. This has necessitated raising the boilers and providing a larger combustion space, as also the providing of fine grate stokers with a different air spacing. A large breaker will soon be erected by the Glen Alden company at Maxwell colliery No. 20 with loading booms like those at Colonial Colliery and at bituminous mines.

With the increase of demand for steam sizes, with their need for greater purity, not only is separate washing needed but equipment that will make a superior product. Roll practice is being studied more closely to avoid unnecessary degradation, which becomes greater as the teeth on the crushers become dulled. Size perfection is becoming a fetish with salesmen, causing efforts to be made to remove more undersize than could possibly interfere with the effective combustion of the fuel.

One company is spraying oil on run-of-mine shipped in railroad cars to the breaker, thus eliminating troubles with frozen coal. Though not completely effective, it helps to solve the problem. Rejigging of the slate ends of primary jigs after breaking is now generally accepted practice.

Several of the coal banks of the Philadelphia & Reading Coal & Iron Co. have been sold to parties desirous of preparing fine sizes, notably six banks to the S. W. Blakeslee Co., which has torn down the old Otto Breaker at Branchdale, Pa., and erected on the old location an entirely new breaker, completed in the present year. It will prepare, by the aid of the Hydrotator, nut, pea, buckwheat No. 1, rice and barley, and buckwheats Nos. 4 and 5, using five units with a Hydrotator classifier to recover a maximum quantity of Nos. 4 and 5. It has feed shakers, picking tables, roll crushers and conveyors and a capacity of about 1,150 tons per 7-hour shift.

The mines of the Reading company in the Southern region had friable coal, and for years these mines have been idle, and the development will in a measure revive the towns to the west of Minersville. Use of the Hydrotator to clean nut is an extension of its territory, which hitherto has been confined to the smaller sizes, though early in the year the Buck Run Coal Co., Buck Run, Pa., put in a unit to handle 50 tons of nut per hour.

Many Hydrotators have been installed in the past year for cleaning and classifying fine coal. The Buck Run Coal Co., besides the installation to which reference has been made, placed in 1937 a unit to handle 35 tons of pea hourly, 25 tons of buckwheat and the same tonnage of rice, adding later a classifier and cleaning equipment to treat and prepare 40 tons of buckwheats Nos. 4 and 5 hourly. Alden Coal Co. also introduced a Hydrotator classifier to deslime 30 tons of anthracite hourly.

Menzies cone separators were provided by five companies to clean coals ranging from egg to buckwheat No. 4—thirteen units in all. All were installed for a narrow range of sizes, usually one, but sometimes two or even three, as at Mineral Springs breaker, where three units, each of 160 tons capacity hourly, treat egg and stove in one unit, chestnut and pea in another, and barley, rice and buckwheat No. 1 in a third. Only one company, the De Angelis Coal Co., put in a cone to clean the whole range from egg to buckwheat, providing a Chance cone for that purpose.

Individual Sizes Treated

The Valley View Coal Co.'s washer is working in a bank that makes it necessary to handle a large tonnage for a relatively small product. The cone is a 180-ton-per-hour unit, but it washes 220 tons down to 44 tons of clean product. Several Deister-Overstrom "Diagonal-Deck" coal-washing tables were installed and two Wilmot-Simplex jigs. Of all breaker construction during the year, only two plants were erected to clean the full range of sizes; the rest, except the two which treat only culm-bank coal, were either additions to existent breakers or plant replacements.

At Winton colliery, the Pompey Coal Co. has its breaker on one side of the railroad and the dump on the opposite side. When the breaker is running, the coal goes by a chute to the breaker. When it is not operating, the coal is dumped into railroad cars and taken to the breaker so that the latter will have coal to run continuously when the tonnage from the mine comes irregularly. Thus the breaker at all times runs at capacity.

Service of power companies has greatly improved and is available all over the region for large or small units and with minimum risk of outages. Capacitors for correcting power factor are becoming commonplace. One mine has a booster fan in the underground workings driven by a 50-hp. flameproof motor and control. Breakers tend to be provided with group drives, though when cones are used, they are provided with their own motor. Pushbutton control is now standard practice.

Squirrel-cage pump motors of 1,000 hp. are now being set in motion

Table I—New Anthracite Preparation Facilities in 1937*

Coal Company	Plant Location	Capacity, Net Tons of Feed, Per Hour	Preparation Equipment
Alden Coal Co.	Alden Station, Pa.	30	Wilmot[1]
S. W. Blakeslee Co.	Branchdale, Pa. (6)	165	Wilmot[2]
Buck Run Coal Co.	Buck Run, Pa (4)	135	Wilmot[2]
	Buck Run, Pa.	40	Wilmot[3]
DeAngelis Coal Co.	Jessup, Pa.	120	Chance[4]
F. H. Downey, Inc.	Harrisburg, Pa.	10[5]	Deister Concentrator[6]
Glen Alden Coal Co.	Scranton, Pa. (4)	280	........................[7]
Jermyn-Green Coal Co.	Plainsville, Pa.	12[5]	Deister Concentrator[6]
Kingston Coal Co.	Kingston, Pa. (2)	50	........................[8]
Lackawanna & Wyoming Valley R. R. Co.	Moosic, Pa.	40	Finch Mfg. Co.[7]
Lehigh Navigation Coal Co.	Coaldale, Pa.	12[5]	Deister Concentrator[6]
Mineral Springs Coal Co.	West Pittston, Pa.	330	Finch Mfg. Co.[7]
Moffat Coal Co.	Taylor, Pa.	320	Finch Mfg. Co.[7]
	Taylor, Pa.	110	Finch Mfg. Co.[7]
Pennsylvania Water & Power Co.	Holtwood, Pa.	16[5]	Deister Concentrator[6]
Sneidman Bros.	East Bloomsburg, Pa.	11[5]	Deister Concentrator[6]
Sullivan Trail Coal Co.	West Pittston, Pa.	160	Finch Mfg. Co.[7]
Valley View Coal Co.	Pittston, Pa.	180	Chance[9]
		2,021	

*Also includes rebuilt plants and major installations of preparation equipment in existing structures. Where information as to the number of units installed, if more than one, is available, the number appears in parentheses after the plant address.

[1]Hydrotator classifier for desliming anthracite silt. [2]Including Wilmot-Hydrotator coal-washing and classifying equipment. [3]Including Wilmot-Hydrotator classifying and cleaning equipment. [4]Including Chance sand-flotation coal-washing equipment. [5]Washed coal. [6]Deister-Overstrom "Diagonal-Deck" coal-washing tables. [7]Menzies cone separators. [8]Wilmot-Simplex jigs. [9]Breaker to re-treat refuse bank; washed-coal output, 44 tons per hour; Chance sand-flotation washing equipment.

without low-voltage starters and are thrown directly on the line. High-starting-torque squirrel-cage motors are being used in applications that previously would have been provided with a slip-ring motor. Important electrically driven fans are provided with a diesel-engine drive in case of failure of electric current or damage to the motor. This is well illustrated by the duplicate drive at the Askam shaft of the Glen Alden Coal Co. Control boards of shaft hoists are being operated by direct instead of alternating current. Electric coal drills, where conditions permit, are making definite progress.

At No. 3 slope of the Pompey Coal Co. a change was made in 1937 cutting out motor-truck transportation to the breaker involving three dumpings: from cars to pocket, pocket to truck, and truck to railroad car. Now the coal comes to the breaker from the mouth of the slope by a 4,000-ft. narrow-gage surface incline, greatly reducing complication and cost.

Finishing touches are being made to the Askam shafts of the Glen Alden Coal Co. at Nanticoke, Pa. They are destined probably to be the deepest shafts ever sunk in the anthracite region, and for many decades doubtless also the deepest coal shafts in the United States. The Auchincloss shafts, formerly the deepest in the region, also the property of the Glen Alden company, are only 1,720 and 1,701 ft. deep. The airshaft at Askam is 2,118 ft. deep and for 1,833 ft. it is 20 ft. in diameter; for 77 ft. further its diameter is 18 ft. and thereafter the diameter is 12 ft. A rectangular section has been chosen for the hoisting shaft, which measures 12x24 ft. and is 2,053 ft. deep.

Both shafts are lined with one to two feet of reinforced concrete, and 800 railroad cars of material have been expended in their construction. With steel buntons and pipe bearers the shafts are fireproof, the only wood used being for cage guides. The shafts penetrate the bottom of the coal basin and cut the Abbott, Mills, Hillman, Baltimore, Forge, Twin, Ross and Red Ash beds.

As the bottom workings have not been provided with gangways and only landings constructed, little water collects and pumping facilities have not been installed thus far. In sinking, however, much water was encountered, and two boreholes had to be sunk 10 ft. from either end of the hoisting shaft below the water-bearing stratum. Grout being pumped in these boreholes sealed the crevices and excluded the water.

Ground was broken for the hoisting shaft Oct. 15, 1929, and the shaft was completed May 1, 1934; a delay between Feb. 1 and Oct. 15, 1932, lengthened the time consumed in sinking. The circular shaft was started Oct. 15, 1929, and completed March 14, 1934, with an interval of idleness between Nov. 30, 1931, and Sept. 30, 1932. The foundations for the hoist houses have had to be supported by concrete piling, and the hoist rests on a mass of concrete that extends 13 ft. down to solid rock. Later, a 600-kw. synchronous motor-generator set using 4,000-volt, 3-phase 60-cycle power, will furnish direct current to the locomotives.

The battle between the operating companies and the city and town taxing authorities goes along merrily. Scranton will spend $50,000 for a new survey in the hope that much unmined coal will be found under the city that coal companies have not declared.

BITUMINOUS COAL

+ Intensifies Fight Against Competition

By J. D. BATTLE
Executive Secretary, National Coal Association, Washington, D. C.

THE DIFFICULTIES which have beset the bituminous coal industry in recent years need no enumeration and many of them still are with us. It has been a hard battle against competitive fuels, price dislocation, steeply increased labor costs and freight rates. It is going to continue to be a hard fight, but the important and encouraging aspect is that today, more than at any time in the past, the industry is awake to its perils, keenly aware of the necessity for cooperative and constructive efforts to preserve coal's rightful markets and apparently resolved to fight hard and intelligently the competitive battle with other fuels.

As I look back over the record and the incidents of the past few years and then take account of the present and look toward the future, I am reminded of the words attributed to General Foch on a memorable occasion during the World War. He is said to have reported: "My right has been rolled up, my left has been thrown back, my center has been smashed, and accordingly I have ordered an advance from all directions."

I believe it is a fair statement of the position of our industry as we enter upon 1938 to say that an advance from all directions is to be undertaken.

We are accustomed to say that bituminous coal is the nation's premier all-purpose fuel. That is not just an advertising slogan but a statement of demonstrable fact and we are setting out to demonstrate that fact to the consumer. When we consider the broad question of the preservation of what we call coal's rightful markets we are faced with some stern and unpleasant facts. First, fuel oil and natural gas are being produced and distributed in steadily expanding volume and under conditions that have permitted a relatively low market price. These competitors of coal have aggressively exploited their products with large-scale sales promotion over a long period. Furthermore, the hydro-electric power promotion of the federal government, with government subsidy, tends to displace coal in the areas where such promotions have been initiated on a large scale and constitutes unfair and destructive competition which we have protested in vain.

The full extent of the great gains by competitive fuels during the past two decades, as compared with coal, is graphically shown in Table I. Taking 1913 as a base point, with an index number of 100 for each of the separate sources of energy, it appears that in 1936 the water-power index number was 384; natural gas, 356; petroleum, 426; anthracite, 60; and bituminous, 91.

Along with the above, we also are faced with the fact that there is no escape from the increased costs of mining coal incident to great advances in mine wages, the increases in taxes and rises in the cost of everything else pertaining to production. In addition there is no escaping the increases, present and prospective, in the cost of the transportation of coal, so that mining and transportation costs together mean, beyond question, substantially higher delivered prices for coal than have prevailed in the recent past.

Soft Coal Is Best Buy

When we talk about promoting new and retaining present markets for bituminous coal—with confident belief that such a campaign will meet with success—we do so with full acceptance of this so-called bugaboo of an increased price level for bituminous coal which finds reflection in the schedules of minimum prices now promulgated by the National Bituminous Coal Commission. Of course, these initial price schedules will require many adjustments and corrections. But when they finally are evolved into the fair and equitable minimum price structure that was contemplated by the act of Congress creating the Commission we expect to be able to demonstrate to the consumers of bituminous coal that the prices they are required to pay are not excessive, that they are in the interests of a sound national economy and that, dollar for dollar, bituminous coal still is their best buy from the standpoints of economy and dependability.

It is self-evident that the stabilization of bituminous-coal prices along sound economic lines is a vitally necessary adjunct to any sustained advance by the industry as a whole. Such stabilization is calculated not only to strengthen the industry itself but also to add dependability of price to coal's other points of superiority (dependability of supply and dependability of performance) in the eyes of consumers.

Advances by our industry are taking many directions. We are aiming

Harris & Ewing

J. D. Battle

to further improvements in the mining of coal and its preparation; to further improvements in the merchandising of coal; to further improvements in the utilization of coal, and, finally, of the greatest importance and of the greatest promise, to give new impetus to the promotion of coal markets.

The coal research and experimentation which underlie all of these divisions are not new and are a long story but are gaining momentum and bringing results, although not spectacular, of far-reaching value. These results are measured in greatly increased efficiency and safety in the mining of coal (including mechanization), increased economy and efficiency in the utilization of coal in consequence of improvements in coal-burning equipment (including mechanical and automatic firing), abatement of the smoke nuisance and in a variety of other ways.

Better merchandising of coal is evidenced in improved preparation of coal at the mines; the development of sales agencies; more attention by the producers to distributors and dealers, and vice versa; producer and dealer advertising; increasing contacts with the consumer so that he may obtain maximum performance from the fuel he buys and hence the most value for his coal dollar; increased cooperation between producers of coal and the manufacturers of coal-burning equipment in recognition of their interdependence in the development and maintenance of markets.

The Goal

WE SAY that bituminous coal is the nation's basic fuel supply. That is true for the following reasons:

1. The supply of bituminous coal, and bituminous coal alone, is inexhaustible.

2. Under existing conditions, one-half of the nation's entire demand for heat and energy is supplied by bituminous coal.

3. For most uses and in most localities, bituminous coal, to a very large extent, outranks its competitors in economy and dependability — a point on which there is a vast deal of public misconception and error, the correction of which is one of our present objectives.

Promotional Gains Made

Finally, in the broad field of market promotion, which means public education with respect to coal and its use, are engineering service to coal consumers, acceleration of the use of automatic coal-burning equipment in the field of automatic heating, and opposition to the inroads of fuel oil, gas and hydro-electric power in coal's markets. The National Coal Association takes pride in the fact that it has long preached the gospel of coal research as an important adjunct to the mining and sale of bituminous coal, and that it has aided in research, both financially and otherwise. Bituminous Coal Research, Inc., organized as a subsidiary of the National, is an evidence of its activity in this field.

The National took a leading part in the organization of the Committee of Ten—the first cooperative effort of the various industries concerned in the production and use of solid fuels and said to be the largest group ever known of individual industries banded together with a common objective. In January a year ago the National announced the setting up of an engineering department within its own organization, headed by C. A. Reed, of Pittsburgh, and having as its major purpose a more extensive service to dealers in and consumers of bituminous coal in practical questions relating to utilization of coal upon the most efficient basis.

Still more recently the National launched on a nation-wide scale a market-promotion campaign in the field of domestic heating, a campaign which is now well under way, is

Table I—Index Number of Various Sources of Energy By Seven-Year Periods and 1936

(B.T.U. Bituminous-Coal Equivalent)

	1913	1920	1927	1934	1936*
Water Power..	22,443,000	37,061,000	64,389,000	72,366,000	86,107,000
Index No....	100	165	287	322	384
Natural Gas...	23,893,000	32,748,000	59,275,000	72,672,000	85,153,000
Index No....	100	137	248	304	356
Petroleum ..	60,802,000	124,389,000	219,733,000	216,069,000	258,969,000
Index No....	100	205	361	355	426
Anthracite ...	95,038,000	93,015,000	83,168,000	59,371,000	56,832,000
Index No. ..	100	98	88	64	60
Bituminous ..	478,435,000	568,667,000	517,763,000	359,368,000	434,070,000
Index No....	100	119	108	75	91

* Preliminary.

going forward, has been widely applauded and is showing gratifying results. The domestic heating field is by no means the major market for bituminous coal, which has been and doubtless always will be predominantly an industrial fuel. But the domestic field is an important one and one in which bituminous coal has a rightful place, and it is the field in which competing fuels have concentrated their efforts and are making big gains.

The readers of *Coal Age* and the industry generally are fully informed respecting this market-promotion campaign by the National, which started with an advertisement jointly sponsored by the National and the Stoker Manufacturers' Association in the *Small Homes* magazine (distribution over a million copies), followed by a booklet "Heat With Bituminous Coal, the Modern Economic Way" (of which more than 300,000 copies were distributed). This was followed with a special booklet for architects and builders and a series of advertisements in building-trade periodicals.

The third booklet—destined for nation-wide distribution and entitled "The Key to the Secrets of Better Heating"—is now on the press. In it is graphically portrayed the following superiorities of automatic coal heat over its rivals: PLENTY OF HEAT—EVEN TEMPERATURES — CONVENIENCE — ECONOMY — SAFETY — DEPENDABILITY and (thanks to scientific washing, and sizing and dustproofing) — CLEANLINESS.

One swallow does not make a summer and, even at the rate of a million copies, booklets are not by themselves a market-promotion campaign of great magnitude, but I believe that we have made a good beginning—a real start—and that as time goes on we shall go a lot further. It is all of these things as enumerated above that bespeak the advance of our industry and offer encouragement for the future.

SUSTAINED PROGRESS

+ Characterizes Service to Coal Face

IN ALL PHASES of mining which do not relate to loading, preparation or stripping and which may be designated "service" or "auxiliary" departments of mining, much progress was made by the bituminous coal industry during 1937. On efficiency in these minor but important adjuncts to loading depends the success of that operation, and mechanization of mining has done much to accelerate improvement in all subsidiary details.

At the New Monarch mine of the Consolidated Coal Co., Herrin, Ill., application of caterpillars to cutting machines has enabled the latter to cut more places. Cutting also has been speeded by bits that break into the coal with less resistance and which less frequently need replacement, also by thinner and deeper kerfs and by positioning of bits to suit the needs of the coal being cut.

Where water is used on the cutter bar, it has been found that machines do not bind in the cut and have to stop. The bits also are cooler and thus are not softened, and probably give longer service. Though cuts can be made more rapidly, chains wear out faster, for gritty material is more harmful when wet.

At one of the Orient mines, Chicago, Wilmington & Franklin Coal Co., near West Frankfort, Ill., it has been found that with shearing 11 ft. to one side of the room center and 3 ft. on the other side with the usual undercutting, the coal yield per pound of powder is increased over 50 per cent, the quantity of screenings and loading-machine repairs are greatly reduced, and the coal is subject to less disintegration in transit and handling, thus giving the consumer greater satisfaction.

In the Pulaski and Delta mines of the Pocahontas Fuel Co., Inc., two Jeffrey universal cutting machines have been introduced, which also have decreased the quantity of explosives needed to blast the coal and have increased the resistance to degradation of the lump, egg and stove coals. Track-mounted cutting and drilling machines have been installed in Utah mines, and C. A. Hughes & Co., at its No. 2 mine, Cassandra, Pa., has added an additional Jeffrey 29-L arcwall mining machine to its equipment. Coal sized at the tipple needs resizing at the distributor's plant if too much powder has been used in its displacement. Mere care to prevent rough usage at the tipple results only in a coal which will break in transit and rehandling.

Much interest centers in better bits. A new type of bit made by cutting diagonally across bit stock by a special high-speed machine giving a reversible bit has been introduced by

Jones Collieries, Inc., at its newly restored Rachel mine in northern West Virginia. Bit cost per ton has been lowered 30 per cent. Others have introduced tipped bits, notably the Hillman Coal & Coke Co. at its Oakmont operation for all its mining machines. As a result, that company reports decreased bit-sharpening labor and also more coal cut in a working shift, due to fewer bit changes.

Where the cutting machines cannot keep pace with the loading equipment, better bits sometimes may turn the trick. At the Wick mine of the Ingle Coal Co., Oakland City, Ind., impurities that ordinary bits would not cut in the bottom of the coal prevented the cutters from filling this part of the daily schedule. Sulphur balls appeared at the bottom of the seam and in different layers in the coal bed. Shearing of the seam was found necessary and these four strata made further difficulty. Hard pendentives from the roof penetrated the seam as much as or more than 2 ft. and these broke all the bits.

For all these reasons, as many as 700 bits were used in a shift. These difficulties were met by the use of Cincinnati bits and "Duplex" chains. Power demands are 33 per cent less than when using 1½x1-in. bits, though the wear of the holder and bit stock involves some extra cost, which, however, is not important. Rate of cutting increased 14.7 per cent. The bits used are those made by cutting lengths off bit stock, to accomplish which the company installed its own bit-making machine. Another advantage is that the bit hole is self-cleaning.

Blasting plugs, which proved so effective in the anthracite region, made in 1937 a definite place for themselves in the bituminous regions, confining the force of the blast within the hole and thus increasing the effectiveness of the shot. Clay tamping, especially if it contains no sand, is likely to be thrown out of the mouth of the hole, where it expends its force on the air rather than on the coal.

At the Bellwood (W. Va.) mine, of the Bellwood Coal Co., better results are said to obtained with Cardox than with explosives. Here the coal thickness mined is only 20 in. and the depth of hole is 12 ft., yet Cardox drops the deep cuts satisfactorily. The manufacture of dummies for stemming by machinery is making headway. Among those using these machines are the Valier Coal Co., Valier, Ill.; Princeton Mining Co., Princeton, Ind., and the Weirton Coal Co., Isabella, Pa. A machine will make 500 to 600 1¾x18-in. dummies per hour.

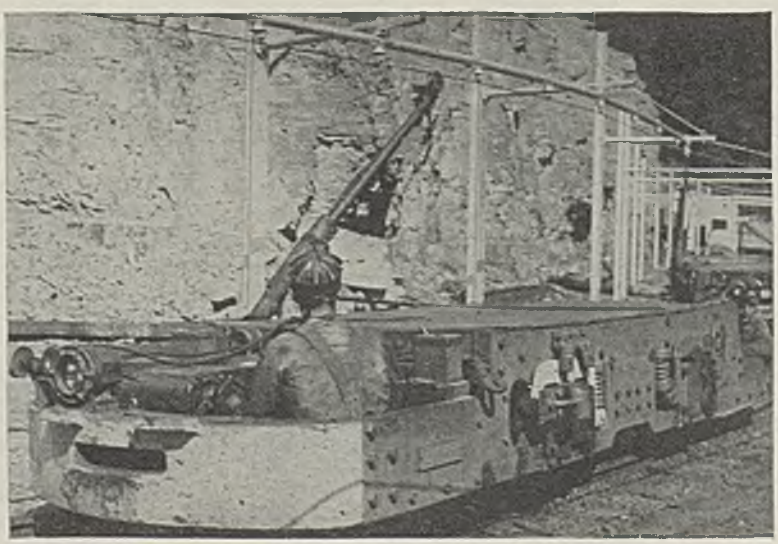
In the Paris (Ark.) field, the coal is thin, and the cost of driving entries is considerable. Johnson & Green, at a new mine, is driving its main entry 55 ft. wide in four 6-hour shifts. The roadway in the center takes 10 ft. of this space and the 5 ft. of top shot down for height is stored at the sides, leaving openings on both sides to serve as return airways. The seam is only 20 in. thick with 4 in. of black "bat," or slate, which, when carefully piled, makes an effective roof support. Excess brushing is hauled out of the mine. In the longwalls, the firm will use conveyors, but later will experiment with scows.

Motorized hoists for lowering monitors or planes bid fair to reduce maintenance costs, which have been unduly high in such work. Operation also has been so risky that many have been discontinued. Bonny Blue mine of the Blue Diamond Coal Co., Bonny Blue, Va., which has a 3,700-ft. incline and lowers a drop-bottom monitor with a 38-ton gross weight and 25-ton net weight, estimated that in two years the savings resulting from motorizing with a 600-hp. unit had cancelled the cost. The motor, acting as drive and regenerative brake, regulates the monitor's descent.

At one of its mines, the Utah Fuel Co., Carbon County, Utah, has seventeen 9-ton storage-battery locomotives at work with extra batteries for most of them. To hold down the investment in locomotives it has been decided to provide replacement batteries for each locomotive. As battery-changing stations have constantly to be moved forward, the company designed for the purpose equipment which can be moved with little effort from one location to another. It consists of a derrick with a post of 5-in. double extra-strong pipe, held in place by a screw jack inserted at one end, which engages the roof. With coal over 20 ft. thick, such as is mined at this operation, height is available above the cars that a derrick can be set between the tracks on any parting, at a room switch or at any convenient place where two tracks are close together.

The pipe is finished at two places to receive the bearings of an arm and tierod. On the end of the arm is a chain block with chain sling for picking up the battery box. By placing a wedge between the frame of the locomotive and the journal to restrain the action of the locomotive spring, the battery can be raised and swung onto the chassis of a wood car, the sides of which have been cut down to the same height above the rail as the locomotive chassis.

With one extra battery chassis on



New locomotive at the Jewell Ridge mines have ample space for crew lead, a string of charged batteries are placed on one track and exchanged for the run-down batteries on the locomotives on the other track. This done, the dead batteries can be moved to some other place for charging, and the parting used for regular mining operations, if necessary.

Because of the 7-hour shift, more or larger storage-battery equipment has had to be provided for gathering locomotives; the Frederick mine of the Colorado Fuel & Iron Co. at Valdez, Colo., is a case in point. It is also true of trolley locomotives; the Martin Mining Co., Martin, Pa., for instance, replaced a slower and lighter locomotive with a 10-ton high-speed unit.

Locomotive Height Cut

Ten new 8-ton Westinghouse locomotives recently were placed in service at the Jewell Ridge Coal Co. mines in Tazewell County, Virginia, for gathering service. As the coal is only 42 in. thick, the locomotives must be low and adequate space is provided at either end of the locomotives so that the safety of those riding the locomotive is assured. These units are equipped with vertical gearless gathering reels.

At the Talleydale (Ind.) mine, the Snow Hill Coal Corporation, seeking to give its sand dryer the benefit of the trouble-free improvements in house heating, has provided a Link-Belt household stoker which supplies heat to a dryer with a capacity of 2 cu.yd. What is good for consumer should be good also for the coal operator; he also desires to avoid unnecessary attendance. The gases travel twice through the sand.

Obsolete mine cars are still found aplenty in the bituminous fields. At the Bradford mine of the Alabama By-Products Corporation, which at Dixiana, Ala., operates the thin Black Creek seam, 26 in. thick, 100 steel cars of new and improved design have been put to work to replace worn-out wood cars of old type. The Barney mine of the same company, Cordova, Ala., in the thicker (40-in.) Mary Lee seam, received 50 new steel cars which will replace the old wood cars as they wear out. Frederick mine of the Colorado Fuel & Iron Co. also put in operation 130 new mine cars.

A large company has equipped 300 cars in one of its mines with Ohio Brass automatic couplers of the same type as those used for such crack trains as the Royal Blue, the Mercury and the Denver Zephyrs. This coupler has heavy draft springs that absorb shocks and make the trip ride easily. If necessary, the couplers can be set in an unlocked position so that cars when kicked from dumps will not couple with others. Coupled cars can be rotated so that they can be used without uncoupling. As the point of engagement is back of the bumper and near the car center, derailment on curves is almost entirely obviated.

Late in 1937, the Boone County Coal Corporation, Sharples, W. Va., commenced to displace its wood cars with new all-steel mine equipment with rubber-supported bodies. These new cars have a coal-carrying capacity of 4.66 tons. Rubber acts as a cushion to ease the jolts at rail joints, so that they will not be communicated from the trucks to the car body, jarring rivets. Loose rubber bushings, which are vulcanized to the steel bushings, separate the body from the car axle. Eighty-six of these cars, which have Miner draft gear and are made by the Brown-Fayro Co., had been introduced by the end of last year.

Track Takes Leading Role

Track, long treated with indifference, has become the keystone of success with mechanical loading, and the seven-hour day has accentuated its importance. It seems to have a leading place in reports from the field. From Alabama to Utah come statements regarding the building of heavier, better track. At the Costa, Praco and Bradford mines of the Alabama By-Products Corporation, slopes were laid in 1937 with 85-lb. rail and creosoted ties, slag-ballasted. The Costa slope is new; in the other slopes the track replaced less substantial material. In West Virginia, the Nellis Coal Corporation graded and laid 2 miles of main-haulage track, using creosoted ties.

In Ohio, the Hanna Coal Co. started the use of a composite tie for 40-lb. track in 1936, the tie consisting of a creosoted base to which was bolted tie plates on which the conventional tie was riveted. In 1937, the company installed at its Willow Grove No. 10 mine 2,000 Koppers "Armoored" ties, differing from the original ties in that a standard Bethlehem steel tie is bolted to a creosoted wood base shaped to fit the tie. The principal result is a more substantial unit. Savings per "Armoored" tie are placed at 2¾c. per month.

Heavier rails and grading were used to provide a better road for its 1½ miles of underground rope haulage at No. 2 mine, Cassandra, Pa., reports C. A. Hughes & Co. At the Frederick mine of the Colorado Fuel & Iron Co., 5,000 ft. of main haulway has been double-tracked, a storage-battery locomotive has been added and a new power line built. In Utah, the Utah Fuel Co. found that with storage-battery locomotives, heavier rail was needed; hence all light rail was replaced and now no lighter rail than 40-lb. per yard is being used.

In the past year, the Sonman Shaft Coal Co., operated by the Koppers Coal Co., completed the installation of a 120-ton Wellman-Seaver-Morgan hoist at Sonman shaft, in Cambria County, Pennsylvania, to haul coal from the bottom of the Lower Kittanning seam slope to the bottom of the shaft, a distance of about 10,000 ft. against an average gradient of 7 per cent. This hoist has a 12-ft.-diameter drum with a face width of 13 ft. 6 in. The drum probably is the largest used for slope haulage in the bituminous field of Pennsylvania. It is grooved for 1⅜-in. rope and will take 4,000 ft. of rope in a single layer; the entire length will wrap the drum with 2½ layers which will weigh 15 tons.

A 1,050-hp. (continuously rated) General Electric Type I, Form M, 20-pole, 360/354 r.p.m., 2,200-volt, 3-phase, 60-cycle slip-ring induction motor drives the hoist. Gear ratio is 8.9:1, which gives a maximum drum speed of 39.78 r.p.m. and a maximum rope speed of 1,500 f.p.m., or 17 miles per hour. Reversing contactor control is used for the primary, with liquid rheostat and contactor for the secondary of the motor. Control voltage is 440. Extensive improvements have also been made at the St. Michael shaft of Berwind-White Coal Mining Co., in Cambria County.

Deep-Well Pumping Grows

Deep-well pumping furnishes the headlines in the 1937 program of mine drainage. Slowly growing in momentum, the deep-well pump in 1936 established itself by a notable installation at the mines of the Humphrey Coal & Coke Co., Greensburg, Pa., where four 16-in., 3-stage, 350-hp. units were installed to handle 2,500,000 tons of water in 46 days. Maximum lift was 200 ft. Last year the Koppers Coal Co. put in a 2,000-g.p.m., 300-hp. deep-well turbine pump in a 450-ft. borehole to tap a worked-out and inaccessible part of its mine at Glen White, W. Va.

The largest of installations, however, was one in the Oliver No. 3

mine of the Commodore Coal & Coke Co., Uniontown, Pa., operated by C. S. B. Ward, of Pittsburgh, Pa. It will remove 3,000,000,000 gal. of water impounded in Oliver Nos. 1, 2 and 3, and in a few other adjacent and connecting mines. To this must be added 6,000,000 gal. of daily influx. For the project, three 24-in., 6-stage deep-well turbine-type pumps are provided driven by three 600-hp., 1,170 - r.p.m. hollow - vertical - shaft, 2,300-volt, 3-phase, 60-cycle motors. These pumps, each weighing 44 tons, are installed over Oliver No. 3 mine shaft and extend down the shaft 433 ft. to the bottom of the coal seam. Total cost of removing the water, including cost of equipment and power, will be $200,000, part of which will be furnished by the Commonwealth of Pennsylvania under Act No. 6, approved, June 16, 1936, and part by interested companies.

Dewatering Flooded Mine

Another expensive deep-well job was started Dec. 3, the dewatering of the inundated Sahara No. 3 mine of the Sahara Coal Co., of Harrisburg, Ill. Three Pomona deep-well turbine pumps will be employed, each with 300-hp., Type CS., Westinghouse 2,300-volt motors. The capacity against 240-ft. head is 3,200 to 3,500 g.p.m. Volume of water to be removed is 3,000,000,000 gal. The annulus up which the water flows is of Plioweld and covered on its inner surfaces with rubber to protect the pipe from corrosion. These pumps were purchased and installed by the Illinois Department of Mines and Minerals; the drainage ditch, flume and power are supplied by the company.

Much acidproof pipe, including Transite and Bermico, has been installed to prevent corrosion. Companies are learning that by not storing water where air can enter, it will not spoil—that is, become acid. Even a few hours, with water rising and falling, will make a great difference, if pyrite is present, as it always is. Unfortunately, some mines have so much methane that operators fear to store water in airtight inclosures which will gather methane that later may escape and make trouble and some fear to store water for fear of an inundation should the walls be breached.

Ventilation, long neglected as a science, is now at full tide. No section seems to have been overlooked. Always compelled by law to provide the necessary air, the coal companies for two decades have provided it at a cost they now begin to realize was needlessly high and growing higher.

A leading company in this reform was the Hillman Coal & Coke Co. It continued its program in 1937. At Oakmont, Jerome and Emerald mines, at Barking, Jerome and Clarksville, Pa., respectively, it installed Jeffrey Aerodyne fans to replace higher-power-cost, less efficient fans. The performance and results have been satisfactory and the power cost has been lowered.

A new fan was installed at the Martin mine of the Martin Mining Co., in Fayette County, Pennsylvania. Two Aerodynes, one a 6-ft. unit, installed, and another a 7-ft. unit, purchased but not yet installed, revised the equipment of C. A. Hughes & Co. in Cambria County, Pennsylvania, which also put in a turbine-type fan at Lilley No. 3 mine. In West Virginia, the Pocahontas Fuel Co., Inc., installed several Aerodyne and Aerovane fans, details of which will be covered in more detail in a later issue.

More Air Provided

At the Katherine (W. Va.) mine, Katherine Coal Mining Co., an 8-72-in. Aerodyne fan replaced old-style units. This fan gives more than twice as much air per minute as the two old fans combined and uses no more power, while having plenty of reserve capacity for future development. The Nellis Coal Corporation, though using the same fan and motor as heretofore, was able to increase the capacity of the former by revision of the mine ventilation system. Improvements in underground ventilation also were made by the Hanna Coal Co.

In Alabama, the Woodward Iron Co., at its Mulga bituminous mine, at the time of the recent explosion was replacing motor and other equipment so as to place in operation the fan at No. 3 air slope, and this fan will increase the air volume in the active workings, to which it is much closer than the older fan, which it will ultimately replace.

This fan at No. 3 air slope is an 8x3-ft. Jeffrey unit rated at 160,000 cu.ft. of air per minute at 5-in. water gage and has a gas-oil engine as auxiliary driving unit. The change will make an average reduction in length of air travel of nearly two miles, thus increasing efficiency and augmenting safety. The area which was the scene of the explosion will be ventilated by the split system and, as the entries are completed, doors will be eliminated in cross-connecting panel entries.

At the Barney mine of the Alabama By-Products Corporation, a new ventilation shaft about 225 ft. deep and 12 ft. in diameter was constructed in 1937, and the fan moved to this location, materially increasing the volume of air and reducing the cost of ventilating the mines. At all the mines of the corporation, new and improved doors were installed, eliminating latches to comply with the new State mine law and increasing safety and efficiency in ventilation.

Near Dawson, N. M., the Phelps Dodge Corporation purposes to erect an 8-84-in. Aerodyne fan in 1938, and the Utah Fuel Co., at Castlegate, Utah—finding that, with more extensive mine developments, aircourses became longer and splits more numerous and that the power bill steadily increased—is driving a rock tunnel from the outside to intersect the return airway beyond the inside end of the rock tunnels entering the seam. After installation of an efficient fan and after increasing the area of the return entry, a material saving should be made in the power and more adequate ventilation provided; all this for a 20-ft. seam of coal or thicker. Seeing that this mine decides for revision of its ventilation system, after long years of efficient management, how much more is such revision needed in mines with thin coal?

Fan Standard Adopted

In Wyoming, the Union Pacific Coal Co. has adopted the Aerovane type of fan as standard, all new fans installed recently being of that type. At the present time two 9-ft. two-stage fans are operating at the Hanna mine, in Carbon County. At Winton No. 1 mine in Sweetwater County, a 9-ft. single-stage fan is in use. All these fans are giving excellent satisfaction, giving a large volume of air with low power consumption. The fans at the new D. O. Clark mine will be described later.

Early in the past year, Jan. 15, a new 756-ft., circular concrete-lined downcast air shaft 20½ ft. in diameter, after nearly seven months had been spent in its sinking, was connected to the workings of the Olga No. 2 mine of the Carter Coal Co., Caretta, W. Va. Five boreholes had been drilled and grouted under pressure with 6,602 bags of cement to keep the shaft dry during and after construction. The purpose of the shaft was to carry the air later to to be delivered by a 13-ft. Aerodyne fan, the largest that had up to that time been built. This fan is direct-connected to a 600-hp. General Electric synchronous motor operating at 600 r.p.m.

The new fan is to operate in parallel with a 14x6-ft. Jeffrey centrifugal unit driven directly by a Harrisburg 575-hp. engine running at 160 r.p.m. The new shaft is located near the active workings, 9,000 ft. from this centrifugal fan. As a result of (1) sinking the new shaft, (2) installing the fan, (3) enlarging the skip and main upcast shafts and the return airways, which were about to be rendered inadequate by the greater air volumes; (4) using some of the intakes for returns, and (5) eliminating a few local high velocities, the air volume has been increased from 517,000 cu.ft. per minute to 774,000. While the power input has been augmented only 5.6 per cent, the volume has been increased 49.7 per cent.

Hence, much that has been said about the inefficiency of fans in parallel is disproved, though it must be remembered that the reduction in the resistance of the mine has aided in the result. So perhaps it should be said that the allegation against fans in parallel is shaken. Should more air be needed, another uptake shaft will be sunk near the same location.

Running both fans together, December, 1937, the Aerodyne delivered 494,060 cu.ft. of air per minute at 6.3 in. water gage, and the steam centrifugal fan 279,880 cu.ft. at 5.88-in. water gage. A countershaft with pulleys and V-belts is being installed to permit the Aerodyne to be operated at 500 r.p.m. instead of 600, as at present.

Use Water on Cutters

Use of water on the cutter bar has made it necessary in some mines to provide means for storing water for that purpose. Mine water may be used, but artesian or surface water will eliminate corrosion or clogging. At the bottom of the water column in the shaft, 50 to 250 lb. pressure is provided, but the pressure in the section is 10 to 100 lb. per square inch, depending on local conditions. Water-tank trucks with pressure pumps are being advocated to eliminate the network of pipes that otherwise would have to be provided. At the mines of the Buckeye Coal Co., Nemacolin, Pa., as at many other mines, especially in Utah, the faces, roof, rib and timbers are washed down before loading and the dry coal at the face subsequently is wetted down as often as needed. But this does not reduce the need for rock-dusting, which at Nemacolin has been continued as thoroughly as ever.

Shelly, or buckwheat, roof may be kept from scaling either by air conditioning or guniting, but in the Fernwood mine of the McAlester Fuel Co., in the Spadra field of Arkansas, on May 18 and 19, 1935, a short length of roof was sprayed with a paint termed Ebonol, made by Sherwin-Williams Co., and, later, the Sukenis Coal Co., Adamson, Okla., made a more extensive application. Recent reports from the former company show that both applications have done satisfactory work.

Hitch Drill Adopted

But with heavy drawslate more drastic measures must be taken. At the Emerald mine of the Emerald Coal Co., Clarkesville, Greene County, Pennsylvania, a subsidiary of the Hillman Coal & Coke Co., a machine has been constructed in the company shop to drill holes in the ribs of headings so that steel beams can be inserted to support the roof. These holes are made deep enough to give a good bearing for the steel beams, and after the latter are in place the holes are filled solidly with brick and cement mortar, thus keying the beam securely in place and keeping air from the coal or slate opening. This self-propelled equipment will drill holes up to 12 in. in diameter and is designed so that it can drill at any location or angle in either rib. It is equipped with a hydraulic lifting jack and a separate motor for operating the drill. Use of this machine has lowered permanent-timbering costs.

Last summer a year ago, a 265-ft. circular shaft, 9 ft. in diameter, was sunk for ventilation by the Eureka Coal Co., a subsidiary of the Old Ben Coal Corporation, near Paris, Ark., by driving a pilot hole of 14-in. diameter and shooting and shoveling the sides into the hole which extended to the mine workings. A 9x9-ft. ventilation shaft was sunk in the past year to a depth of 106 ft. at the Sunshine mine of the Binkley Mining Co., in the Spadra field, by a similar method.

The rock was broken and dropped down a 12-in. borehole drilled before the shaft was commenced. It fell to a chain conveyor at the foot of the hole, by which and on a train of belts, provided for the regular operation of the mine, which was then not producing, it was brought to the surface. Thereby it was made possible to sink 80 ft. of the shaft in six days, each of two shifts, by two men and a shift leader. This shaft temporarily will carry the air current from a small Sirocco fan, which will be replaced as soon as distances and volume of air to be delivered render it inadequate.

A Dalton rock dumper was installed at the Jodie and Ansted mines of the Gauley Mountain Coal Co. in April, 1936, and its effective use received further exemplification in 1937. It consists of a self-propelling chassis on which is mounted a turntable carrying a long boom which has a car puller at one end and a rotating cradle at the other for holding a car and turning it upside down. When a loaded rock car or train of cars has been spotted on the track near the point where it is to be discharged, the cars are uncoupled, and the dumper is run on the track to the end of the trip, where it pulls the nearest car onto one end of its long overhanging boom. The boom then turns through a right angle, carrying the car well over the side of the hill or embankment. Then the car is upset sidewise and when the rock is discharged the car is tilted into an upright position. Revolving a further 90 deg., thus completing a half circle, the dumper carries the car so that it is over the track on the opposite side of the dumper from its original position. Here the car is retracked and released, ready for the mine, but reversed in direction. With this equipment, given a steady procession of cars, 200 loads could be dumped in seven hours. A 3,500-ft aerial tramway is being constructed by the Buckeye Coal Co. at Nemacolin, Pa., for disposal of refuse.

New Town Under Way

Toney Fork is the site of a new town and mine that the Koppers Coal Co. is constructing in Wyoming County, West Virginia. The town will be known as Kopperston and at first will consist of 400 houses all of which will be of high-class construction. Thus far, 200,000 cu.yd. of material has been excavated in preparation for building. Grading of tramroads and of 20 miles of roadbed connecting with the Virginian Ry. is rapidly approaching completion. The mine will develop a tract of 10,000 acres which extends into Boone County.

At Costa mine, to eliminate extremely bad haulage conditions, resulting from bad roof, excessive gradients, long distances and other unfavorable factors, the Alabama By-Products Corporation completed a new slope and tipple in 1937 and an outside haulage therefrom to the old preparation plant. This opens a body of virgin coal, otherwise inaccessible, and eliminates the delays and expense of the old outside haulage.

Near Superior, Sweetwater County, Wyoming, a plant is being developed by the Union Pacific Coal Co., to be named after D. O. Clark, who entered the company's service in 1868 as mine clerk and surveyor, serving as general manager for many years and retiring in 1914. He died in 1921.

This mine is being developed through two parallel rock slopes, 50 ft. apart, which pitch at 10 deg. and intersect the coal seams, which are pitching 4 deg. in the opposite direction. One is to be used for a man-and-material track and is 12 ft. wide with 7-ft. clearance between floor and supporting I-beams, and a second is 9½ ft. wide with a similar clearance of 6 ft. The latter will have a 48-in. Link-Belt conveyor installed in four sections with a total length of about 2,600 ft. Loading stations with Link-Belt rotary dumps will be located where the belt slope strikes Nos. 7 and 15 coal seams. The first will be located about 1,000 ft. from the mouth of the slope and the second about 2,500 ft.

Handling 6,000 tons daily, the new plant will extract six seams of coal, the product of which will all come to the surface through the D. O. Clark slope. The mine will be equipped with 4-ton-capacity cars of the coal company's standard type, and be mined throughout by undercutting machines and mechanical loaders.

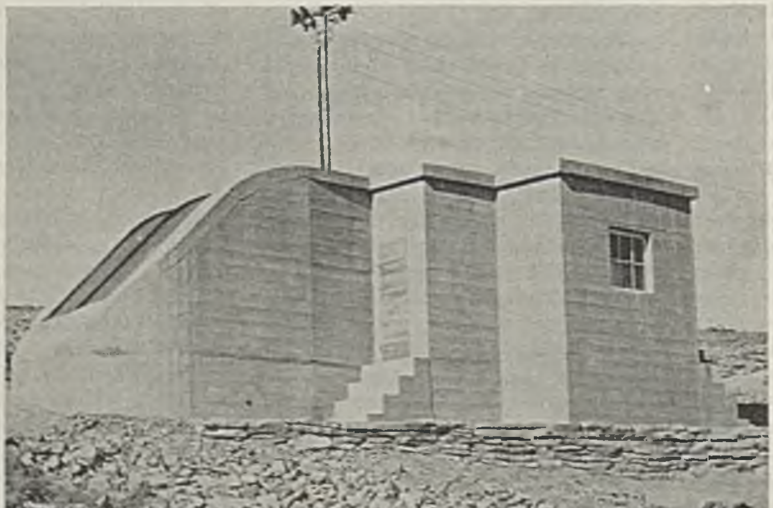
Two ventilating shafts have been completed, each 12x16 ft. in inside dimensions, the first driven to No. 7 seam at a depth of 242 ft. and the second to No. 15 seam at a depth of 549 ft. Aerovane fans have been installed over both air shafts, the No. 7 seam fan of 9-ft. diameter, a single-stage unit, and the No. 15 seam fan of 10-ft. diameter with two stages. Temporarily the two slopes serve as intakes, but eventually the mine will be ventilated through openings from the respective coal seams where they come to the surface. The tipple is being constructed by Allen & Garcia Co. and operation should commence Aug. 1 of this year.

With a proved reserve of 35,000,000 tons and unproved resources even greater, the D. O. Clark mine will replace the operations at Superior B, C and D, which will be exhausted in the next few years. It will have the largest capacity of any mine west of Illinois and will be the only mine west of the Mississippi River to use a conveyor-belt system to transport coal from the mine bottom to the tipple. Rock Springs coal being normally clean, no special preparation is required to fit it for railway-fuel purposes.

Modernization of the Columbia Steel Co.'s coal mine at Columbia, Utah, is practically complete. New cutting, drilling and loading machinery, and rolling stock have been provided. All the horses used in the lower levels of the mine have been replaced by three new 8-ton electric locomotives to supplement those in use. One hundred new 6-ton mine cars of Cor-ten steel have been added to the mine equipment. These cars are larger than those hitherto used, thus necessitating installation of new car scales and a dumper at the mine tipple.

In the mine proper, cutting machines, added recently, will undercut the coal seam to a depth of 9 ft. They can also shear and overcut the coal. Track-mounted loading machines will be used to load the coal in the rooms. All equipment is operated by direct-current motors. To supply additional power a 200-kw. motor generator with full automatic control has been installed, which can be started or stopped from either the inside or outside of the mine.

At the Nellis mine, a waiting room was erected in 1937 at the drift mouth for the accommodation of inside employees. The Gauley Mountain Coal Co. last year completed a new machine shop to provide economical and speedy equipment maintenance.



Concrete fan house at Winton, Wyo., Union Pacific Coal Co.

MECHANIZATION

+ Forges Ahead in Active Year

WITH INTEREST centered on mobile loaders and conveyors—the two major types of equipment commonly included in the mechanization group—the bituminous industry continued its program of mechanization of loading at only a slightly lower rate in 1937 than in 1936, measured by the number of equipment units installed. In terms of interest which eventually may be expected to metamorphose in action, however, 1937 was the banner year in mechanization history as well as in tonnage handled by mechanization units. The reasons, which lost none of their force last year, were lower costs to retain and widen markets in the face of higher wages and shorter hours.

Sales of mobile-loading machines, which closely approximate the number of new units placed in service, totaled 297 in 1937, against 344 in 1936. Conveyor sales, on the other hand, rose from 682 in 1936 to 828 in 1937. While Illinois again added materially to its list of mobile loaders, as did other States which early adopted this equipment, the major increase in installations was in West Virginia, particularly the northern part. Joy equipment led in this region, although a number of track-mounted units were adopted, including Goodman loaders at the mines of the Dawson and Jamison coal companies. Substantial shipments of mobile loading machines also went to western Pennsylvania, where the Weirton Coal Co., among others, mechanized with Whaley "Automat" units. Sizable sales also were made in Ohio and Kentucky. A complete breakdown of sales by regions is given in the article beginning on p. 56 of this issue.

Conveyor sales (see also p. 56) found West Virginia far ahead in number of installations, with Kentucky, Pennsylvania, Alabama and Tennessee, and the trans-Mississippi States also installing units in quantity. Scraper and pit-car-loader installations, as in other recent years, were limited in 1937.

Mobile-loader progress in 1937 was distinguished not only by the development of new-type machines, particularly for lower seams (both track- and caterpillar-mounted types), and new highs in outputs per loader and per man per shift but also by additional departures from the traditional principle of cars and locomotives for transportation. In fact, perhaps the major development in mobile loading last year was the study given to the problems of providing either a continuous transportation medium behind loaders or of reducing the handicap involved in changing individual cars.

Lower Coal Loaded

The height of coal in which mobile loaders can be introduced was subject to still further reduction in 1937. As an example, the Stith Coal Co., America, Ala., began the use of Joy, Jr., loaders with chain conveyors in the latter part of the year to recover coal averaging around 30 in. in thickness. Tonnage figures of 200 per shift on wide work and 180 in narrow work are reported.

In slightly thicker coal (36 in. or over) a number of loading programs were initiated, the majority employing chain conveyors for the initial transportation stage from the loader back to cars or to a main conveyor. This principle is epitomized in new work being undertaken by the Binkley Mining Co. at an operation in the Spadra field of Arkansas, incidentally the first mobile-loader operation in the Southwest. Total coal thickness, including a parting cut out by machine, is 42 in. No mine cars are employed, as the entire transportation system is built around conveyors, including a belt in a slope opening—an increasingly frequent practice in late years and adopted at several new mines started in 1937. In the next upward step in coal thickness, in the range around 4½ ft., track-mounted loaders began to increase in numbers in the past year.

With improvements in machines, operating technique, face-preparation practices and transportation methods (including new methods of moving coal), coupled with changes in mining plans in certain instances, production efficiency was substantially increased in 1937. Outputs of 600 tons or more per machine shift were not uncommon in 6-ft. coal, with much higher figures frequent in thicker seams. As a corollary, outputs per man per shift, all underground men, commonly exceeded 10 tons, even in thin coal, and in several instances averages of 20 tons and more were obtained normally.

In improving service to the loader and thus increasing loading time, the earliest and most-used method was increasing car size. It was continued in 1937, particularly in mines with thick coal. In thinner seams, however, operators, as indicated above, turned more to the use of conveyors to service the loader, these conveyors, of the chain-and-flight type, usually feeding onto a mother-belt system carrying the coal either to a mine-car-loading station or to the outside. This principle, however, was not confined to thin seams, as several operators went ahead with plans for using conveyor transportation in coal high enough for a big mine car.

With additional installations, plus heightened interest throughout the industry, still another method of trackless mining made further strides in 1937. This method, developed by James H. Fletcher, consulting engineer, Chicago, involves the use of battery-powered tractors pulling bottom-dumping trail cars, all running on the mine bottom on rubber tires. The first application was at the Bluebird Coal Co., Carrier Mills, Ill., in 1936, followed in 1937 by installations by the Moffat Coal Co., Sparta, Ill., and at the Moss Hill No. 2 mine, Hart Coal Corporation, Morton's Gap, Ky. All three companies since have purchased an additional unit—two caterpillar loading machines, four to six tractor-trailer units, and the necessary auxiliary equipment per unit.

At Moss Hill No. 2, the first unit was installed in March, 1937, with the second going into operation Nov. 22. With the two units, completely mechanizing the mine, average production per seven-hour shift is 1,200 tons or more from 56- to 61-in. coal (*Coal Age,* January, 1938, p. 47), while the average output per man employed underground per shift is 20 tons or more. At the Moffat mine, where the coal thickness is about 5 ft., production per manshift, coal on the parting, was running about 28 tons at the end of the year.

Although tractor-trailer installations made in 1937 were confined to coal from 4 to 5 ft. in thickness, several projects for broadening the application of this equipment were under consideration at the end of the year.

One involved the development of units for coal as low as 30 in., while other operators took under advisement the possibility of using the equipment behind the largest-size loading machines in fairly thick coal. A major factor to receive the attention of prospective users was the lower investment cost per ton of output.

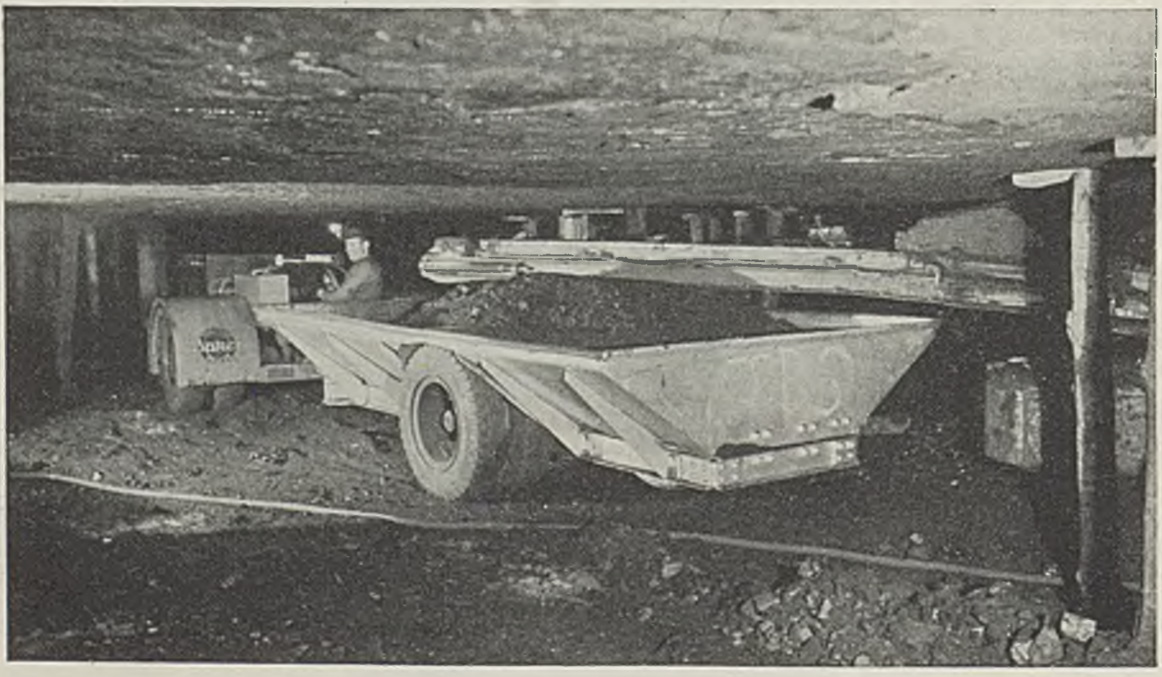
One of the secrets of the Fletcher system is the fact that loaders are served by a very mobile transportation unit with the maximum capacity possible within the limitations of seam height, which hauls only a short distance to a transfer point, where the coal goes into a trip of mine cars or a conveyor. Thus, if cars are retained for main haulage, they may be loaded in trips, eliminating the problem of handling them behind loaders, as well as the handicap of small capacity. The latter was the major reason behind a modification in previous practice last year by one Illinois company, which installed large bottom-dumping cars pulled by electric locomotives for servicing loading machines. These cars dump into a pit hopper, from which the coal is transferred to the standard 2,800-lb. cars, which are filled in trips by a loading conveyor. Due to shaft dimensions, the size of car which can be hoisted is limited. Consequently, this system is expected to give all the changing advantages of a big car and yet allow present car equipment to be used in main haulage and hoisting.

Still another solution of the problem of reducing car-changing time was adopted by the Utah Fuel Co. as a result of concern over the relatively low loading rate of the larger machines. "These loaders," it was reported, "can easily handle 5 tons per minute, yet the average actually obtained is nearer 1 ton per minute," due not to the loader itself but to the way it is serviced. "In thick coal, where the top is shot down after completion of the room, the necessity of moving the loader seems particularly objectionable." Consequently, the company has designed "multiple loading equipment in cooperation with one of the larger manufacturers. This equipment consists of a flexible portable conveyor to go with and be a part of the loader unit as a whole. This will make it possible to load four or five cars, or one battery-locomotive trip, at a time. Only about one-fourth as many car changes to the loader, therefore, will have to be made as compared with present practice. This will be a particular advantage when loading top coal and should easily double the output per unit."

The year 1937 also provided at least two examples of driving slopes with Joy loaders—a new operation near Harrisburg, Ill., and the new Buckhorn mine of the Consolidated Coal Co., Herrin, Ill. Pitch in both cases is slightly under 18 deg., and in one instance no tail ropes were employed. Chain conveyors carried the material up the slopes in both cases. One result was a striking reduction in sinking time, as well as in cost, due to the increased speed of mucking.

Mining systems in general showed little change in 1937, except in detail, with the room-and-pillar system or its modifications in the ascendency. The major departure from usual practice last year was the system worked out by J. H. Fletcher for use with tractor-trailer haulage, in which pockets on short centers are gripped

Battery tractor and trailer behind loader, Moss Hill No. 2 mine



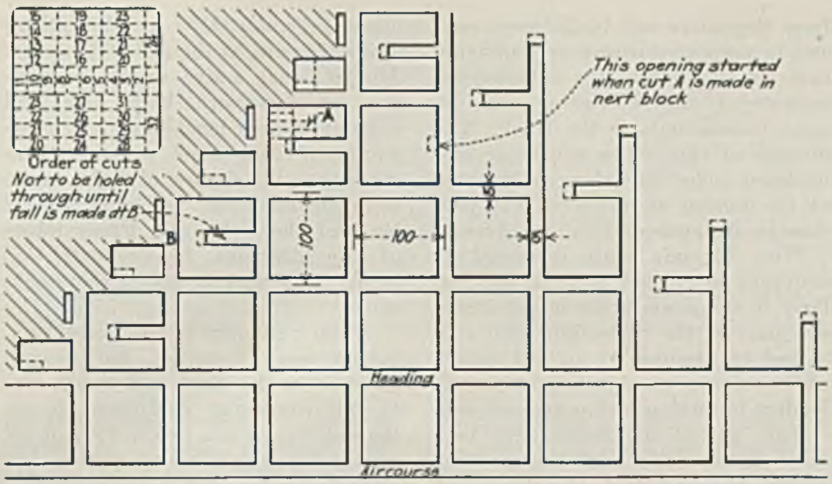


Fig. 1—Open-end cut-over system of mining used in northern West Virginia

out on each side until they meet and form a long face. The latter then is slabbed a certain number of cuts after which the process of cutting pockets is repeated. This system, as applied at the Moss Hill No. 2 mine, is detailed in the January *Coal Age,* p. 47.

Operators in the East and South continued study of methods of using loading machines in the extraction of pillars. In northern West Virginia, a number of properties used the open-end cut-over system shown in Fig. 1 in mining blocks. Reported advantages are increased tonnage and better roof control. Long-face mining with mobile loaders was studied in 1937, but applications were few and mostly of the experimental type.

In the realm of face preparation, breaking down the coal to obtain the maximum proportion of the larger sizes and at the same time increase loader output and reduce machine wear continued to engross operators. One method was the use of slow-speed coal-breaking mediums, such as explosives with a low rate of detonation in conjunction with a revision in number and placement of shotholes. In the same field, Cardox marked up substantial gains, with many operators showing a disposition to use this medium where cuts deeper than usual were made.

The trend toward track-mounted cutters to supplement track-mounted loaders continued in 1937, although installation of this type naturally was not confined to this particular application. Cutting out bands and partings made further gains last year, and a number of mining companies tackled the problem of using cutting equipment either to remove overlying rash or drawslate entirely or to make a kerf in it to facilitate gobbing as one step in the preparation cycle in mobile-loading programs.

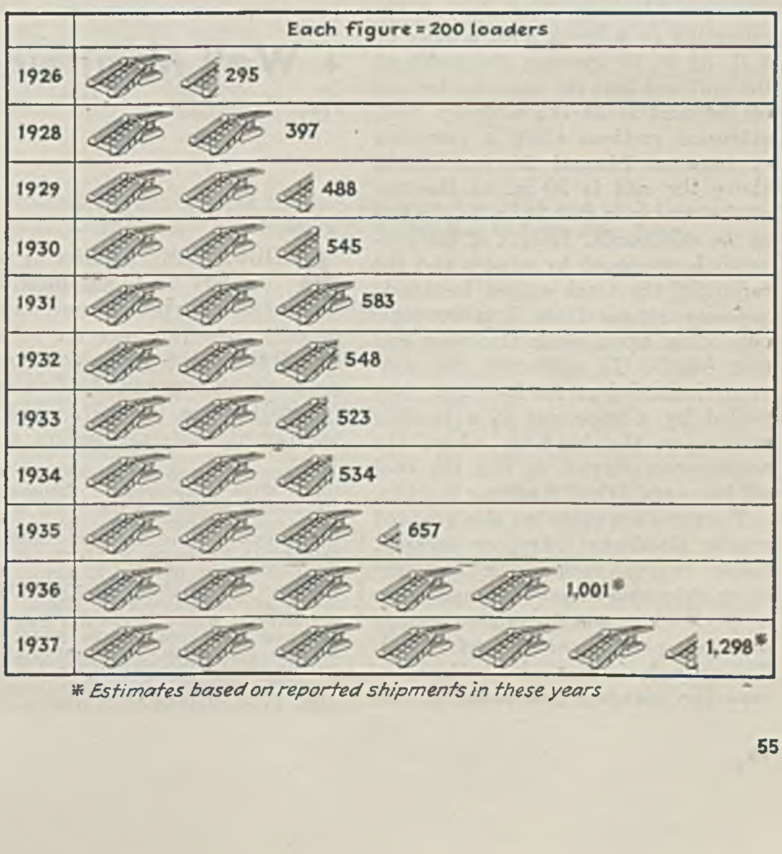
Caterpillar-mounted cutting equipment appeared in 1937, the Consolidated Coal Co. installing a cutting and shearing unit at one of its Illinois operations. Caterpillar-mounted mining-machine trucks increased last year also, in response to the need for some method of moving shortwall equipment around in trackless-mining operations. Joy trucks, for example, were installed by the Moffat Coal Co., using, as noted above, tractors and trailers, and by the Akron Coal Co., Ohio, using chain conveyors behind loading machines. At operations employing conveyors, this equipment also was found useful in moving pans and drives.

Mining with either hand-loaded or self-loading conveyors was again active in 1937, with installations throughout the United States, primarily in coal considered too thin or too steep for mobile loaders. But conveyors were not restricted entirely to the two major fields outlined above, as the self-loading qualities of the shaking type were employed by several operators with fairly thick and level or nearly level seams.

In Washington, mines east of the Cascade mountains still continued as the only fully mechanized operations in the State (*Coal Age,* May, 1936, p. 183). Normal inside development was continued and additional shearing machines were added where necessary. Shearing, rather than undercutting, played an increasingly important rôle in this field in 1937, which also witnessed the introduction of the newer lower-capacity cutting machines designed primarily for conveyor sections or others where a light-weight machine might prove advantageous. The Northwestern Improvement Co., as an example, installed two Sullivan "Buddy" cutters, which are being used on 30- to 50-deg. pitches, cutting directly up the pitch in some cases and across the pitch in rooms in other cases.

Utah, formerly the stronghold of the mobile loader because of the predominance of extremely thick seams, witnessed another growth in the extraction of thinner coal in 1937 by the use of conveyors, mostly of the shaking type. Colorado continued its

Fig. 2—Mobile loaders in service show still another increase in 1937



* Estimates based on reported shipments in these years

work with conveying equipment, with Wyoming retaining self-loading units in many steep-pitch operations.

Arkansas, long a user of conveyors, added to the number in service in 1937 in regions where pitching veins are encountered, particularly in the Excelsior field. Development plans in this field are similar in general to that described in the October, 1937, *Coal Age,* p. 51, and these in turn are substantially the same as those in the Paris field, one of the earliest to adopt conveyors on a major scale in the State. In the latter field, revisions in equipment have been a feature of progress in late years. The Eureka Coal Co., for example, has installed Boal Foundry & Machine Co. conveyors with a speed of 65 f.p.m., compared with 40 f.p.m. for the units originally used. At the same time, length of the long faces employed has been increased from 350 to 400 and then to 450 ft.

Farther east, considerable interest was evident in shaking conveyors with self-loading heads in western Kentucky in 1937, with the West Kentucky Coal Co. and a few other operations trying out a number of Goodman units in both development and room work.

Conveyors Make Progress

Conveyor progress was most marked in the Eastern and Southern fields of the United States in 1937. In central Pennsylvania, long a conveyor stronghold, the Clearfield Bituminous Coal Corporation has been employing for about a year a large-capacity Goodman self-propelling conveyor (January *Coal Age*, p. 92) operating on a track with a gage of 6 ft. 5½ in. to increase the width of the unit and thus its capacity. Length of the unit is 23 ft., although 6-ft. extension sections allow a variation of between 14 and 26 ft. Height above the rail is 30 in. to the top of the conveyor and 34 in. to the top of the sideboards. Length of the conveyor is governed by grades and the radius of the track curves installed; capacity ranges from 5 to 10 tons, depending upon seam thickness and unit length. In operation, the conveyor is loaded at the face and then pulled by a rope out to a loading station on the heading, where the conveyor is started to run the coal off into cars. Coal thickness is 44 in.

The same organization also adopted a new Goodman entry, or scraper, loader which includes a sectional boom extension attached to and made a part of a wheel-mounted power unit (see above *Coal Age* reference). The extension has a solid bottom, except for openings graduated in size from the power unit to the front end, and is supported over a trip of mine cars by adjustable legs mounted on wide-faced wheels resting on the mine bottom outside the track. The number of cars which can be accommodated under the extension is based on the number of cars a cut will produce in one cycle of heading advance.

West Virginia again increased its conveyor equipment in 1937, particularly in thin-seam areas in the southern part of the State, and also furnished an example of an installation of conveyors to supplement mobile loaders in mining a thin area of coal.

This was at the Nellis (W. Va.) mine of the Nellis Coal Corporation, which installed two two-room Joy conveyor units, including face, room and cross conveyors and elevators to mine coal too thin for the five Joy 8BU loaders, one Jeffrey 44DD loader and one Myers-Whaley No. 3 "Automat" loader in service. Nellis also radically revised face-preparation methods (*Coal Age,* November, 1937, p. 47), including installation of a Sullivan 7AU track-mounted cutting and shearing machine with 9-ft. bar, replacing two shortwall cutters.

Conveyor developments in eastern Kentucky in 1937 were paced by the Elk Horn Coal Corporation, Wayland, which opened the new Col. Tom mine (*Coal Age,* November, 1937, p. 61) on a full-mechanical basis, using Jeffrey three-room conveyor units and a Joy 8BU loader, loading into mine cars, at the end of the year. Alabama was active in the installation of conveyors, both with and without loading machines. As an example of the latter practice, both shaking and chain-and-flight units were installed on an experimental basis at the Colta and Praco mines of the Alabama By-Products Co., being used largely in development work.

While a number of individual conveyors were installed, the general practice in the East and South was to put conveying equipment in on the unit basis; i.e., two to four or six conveyors, in as many places, operated as a unit and discharging into a gathering conveyor on the heading. Complete conveyor operations also were more numerous, an example being the Turner No. 2 mine, Turner Elkhorn Mining Co., Drift, Ky., where shaking conveyors (La-Del SLS drives and La-Del and Goodman pans) discharge into belt-type cross conveyors in turn feeding onto a belt-type main conveyor. Seam thickness averages 48 in., including 6 in. of rash in the top. Indicative of the results that have been attained under conveyor operation, Turner output per man per shift, all underground and surface employees, was 8.27 tons over the three months period March to May, 1937 (*Coal Age*, September, 1937, p. 66).

LOADING-MACHINE SALES

+ Well Maintained in 1937*

By L. N. PLEIN, R. L. ANDERSON
M. van SICLEN and F. G. TRYON †

A DECREASE in sales of mobile loaders and an increase in sales of other types of equipment, especially conveyors, are the outstanding features of manufacturers' reports on underground loading devices for coal mines in 1937. The total number of units shipped to anthracite mines showed a decrease from 1936, while the number shipped to the bituminous mines showed a slight increase.

The number of mobile loaders sold in 1937 for use in the United States was 297. This was 47 machines less than the record established in 1936, but much above the levels of the early depression years. The number of scrapers increased from 28 in 1936 to 30 in 1937. An increase was reported also in the number of pit-car loaders, large in terms of per cent but small in actual numbers or capacity.

Conveyors again established a new record. The total number of con-

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Table I—Units of Mechanized Loading Equipment Sold to Anthracite and Bituminous Mines, as Reported by Identical Manufacturers 1933 to 1937, Inclusive*

						Percent Increase (+) or Decrease (−)	
	1933	1934	1935	1936	1937	1937 over 1936	1937 over 1935
Mobile loaders	41	55	115	344	297	− 13.7	+158.3
Scrapers†	65	34	22	28	30	+ 7.1	+ 36.4
Conveyors‡	396§	610§	681§	994§	1,088	+ 9.5	+ 64.6
Pit-car loaders	18	26	28	11	38	+245.5	+ 35.7

* The figures cover reports from 29 identical manufacturers.
† Reported as scrapers or scraper haulers and hoists.
‡ Includes hand-loaded conveyors and those equipped with duckbills and other self-loading heads. A considerable number in 1936 and 1937 are used in conjunction with mobile loaders.
§ Revised to include reports recently received from one manufacturer of shaker conveyors not covered by preceding surveys.

Table II—Total Number of Units of Mechanized Loading Equipment Shipped for Use in Each State or Region in 1937

(L = mobile loading machines; P = pit-car loaders; S = scrapers; C = conveyors, including those with duckbills)

	Number of units of all types shipped in 1937	Types of equipment in approximate order of capacity
Bituminous		
Northern Appalachian States		
Pennsylvania and Maryland	128	C, L
Ohio	57	L, C, P
Southern Appalachian States		
West Virginia	381	C, L, S, P
Viriginia	25	L, C, S
Kentucky	124	C, L
Alabama	76	C, S, L
Tennessee	40	C, S, L
Middle Western States		
Illinois	113	L, C, P
Indiana	32	L, C
Trans-Mississippi States		
Arkansas and Iowa	26	C, L
Colorado and New Mexico	69	C, S, P
Montana and Utah	40	L, C
Wyoming	66	C, L, S, P
Total bituminous	1,177	L, C, S, P
Anthracite		
Pennsylvania	276	C, S
Grand Total	1,453	L, C, S, P

veyor units of all types, other than mother belts or haulageway conveyors, increased from 994 in 1936 to 1,088 units in 1937. Figures for conveyors include both hand-loaded types and those equipped with duckbills or other self-loading heads. The number of duckbills cannot be shown separately without disclosure of individual business, but it may be said that the record for this type of machine shows an increase, along with the hand-loaded conveyors. The total of 1,088 units also includes a number of machines sold for use in conjunction with mobile loaders and, therefore, not destined for hand-loading. A considerable part of the sales of conveyors in the last two years are for such joint use, and the combination of the mobile machine for loading and the conveyor for initial transportation is a promising field of development. Sales of 50 other conveyors were reported for use in haulageways or slopes, which are not included in the 1,088 units mentioned.

Total Sales by States—Shipments of mechanized loading devices of one type or another were made to seventeen States in 1937. All of the larger producing States are represented in the list. In some cases, it is not possible to show the number of machines of each type sold without disclosing the business of individual manufacturers. Table II, however, gives the total number of units shipped to each State or region during the year. The several types are arranged in the rough order of their capacity: thus, for Kentucky, a total of 124 units is shown, followed by the letters *C* and *L*, indicating that the highest capacity was in the form of conveyors, followed by mobile loaders.

Units Sold Compared With Units in Use—The changing demand for the principal types of equipment is indicated in Table III. The number of mobile loaders in active use as reported by mine operators increased from 488 in 1929 to 657 in 1935. Final statistics of the number in use in 1936 are not yet available.[1] However, the sales of 344 mobile loaders made during 1936 and 297 during 1937 were nearly equivalent to the number previously in use. The sales of conveyors in 1935 and 1936 constituted a large per cent of the number previously installed as reported by the operators, especially in the bituminous fields. Because of uncertainties in definition of what constitutes a conveyor, the record of sales is not fully comparable with the record of number previously in use, but the fact of the large increase is clear.

The number of scrapers sold was comparatively small measured against the numbers previously employed. In the bituminous fields the number of scrapers in use reached a peak in 1930 and has since declined. In the anthracite fields, the number of scrapers continued to increase down to 1934, declining slightly in 1935 and 1936.[2] Installations of pit-car loaders reached a maximum in 1931 and have since declined in both the bituminous and anthracite mines.

Regional Distributions of Mechanized Capacity—It is well known that the proportion of the underground output obtained by mechanical loading has been highest in the coal fields of the northern Rocky Mountains and the Middle West, where high rates combined with favorable seam

[1] Transfer of the staff engaged upon bituminous coal statistics from the Bureau of Mines to the National Bituminous Coal Commission on July 1, 1937, has delayed publication of the detailed statistics of mine operation in 1936 because of the time required to obtain releases from producing companies, making available the reports previously filed by them with the Bureau of Mines for use by the Coal Commission. The 1936 records, however, are now nearly complete and final data for that year will shortly be available.

[2] According to the Pennsylvania Department of Mines, the number of scrapers in use in the anthracite region in 1936 was 482.

Table III—Sales of Mechanized Loading Equipment in 1936 and 1937 Compared With Total Number of Machines in Active Use in Preceding Years

	Number of machines in active use, as reported by mine operators							Number of machines sold, as reported by 29 manufacturers	
	1929	1930	1931	1932	1933	1934	1935	1936	1937
Bituminous mines:									
Mobile loading machines	488	545	583	548	523	534	657	344	297
Scrapers	126	150	146	128	93	119	78	19	14
Pit-car loaders	2,521	2,876	3,428	3,112	2,453	2,288	2,098	9	28
Conveyors equipped with duckbills, and other self-loading heads	99	140	165	159	132	157	179	682‡	828‡
Hand-loaded conveyors — number of units	...†	...†	...†	...†	525	574	670		
Anthracite mines (Pennsylvania):									
Mobile loading machines			5	11	18	14	1	......	....
Scrapers	350	384	457	479	455	517	507	9	16
Pit-car loaders			28	24	19	25	22	2	....
Conveyors equipped with duckbills, and other self-loading heads	355	421	1	17	12	13	30	312‡	260‡
Hand-loaded conveyors — number of units			547	818	940	1,338	1,563		

† Number of units not reported in these years.
‡ Reported as face conveyors (hand-loaded), "shaker drives," and "duckbills." The figures of numbers sold in 1936 and 1937 are not exactly comparable with the number in use in 1935, because of uncertainities in defining what constitutes a conveyor.

Table IV—Comparison of Mobile Loaders and Scrapers in Actual Use in 1935 With Sales Reported in 1936 and 1937 by Regions

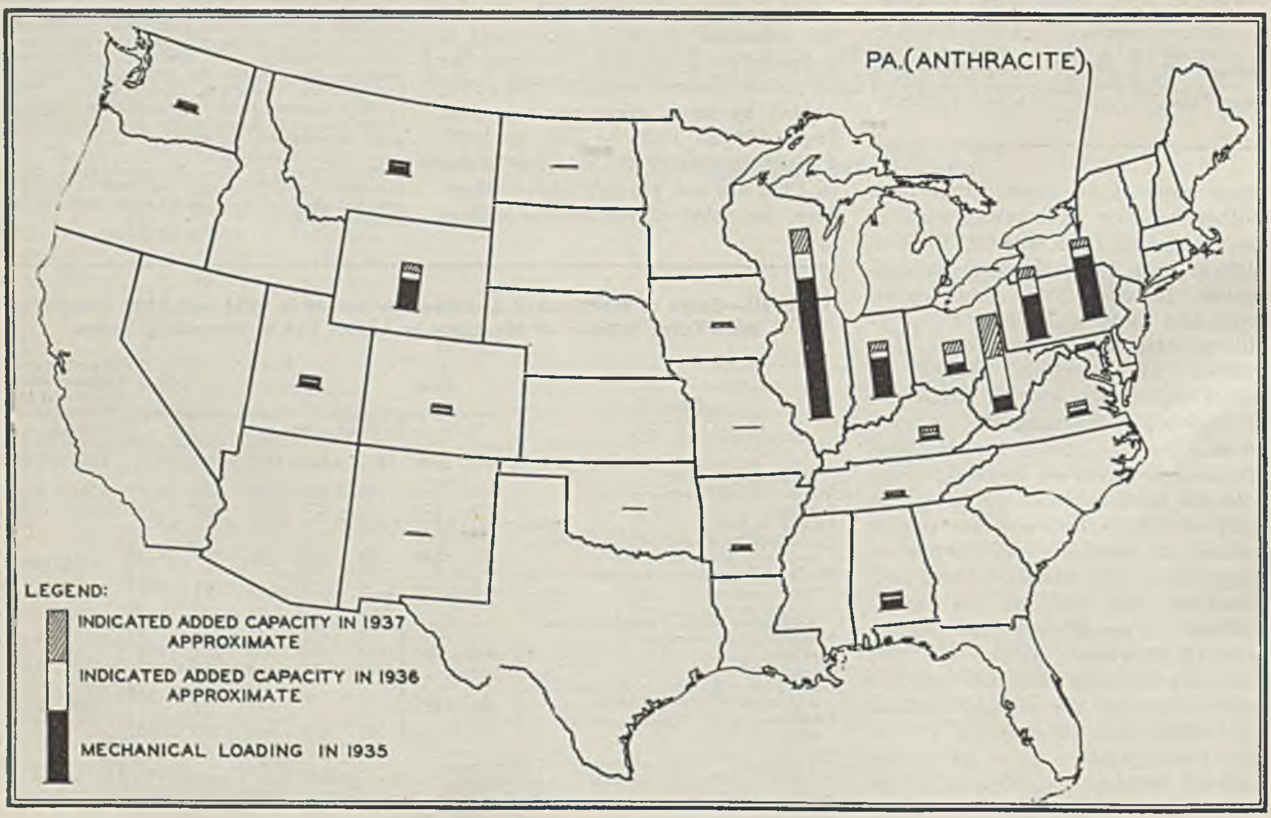
	Mobile loaders			Scrapers		
	In use in 1935	Sales in 1936	Sales in 1937	In use in 1935	Sales in 1936	Sales in 1937
Bituminous						
Northern Appalachian States						
Pennsylvania — Maryland	41	66	23	19	2	....
Ohio	27	22	22	....	....	....
Southern Appalachian States						
West Virginia	38	105	84	3	1	5
Virginia	1	5	8	....	4	1
Alabama	4	9	7	20	5	5
Kentucky	2	5	18	2	....	....
Tennessee	2	....	1	2	1	1
Middle Western States						
Illinois	319	95	81	....	....	....
Indiana	123	22	31	....	....	....
Trans-Mississippi States						
Arkansas, Colorado, Montana, New Mexico, Utah and Wyoming	100	15	22	32	6	2
Total bituminous	657	344	297	78	19	14
Anthracite						
Pennsylvania	1	....	....	507	9	16
Grand Total	658	344	297	585	28	30

conditions have stimulated the process of mechanization. In the last two years, however, market conditions and the trend of wage rates have tended to stimulate mechanization in the Appalachian region, and a large part of the sales of equipment reported by manufacturers in 1937 went to the Eastern and Southern fields.

Fig. 1 shows in a generalized form the regional distribution of sales in relation to preexisting capacity. In this map the tonnage loaded mechanically in 1935, as reported in detail by all mine operators, is shown by the black columns. To these have been added, in white, an indication of the capacity of the equipment purchased in 1936, and also in diagonal shading, the capacity purchased in 1937. The diagram is the roughest of approximations. It makes no allowance for the retirement of machines of obsolescent types which were active in 1935 but have since been replaced by new machinery or for an element of double counting between certain mobile loaders and certain conveyors which are sold for use in conjunction. Accurate figures of the increase in actual tonnage mechanically loaded must await the publication of final statistics from the operators, which will be shortly available. In the meantime, however, the map may suffice to indicate the areas where sales of equipment have been most active.

The largest installations of mechanical loading equipment during the last two years were made in West Virginia. In that State the monthly report of the State Department of Mines gives a current record of the increase in tonnage mechanically mined. From January to November, 1937, a total of 3,664,570 tons of coal was loaded on conveyors in the State and 10,572,634 tons was produced by mobile loaders, scrapers and other devices, eliminating hand shoveling. The total loaded with the aid of the mechanical devices was thus 14,237,204 tons for the eleven months period, indicating that the year as a whole may show a figure as high as 15,500,000 tons. In 1935, the total for the State, as reported by the U. S. Bureau of Mines, was 2,059,322 tons. West Virginia's rise in mobile loading during the last three years has thus been rapid but it should be remembered that only 14 per cent of the State output is as yet produced by mechanical loading while 86 per cent is still shoveled by hand into mine cars. Loading machinery is

Fig 1—Tonnage mechanically loaded in 1935 and approximate capacity of new equipment shipped in 1936 and 1937



mine cars. Loading machinery is also being introduced into eastern and western Kentucky.

Loader and Scraper Sales by Regions—It is not possible to show the sales of each type of equipment in every State without disclosing the business of individual manufacturers, but Table IV gives the sales of mobile loaders and scrapers in the larger States or regions. In 1937, manufacturers reported selling 81 mobile loaders of all types to operators in Illinois. These sales may be compared with a total of 319 machines of similar type in active use in the same State during 1935. Some part of the sales of mobile loaders in this State and in Indiana undoubtedly represent replacement of pit-car loaders.

The largest number of mobile loaders sold in any State in 1937 went to West Virginia. Other areas to which substantial shipments of mobile-type machines were made include western Pennsylvania, Ohio and Kentucky. Sales in smaller volume went to seven other States. Sales of scrapers were consigned largely to areas of special seam conditions where this type of equipment offers particular advantages.

Table V—Comparison of Conveyors in Actual Use in 1935 With Sales Reported in 1936 and 1937, by Regions*

(Includes hand-loaded conveyors and conveyors equipped with duckbills or other self-loading heads.)

	Conveyors in use in 1935*	Sales of conveyors in 1936	Sales of conveyors in 1937
Bituminous			
Northern Appalachian States:			
Pennsylvania	347	77	105
Ohio	....	49	34
Southern Appalachian States:			
West Virginia	71	239	271
Virginia	44	32	16
Kentucky	15	36	106
Alabama and Tennessee	78	55	102
Middle Western States:			
Illinois and Indiana	12	18	19
Trans-Mississippi States:			
Ark., Colo., Iowa, Mo., Mont., Okla., Utah, Wash., and Wyo.	282	176	175
Total bituminous	849	682	828
Anthracite			
Pennsylvania	1,593	312	260
Grand total	2,442	994	1,088

* The figures of number in use in 1935 are not exactly comparable with the number sold in 1936 and 1937 because of uncertainities in defining what constitutes a conveyor. The comparison, however, will serve to indicate which regions have made the largest proportinate increases.

Conveyor Sales by Regions—Table V shows the geographical distribution of sales of conveyors as far as they can be given without disclosing individual business. Manufacturers reported shipments of 828 units to the bituminous coal fields extending from Pennsylvania south to Alabama and from Virginia westward to Washington. In all, conveyors were sold in fifteen States. The largest number sold in any State of the bituminous fields went to West Virginia, particularly to the southern portion. Pennsylvania anthracite mines continued to offer the largest single market for conveyors; sales of 260 conveyor units were reported in 1937 as against 312 in 1936. Most of these were shaker chutes.

BITUMINOUS STRIPPING

+ Featured by Transportation Progress

WITH A NUMBER of new operations either reaching the production stage or under construction, 1937 was a year of greater activity in bituminous stripping. But while stripping and loading equipment again was marked by increases in both size and number of units, perhaps the outstanding developments of the year were in the field of transportation.

Strip-shovel dipper size rose again to 34 cu.yd. in 1937, the capacity of the unit on a new Bucyrus-Erie 950-B machine for No. 15 mine, Pittsburg & Midway Coal Mining Co., West Mineral, Kan. The stripper is accompanied by an 85-B horizontal-type loader. In the same field, the Commercial Fuel Co. installed a Marion 5560 shovel with 32-cu.yd. dipper, 110-ft. boom and 68-ft. dipper stick to recover the 22-in. Weir-Pittsburg seam under 30 to 50 ft. of overburden.

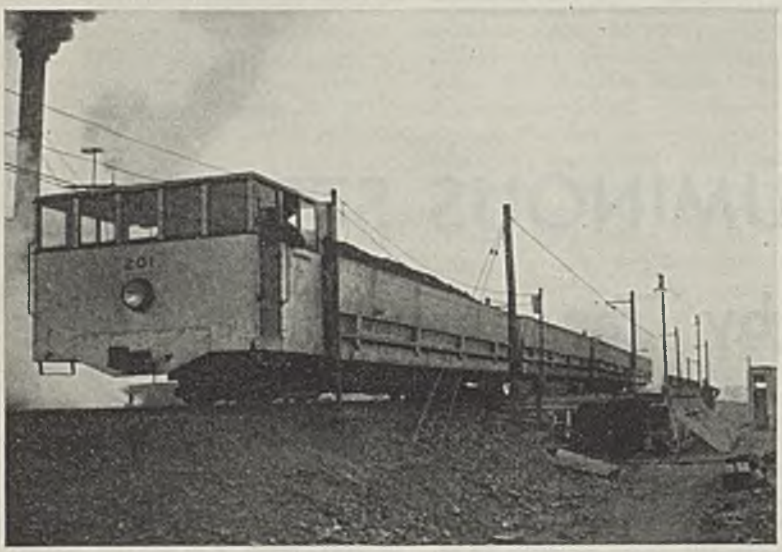
Replacing previous equipment, the Hume-Sinclair Coal Mining Co., Tiger, Mo., put in a Marion stripper with 32-cu.yd. dipper which, in the first month of operation and in spite of the usual breaking-in difficulties, handled over 800,000 cu.yd. of overburden. In Illinois, 950-B shovels were installed in a new pit at the Fiatt operation of the Truax-Traer Coal Co. and at the new Buckheart mine of the United Electric Coal Cos.

Installation of new and larger dippers to increase shovel capacity continued in 1937, while the Maumee Collieries Co. experienced a year of successful operation with a 12-cu.yd. all-electric walking dragline at its Old Glory No. 17, recovering 2½ to 3 ft. of coal under 50 to 58½ ft. of cover, with a little as low as 40 ft. (January *Coal Age,* p. 67). Western Kentucky got its first large-scale stripping with the start of operations by the Sentry Coal Mining Co. with equipment moved in from the Tiger and other Sinclair properties. Ohio also experienced an increase in activity, and stripping began to register gains in Pennsylvania as well.

The first 40-ton tractor-trailer haulage units and the first 30-ton straight truck made their appearance in 1937, along with electric haulage at one pit between a field dump hopper and the tipple. Six 40-ton trailers were installed at Sinclair mines in Missouri. These trailers, made by the company from standard-gage Sanford-Day bottom-dump cars originally purchased for use with track haulage, are pulled by Dart special tractors powered by Hercules HXE engines with a 935-cu.in. displacement and a rating of 198 hp. at 2,000 r.p.m. Trailers are carried on eight wheels, with the same number in tandem on the tractor. Two of these haulage units are in service at the Tiger mine and four at the Mark Twain mine of the Huntsville-Sinclair Mining Co., Huntsville, Mo.

The Sunlight Coal Co., which pioneered the large-capacity W-shaped side-discharging bodies used on Mack truck chassis, installed two 30-ton units last year at its Boonville (Ind.) operation. Original units had a ca-

This Sunlight truck has a capacity of 30 tons.



Enos electric train over the dump hopper at the preparation plant.

Ten-ton end-dump trucks are used for transportation by the Crowe Coal Co.

pacity of 15 tons. With the new unit, the main part of the load is carried on eight wheels in tandem at the rear end of the truck chassis. Air-operated doors in the sides of the body empty the coal to each side.

Large-capacity end-dump trucks also were used in greater numbers in 1937, the Crowe Coal Co., Clinton, Mo., offering an example of this practice. After contracting haulage for six years, the Crowe organization last year installed a fleet of eight International Harvester six-wheel trucks with a capacity of 10 to 11 tons of coal. Making an average of 19 to 20 round trips of five miles each per shift, the trucks handle about 1,600 tons of raw coal, and in addition haul about 260 tons of refuse back to the pit for disposal. With the advent of company haulage, a 30x128-ft. garage and shop (welded-pipe framework and corrugated-metal siding and roofing) was constructed. All trucks are washed at the end of each shift, and at the end of every operating day one of the units is carefully inspected and lubricated.

Tandem Trailers Increase

Tandem operation of trail cars gained a few more adherents in 1937. The Buckheart haulage plan, for instance, is laid out with the idea of using semi-trailers while the distance is short and then adding a full trailer to each unit for longer distances. Austin-Western trail cars with a capacity of 25 tons each are employed, making the tandem capacity 50 tons. The trail cars are pulled by Walter four-wheel-drive tractors with automatic-locking transmission to insure traction even though one or more wheels are off the ground.

With the advent of automotive equipment, a number of stripping operators adopted the principle of two-stage haulage, using tractor-trailer units for work in the pit and steam equipment for the main haul from a field-transfer station to the preparation plant. In 1937, the Enos Coal Mining Co., Oakland City, Ind., eliminated steam locomotives and small-capacity side-dump cars in favor of Differential electric trains, with a substantial reduction in per-ton cost. Three electric trains, each consisting of an electric locomotive, also carrying a pay load, and three cars, are in service and are designed to haul an average of 5,000 tons in seven hours over a one-way distance of 4½ miles. An article on the Enos system is scheduled for future publication.

Overburden drilling practice in

1937 was distinguished by a trend toward the use of combination setups such as well-type and horizontal drills, United Electric's Fidelity No. 11 mine, and horizontal drills and vertical overburden augers, Delta Coal Mining Co. The increased flexibility enables drilling and shooting to be better adjusted to the type of overburden encountered and reduces the cost. Delta in 1937 brought out an improved type of vertical overburden auger, featuring tractor mounting and a quick method of handling auger lengths.

Tractor-powered scrapers made substantial gains at strip pits in the last year. In general, this equipment was used for road construction, dam building, opening box cuts and miscellaneous overburden work, although in a few cases it was reported to be the sole stripping medium, as at the Hanna (Wyo.) operation of the Nugget Coal Co., where a 12-cu.yd. LeTourneau "Carryall" machine is removing 6 to 30 ft. of soil and clay over 30 ft. of coal, which is loaded by a dragline.

Railroad grade and dam work in opening the new Buckheart plant fell largely to four 7-cu.yd. Continental wagon scrapers powered by Allis-Chalmers "SO" and "L" tractors and two 4½-cu.yd. Bucyrus-Erie wheeled scrapers operated by International Harvester TD40 and Caterpillar RD6 tractors. The railroad grade, with a length of roughly 2½ miles, involved the movement of about 300,000 cu.yd. of dirt; average cut was 15 ft.; maximum, 40 ft. Construction of dams, truck-haulage roads and building sites involved an additional 200,000 cu.yd. of dirt, a large part of which also fell to the scraper units, the six of which worked about 120 days of 21 hours each. Stripping and preparation at Buckheart will be described in articles scheduled for March publication.

Truax-Traer mines in Illinois were equipped with late-type power sweepers for cleaning off coal in front of the loading shovel. In essence, the sweepers consist of revolving brushes mounted on tractors, and the 1937 units represent the culmination of a long investigation by coal-company officials.

Improvement of strip-mine spoil banks made gains in 1937. In Illinois, and particularly in Fulton County, the question assumed aspects bordering on the serious as a result of public reaction to late developments. Consequently, interest in tree-planting and other improvement programs was marked, with the State Forestry Department offering its cooperation, particularly from the tree-planting angle.

In Indiana, where tree-planting has been carried on under the direction of the Indiana Coal Producers' Association since 1928, probably 1½ million trees will be set out in 1938. Trees are purchased from the Indiana Department of Conservation by the association, which then apportions them among its membership and bills them for their cost. Planting is done by the operators, using casual labor and supplying their own tools, with supervision by the State. Up to the end of 1937, trees set out numbered about 3¼ million. In addition to tree-planting, individual operators have embarked on special improvement programs, including in certain cases the donation of acreage and housing facilities to the Boy Scouts and other organizations.

OPERATING DEVELOPMENTS

+ Forecast Greater Need for Engineering

By PAUL WEIR
Mining Engineer, Chicago

THE DEGREE and extent to which the engineering sciences are applied to the solution of problems arising within any industry largely determines the direction in which that industry moves. Naturally, there are economic forces to which engineering principles cannot be applied, but, generally speaking, in the fields of design, production and utilization, proper and sufficient engineering is necessary and essential for the success of an industry as a whole and of the individual units in any given industry. Indirect costs in the form of penalties which arise out of a paucity of engineering invariably are greater than the direct costs, with the resulting benefits, of having it. No monopoly based upon natural laws alone survives indefinitely for the reason that engineers and scientists accept the challenge offered and proceed to develop substitutes. The coal industry is not exempt from these generalizations.

It is worth while to state the situation which surrounds the coal industry today. Knowledge of these conditions is essential in the application of engineering principles to the various problems. The natural conditions of roof, bottom, thickness of vein, inherent quality of coal, inclination of vein and geographical location are things over which no one has control. They must be accepted as they are. Coal's so-called monopolistic grip on the energy market has been badly shaken by natural gas, fuel oil and hydro-electric power. Convenience and cost are the factors involved.

Mine labor is almost completely unionized and a related, universal wage scale on a relatively high basis, with a seven-hour work day, is in effect. Certainly the trend of wage scales is not downward. Coal is confronted with an ever-increasing cost of transportation to markets, which usually exceeds the market value of the coal. Minimum mine prices for all sizes and grades of bituminous coal, based on weighted average costs of production, recently have been established by the National Bituminous Coal Commission.

Higher wage scales, higher freight

rates, and elimination of sales below cost of production result in higher destination prices for coal, which in turn result in a decrease in consumption. This decrease in consumption arises out of the increased use of substitute fuels, the prices of which are not regulated except by the law of supply and demand. Likewise, consumers, in face of higher costs of coal, make every effort to counteract the effect by greater efficiency in utilization. All these factors add to the engineer's importance in achieving the improvement in product and reduction in cost essential to the coal industry.

In analyzing any problem the engineer proceeds to determine the facts, arrange them in proper perspective and then to deduce from them his conclusions and recommendations. These considerations, while general, are fundamental. Their proper application taxes the ingenuity of the engineer. With the vast increase in the amount of machinery and equipment, and with the improvements in the design and construction of such, the trend in engineering as applied to mining is toward a closer observance of these fundamentals, coupled with a willingness to seek out facts and look critically on inherited practices.

THE HOPE of the coal industry to maintain or to increase its proportionate share of the available market for fuels lies in providing a better product at a cheaper cost of production. The solution to this problem is to be found very largely in the development and application of cost-reducing machinery, equipment, practices, and systems of mining. It is the task of the engineer.

The approach to this problem of cost reduction is the same whether the mine is strip or underground, whether it is now employing hand loading or mechanical loading, or whether it still is in the embryonic stage. Likewise, it is the same regardless of the present degree of operating efficiency.

Reduction in cost of production may come through capital expenditures for additional or improved equipment, from changes in systems and practices, or from a combination of the two.

When capital expenditures are involved, the problem consists in balancing the amount of such expenditures against resulting reductions in production cost, at the same time taking into account the effect of possible changes in the sales realization of the product.

Existing mine layouts are the result of years of trials to obtain systems which would produce the desired recovery of coal at what may be considered a reasonable cost. There is a hesitancy, and rightfully so, in the adoption of new entry and room centers and widths. Mechanical mining frequently introduces a change in the "time element," as the life of the individual working place may be shortened by one-half to two-thirds. Such reduction may permit advantageous changes in centers and width of rooms and entries without affecting the percentage of recovery. Bucky, in the January, 1938, *Coal Age,* p. 61, presents a study of the fundamentals of roof control, a knowledge of which is essential when considering changes.

In the highly mechanized mines of southern Illinois, pillars are not extracted. The percentage of open work on the advance is kept at a point just below that which might bring on a squeeze. A rearrangement of centers and widths of rooms and crosscuts while maintaining the same percentage of open work results in an increase of 60 per cent in coal available for loading for each move into a room and a corresponding reduction in the number of moves into a place during its life. Crosscuts serve for more than just ventilation.

Larger Falls Advantageous

The advantages of altering prevailing dimensions wherever possible to provide larger quantities of coal per fall are evident, not only in loading but also in cutting, drilling, shooting and transportation. Greater concentration of work follows. The fewer the number of moves per loading machine per shift, the greater is its production. The same may be said for cutting and drilling. At the same time, the smaller is the investment in track and copper.

The great variety of loading, cutting, drilling and transportation equipment (locomotives, cars, conveyors and tractors) now available permits flexibility in selection and application of machines that go to make up a loading unit. The combinations which are possible assist in fitting the unit to existing natural conditions.

At present there are available two sizes of track-mounted and four sizes of caterpiller-mounted machines. However, under extremely difficult natural conditions, replacement of

Blank & Stoller

Paul Weir

hand loading may not yet be profitable.

For cutting there are four general kinds of track-mounted machines: namely, straight cutting, slabbing, cutting and shearing, and shearing. Shortwall machines may be moved on track-trucks or on caterpillar-trucks. In addition to these there are longwall machines and longwall-shortwall combinations, as well as shortwall top cutters.

Transporting coal from the face to the preparation plant may be done by conventional locomotives, cars and track. Conveyors may replace cars and track between the face and the mouth of the room. At times a mother belt conveyor may replace the panel-entry track. In several mines track has been completely replaced by conveyors. "Automotive" haulage also makes track unnecessary in panel entries and rooms.

The coal may be drilled by hand or by an electric drill mounted on a truck or on a post, or held by hand, and may be dislodged by permissible or black powder, by Cardox or Airdox or by a hydraulic cartridge.

A comparison of existing equipment and devices with those available five or ten years ago reveals trends. The small-sized loading machine, the universal cutting machine, long portable conveyors, and automotive haulage are quite recent contributions. Present trends are toward equipment suitable for use in thinner veins and inferior natural conditions and also toward improvement in performance in thicker veins.

The selection of the individual pieces of equipment that go to make up a loading machine unit depends primarily upon the natural conditions of vein, roof and bottom. Obviously these things automatically eliminate some types of machines. In addition to this, consumer requirements, present mine layouts and the necessity for using existing equipment impose further restrictions on choice. Furthermore, the individual pieces must synchronize one with the other into a harmonious unit.

While the recovery of coal is the objective of strip mining, it may be considered, from an engineering standpoint, as incidental to a mammoth job of excavation. For this reason the future of strip mining is closely associated with engineering developments in methods and equipment for moving tremendous quantities of rock and dirt.

Complete Data Required

In the past, data on performance of individual pieces of equipment have been to some extent incomplete. Results were not interpreted in terms of favorable or unfavorable natural conditions. At the present time there is available the experience arising out of many successes and failures. A study of the reasons for success and failure furnishes a basis for establishing programs for improvements. The trend is toward the creation of complete programs which tell the expenditure, the expected reduction in cost of production and the effect on the market value of the coal. Experiments in selection of equipment can be held to a minimum and standardization adhered to.

Service and production records are not always readily available. Past records, for the majority of mines, are incomplete. In addition, the breakdown of costs is not always sufficient to provide detailed information. Inquiry as to methods sometimes reveals "excuses" instead of "reasons" for procedure. Likewise, because of lack of proper records, misleading information is circulated.

The importance of proper service records of equipment, materials and supplies is evident. Without such records, decisions on kinds of materials is haphazard and inconclusive. Schedules for systematic maintenance are based on service records. Daily cost sheets showing operating and maintenance charges for the individual units as well as for the mine as a whole are indispensable if good engineering practices are to be followed. Variations in performance require investigation. Carefully planned and executed time studies on the performance of equipment reveal chances for improvements. They also assist in properly relating individual operations.

In those mines in which improvements in performance are sought, there is a growing appreciation of the value of useful records. The figures extending down the right-hand side of the cost sheet are being scanned as carefully as those at the bottom.

Closely related to the growth of mechanization of loading is the increase in mechanical cleaning. In some districts they move hand in hand. No small number of cleaning plants have been built without adequate knowledge of the nature of the cleaning problem from the standpoint of washability of the coal and from the standpoint of market requirements. Engineering studies based on properly taken samples of raw coal and on an understanding of market requirements will reveal the most economical method, or methods, of cleaning, the quantity of reject to be expected and the quality of the cleaned coal. Mechanical cleaning in some cases is necessary to make a coal salable, regardless of price. In other cases the degree of improvement plus the cost of cleaning must be offset by an increase in sales value of the coal. There is increasing recognition of the fact that each mine presents a special problem in cleaning.

Much that has been said about the operation and maintenance of underground equipment applies equally as well to mechanical cleaning plants. There is no substitute for daily records of plant operation. Haphazard control without continuous tests results in a product containing too much refuse, a refuse containing too much coal, or both. There is increasing recognition that close attention to plant control results in additional coal recoveries and in greater consumer satisfaction.

Production costs, actual or estimated, should be based upon the quantity of cleaned coal actually prepared for the market. Costs based upon the amount of feed to the preparation plant, while reflecting an apparent lower cost per ton, are misleading.

Closely related to modern preparation of coal is the matter of its most economical utilization. The combined effect of intense competition in the fuel market and increased consumer demand for better fuel has developed the practice of rendering engineering service to the consumer. Combustion engineers, with an intimate knowledge of their coals and of combustion equipment, endeavor to provide the consumer with greatest economies of operation. At the same time the producer is discovering the necessity for a better understanding of the physical and combustion characteristics of his coal in order to apply the most suitable qualities and sizes of coal to existing types of combustion equipment. Information and data, too often considered in the past as having academic value only, are being sought out, studied and put into practical use.

Safe Operation Necessary

Safety is and must be a primary consideration in the development of methods and design of equipment. It is worthy of note that in those mines in which engineering has produced a high degree of efficiency, accident prevention work has been intensified.

Progress during the past 10 exceeds that of the earlier 20 or 30 years. The pressure of intense competition has been the chief cause. However, the willingness of the engineers to critically examine traditional methods and equipment, to effect improvements and to adapt the tools of other industries to their own has been the means by which progress has been made. As long as there exists the necessity for a better product at a cheaper production cost there is every reason to believe that the cooperative efforts of the engineering staffs of producers of coal with those of manufacturers of mining equipment will continue. There are no signs of a respite from the intense competition of the present. Improvements during the next ten years should completely overshadow those of the past decade.

BITUMINOUS PREPARATION

+ Registers New Gains in 1937

BITUMINOUS COAL preparation enjoyed what might be termed a mild boom in 1937, measured both in terms of facilities installed or modernized and in new plant designs, equipment and preparation techniques. The trend toward the junior sizes continued under the impetus of household-stoker gains and was evidenced by the activity in the installation of crushing, rescreening and dedusting facilities, supplemented by equipment for removing tramp iron. Along with this was a substantial increase in the output of dustproofed coal.

Wet washing made further strides in a year marked by the introduction of two new types of equipment, as well as the development of so-called "self-contained" washing units embodying established cleaners and the necessary auxiliaries in a compact unit to be added to an existing plant with a minimum of alterations and construction. More operators in 1937 went to the practice of washing coal up to 6, or even 7, in. in size. A factor in this trend was the definite cost reduction in many instances, as compared with hand picking, particularly at mechanical mines, coupled with a greater degree of uniformity. For appearance's sake, however, some operators found it advisable to have a picker or two follow washers operating on large coal, even though technically they were doing well.

Dry cleaning was marked by substantial progress, and there was an increase in the number of combination plants. The primary objective in most cases was avoidance of water difficulties. Two of the air plants installed last year were distinguished by dustproof design, with excellent results at a reasonable cost. In the wet-washing field, installation of drying equipment to reduce moisture in the fine sizes sufficiently to prevent freezing gained greater momentum in 1937, with mechanical or heat systems, or combinations, increasing in number. Heat-drying screens made their appearance, along with a cooling table.

Reduction of losses through retreatment of certain, or all, refuse fractions or the recovery of part or all of the very fine material formerly wasted under a number of preparation set-ups attracted increased attention last year and was reflected in several equipment installations. Growing interest in pyrite recovery, particularly in the Middle and Southwest, was reflected in a few installations in addition to those made in previous years, although uncertainty as to market possibilities was a deterring factor in the case of several proposals. Stoker-coal growth, in addition to the other activities outlined at the beginning of this article, also resulted either in the adoption of mechanical-cleaning equipment for this grade or in its addition to sizes already being treated. As a corollary, mixing or blending facilities registered a gain.

Legislation Enters Picture

Legislation and federal regulation, in addition to that governing stream pollution, made their appearance in 1937 as factors either actually or potentially affecting coal-preparation practice. St. Louis, for example, passed smoke-prevention legislation embodying, among other things, a provision that all coal smaller than 2 in. containing more than 12 per cent ash or 2 per cent sulphur (dry basis) must be washed, supplementing this with a provision that coal larger than 2 in. must be handpicked or otherwise cleaned to reduce the visible impurities to a maximum of ¾ per cent. A contest in the federal court was decided in favor of the city. As a result, washing plants went in at a number of Illinois mines serving the city, while other preparation methods were tightened up.

Possibility of a substantial modification in crushing practice was an outgrowth of the promulgation late in December of price schedules under the Bituminous Coal Act of 1937, although the particular provision bearing on this practice later was suspended. Under this provision, code members were forbidden to sell "any coal crushed or pulverized at a price less than the minimum price established for the grade and size of coal before the crushing or pulverizing process, plus 5c. per net ton." A rule that at least 10c. must be added to the price of dustless-treated coal also met with protests from producers.

A striking feature of 1937 preparation developments was the impetus given to that type of plant design marked by structural simplicity and arrangement of equipment for greater operating efficiency and more convenient access. An outgrowth of an evolution in thinking by designers, this type of plant also is marked, in a number of cases, by a new outward dress embodying, in its ultimate manifestations, a liberal use of squared forms and long unbroken masses of glass or other liberalization of exterior aspects to provide a more distinctive appearance and thus leave with the visiting layman or coal buyer the impression that "only good coal could come from such a beautiful plant," not to mention its effect on the morale of the operating force.

With the more complicated flowsheets of today the design principle in question yields at the same time a plant layout distinguished by roominess and convenience, in addition to other advantages such as the following: safety and easy access to equipment by adequate walkways, clearances and proper guarding; better natural and artificial lighting; improved ventilation, insulation and resistance to fire; reduced plant upkeep, etc., all directed toward a more efficient operation.

Of the plants either built or contracted for in 1937, those of the Sentry Coal Mining Co., Madisonville, Ky.; Kelly-Carter Coal Co., Garland, Kan.; and the Kelleys Creek Colliery Co., Maidsville, W. Va. (McNally-Pittsburg), are distinguished by the characteristic squared forms and window arrangements of the modernistic type. In the case of the new Jeffrey plant placed in service at Jasonville, Ind., by the Hickory Grove Coal Mining Corporation, lines and form have been determined primarily by functional objectives. At the same time, utilitarian aspects have been liberalized to modernize the exterior.

Among the new wet washers making their appearance in 1937 was the Koppers-Battelle launder installed at the Nellis (W. Va.) mine of the Nellis Coal Corporation to treat minus $\frac{3}{16}$-in. coal classed as "difficult" to clean (January *Coal Age,* p. 43). Essentially, the launder is a trough with a series of wedge-shaped pockets in the bottom, each of which is supplied with controlled upward currents of water. The object of the wedge-shaped pockets is to crowd the refuse particles as they deposit from the moving mass of coal, thus closing up the spaces between the particles of refuse and keeping it free from coal. Deposition of clean refuse is further aided by the use of the controlled upward currents of water.

New Washer Makes Bow

The new Prins washer, installed in Morrow additions to plants of the Knox Consolidated Coal Corporation, Bicknell, Ind., and the New York Coal Co., Chauncey, Ohio, both treating 3x1¼-in. material, consists of a combination launder and oscillating basket submerged in water in a tank. Water currents are arranged so that the coal is carried forward and upward while the refuse works backward against the water to the bottom of the tank.

Of the new "self-contained" washeries, an example in 1937 was the installation at the Raven (Va.) mine of the Raven Red Ash Coal Co. This unit, with a capacity of 60 tons an hour, comprises a Jeffrey diaphragm jig, water-circulating and clarifying system, dewatering screen and conveyor equipment for raw and washed coal and refuse.

Washers handling a wide range of feed were led by a McNally-Norton automatic unit added to the plant of the Hume-Sinclair Coal Mining Co., Hume, Mo., to handle 7x0-in. coal at 250 tons per hour. Two Jeffrey Baum-type jigs will be used by the Mackie-Clemens Coal Co., Mulberry, Kan., to clean 6x0-in. coal at 350 tons per hour. Other 6x0-in. installations (McNally-Norton) include: Kelly-Carter, Pittsburg, Kan.; Sentry, Madisonville, Ky.; and Truax-Traer, Fiatt, Ill. A McNally-Norton washer also will handle 5x⅜-in. coal at the new Kelleys Creek plant, while the new Pursglove Coal Mining Co. plant, Pursglove, W. Va., is designed to clean 5x¼-in. coal in a Chance cone.

At the other end of the scale, the Alabama By-Products Corporation installed a Deister-Overstrom "Diagonal-Deck" coal-washing table at its Colta (Ala.) operation for treating 14x48-mesh material, with a clean-output capacity of 2½ tons per hour. To prepare boiler fuel, the Antioch Power Co., Linton, Ind., owned by the Sherwood stripping interests and supplying current primarily to near-by mining operations, installed two "Plat-O" coal-washing tables with a capacity of 40 tons per hour to handle the $\frac{3}{16}$x0-in. undersize from rinsing screens in two adjacent washing plants.

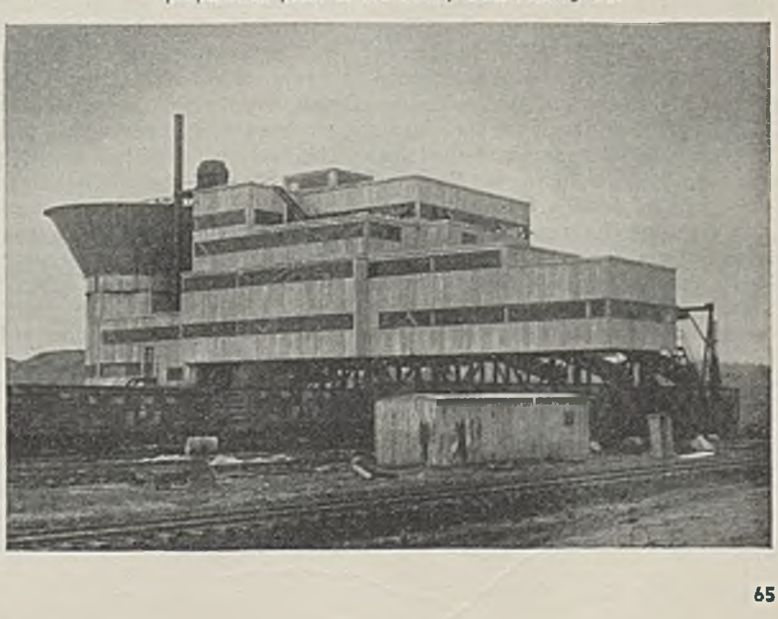
Air-cleaning equipment was put in in 1937 to handle coal from ¼x0 up to 2¾x0 in. The Monroe Coal Mining Co., Revloc, Pa., placed additional Stump "Air-Flow" equipment to clean minus ¼-in. material, supplementing a Menzies hydrosepator addition to handle 4x2-in. coal. On the other hand, the Goose Creek Mining Co., Garrett, Ky., installed an American pneumatic separator and auxiliary equipment for treating 2¾x0-in. coal.

The major examples of new combination plants in 1937 were those contracted for by the Berwind-White Coal Mining Co., St. Michael, Pa. (Chance cones for 4x¾, Stump "Air-Flow" equipment for ¾x0, plus a Dorr thickener), and the Island Creek Coal Co., Holden, W. Va. (Menzies hydro-separators and Stump units). Pittsburgh Coal Co. converted its Champion No. 6 plant, Negley, Ohio, into a combination operation by adding 4-ft.-wide Stump units for ⅜x0-in. coal to existing Rheolaveur equipment. At the same time the air plant was rendered completely dustproof by inclosing all conveyors, tables, screens, etc., in housings with pitched or gasketed joints (January *Coal Age,* p. 52), in addition to suction ducts to dust-collecting equipment where necessary. Ducts also were run to the original wet-washing side to take dust away from screens, conveyor discharges, etc. Finally, to gather any dust that might leak out, a two-unit United States-Hoffmann vacuum-sweeping plant was installed.

In ranges under 5 in., a number of mechanical cleaners were installed for treating 4x0 coal, grading from there down through 3x0, 2x0, 1¼x0 and 1x0 to ¼x0 coal. In addition, several nut, pea or similar cleaners were installed during the year, such as a Jeffrey diaphragm jig for pea by the Phelps Dodge Corporation, Dawson, N. M., and a chloride washer for stove at Jewell Ridge, Va., by the Jewell Ridge Coal Corporation, which also put in a McNally-Norton pick breaker for sizing extra large lumps and hot-oil treating equipment for all sizes of coal (also at Jewell Valley). Hydroseparators were adopted at the Bartley (W. Va.) Nos. 1 and 4 mines of the Pond Creek Pocahontas Corporation for 1½x¼-in. coal. No. 1 also furnished an example of the growing practice of rescreening after washing this or similar sizes, using vibrators to separate the cleaned coal into 1½x¾- and ¾x¼-in. fractions.

In the realm of reducing coal

Squared forms and long stretches of gleaming glass feature the modernistic preparation plant of the Sentry Coal Mining Co.



Liberalization of the utilitarian aspects dresses up the appearance of the new plant of the Hickory Grove Coal Mining Corporation

losses, installations included provisions for re-treating either very fine material, crushed pickings or refuse from other mechanical-cleaning units. The Midland Electric Coal Corporation, Farmington, Ill., completed early in the year a Rheolaveur fine-coal installation for re-treating secondary jig refuse, after crushing to minus 3/8 in., as well as minus 1/16-in. coal from the vibrating dewatering screens following the main washing units.

An Island Creek plant, Holden, W. Va., included provision for a Jeffrey Baum-type jig to handle refuse from the main wet-washing units, while a McNally-Norton washing addition to the St. Louis Coal Co. plant, Coulterville, Ill., is arranged so that pickings may be crushed and run to the cleaner. A Deister-Overstrom "Diagonal-Deck" coal-washing table to handle jig refuse was installed by the Sloss-Sheffield Steel & Iron Co., Lewisburg, Ala., and the Northwestern Improvement Co., Roslyn, Wash., added re-wash jigs. Equipment for the Chance p'ant of the Westmoreland Coal Co., Yukon, Pa., includes a Bradford breaker and also a Cochrane plant for treating the mine water to be used in washing.

In dewatering coal, other than in cases where shaking or vibrating screens were used, the trend was toward a combination of centrifugal and heat-drying units, although in certain instances operators selected only one type, such as at the St. Ellen mine, Perry Coal Co., O'Fallon, Ill., where new washing equipment was rounded out by centrifugal drying. Also, equipment at the Champion No. 1 plant, Pittsburgh Coal Co., was supplemented by two Carpenter centrifugal units for 3/8x0-in. material.

To complete the Hickory Grove plant noted above, installation of a drying plant was under way at the end of the year to handle minus 1-in. coal. The plant is equipped with both centrifugal and heat-drying equipment, and is arranged so that the coal may be centrifuged alone or centrifuged and dried. Combination drying also features the new metallurgical-coal plant of the Weirton Coal Co., Isabella, Pa., equipped with two Link-Belt Simon-Carves washing units. Equipment in the drying and blending plant includes both Carpenter centrifugal and heat dryers.

A heat-drying screen developed by the Island Creek Coal Co. was installed in the new Rheolaveur preparation plant at the Buckheart strip mine of the United Electric Coal Cos. (to be described in the March *Coal Age*). The screen is a high-speed unit over which is installed a hot-air hood and under which is a suction casing. Heated air is pulled down through the coal on the screen by a fan. Buckheart plans call for drying the 1¼x1/16-in. size over this screen down to the inherent moisture, so that this coal, when mixed with minus 1/16-in. coal from Carpenter dryers, or other washed coal, will tend to take up moisture and thus reduce the content of the mixture.

The first Vissac dryer in the United States was installed last year by the Northwestern Improvement Co., Washington. This dryer consists of a horizontal wedge-wire screen deck with a reciprocating drive. Heated air passes down through the coal on the screen in pulsations, which are synchronized with the movement of the deck so that the coal bed is distended while the air is passing through it. Good results are reported. In the same field, the Roslyn-Cascade Coal Co. installed a Link-Belt cooling table after its Ruggles-Cole dryer. Length of the water-jacketed table is 100 ft.; width is 3 ft. Passing the hot coal over the table by means of a chain conveyor eliminates the possibility of fire in transit.

Activity in plants for the preparation of coal by screening and handpicking again marched with activity in mechanical preparation. A major feature was reconstruction of existing plants by the addition of picking tables, mixing conveyors, rescreening and dedusting equipment and crushers either to improve preparation or make possible the production of an additional size or sizes. The Colorado Fuel & Iron Co., for example, rebuilt its Frederick tipple and installed a new crusher. A new screen was installed by the Culgun Coal Co., Amsterdam, Ohio. Rotary dumps and tipple equipment were added by the Pardee & Curtin Lumber Co., Bergoo, W. Va., and the Boone County Coal Corporation, Monclo, W. Va., with tipple equipment for the McLaren Coal Co., Carterville, Ill. These examples are only part of a comprehensive list that could be prepared on 1937 improvements.

Rescreening Plants Gain

Rescreening plants were a further preparation item last year, not only in new picking and screening operations but as additions to existing plants. Purposes in general were two: production of additional sizes, usually the smaller, or dedusting. The installation of the Freeman Coal Co., East St. Louis, Ill., is an instance of the latter practice. Use of high-speed shakers for dedusting also continued in 1937, supplemented by the adoption of special equipment for this purpose, as at the Orient (Ill.) No. 1 mine of the Chicago, Wilmington & Franklin Coal Co., which put in two Birtley dedusting units with a combined capacity of 170 tons of 1/16x0-in. coal per hour.

Activity in rescreening for the production of additional sizes was reflected in installations by the Clinchmore, Crummies Creek, Eastern Coal, Standard Brazil Block and other companies. Supplementing a previous rescreening plant, Stonega Coke & Coal Co., Derby, Va., put in a blending plant consisting of track hoppers, feeder elevators and conveyors, and steel storage bins for 1½- or ¾-in. x 10-mesh coal. Similar activity in rescreening naturally featured a number of plants using mechanical-cleaning equipment.

Most rescreening, and in fact a majority of all screening of fine coal, was done on vibrating equipment in 1937. In addition, vibrators made further gains in the field of large-coal sizing, with Robins tipples for the Carbon Fuel Co., South Carbon, W. Va., and the National Mining Co., Sygan, Pa., equipped to perform all screening operations on Gyrex or Gyrex and Vibrex units.

New Features Adopted

Several of the 1937 tipples incorporated departures from usual practice. A jury table with a capacity of 50 to 60 cars per day was included in the Page (W. Va.) installation of the Koppers Coal Co., along with automatic sampling of mine-run. The Kemmerer (Wyo.) plant of the Kemmerer Coal Co. was equipped with loading booms for either gondola or box-car loading, using storage conveyors with the booms to allow continuance of tipple operation while loading box equipment. Apron-type picking tables on shuttling frames (an improvement over equipment installed previously at another operation of the company) were incorporated in the Keen Mountain (Va.) plant of the Red Jacket Coal Corporation (to be described in a coming issue of *Coal Age*). Each table discharges over a degradation screen of the shaking or vibrating type.

Centralizing preparation in the Wayland (Ky.) division, the Elk Horn Coal Corporation started up a new Fairmont plant with a capacity of 600 tons per hour late in 1937. A feature of the plant is the installation of crushing, screening and blending facilities to process the entire feed into stoker sizes—either domestic or commercial—if desired (*Coal Age*, November, 1937, p. 61).

Stoker-coal considerations, in addition to influencing crusher installation, also brought magnetic equipment for the removal of tramp-iron more into the picture in 1937. Magnetic pulleys made gains, particularly as a means of removing iron before the coal entered a rescreening plant, with activity continuing in the installation of chute-type equipment.

Crushing developments last year took several directions: i.e., reduction of unmanageably large lumps in raw mine-run, reduction of prepared sizes to make smaller sizes that could be moved more easily and

New Bituminous Preparation Facilities in 1937*

Coal Company	Plant Location	Capacity, Net Tons per Hour	Preparation Equipment
Alabama By-Products Corporaion	Colta, Ala.	2[1]	Deister Concentrator[2]
Antioch Power Co.	Linton, Ind. (2)	40	Deister Machine[3]
Berwind-White Coal Mining Co.	St. Michael, Pa.	140	Roberts & Schaefer[4]
	St. Michael, Pa.	250	United Engineers[5]
Black Hawk Coal Corporation	Terre Haute, Ind.	120	Jeffrey[6]
Brookside Pratt Mining Co.	Blossburg, Ala.	60	Jeffrey[6]
	Blossburg, Ala. (2)	30	Deister Machine[3]
	Lindbergh, Ala. (2)	30	Deister Machine[3]
Brown Coal Co.	St. Louis, Mo.	50	Jeffrey[6]
Butte Valley Coal Co.	Walsenburg, Colo.	15	Link-Belt[7]
Carbon Fuel Co.	Carbon, W. Va.	50	Roberts & Schaefer[4]
	South Carbon, W. Va.	200	Robins
Carbon Glow Mining Co.	Carbon Glow, Ky.	75	American[8]
Central States Collieries, Inc.	St. David, Ill.	200	Link-Belt
Chafin-Jones-Heatherman Coal Co.	Peach Creek, W. Va.	40	Kanawha[8]
Chicago, Wilmington & Franklin Coal Co.	Orient, Ill. (2)	170	Koppers-Rheolaveur[9]
Clinchmore Coal Mining Co.	Clinchmore, Tenn.	125	Morrow[10]
Colony Coal Co.	Rock Springs, Wyo.	225	McNally-Pittsburg[16]
Colorado Fuel & Iron Co.	Valdez, Colo.	250	Link-Belt
Colorado & Utah Coal Co.	Mt. Harris, Colo.	100	Link-Belt
Continental Coal Co.	Cassville, W. Va.	275	Jeffrey[11]
Crummies Creek Coal Co.	Crummies, Ky.	300	Morrow[10]
Crystal Block Coal & Coke Co.	Buchanan Co., Va.	...	Jeffrey
Culgun Coal Co.	Amsterdam, Ohio	125	Morrow
Douglas Coal Co.	Fireco, W. Va.	50	American[8]
Eastern Coal Corporation, Inc.	Hardy, Ky.	200	Morrow[10]
Elk Creek Coal Co.	Amherstdale, W. Va.	250	Link-Belt
Elk Horn Coal Corporation	Wayland, Ky.	500	Fairmont
Emerald Coal Co.	Hillsboro, Pa.	400	Morrow
Franklin County Coal Corporation, Inc.	Herrin, Ill.	165	Link-Belt
Freeman Coal Co.	E. St. Louis, Ill.	200	Jeffrey[10]
Goose Creek Mining Co.	Garrett, Ky.	50	American[8]
Hanna Coal Co.	St. Clairsville, Ohio	75	Link-Belt
Hickory Grove Coal Mining Corporation	Jasonville, Ind.	300	Jeffrey[11]
	Jasonville, Ind.	75	Jeffrey[12]
Hume-Sinclair Coal Co.	Hume, Mo.	250	McNally-Pittsburg[13]
Island Creek Coal Co.	Holden, W. Va.	600	Roberts & Schaefer[14]
	Holden, W. Va.	250	Jeffrey[15]
Kelleys Creek Colliery Co.	Maidsville, W. Va.	350	McNally-Pittsburg[13]
Kelly-Carter Coal Co.	Garland, Kan.	250	McNally-Pittsburg[13]
Kemmerer Coal Co.	Kemmerer, Wyo.	200	Jeffrey
Kemmerer-Gem Coal Co.	St. Charles, Va.	250	Fairmont
Knox Consolidated Coal Corporation	Bicknell, Ind.	110	Morrow[16]
Koppers Coal Co.	Page, W. Va.	400	Koppers-Rheolaveur
Laurel Smokeless Coal Co.	Laurel Creek, W. Va.	40	American[8]
Lumaghi Coal Co.	Collinsville, Ill.	120	Jeffrey[6]
Mackie-Clemens Coal Co.	Mulberry, Kan.	350	Jeffrey[11]
Maumee Collieries Co.	Linton, Ind.	250	McNally-Pittsburg[17]
Martin Mining Co.	Martin, Pa.	250	Roberts & Schaefer
Maryland New River Coal Co.	Winona, W. Va.	200	Jeffrey
McLaren Coal Co.	Carterville, Ill.	45	Link-Belt
Monroe Coal Mining Co.	Revloc, Pa.	100	Roberts & Schaefer[18]
	Revloc, Pa.	120	Roberts & Schaefer[4]
National Mining Co.	Sygan, Pa.	400	Robins
New York Coal Co.	Chauncey, Ohio	25	Morrow[16]
Northwestern Improvement Co.	Roslyn, Wash.	12[1]	Deister Concentrator[2]
Pardee & Curtin Lumber Co.	Bergoo, W. Va.	300	Link-Belt
Perry Coal Co.	O'Fallon, Ill.	400	Jeffrey[11]
Phelps Dodge Corporation	Dawson, N. M.	60	Jeffrey[6]
Pittsburgh Coal Co.	Macdonald, Pa. (2)	80	Koppers-Rheolaveur[19]
	Negley, Ohio	100	Roberts & Schaefer[4]
Pond Creek Pocahontas Co.	Bartley, W. Va.	115	Kanawha[9]
	Bartley, W. Va.	80	Kanawha[9]
Pursglove Coal Mining Co.	Pursglove, W. Va.	300	United Engineers[20]
Pyramid Coal Corporation	Pinckneyville, Ill.	150	Link-Belt
Raven Red Ash Coal Co.	Raven, Va.	60	Jeffrey[6]
Red Jacket Coal Corporation	Keen Mountain, Va.	400	Jeffrey Fairmont[21]
	Rittermines, W. Va.	90	Jeffrey[6]
David E. Rowland	Cuba, Ill.	150	Morrow[22]
St. Louis Coal Co.	Coulterville, Ill.	100	McNally-Pittsburg[17]
Sentry Coal Mining Co.	Madisonville, Ky.	400	McNally-Pittsburg[13]
Sloss-Sheffield Steel & Iron Co.	Lewisburg, Ala.	7[1]	Deister Concentrator[2]
Standard Brazil Block Coal Co.	Clay City, Ind.	80	Morrow[10]
Stonega Coke & Coal Co.	Derby, Va.	100	Morrow
Superior Coal Co.	Benld, Ill.	600	Link-Belt
	Gillespie, Ill.	600	Jeffrey
Truax-Traer Coal Co.	Fiatt, Ill.	500	McNally-Pittsburg[17]
Union Coal Co.	Peru, Ill.	35	Link-Belt
United Electric Coal Cos.	Canton, Ill.	650	Koppers-Rheolaveur[23]
Universal Coal Washing Co.	Pinckneyville, Ill.	250	McNally-Pittsburg[17]
Weirton Coal Co.	Isabella, Pa.	360	Link-Belt[24]
	Isabella, Pa. (3)	150	Koppers-Rheolaveur[19]
Westmoreland Coal Co.	Yukon, Pa.	350	United Engineers[20]

*Also includes complete plants and major installations of preparation equipment in existing structures. Where information is available, number of units installed, if more than one, is shown in parentheses after the plant address.

[1]Washed-coal tonnage. [2]Deister-Overstrom "Diagonal-Deck" coal-washing tables. [3]Deister "Plat-O" coal-washing tables. [4]Including Stump "Air-Flow" coal-cleaning equipment. [5]Chance cones, 4x¾-in. coal; also Dorr thickener.

[6]Including Jeffrey diaphragm-jig coal-washing equipment. [7]Coal-washing jig. [8]American pneumatic separators and auxiliaries. [9]Birtley dedusters, 5/16x0-in. coal. [10]Includes crushing and rescreening or rescreening facilities.

[11]Including Jeffrey Baum-type-jig coal-washing equipment. [12]Drying-plant addition. [13]Tipple and washery, including McNally-Norton automatic washers and pick breakers. [14]Including Marcus screens, Menzies hydroseparators and Stump "Air-Flow" coal cleaners. [15]Jeffrey Baum-type jig; capacity shown is for handling refuse.

[16]Prins "Multi-Flow" washing equipment and auxiliaries. [17]Includes McNally-Norton automatic coal-washing equipment. [18]Menzies hydroseparator equipment. [19]Carpenter centrifugal dryers. [20]Including Chance coal-cleaning equipment and auxiliaries.

[21]Headhouse, and dumping and conveying equipment to tipple. [22]Truck-loading tipple with bins and loading facilities. [23]Complete plant with Rheolaveur coarse- and fine-coal washers, Carpenter dryers and heat-drying screen. [24]Complete cleaning and screening plant, including Link-Belt Simon-Carves coal-washing equipment.

reduction of pickings or boney coal as a step in re-treatment to recover coal values. All three objectives, for example, were included in the Buckheart plant noted above, as follows: McLanahan & Stone single-roll crusher for reducing lumps in mine-run to about 12 in.; Jeffrey single-roll unit for breaking down bone and pickings; and two American Pulverizer ring units for reducing, respectively, hand-picked lump and egg and the washed sizes over 1¼ in. The lump-and-egg crusher is designed as a reversible unit, crushing one size in one direction of rotation and the other in the opposite direction. Pick breakers also were favored by a number of companies with large coal to reduce. A considerable number of Boal units were ordered to supplement those already in use in the Paris field of Arkansas, for example, while McNally-Norton equipment was included in plants for the Kelly-Carter, Sentry, and other companies, in addition to installations of individual units.

Picking-table illumination (see article beginning below) was featured by wide adoption of high-intensity mercury-vapor lamps.

Dustless treatment became almost a preparation must in 1937, with the hot-oil or hot-wax methods leading, although a variety of other treating preparations were adopted by different operating companies. And while hot oil retained its leadership, waxing gained many new converts. Wax-treatment proponents stressed the contention that advantages included prevention of moisture loss with consequent slacking, leading to the conclusion that successful treatment of high-moisture coals, and even lignites, may be expected.

Among the conclusions reached during the year as a result of research in dustless treating by the Battelle Memorial Institute under the sponsorship of Bituminous Coal Research, Inc., Standard Oil Co. of New Jersey, Sun Oil Co. and the Viking Manufacturing Co. was one that higher-viscosity oils are more effective in dust control (*Coal Age*, November, 1937, p. 90). Work by the Gulf Oil Corporation (*Coal Age*, June, 1937, p. 252) indicates also that oil treatment lessens the danger of spontaneous combustion. The fire hazards growing out of the increased use of petroleum products received increased attention in 1937.

In addition to the usual methods, two new refuse-disposal systems were introduced in 1937. The Gauley Mountain Coal Co., Ansted, W. Va., developed a track-mounted car dumper which lifts a car up in a cradle, swings it around over the edge of the dump, turns it over, rights it and then continues on around to place the car on the track behind the dumper (*Coal Age*, May, 1937, p. 214). Thus, the dumper can work its way through a trip, using the same track as the cars. Hydraulic refuse-disposal was adopted by the Amherst Coal Co., Amherstdale, W. Va., reducing daily costs $23.10 (*Coal Age*, March, 1937, p. 114). Refuse is first crushed to 3 in. or less and then run into a tank, where it is mixed with water. From this tank the refuse-water mixture is pumped 500 ft. or more to the disposal point by an Allen-Sherman-Hoff "Hydroseal" centrifugal pump.

ELECTRIFICATION

+ Rounds Out 50 Years of Progress

ANNIVERSARY memories naturally fade into an attempt to read the future. The year 1937 marked the fiftieth anniversary of the first commercial application of electricity to American coal mining. Reviewing the uninterrupted march of progress during this first half century of applications serves to convince that our present plane of achievement will appear in a few years as just another step in the climb to more general, more efficient and safer utilization of electrical machinery in every phase of coal mining. The year just closed was decidedly one of progress, but for the most part it was in the field of extended applications rather than in introduction of entirely new equipment.

Credit is due those pioneers of the Lykens Valley Coal Co. who in 1887 dared to install electric haulage underground on a commercial scale and the completion of which apparently trailed but a few months the installation of an arc-lighting plant to illuminate a breaker of the Hillside Coal & Iron Co. Considering the space restrictions in underground tunnels, it is remarkable that this locomotive installation, "operating at 400 volts at the utmost," followed so closely the early demonstrations of electric traction and came the same year as the first truly successful electric street-car line at Richmond, Va. Edison, in 1880, following still earlier demonstrations by other inventors, operated a locomotive at Menlo Park, but it took the Chicago Railway Exposition of 1883 to convince the public of the practicability of electric traction.

Viewing the growth of electrical applications to coal mining, it is evident that nine times out of ten the pioneer was right. For some years his "new-fangled ideas" may have been ridiculed, but ultimately his example was adopted as common practice. In some cases the delay was due to waiting for the development of better materials with which to build more reliable equipment, but in more cases the delay, with its failure to reap the economic benefit, was due to the inertia of mine management. Today, management, like equipment, has shaken off excess weight and cut its inertia; therefore a shorter period can be expected between successful demonstrations and widespread application.

No doubt the greatest plague that has persisted in coal mining has been that original but at that time pardonable sin of the "400 volts at the utmost." Only during the last few years has the industry as a whole awakened to the true economic advantages, direct and indirect, of maintaining full d.c. voltage at the working face. It is but fair to recognize, however, that, thanks to some early electrical engineers and their abilities to convince, plus perhaps their good fortune in working for receptive managements, commendably stable voltage became a reality with some companies many years ago.

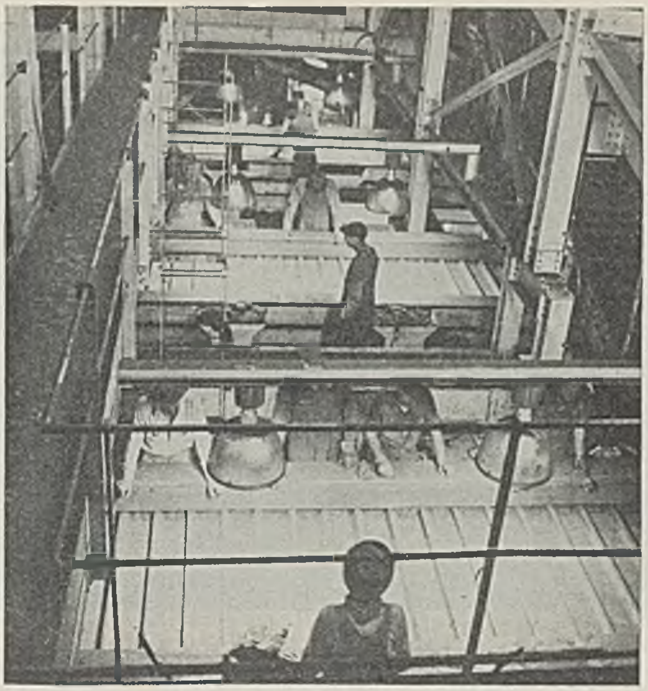
Substation equipment, the most important tool in maintenance of efficient d.c. voltage, stands first among the 1937 applications of improved machinery. Including two rectifiers which were being installed late in 1936 (one 600-kw. 575-volt tank-type Allis-Chalmers, Pittsburgh Coal Co., and one Westinghouse 300-kw. 275-volt tube-type, Union Collieries Co.; *Coal Age,* February 1937, p. 78), at least six rectifiers went into service in 1937, bringing the coal-mine total to eight or more units. Already this year it is reported that two more tank-type units have been sold and will be installed during 1938.

Three of the 1937 installations were 275-volt ignitron tube-type units (Westinghouse) arranged for portable service at a Pennsylvania mine. Capacity is 300 kw., the primary voltage is 4,000 and the apparatus of a unit is mounted on three trucks. One truck carries the power transformer, a.c. circuit breakers and certain other a.c. control items; a second truck has the rectifier, water-to-air heat exchanger and auxiliaries, and the third carries the d.c. circuit breaker, relays, meters and d.c. auxiliaries. At a mine in Ohio a 575-volt tank-type rectifier was put into service.

Efficiency Higher at 575

As might be expected, rectifiers first edged their way into the 575-volt mines because their efficiency advantage at that voltage over rotating machines is much greater than for 275-volt rectifiers. Another advantage, however—lower maintenance cost—appears sufficient in itself to commend the rectifier ahead of rotating equipments for new purchases of 275-volt substation machinery for most conditions.

Communication experiments in several mines during 1936 accelerated development of the use of carrier current on d.c. underground systems and resulted in the installation of eight Carrier-Call telephones in the Nellis (W. Va.) mine of the Nellis Coal Corporation. Seven of these are in stationary service and one is on a main-line locomotive. The 275-volt d.c. trolley and feeder lines act as conductors for the communication and it is reported that the motorman is able to converse with another station while the locomotive is in motion. Instruments are of the loud-speaking type with built-in microphones. A difficult slate top in the Nellis mine makes it especially desirable to eliminate telephone wires.



Six 400-watt high-intensity mercury lamps light three picking tables at Wayland

More efficient use of electric power in mine ventilation is a prominent item among the happenings of the past year. At numerous mines smaller motors were applied and power consumption reduced, while at others the air circulation was increased without increasing power. This change came about by rapid acceptance of the late-type propellor fan which, due to its scientific straight-flow design with a stream-lined housing over the pulley and hub, makes possible a static efficiency of over 80 per cent.

Single-motor locomotives for gathering service, a pre-world-war development, staged a come-back at several operations in western Pennsylvania. The power range of cutting machines was broadened to include a 100-hp. motor and in October the U. S. Bureau of Mines issued permissible plates to both the Joy and Goodman companies for slate-cutting machines of that horsepower.

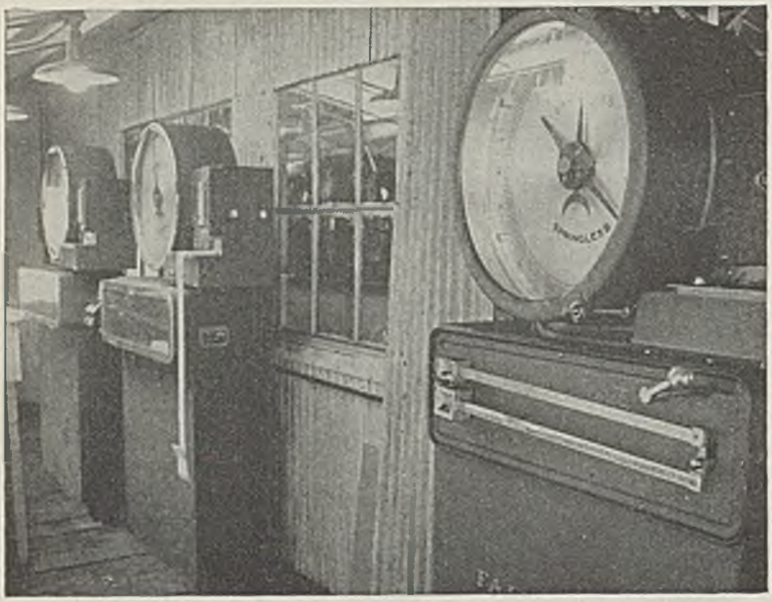
Completion in 1937 of No. 2 mine of the High Splint Coal Co., Harlan County, Kentucky, put into service the last of three recent large motors to act as brakes or drives to regulate speed on monitor planes. This No. 2 mine job consists of a 500-hp. Westinghouse motor and control. Just prior to its installation the High Splint company added a 500-hp. General Electric motor to its old No. 1 monitor plane, which delivers to the same tipple.

Not long before that the largest motor in use in this country on a coal-lowering plane, a 600-hp. unit, was applied to an existing plane at the Bonny Blue (Va.) mine of the Blue Diamond Coal Co. (*Coal Age,* January, 1938, p. 58). On a mine-car plane of a new operation of the Mary Helen Coal Corporation, Coalgood, Ky., also in Harlan County, there was installed a 350-hp. motor for regenerative braking.

Stationary motors installed in preparation plants completed during the year show a continued trend toward ball bearings and total inclosure. In some jobs totally inclosed motors were installed only in the exceedingly dusty locations of the plant. Although recent developments indicate that plants of the future will control dust to a much greater degree than now is general, it is likely that before many years totally inclosed motors will become the standard for preparation-plant duty.

V-belt motor drives continued to hold first place for mine fans and for special duties such as shaking and vibrating screens and crushers, but for the other drives of preparation plants the V-belt and inclosed gear reducer continued a close race.

In the smaller sizes, gearmotors and "motoreducers" find preference



The weight indicated on the scale in the foreground is "read" by an electric eye

because of the unit-base mounting. Plant designers are making wider use of variable-speed connections between motors and driven units in order to secure that flexibility of adjustment for the want of which preparation has suffered in the past.

An innovation to recent practice but not a new practice is the application of variable-speed d.c. motors to feeders in the new preparation plant of the Hanna Coal Co., at Willow Grove, Ohio (*Coal Age,* October 1937, p. 66). The electrical controls of these motors are so arranged that the speed changes can be made by finger touch from the plant operator's control station. This arrangement fits admirably into the present practice of central control and the need for cutting delays in making adjustments. Some plants are so situated, however, that the practice would require a special small-capacity motor-generator, converter or rectifier to supply the direct current.

The status of full-sequence control for preparation plants appears uncertain. For instance, two new plants of the year, the Wayland plant of the Elk Horn Coal Corporation and the new plant of the High Splint Coal Co., both are controlled by a series of pushbuttons arranged on a control board in position sequence corresponding to the starting sequence. A new plant which uses full-sequence, the Keen Mountain (Va.) operation of the Red Jacket Coal Corporation, effects that control by a synchronous-motor-driven master relay which has a pair of contacts for each motor. An identical method was used at the Wyoming (W. Va.) plant of the same corporation built the previous year. Both those installations were antedated, however, by a 1935 installation of a motor-driven timing sequence relay to replace manual timing in a plant of the Boone County Coal Corporation, Sharples, W. Va.

In the realm of electrical controls for semi-automatic centrifugal mine pumps the use of undercurrent relay protection against loss of water was advocated by T. M. Googin, industrial division, Westinghouse. The undercurrent relay will protect against blocking of the water intake, a feature which a float switch does not afford. This same relay, if added to an installation having a float switch, affords dual protection against low water, the regular occurrence.

General level of illumination for hand picking was raised—perhaps 100 per cent—last year by extensive installations of high-intensity mercury-arc lamps in 250- to 400-watt sizes. Installation of this type of lamp got under way the year before, but many of those jobs were in the nature of tests of one or two lamps as trials or to overcome some special problem. Most of the preparation plants put into service during 1937 have complete high-intensity mercury-vapor illumination over all picking tables, and in one plant at least, Glen Lyon breaker, Susquehanna Collieries, these lamps are used for general illumination.

Light emission per watt of power used is close to 40 lumens for mercury, as compared to less than half that for incandescent lamps. Experiments have indicated that visual acuity is increased and that under the mercury light certain types of impurities appear in greater contrast to the coal. Illumination intensities of 200 and even 400 foot-candles on the coal are attained in many of the installations—quite a departure from the intensities of 1 to 20 foot-candles common less than ten years ago.

Another application of the electric eye appeared during the year. This "reads" an indicating hand on a weighing scale and stops the feeder when the weigh basket contains 1,000 lb. of reject. The scale hand intercepts a light beam which normally shines through a hole in the dial and onto a photo-electric tube. This application, at the Wayland plant of Elkhorn Coal, provides for counting the 1,000-lb. loads and thus records the total reject by plant preparation (*Coal Age,* November, 1937, p. 63).

As to electric power source, purchased power added many mines to its rolls during 1937, while there was only slight activity in the building of private generating plants, although greater loads and higher load factors by reason of underground mechanization, mechanical cleaning and multiple-shift operation were favorable to generated power. Practically all of the new mines opened during the year are being operated with purchased power.

Switches to Mine Power

In May the North-East Coal Co., Auxier, Ky., switched from purchased power to a generating plant consisting of three 360-hp. boilers and two 750-kw. turbo-generators (*Coal Age,* October, 1937, p. 63). At least two mine power plants were improved by installation of B. & W. integral-furnace steam-generating units which include pulverizer, blowers, furnace, boiler, superheater and complete control equipment. For these units efficiencies of 84 per cent and above are claimed by the manufacturer.

Operators of power plants built prior to 1937 found them still a reliable source of energy and a paying investment. An example is the Richlands (Va.) plant of the Jewell Ridge Coal Corporation (*Coal Age,* March, 1934, p. 92), now serving the new Jewell Valley mine, started in 1935 and now in full operation, in addition to the original Jewell Ridge operation. Careful construction of the transmission line from the power plant to Jewell Ridge, a distance of about nine miles, plus care in selecting the right-sized equipment and the design of the generating plant, has kept interruptions in service to the mine to less than one hour per month. With a capacity of 2,500 kva. in two turbo-generators, the power plant now averages approximately 6,000,000 kw-hr. per month in serving two tipples and seven motor-generator substations. Jewell Valley is about thirteen miles from the power plant.

Power-consumption trends generally were upward in 1937, reflected in some cases by additions to power-plant equipment, and at other operations purchasing power by increases in transformer or conversion capacity. The Page Coal & Coke Co., Page, W. Va., added two boilers to its power plant, as an example, while the Crozer Coal & Coke Co. and the Upland Coal & Coke Co., Elkhorn, W. Va., went on full purchased-power schedules in 1938. Prior to that time, Crozer had generated part of its power.

At the Martin (Pa.) mine of the Martin Mining Co., where a three-track tipple, a new fan, a bigger main-line locomotive and additional cutting equipment were put in service in 1937, another motor-generator unit was installed, doubling the previous conversion capacity, to take care of the increased load. Similar experiences might be multiplied all the way across the country to the West, where, as an example, the Utah Fuel Co., as a result of continual additions to load, has steadily increased the size of underground transformers until now the minimum is a bank of 15-kva. units, ranging from there up to 50-kva. equipment. All transformer sets are placed in fireproof vaults set on regular steel mine-car chassis. "We now find," a Utah Fuel official reports, "that the main high-voltage lines leading to and through the mine are nearing capacity. In order to eliminate low voltages and expensive line losses, these will have to be increased."

During the year, maintenance of mining equipment leaned still more heavily on the electric arc and gas torches. Indicative of the numerous uses and the degree of specilization in applications of these autogenous welding instruments to mining and preparation machinery is the assortment of rods and electrodes stocked by some of the larger coal companies. For example, the Bell & Zoller Coal & Mining Co. carries in regular stock in its warehouse at Zeigler, Ill., 29 items of rods and electrodes, including bit-plating materials (*Coal Age*, December, 1937, p. 133).

Although maintenance of loaders and other underground machines for multiple-shift full-mechanical mining is still a problem at mines recently converted to mechanical operation, education and interchange of ideas has to a great extent standardized the methods in that phase of maintenance. Still more important is the maintenance of the central cleaning plant in which breakdown of one item may stop the whole operation. Only by careful and frequent inspection and by replacement long before actual breakdown is expected can those delays be avoided. Some choose to term this "over-maintenance" and by that imply that many parts are renewed while they are still good for considerable service.

First Half Century of Coal-Mine Electrification

*Milestones in Progress Since 1887**

1887*—Arc-lighting plant; Hillside Coal & Iron Co., in northern anthracite field of Pennsylvania; to illuminate breaker; Thomson-Houston plant.

1887—First electric locomotive for coal-mine haulage, Lykens Valley Coal Co., in southern anthracite field; designed by W. M. Siesinger, Philadelphia; built by Union Electric Co.

1888—First electric locomotive (Jeffrey) in bituminous industry; Shawnee (Ohio) mine; Upson Coal Mining Co.

1888—Electric motor-driven coal cutter offered.

1889—Six 15-hp. electric coal cutters (Jeffrey) installed in Brush Fork No. 2 mine, Ellsworth-Morris Coal Co., Ohio.

1889—Polyphase a.c. motor (experimental) installed on Hercules drilling machine to undercut coal. First Pool Monongahela Gas Coal Co., near Pittsburgh, Pa.

1889–1890—Motor-driven pump.

1892—Jeffrey electric coal drill offered.

1898–1899—Hand-cranked reel added to locomotive to accommodate a trailing cable; Anaheim, Southwest Virginia Improvement Co.

1899—Battery locomotive (Jeffrey), Pocahontas Collieries Co., Virginia.

1899—Battery locomotive (Baldwin-Westinghouse), Southwest Virginia Improvement Co., Virginia.

1900—Power-driven cable reel for locomotive, Pocahontas Collieries Co., Virginia.

1901—A.c. transmission underground with cables for underground a.c. circuits; lead-sheathed cable, 25 cycle, 5,600 volts a.c. to drive 275-volt d.c. underground substation, Webster Coal & Coke Co., Ehrenfeld, Pa.; installed by General Electric.

1902—Booster sets in series with long d.c. feeders outgoing from central generating plants, Pittsburgh Coal Co.

1903—Steam turbine drive direct-connected to generator in mine power plant, Delaware, Lackawanna & Western Ry., Hampton, Pa.

1905—250 volts d.c. used at majority of mines in western Pennsylvania.

1907—500 volts d.c. used at 39 per cent and 250 volts d.c. at 61 per cent, Pittsburgh Coal Co. mines.

1908—Synchronous motors on pumps (two at 100 hp., coal-washer service), Glen Alden Coal Co.

* Brief experiments with electricity at coal mines were reported before 1887. In 1885 at Streator, Ill., experiments were made with a motor drive for a cutting machine.

1908—Electric cap-lamp development begun by Philadelphia & Reading Coal & Iron Co.; pasted cells used first.

1909—500 volts d.c. used at 73 per cent and 250 volts d.c. at 27 per cent, Pittsburgh Coal Co. mines.

1910—Definite trend to central a.c. generating plants and transmission lines to replace individual d.c. plants; principally 60 cycle instead of the earlier frequencies of 25, 50 and 133 cycles.

1910—Ball bearings applied to mine-locomotive motors (Jeffrey).

1911—Synchronous motor on mine fan, McKell Coal & Coke Co., southern West Virginia; Westinghouse 250-hp. motor.

1911—Lead-sheathed wire-armored cable suspended in 350-ft. borehole, McKell Coal & Coke Co.

1911—Retired from service, Thomson-Houston locomotive installed 1887 or 1888 at Erie Colliery, Hillside Coal & Iron Co.

1911—Central a.c. generating plant built by Stearns Coal & Lumber Co., Stearns, Ky.

1911—Electric cap lamp (Hirsch-type cell), produced by Philadelphia & Reading Coal & Iron Co. (described in 1911 by J. T. Jennings, electrical engineer).

1912—Test of Sullivan chain-type mining machine driven by a.c. motor, Star Mining Co., Rugby, Colo.

1912—Electric cap lamp (Ceag) approved by U. S. Bureau of Mines.

1912—"Explosion-proof" motors submitted for test by five manufacturers at behest of U. S. Bureau of Mines.

1912—Ironclad telephone developed for underground service.

1912—Ilgner-Ward Leonard hoist control, Mine No. 11, Old Ben Coal Corporation, Christopher, Ill.; installed by A. W. Spaht, now (1937) electrical engineer and top-works superintendent.

1912—Operating station, mine-hoist contactor control, installed at dump in tipple, Rock Island Ry. mine, Dallas, Iowa; Carl Scholz, manager "fuel and mining department."

1913—Definite trend to purchased power as alternative to central a.c. generating plant for ending difficulties from long-distance d.c. transmission.

1913—Purchased-power contract signed for twelve mines, Pittsburgh Coal Co.; A. B. Kiser, then and now, electrical engineer.

1913—Two-speed induction motor on mine fan, Keystone Coal Co., Pennsylvania.

1913—Portable substation, mounted on standard-gage railway car, used by power company to supply energy for rapid development of mines; 400-kw. unit.

1913—Six 2,300-volt electric shaft hoists ordered by Pittsburgh Coal Co.

1913—Liquid-rheostat control of 700-hp. induction motor hoist; Woodward Iron Co. coal mine, Alabama.

1913—Brush-shifting variable-speed a.c. motor on mine fan; Pittsburgh Coal Co. (General Electric Type "BTS" motor).

1913—Thirty 2,300/500-volt motor-generator sets ordered by Pittsburgh Coal Co.

1913—Sherbius variable-speed a.c. drive (General Electric), installed on mine fan; Pittsburgh Coal Co.

1914—Non-metallic covered cables installed in boreholes, Lehigh Navigation Coal Co., Lansford, Pa.; G. M. Kennedy, then and now, electrical engineer.

1914—First "completely electrified" mine in Indiana, J. K. Dering Coal Co., Clinton; fan and hoist both electrically driven.

1914—Purchased power in use at 30 Pittsburgh Coal Co. mines.

1914—Electric dragline, 3½-cu.yd. dipper, Shenandoah anthracite stripping, Locust Mountain Coal Co.

1914—Percussion-hammer electric drill (Ft. Wayne) announced.

1914—Permissible plate granted for Type CE-7 Sullivan shortwall undercutter.

1914—Six storage-battery locomotives at Grant mine, Grant Mining Co., Goshen, Ind. (Jeffrey locomotives, Edison batteries).

1915—Electric strip shovel, 6-cu.yd., 300-kw. General Electric synchronous motor-generator set, Piney Fork Coal Co., Smithfield, Ohio.

1915—First extensive installation of Edison-battery cap lamps, Pittsburgh Coal Co.

1916—Automatic d.c. breakers and the start of semi-automatic substations (Automatic Reclosing Circuit Breaker Co., now I-T-E).

1916—Dynamic braking of induction hoist motor by applying d.c.; 700-hp. motor, Packer No. 2 anthracite slope, Lehigh Valley Coal Co.

1918—A few scattered installations of arc-weld bonds.

1918—18,000 Edison cap lamps in use by Pittsburgh Coal Co.

1919—Magnetically vibrated screen, Steelton, Pa.

1919—Automatic telephone system, Raleigh Coal & Coke Co., Raleigh, W. Va.

1920—Automatic d.c. substation, Cordova mine, Mount Carmel Coal Co., near Birmingham, Ala.; induction motor started by Cutler-Hammer magnetic starters with Automatic Reclosing Circuit Breaker Co. equipment on d.c. feeder.

1920—High-speed multiple-cylinder gasoline engine direct-connected to a.c. generator for emergency power for mine fan; 100 kw., 2400 volts; Lincoln Gas Coal Co., Nanty-Glo, Pa.

1920—Even prior to this date a few experiments with welded rails, principally by Thermit process.

1921—Demand limiting performed manually in compliance with signals actuated by contacts added to indicating demand meters.

1921—Automatic substation, factory-assembled Westinghouse control with thermostatic bearing protection, Lincoln Coal Co., Nanty-Glo, Pa.

1922—50 full-automatic substations in use.

1922—"Submerged-type" pumping station, four 500- and four 300-hp. units, Hudson Coal Co.

1922—Automatic electric signal and flagger, Jenkins (Ky.) mine, Consolidation Coal Co. (Canton equipment).

1922—Individual metering of electric service to all company-owned miners' houses, Banner Fork mines, Fordson Coal Co., Kentenia, Ky.; C. B. Locke, electrical engineer.

1923—Battery power for cutting machines, Consolidation Coal Co.

1923—Automatic electric track-switch thrower offered (American Mine Door Co.).

1923—100 "government-approved" shortwall mining machines (Jeffrey 35B) purchased on one order by the Pittsburgh Coal Co.

1923—Arc-welding to fill locomotive tires, Consolidation Coal Co., Jenkins, Ky.; Elkhorn Piney Coal Mining Co., Weeksbury, Ky.

1923—Fully automatic pumping station, Draper (Pa.) anthracite colliery, Philadelphia & Reading Coal & Iron Co.; J. T. Jennings, electrical engineer.

1924—"Wireless" mine; battery power for cutting, gathering and haulage, No. 1 mine, Pond Creek Pocahontas Co., Bartley, W. Va.

1924—"Portable electric power plant" (battery truck to operate coal-cutting machine) approved by U. S. Bureau of Mines (Mancha Storage Battery Locomotive Co.).

1924—Sequence control; first extensive installation, 4-mile conveyor belt, Colonial mines, H. C. Frick Coke Co., Pennsylvania.

1924—Forty permissible plates issued by the U. S. Bureau of Mines to this year.

1924—Prior to this year the General Electric Co. built automatic cable-trolley switches by combining two standard contactors with mechanical interlock.

1924—Simplified automatic cable-trolley transfer switch, Fordson Coal Co.; C. B. Locke, electrical engineer.

1924—Two substations in Pennsylvania fitted with rheostat-type automatic synchronous field regulators at this time.

1925—Turbine-type deepwell pumps to dewater mines, motors on surface, Powderly mine, Hudson Coal Co.; 250 hp., 90-ft. head.

1925—Automatic demand limiting by opening feeders through contacts added to indicating demand meters.

1925—Twenty-four internal-combustion engines aggregating 2,567 hp. in use at coal mines; practically all driving electric generators.

1925—Capacitor (static condenser) to improve power factor, Richmond Coal Co., Pennsylvania anthracite.

1925—Two 2,000-hp. Westinghouse motors driving one hoist, New Orient mine, Chicago, Wilmington & Franklin Coal Co., West Frankfort, Ill.

1925—Five fans, Pennsylvania Coal & Coke Corporation, Cresson, Pa., equipped with full-automatic control and thermostatic protection; J. F. McWilliams, then and now, electrical engineer.

1925—Remote starting and remote speed control of wound-rotor motor on mine fan; Nuttalburg (W. Va.) mine, Fordson Coal Co.; C. B. Locke, electrical engineer.

1925—Size No. 6/0 trolley wire being installed in a Pennsylvania bituminous mine.

1925—Use of separate magnetic clutch with synchronous motor on mine fan, Geo. F. Lee Coal Co., Avondale, Pa.

1925–26—Electric vibrating screens appeared (see also 1919).

1925—Glider (also termed shoe or slipper) applied in place of trolley wheel, New Castle Coal Co., of Alabama (Miller glider).

1926—Comprehensive test of slow-speed (3½-m.p.h.) gathering locomotive in New Orient mine; built at suggestion G. H. Shapter, transportation department, General Electric Co.; test conducted by A. E. Giles, electrical engineer for the coal company, and W. E. McDougle, General Electric.

1926—Super-synchronous motor (bearing-mounted "stator") on mine fan, Glen Alden Coal Co., Pennsylvania anthracite; C. R. Seem, then and now, electrical engineer.

1926—Portable d.c. substation underground, Union Colliery Co., Dowell, Ill.

1926—500 volts d.c. used at all mines of Pittsburgh Coal Co.

1926—Remote telephone control and supervision of full-automatic substation, Wolfpit (Ky.) mine, McKinney Steel Co.

1927—Rectox rectifier (Westinghouse) to insure polarity of full-automatic substation, North-East Coal Co., Paintsville, Ky.

1927—Melton inherent exciter-type power-factor regulation of synchronous motor in full-automatic substation, Shamrock (Ky.) mine, West Kentucky Coal Co.; Sherman Melton, then and now, electrical engineer.

1927—Blowers for locomotive motors advocated and described in a paper by G. H. Shapter, General Electric Co.

1927—500-hp. motor for regenerative braking on coal-lowering incline, Clover Splint Coal Co., Harlan County, Kentucky (first large installation at Eastern mine; was preceded by several Rocky Mountain installations).

1927—Automatic starting control for high-speed gasoline engine-generator to provide auxiliary power for mine fan, Lehigh & Wilkes-Barre Coal Co.

1927—Railway-type full-automatic track signals (Nachod equipment), Banner No. 1 mine, Pittsburgh Coal Co.

1927—150 full-automatic pumping plants in use in Pennsylvania anthracite mines.

1927—Mercury-arc rectifier substation; installed by Appalachian Electric Power Co. to supply 550-volt d.c. to Rolfe mine, Pocahontas Fuel Co., Worth, W. Va. (Brown-Boveri, now Allis-Chalmers).

1928—De-ion-type circuit breakers, Westinghouse.

1928—Synchronous motor with built-in magnetic clutch on mine fan, New Orient mine.

1928—Edmore "Limitator," a specially built demand limiter, offered.

1928—Remote metering as well as telephone control of full-automatic substation, Nemacolin (Pa.) mine, Buckeye Coal Co., a subsidiary of the Youngstown Sheet & Tube Co.

1928—Synchronous-motor m.g. set supplies direct current for hoisting (Ward Leonard control), Mine No. 58, Peabody Coal Co., Springfield, Ill.; Carl Lee, then and now, electrical engineer.

1929—Ground-cable transmission to strip-mine shovels, Northern Illinois Coal Corporation.

1929—Wildwood (Pa.) mine started production; first mine opened as a completely electrified operation (including loading and cleaning); Butler Consolidated Coal Co.

1930—275-volt mercury-arc rectifier (experimental installation), Glen Alden Coal Co.

1930—Accepted arrangement of Mazda lighting units for picking tables, Johnstown (Pa.) mine, Imperial Cardiff Coal Co.; Westinghouse design.

1933—Transformers with non-inflammable non-explosive cooling medium offered ("Pyranol" liquid, General Electric Co.).

1933—Two 1,000-hp. linestart induction motors on mine pumps, Marvine colliery, Hudson Coal Co., Scranton, Pa.

1933—Demand-limiting instrument (Type DM-10) with complete facilities offered by General Electric Co.

1933—Arc-welded rail joints adopted as standard practice in New Monarch mine, Consolidated Coal Co., Herrin, Ill.

1933—Largest 3-conductor a.c. cable in coal-mine power use; 800,000 circ.mil in 880-ft. shaft, Greenwood colliery, Lehigh Navigation Coal Co., Lansford, Pa.

1934—High-intensity mercury-vapor lamps appear in numbers with several trial installations effecting intensities of 200 foot-candles or more.

1934—Demand meter in dispatcher's office underground; western Pennsylvania mine.

1935—Motor-driven timing-relay sequence starting of preparation-plant motors, Boone County Coal Corporation, Sharples, W. Va.; C. B. Locke, then and now, electrical engineer.

1935—600-hp. linestart synchronous motor on fan, No. 1 mine, Pond Creek Pocahontas Co., Bartley, W. Va.

1935—Dust filters installed on intakes of blowers, cooling underground d.c. substations, West Virginia Coal & Coke Corporation, Omar, W. Va.; T. A. Stroup, chief engineer.

1936—First permanent installation of coal-company-owned mercury-arc rectifier as d.c. substation, Crescent No. 2 mine, Pittsburgh Coal Co., Belle Vernon, Pa.; Westinghouse tank-type unit, 600 kw., 575 volts.

1936—Skid-mounted portable automatic feeder breakers for use with mechanical loading units, Adena (Ohio) mine, Wheeling Township Coal Co.; E. J. Christy, master mechanic.

1936—Ignitron tube-type rectifier substation offered by Westinghouse.

1936—Portable substation units with self-carried covers to obviate necessity for special substation rooms, New Orient mine.

1937—Ignitron tube-type rectifier substation, stationary type, Union Collieries Co., Pennsylvania (Westinghouse, 300 kw., 275 volts).

1937—Twelve brush-shifting variable-speed a.c. motors (75 to 200 hp.) in use driving mine fans for the Pittsburgh Coal Co. (see 1913 for first installation).

1937—1,200 kw. of 575-volt mercury-rectifier substation capacity in use by Pittsburgh Coal Co.; both 600-kw. units of multiple anode, or tank, type (one Westinghouse, one Allis-Chalmers).

1937—"Carrier-Call" telephone communication via d.c. trolley wires and feeders; stations to moving locomotive, Nellis Coal Corporation, Nellis, W. Va.

1937—Three Westinghouse portable igniter-type rectifier substations (300 kw., 275 volts d.c., 4,000 volts a.c.) installed at the Isabella (Pa.) mine, Weirton Coal Co.

SAFETY DEVELOPMENTS

+ In the Coal-Mining Industry in 1937

By D. HARRINGTON

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Washington, D. C.

SAFETY in coal mining suffered a recession in 1937 in a manner somewhat similar to that experienced by general industrial work in the United States; notwithstanding the occurrence of two major disasters in March, with a total of 27 fatalities, the safety record of the industry for the first half of the year gave grounds for the expectation that our coal mines might equal or even surpass that for 1936, the best in the history of the industry during the present century and probably during its existence. Notwithstanding the definite increase in the fatalities from explosion and fire disasters during the first half of the year, this menace was more than counterbalanced by a definite decrease in fatalities (and in the fatality rate) from falls of roof and coal; hence, the combined fatality rate from all causes for the first nine months of the year 1937 was almost as low as that of 1936. However, October had two major explosions, with total of 48 fatalities; this, plus the fact that the lower fatality rate from falls of roof and coal during the first ten months of the year was obliterated in November and December, resulted in the tentative fatality rate for all causes in the coal mines of the United States for 1937 being about 2.98 fatalities per million tons of coal produced, or materially higher than the rate of 2.72 (also tentative) established as an all-time "low" in 1936.

Table I (in which all of the figures are tentative except the number of fatalities for 1936, which is final) indicates that 1,467 persons were killed in our coal mines in 1937, as against 1,330 in 1936, the fatality rates (persons killed per million tons of coal produced) being 2.98 (tentative) in 1937, against but 2.72 (also tentative) in 1936. Bituminous mine fatalities increased from 1,086 (final) in 1936 to 1,245 (tentative) in 1937, and it is probable that the final figures for 1937 will be higher than those now recorded.

Anthracite mines had a reduction in fatal accidents from 244 (final) in 1936 to 222 (tentative) in 1937, the fatality rate remaining almost the same, however, because the estimated anthracite tonnage for 1937 was somewhat lower than that for 1936. The main disappointments in the 1937 record, as indicated in Table I, are the fatalities and fatality rates from explosions and from falls of roof and coal. The tabulation lists 95 persons killed from major explosions of gas and dust in 1937, one

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major explosion with 6 deaths being assessed to explosives; 116 persons are listed as having been killed in explosions (major plus minor) of gas and dust in 1937, or a decidedly poorer record than the 58 persons suffering death from similar causes in 1936, the 1936 figure being exactly doubled in 1937.

The brightest phase of the explosion record of United States coal mines in 1937 is that during the entire year not a single fatal accident was recorded as due to a gas or dust explosion in an anthracite mine; in fact, for the sixteen months preceding Jan. 1, 1938, no fatality from a gas or dust explosion has been reported from the anthracite region, a very excellent record.

The years 1933, 1934, 1935 and 1936 were remarkable for the fact that major explosion disasters in coal mines of the United States were "few and far between," not only as regards the number of individual disasters but also as to the number of fatalities in any one disaster, as well as the total fatalities from all of them. This relative immunity from major disasters was largely responsible for the fact that the coal-mining fatality rate, including all causes, was lower in these four years or in any one of them than in any year or years preceding 1933. The occurrence of six major coal-mine explosion disasters, with a total of 101 deaths, in 1937 does not augur well for the future of coal-mine safety, indicating as it does that there is material relaxation in precautionary measures looking to the avoidance of these disasters. The short summary of major disasters in Table II practically tells its own story.

The facts that major explosion disasters in our coal mines are increasing definitely, year by year, from the

D. Harrington

all-time "low" established in 1933 and that this increase includes increase in number of major disasters, as well as increase in the total number of persons killed from them and in the average killed per disaster, "bode no good" for the future. Obviously our coal-mining people must begin to "tighten up" in explosion prevention, or the coal-mining industry will soon revert to the anything but creditable safety showing of the years before 1933.

Bobby Burns' often-repeated "Man's inhumanity to man makes countless thousands mourn" is well exemplified in the fact that mine disasters are almost invariably caused by man failure. Very often management is responsible; this is shown by the fact that most of the mine disasters of recent years have been due to a combination of poor ventilation practices and the use of nonpermissible electrical equipment, poor blasting practices, or other unsafe equipment, methods or procedures. Sometimes the fault lies with the workers themselves, as was exemplified in a recent explosion due to open-light ignition of gas, which caused the death of twenty coal miners in a mine in which the workers themselves prevented the use of the much safer closed lights by imposing a fine of $25 for all workers (with a very few exceptions) who used the safe type of lighting equipment. In another mine a worker locked a ventilation door open in a definitely gassy part of a mine known to be dangerous; then, to make matters worse, either he or another worker used a match to relight a flame safety lamp in a closed-light mine and caused an explosion which took thirty-four lives. Seventy-four of the 101 fatalities in four of the six major coal-mine disasters of 1937 were due to open lights or matches.

It is distinctly disheartening to coal-mine safety workers to realize that in 1937 the fatalities from major disasters numbered nearly three times as many victims as for 1936, nearly five times as many as for 1934 and more than fourteen times as many as for 1933. In fact, the fatalities from major coal-mine disasters in 1937, 101, exactly equaled the total for the same cause in the combined years 1933, 1934, 1935 and 1936. These facts are the more appalling when it is known that in practically every present-day major coal-mine disaster some negligence of both management and workers is involved and that, in probably 99 cases out of 100, there is no good reason why any coal-mine disaster should occur in this day and age, with the knowledge available on the causation of mine disasters and measures for their prevention.

The increase in the number of fatalities and the fatality rate from falls of roof and coal in 1937 over figures for that cause in 1936 is distinctly discouraging, as the record for the first ten months of 1937

Table II—Major Disasters in Coal Mines of the United States

Year	No. of Major Disasters	No. of Fatalities	No. of Fatalities per Disaster	Maximum Fatalities in Any One Disaster
1933...	1	7	7	7
1934...	2	22	11	14
1935...	4	35	8¾	13
1936...	5	37	7⅖	9
1937...	6*	101	16⅚	34

* One of these major disasters was an ignition of black blasting powder with 6 deaths, and coal dust may or may not have participated.

Table I—Causes of Fatalities in Coal Mines of the United States, 1936* and 1937†

(Figures for tabulation assembled by W. W. Adams)

Cause	Bituminous 1936 Fatals	Bituminous 1936 Rate	Bituminous 1937 Fatals	Bituminous 1937 Rate	Anthracite 1936 Fatals	Anthracite 1936 Rate	Anthracite 1937 Fatals	Anthracite 1937 Rate	Total 1936 Fatals	Total 1936 Rate	Total 1937 Fatals	Total 1937 Rate
Falls of roof and coal	619	1.43	668	1.51	120	2.19	118	2.30	739	1.51	786	1.60
Haulage	199	0.46	216	0.49	26	0.47	28	0.56	225	0.46	244	0.50
Local gas and dust explosions	18	0.04	21	0.05	12	0.22	...	....	30	0.06	21	0.04
Major gas and dust explosions	23	0.05	95	0.22	5	0.09	...	....	28	0.06	95	0.19
Explosives	31	0.07	40	0.09	20	0.37	19	0.38	51	0.11	59	0.12
Electricity	46	0.11	50	0.11	8	0.15	7	0.14	54	0.11	57	0.12
Machinery	33	0.08	36	0.08	2	0.04	2	0.04	35	0.07	38	0.08
Miscellaneous underground	45	0.10	35	0.08	23	0.42	18	0.36	68	0.14	53	0.11
Shaft	11	0.02	14	0.03	6	0.11	6	0.12	17	0.03	20	0.04
Stripping or open cut	15	0.03	16	0.04	8	0.15	7	0.14	23	0.05	23	0.04
Surface	46	0.11	54	0.12	14	0.25	17	0.34	60	0.12	71	0.14
Total	1,086	2.50	1,245	2.82	244	4.46	222	4.44	1,330	2.72	1,467	2.98

* The figures for 1936 are final as to fatalities but tentative as to fatality rates, as final tonnage data are not yet at hand.

† The figures for 1937 are tentative as estimated on Jan. 8, 1938, by W. W. Adams, Employment Statistics Section, U. S. Bureau of Mines. The 1937 figures will be subject to revision as final reports for 1937 are received some months from the present.

‡ Final figures covering production of coal are not avilable for 1936 or 1937. Estimated production for 1936 is: anthracite, 54,760,000 tons, and bituminous, 434,070,000 tons; for 1937 the estimated production is: anthracite, 50,037,000 tons, and bituminous, 441,600,000 tons.

showed a much lower fatality rate and number of deaths from falls of roof and coal than for the corresponding period of 1936; there were 552 fatalities to Nov. 1, 1937 (tentative), against 593 at the same date in 1936, the 1937 rate for the ten months being 1.353, against a rate of 1.513 for the ten months of 1936, hence the disappointment at finding total fatalities from falls of roof and coal for the entire year 1937 set tentatively at 786 against 739 for 1936, the 1937 rate (tentative) being 1.60 against 1.51 (tentative) in 1936.

The prevention of fatal and serious accidents from falls of roof and coal has long been the most difficult problem confronting our mining people, as about 53 per cent of all coal-mine fatalities for the past ten or more years came from this one cause, even though such accidents usually affect only one person at a time, and feasible methods of overcoming this leading source of accident occurrence have been difficult to find or to apply.

Injuries From Falls Lower

The much lower rate of occurrence of accidents from falls of roof and coal in the first nine or ten months of 1937 gave rise to the belief (or, at any rate, to the hope) that at last this very fertile cause of mine fatalities was being solved. Much of the credit was given to expansion of the use of safety hats, as fragmentary information now available gives good foundation for the belief that at least 100 lives are being saved in our coal mines annually by the efficacy of hard or safety hats in warding off accidents from falling materials (including roof and coal). The unquestionably good effect of safety hats in reducing the number and seriousness of accidents from falling materials in our mines is nullified, in part, at least, by an increase in serious accidents from falls of roof and coal. These frequently occur when employees on coal-cutting machines, conveyors, loaders, scrapers, and other similar equipment either take long chances in not placing enough props, timbers, or other supports, or when, in manipulating or moving their machinery, they remove props or other supports temporarily in the way without replacing them soon enough or installing substitute supports. That this is a prolific cause of fatal and serious accidents from falls of roof and coal can be readily realized by reading the excellent monthly fatality reports now issued by many of the State coal-mine inspection departments. Few of these reports from coal-mining States using mechanized mining, loading, hauling, or other equipment to any considerable extent fail to list one or more fatalities from falling roof or coal at or in connection with mechanized equipment in the face region.

Table III gives the coal-mine fatality rate (fatalities per million tons of coal produced) for 1930-37, inclusive, and, while the upward trend shown in 1937 unquestionably is disquieting, the outlook is not so very dark. The fact that the combined anthracite and bituminous fatality rate is set tentatively at 2.98, or less than 3.00, thus joining 1933, 1934, 1935, and 1936 as the only years in the present century with fatality rate under 3.00, is encouraging. It is gratifying, of course, that 1936 set an all-time low fatality rate and that for the first nine months of its existence the year 1937 had a rate which either equaled or exceeded that for the similar period of 1936. It is unfortunate that disasters in the last three months of 1937 spoiled the possibility of establishing an all-time low record in coal-mine accident occurrence, but this heartens the mine safety man in his efforts for 1938. The coal-mine safety man, however, is confronted with numerous obstacles in attempting to achieve safety records equaling or excelling those of the past five years; the rapid changes now confronting the coal industry make his path by no means a bed of roses.

The rapid extension of mechanized mining introduces new conditions which tend to increase accident occurrence unless definite and adequate measures are taken to handle the new hazards created simultaneously with the installation of mechanized equipment and procedures. This does not mean necessarily that increased mechanization will cause a permanent increase in accident occurrence; past experience proves that where there is adequate recognition of the fact that new methods are almost sure to develop new hazards and definite effort is made to overcome these hazards, mechanized mines where this is done have established the most excellent safety records.

Some of the problems arise in connection with extension of the use of electrical equipment at or near faces which are or at any time may be definitely gassy or dusty. Certainly safety demands that in the extension of the use of electrical equipment in coal mines the equipment be of types giving maximum protection to the workers: namely, permissible equipment approved by the Bureau of Mines. Extension of blasting during the working shift, which usually is held necessary to the success of up-to-date mine mechanization, most certainly involves numerous serious hazards, and during 1937 at least thirty-five lives were lost because of this fact. Moreover, the use of multiple shifting, which in many cases accompanies the mechanization of mines, certainly introduces numerous hazards. Safety is very likely to suffer severely from the relaxation of supervision which almost always accompanies night shifting, and at least 50 lives were sacrificed in 1937 almost directly due to this.

The heavy increase in air dustiness likely to accompany the extension of mechanical handling of coal in the confined working places of coal mines not only introduces a definite increase in the explosion hazard but also decreases visibility very markedly (in some cases causing available lighting facilities to lose 75 to 90 per cent of their efficiency); this, too, is a very definite menace to safety. The heavy concentrations of dust in the air which must be breathed by workers also is a health hazard and is an item which must be recognized, in view of the rapid extension of occupational disease laws in the various States. In fact, dust menace in connection with mechanized mining cannot be ignored if even reasonable safety is to be achieved in the future. Moreover, extension of the use of machinery in mines causes a material increase in noise—another detriment to safety, as it prevents the

Table III—Coal-Mine Fatality Rates, United States, 1930-37 Inclusive

	Fatality rate per million tons				
Year	Bituminous	Anthracite	Combined	Fatalities	Total Tons
1930	3.46	6.40	3.84	2,063	536,911,136
1931	2.83	6.42	3.31	1,463	441,750,978
1932	3.09	4.99	3.36	1,207	359,565,093
1933	2.50	4.66	2.78	1,064	383,171,877
1934	2.65	4.69	2.93	1,222	416,536,313
1935	2.60	5.24	2.925	1,242	424.632,005
1936	2.50*	4.46*	2.72*	1,330	488,830,000*
1937	2.82†	4.44†	2.98†	1,467†	491,637,000†

* These figures are from Bureau of Mines records and, while tentative, are essentially correct and are likely to vary but little from the final figures.

† Tentative as estimated Jan. 8, 1938, by W. W. Adams, Employment Statistics Section, U. S. Bureau of Mines. These figures are likely to vary but slightly from the final figures, which will not be available for several months.

worker from hearing the usual sounds that give premonitory evidence of danger from falling roof or coal, from haulage equipment, etc.

The recital of these hazards which which confront the coal-mine safety man in the current rapid mechanization of coal mines is not intended to intimate that mechanized mines cannot be operated safely; but it is desired to call attention to the fact that unless our mining people recognize the various new hazards being introduced and take adequate measures to safeguard their mines and mine workers against them, safety in United States coal-mine operation has a sad time in store.

The safety problems now confronting our coal mines, while serious and pressing, are by no means unsurmountable; proof of this is offered by the fact that the first nine months of 1937 had a better safety record on a fatality-rate basis than the same period of 1936, the banner year in coal-mine safety. All that is needed to proceed to greater and better safety records in coal mining in the United States in 1938 is commonsense recognition of the problems involved in making our mines safe under the new conditions being evolved and application of readily available and well-known and effective methods to handle these problems.

MORE RESEARCH PROJECTS

+ Than Ever Are Listed in 1937

RESEARCH, despite some soft spots, was pursued on the whole last year with as much energy as in the last few years, if not actually with more. A most encouraging feature was the evidence of research-mindedness in the coal industry. Research seems at last to have touched the pocketbook nerve.

The U. S. Bureau of Mines, has not played as large a part in independent research as it might have with more liberal appropriations. Many of the projects now under way by that agency are purely investigatory and made by field men who merely correlate the practices of the coal field and use the unheralded trial-and-error research of the operator and others, here and abroad, as a basis for their valuable findings. Western Congressmen saw to it that research be started in the West on the carbonization of its coals, and $100,000 of federal money will be expended in the next five years on that project. The Colorado School of Mines has raised funds to provide adequate office, laboratory and testing space for the experimenters. But all older Bureau of Mines institutions find support curtailed or withdrawn, for the hydrogenation study, which, alone of these, is quite active, may be ranked among the newer developments.

By a subscription of $350,000, the Coal Research Institute at the Carnegie Institute of Technology, Pittsburgh, Pa., renewed its lease of life for at least four more years. The donors included seventeen coal-operating organizations, one steel-and-coal industrial company, four railroad and two industrial companies. During the year the Battelle Memorial Institute and the Pennsylvania State College continued their work for Bituminous Coal Research, Inc., and the Anthracite Industries laboratory (formerly the Anthracite Institute laboratory) extended its investigations.

Battelle is studying the relation of the characteristics of coal to their performance on typical underfeed stokers. Particular attention was given in 1937 to the relation of size of coal and caking characteristics to the performance of the stoker. A stoker with a mechanically operated fuel-bed agitator was tested and found to have merit for strongly caking coals. Several automatic air-volume controls were tested.

The fundamentals of the process of combustion in small stoker fuel beds were studied by taking temperature measurements, by sampling and by analyzing the gases from within the fuel bed; so also were the relation of the properties of oils and petrolatum and the properties of coals to the initial and permanent effectiveness of the treatment of coal in elimination of dust in handling. The effect of oil coatings on oxidation, spontaneous combustion, degradation and segregation in handling and on the combustion characteristics also is being investigated. It has been found, using 0x1½-in. Island Creek coal, that less oil of the stiffer 20-second Saybolt Universal viscosity will coat more coal for a given dustiness index than the lighter 100-second oils, based on the condition a week after application.

Much coal is condemned because it segregates in delivery from the consumer's storage. Hence, Battelle has studied segregation of coal in the bunkers of power plants. Problems in the utilization of bituminous coal on the industrial stokers of the Middle West also are being surveyed. As regards new uses, work has been done at Battelle on the wet oxidation of coal and the production of humic acid, and a study has been made of the possibility of using that acid as an "intermediate" in the manufacture of commercial products; but this is not a Bituminous Coal Research study.

Two new projects undertaken by the Coal Research Laboratory depart somewhat from the fundamental research hitherto sought. One of these is to test temperatures and gas compositions in a large underfeed stoker at the Hell Gate generating station of the Consolidated Edison Co. of New York. This will be done in cooperation with the engineers of the company and with Bituminous Coal Research, Inc., through its staff at the Battelle Memorial Institute.

As the highest temperature observed in the preliminary study was about 2,830 deg. F. about 9 in. beyond the tuyere plate over the extension grates, difficulties may prevent the taking of gas samples, but it has been found at least that the samplers can be inserted into the spaces above the tuyere stack and the retort and that they can be kept there long enough to obtain stationary temperature readings at several levels in each zone and to withdraw gas samples, but it was not possible to determine absolutely whether readings obtained with a water-cooled sampler were the same as those with an uncooled sampler, although the indications were that the cooled sampler gave low readings. These tests will be continued.

Will Study Coke Making

The other Coal Research Laboratory study is to ascertain factors in coal carbonization. At first, a commercial coke oven was to be used for the purposes of the inquiry, but the difficulties involved in preparing an oven for test induced the laboratory to design and construct an oven, which in itself weighs 5 tons, to carbonize a 12x12x18-in. charge of coal —about 30 lb.—heated on one side in such manner that the charge will represent essentially an element of volume of a coke oven. In this, the variables affecting carbonization can be both controlled and measured. The oven will have a movable wall and be mounted on trunnions so that the major axis of the charge may be made either horizontal or vertical. Tests in Russia made by Sapozhnikov have suggested that provision be made for measuring the thickness of the plastic layer during carbonization. His simple apparatus measures the maximum thickness of this layer and the total shrinkage under pressure on heating the coal to 1,652 deg. F.

Meanwhile, the temperature distribution in a 10-in. column of 60x80-mesh coal of 1½-in. diameter heated from one end was determined. Comparisons of the temperatures observed with fresh coal in the furnace with those observed with coal previously heated to 752 deg. F. indicated that the fresh coal underwent some exothermic reaction—that is, a change that emitted heat. Some exothermic change, possibly one in molecular constitution, has been presumed, but the total reaction at such early temperatures usually has been regarded as endothermic, or heat-absorbing, rather than heat-creating, but in these tests, which were preliminary, the atmosphere in the column of coal was not kept inert, or neutral, although, in subsequent work, means were provided for establishing a nitrogen atmosphere. Hence, it is impossible to state whether the heat observed arose from oxidation or from exothermic pyrolytic (decompositional or depolymerizing) changes.

It had been hoped that the apparatus was simple enough from the point of view of heat flow that the data could be analyzed in the light of heat conduction. For this to be practicable the heat flow would have to be strictly in the direction of the principal axis, but analysis of the data indicated that radial conduction, in directions at right angles to the principal path of heat flow, was too important to be neglected. This condition made it impossible to correlate the data to determine the rate of exothermic change.

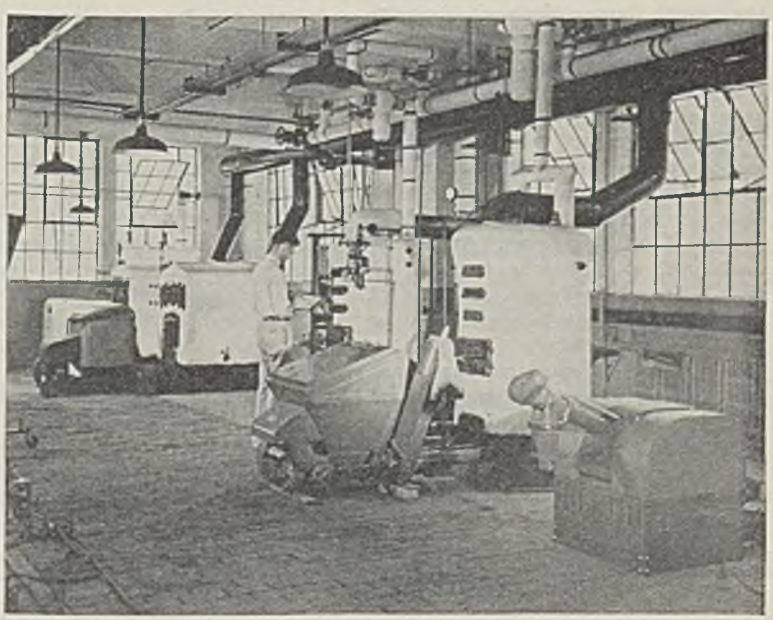
Rather than spend time on this apparatus, as the large oven already in construction would permit the chemists to obtain the same data under better conditions, a calorimetric method of determining the heat of reactions at the low temperatures known as the "sensitive range" was attempted.

Coke quality generally has been recognized as of importance in blast-furnace operation. The most important property or combination of properties which determines quality is still largely a matter of opinion. Examination of certain properties of laboratory and commercial cokes by methods developed in the Coal Research Laboratory has shown such wide ranges of values that the chemists decided to undertake to determine if consistent differences could be found between pairs of cokes selected by blast-furnace operators and designated by them as "good" and "inferior." Four such pairs of coke samples have been submitted, also nine samples representative of the product of different coke plants.

Studies indicate that, when bituminous coal is oxidized by aqueous alkali and compressed oxygen, carbonic, acetic, oxalic and aromatic acids are formed, the last representing about one-third of the carbon in the original coal. When, with Edenborn coal, potassium hydroxide and compressed oxygen, no catalyst or one of a long list of catalysts was used, the carbon in the resultant aromatic acids ran between 32.3 and 38.1 per cent of that in the original coal—a fairly constant result. Carbon in both the carbonic acid and oxalic acid ran with almost equal consistency, but with cupric sulphate as catalyst, the carbon percentage in the oxalic acid dropped to one-half its normal value and the carbon percentage in the aromatic acids dropped even more, while the carbon percentage in the carbonic acid gained from both. It appears that sodium hydroxide is not as potent as potassium hydroxide and that calcium hydroxide can replace the potassium hydroxide in considerable part without change in the result. Low-temperature coke is more resistant to oxidation than coal, as might be expected; only 30 per cent of the caibon was recovered as carbon dioxide under conditions where coal yields were 45 to 50 per cent.

Efforts have been made by the U. S. Bureau of Mines to discover why a certain rib of coal in the anthracite region apparently ignited spontaneously. Certain kinds of anthracite will thus ignite or become

Testing floor, Anthracite Industries Laboratory



ignited by shooting. A fire occurring in the Top Split of the Mammoth suggested a study of the coal seam at Locust Gap, Pa., though in another section of the Southern field the tendency to self-ignition is still more noticeable.

It was found that a certain dirty layer of coal having 35.4 per cent ash and only 0.5 per cent of sulphur (dry basis) had the lowest ignition temperature of any layer in the bed —namely, 655 deg. F.—whereas clean layers had ignition temperatures from 788 to 880 deg. F. Average ignition temperature of several anthracite samples was 844 deg. F.; of the most ignitable anthracite tested, 655 deg.; of two Washington State coals, 504 deg., and of a Colorado coal, 367 deg. F.

Silicon-Carbide Coke Test

In the search for a standard method of determining the agglutinating value of coal when subjected to coking heat, silicon carbide (Carborundum) was investigated at the Pittsburgh Station of the U. S. Bureau of Mines and found to be sufficiently uniform in surface characteristics for mixing with coal as the inert material to weaken the coking quality so as to determine how much may be added and still permit a button of coke to be made of the standard coking strength. Cooperative tests are now in progress to determine how close will be the determinations of different laboratories on the same coal. Hitherto, Ottawa sand has been the favored material, but results were erratic.

Reporting on the investigation of the Knowles sole-flue oven of the Radiant Fuel Corporation, at West Frankfort, Ill., the Illinois State Geological Survey declared that the plastic zone travels upward 0.78 in. per hour in the lower 7 in. of the charge. The lower two-thirds of the coke bed may have the properties of a high-temperature, low-volatile coke and the upper third may be more like a low-temperature product. Such coke can be readily pushed from the oven. When the coking process is continued, all the coke becomes of high-temperature type. At none of the several low-temperature or medium - temperature carbonizing plants was any constructional work for increase of capacity undertaken, though 1938 may see some further development, for the products market freely.

A pilot plant of a capacity such that 20 to 40 lb. of material can be carbonized at one time has been operated by G. B. Cramp at the Burnham shops of the Denver & Rio Grande Western R.R. Co., in Denver, Colo. High- and low-grade Kansas, Colorado and Utah coals, both coking and non-coking, and ranging from 7 to 30 per cent moisture, have been treated, also lignite, peat and oil shale. Bituminous and anthracite dusts and coke breeze have been combined with semi-coking bituminous coals to form lump-sized smokeless coal.

Lignite, the experimenter declares, retains its original form after carbonization, but shrinks, as is to be expected. The still is heated by low-voltage electricity, so as to permit an account to be taken of all the heat entering the process, though, in a commercial plant, heat would be supplied by cycling the gases from treatment, which, it is said, would leave half of them, 4,000 cu.ft. per ton of about 500 B.t.u., available for other purposes. About 16 gal. of oil per ton is obtainable and 12 to 15 per cent of the volatile matter is left in the product.

Instead of treating the coal by application of heat on the outside of the retort, it is placed in a uniform layer around the central heating element. Thus, the oil vapors, according to Mr. Cramp, are driven off into cooler zones and do not crack into hydrogen and fixed carbon, pitch or tar and leave the still as a true oil lighter than water. Treatment progresses at a rate of 1 in. of coal thickness per hour. Temperature of the still is 800 deg. F. or less. Emergent moisture, oils and gases are at temperatures as low as 120 deg. F. The direct object of the investigation was to discover a suitable fuel for freight and passenger service through the 6-mile and 40 other tunnels on the Dotsero cut-off.

Water Gas From Lignite

At the Northwest Research Institute a furnace was constructed in 1937 for the production of modified water-gas from lignite. Built on a semi-plant scale, it uses about 30 lb. of coal hourly. It has been running at intervals since September and has been successful in producing good yields of water-gas. Experiments will continue in 1938.

Tests made by the Northern States Power Co. into the photographing of the behavior of ash cones under increasing temperatures show that when the cones melt, some go down more than others at the same temperatures, yet both, under the standard, are recorded as having the same softening characteristics, putting them by inference in the same clinkering category. The experimenters believe they should be differentiated and expect to compare the fusing characteristics of the ash as developed in the photographs with the clinkering action as exhibited in industrial furnaces. It is beginning to be realized that softening temperature inadequately defines the clinkering characteristics of a coal. Perhaps the photographic method will furnish a more accurate method of ascertaining action and character of clinker.

Tests made with rabbits, rats and mice at William H. Singer Memorial Research Laboratory of the General Hospital and at Mellon Institute revealed not even the faintest suggestion of fibrosis of the lungs (an increase of interstitial fibrous tissue) in certain control animals or in those exposed to gases from the burning of anthracite or coke. In the lungs of animals exposed to the smoke from the combustion of bituminous coal, the spindling of carbon-laden cells —apparently the earliest stage of fibrosis—was noted. It seems likely, the experimenters say, that bituminous coal smoke, even when unaccompanied by other dusts, is capable of producing fibrosis if exposure is sufficiently prolonged.

Pneumonia From Coal Smoke

Animals exposed to the products of combustion of bituminous coal had the greatest number of uncomplicated pneumonias and the greatest incidence of bronchitis. Phagocytosis, or the destruction of microorganisms by phagocytes in the carbon pigment, was scarcely seen in the lungs of the control animals and was slight in those exposed to the gases from the burning of anthracite, but was more obvious in those subjected to the gases from burning coke and was very marked in those exposed to the smoke and gases from bituminous coal.

Percentage of hemoglobin and the number of red and white blood cells per cubic millimeter of blood rose consistently in all groups of animals, but these rises were least noticeable in the rabbits exposed to the gases from burning anthracite. The most immediate and pronounced increase of leucocytes, hemoglobin and red corpuscles in the blood occurred in the animals subjected to the smoke from bituminous-coal fires. Intermediate conditions were seen in animals exposed to coke-fire emanations.

Putting the gain in weight of the control animals at 100, rats in anthracite flue gases gained 105; in coke flue gases, 114; and in bituminous smoke, 75. With rabbits these gains were 100, 84, 77 and 9 respectively. Of course, all the flue gases were mixed with air, so that the concentration of sulphur dioxide and carbon dioxide at all times was nontoxic and only a trace of carbon monoxide could be found.

Pittsburgh's tuberculosis death rate is low per 100,000 of population in comparison with that of the U. S. Registration Area and of Metropolitan Life Insurance policyholders, declares the same research organization. From studies begun in December, 1933, it was concluded that such pneumonoconiosis as generally occurs in the Pittsburgh area is not a medical hazard and does not predispose to tuberculosis. Any grade of anthracosis, moreover, may develop entirely independently of the presence of heart disease.

Practically no relationship could be demonstrated between heavily pigmented lungs and pneumonia, although the pneumonia death rate in the prosperous years, when factories were belching smoke, was in Pittsburgh more than twice that of other large cities. Earlier studies indicated that anthracosis, which is one form of pneumonoconiosis, tends to aid in the localization and healing of pulmonary tubercles, but that pneumonia was more likely to heal by organization than by resolution and that small abcesses tend to form in heavily pigmented lungs.

Coal Research in Progress or Completed in 1937 Or Planned for 1938

Air Pollution: Smoke Abatement

(See also *Safety and Health*)

Concentrations of Volatile Sulphur Compounds in Atmospheric Air† (1936), Mellon Inst. for Air Hygiene Found., Bull. 1 Part i

Dust Precipitation and Agglomeration During Flow Through a Duct,* Mass Inst. of Tech.

Electrostatic Deposition of Dust in Atmospheric Air, Westinghouse Elec. & Mfg. Co.

Elimination of Sulphur From Gas and Smoke,* Pitts. Exp. Sta., U.S.B.M.

Relation of Pneumonia and Heart Disease to Impure Air of Cities,* Singer Memorial Res. Lab., Allegheny General Hospital and Mellon Inst.

Removal of Sulphur Dioxide and Flue Dust From Stack Gases,* Univ. of Ill., for Utilities Res.

Smoke Abatement Commission, Pitts. Exp. Sta., U.S.B.M.

Smoke Elimination,* Ohio State Univ.

Smoke Pollution in New York Area* (1931), Stevens Inst. of Tech.

Sootfall and Suspension of Solids,* Mellon Inst., W.P.A.

Sulphur-Dioxide-Concentration Measurements of Air in Chicago, Univ. of Ill.

Ash and Clinker

(See also *Combustion, Domestic Furnaces*)

Addition of Various Materials to Coal to Change Ash Characteristics,* Northern States Power Co.

Determination of Fusing Points With Aid of Photography,† Northern States Power Co.; *Ind. & Eng. Chem.* (Anal. Ed.) 9–106

Fusion Temperature of Kansas Coal Ashes in Relation to Cleaning,* Univ. of Kansas

Method of Determination of Fusibility of Coal Ash,* Ohio State Univ.

Methods of Raising Fusion Point of Northern West Virginia Coal* (1936), W. Va. Univ.

Relation of Kind of Clinker to Furnace Performance,* Northern States Power Co.

Briquetting of Coals and Briquets

Briquetting of Alabama Lignite, Ala. Poly. Inst.

Briquetting of Coal, Battelle Mem. Inst.

Briquetting of Coal Without Binder to Produce Smokeless Fuel* (1935)†, Ill. G. S.

Burning Characteristics of Briquets Made From Various Mixtures of Anthractie and Bituminous Coal or of Both With Other Materials, H. C. Porter

Sodium-Silicate Briquetting of Coal and Mixtures of Anthracite, Bituminous Coal and Coke, F. D. Snell, Inc.; *Ind. & Eng. Chem.* 29–724

Carbonization and Distillation of Coals

Agglutinating Values of Coal,* Committee D-5, Coal & Coke, A.S.T.M.; Pitts. Exp. Sta., U.S.B.M.; *Ind. & Eng Chem.* 29–840

Blending of Coals in Coking, H. C. Porter, for A.S.T.M. and Am. Gas. Assn.

Carbonizing Properties of American Coals,* Pitts. Exp. Sta., U.S.B.M.

Carbonizing Properties of Illinois Coals,† (1932), Ill. G.S.; Bull. 64

Coal Plasticity Under Heat, H. C. Porter for A.S.T.M. and Am. Gas. Assn.

Coking Coal Heated in Suspension by Convection and Radiation and in Later Stage by Conduction,* Univ. of Ala.

Coking of Coal,* Penn State

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* Items starred indicate that work on such projects was still continuing at the close of 1936.
† Items marked with a dagger were concluded in that year.
‡ Items marked with a double dagger indicate that a report probably will be made in 1938. Figures shown in parentheses indicate year in which the particular project was started. Absence of notation indicates the informant failed to indicate status of project. Notations following name of body making the research and of the company sponsoring it refer to papers or reports in which these investigations were, in whole or in part, communicated. Certain of the items in the listing might with almost equal propriety be grouped under some other heading. Where the project is of multiple interest, requiring listing in more than one subject or where it cannot be listed under any one subject, it is placed either under "Surveys" or "Miscellaneous."

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* Items starred indicate that work on such projects was still continuing at the close of 1937.

FEDERAL PRICE CONTROL

+ Takes Effect in Bituminous Industry

FEDERAL control of bituminous mine prices—long vigorously advocated and as violently condemned—again became a reality last year with the enactment of the Guffey-Vinson act. This measure, successor to the outlawed Bituminous Coal Conservation Act of 1935 and the NRA price-control system in 1933, passed Congress and was signed by the President in April. Although the National Bituminous Coal Commission established under the law was sworn in on May 17, no minimum price schedules were promulgated until Nov. 30.

At that time, the Commission announced prices effective Dec. 16 for all producing fields east of the Mississippi River and for Iowa. Arkansas and mines in Haskell, Le Flore and Sequoyah counties, Oklahoma, were covered in a schedule published Dec. 9 to become effective Dec. 27. Prices for all other producing districts except the Dakotas were promulgated Dec. 16 to be effective Jan. 3, 1938. Action on Dakota prices was withheld pending a decision whether coal produced in those two States is subject to the act, which specifically excludes lignite.

Before the Commission could enter the price-determination stage of its work, however, it was necessary to organize district boards for the 23 producing districts[1] named in the law, set up statistical bureaus in each district and establish classifications for each code-member mine. Initiative in classification, proposing base prices and in coordinating prices of competing districts into common markets rested with the producers' district boards. In many cases, failure of these boards to agree upon competitive relationships and, in some instances, dissension within a district on proper classification compelled the Commission to take over the job of reconciling views.

The first formal public hearings of the Commission were held in July to consider proposed standards of classification. Taking their cue from an order of the 1935 Commission, district board spokesmen generally testified that these standards should include: (1) Chemical analysis, (2) physical characteristics, (3) plant-performance characteristics, (4) market history and sales experience, and (5) values as to use. This last proposed standard, which was not a part of the 1935 order, immediately became a storm center, with union spokesmen denouncing it as a device to give favored consumers—particularly the railroads—special advantages. Defenders of the use standard

[1] These districts are: 1—Eastern Pennsylvania, including Maryland, and Grant, Mineral and Tucker counties, West Virginia; 2—Western Pennsylvania; 3—Northern West Virginia, including mines in Nicholas County served by the Baltimore & Ohio R.R. and north; 4—Ohio; 5—Michigan; 6—West Virginia Panhandle; 7—NRA Southern No. 1 field, covering principally low-volatile operations of West Virginia and Virginia; 8—NRA Southern No. 2, covering principally high-volatile operations of the Virginias, eastern Kentucky and parts of Tennessee and including Buchanan County, Virginia, low-volatile field; 9—Western Kentucky; 10—Illinois; 11—Indiana; 12—Iowa; 13—Alabama; Dade and Walker counties, Georgia, and Marion, Grundy, Hamilton, Bledsoe, Sequatchie, White, Van Buren, Warren, McMinn and Rhea counties, Tennessee; 14—Arkansas and Haskell, LeFlore and Sequoyah counties, Oklahoma; 15—Kansas, Missouri, Texas and coal-producing counties in Oklahoma not included in District 14; 16—Northern Colorado; 17—Southern Colorado and New Mexico counties not included in District 18; 18—Grant, Lincoln, McKinley, Rio Arriba, Sandoval, San Juan, San Miguel, Santa Fe and Socorro counties, New Mexico; Arizona and California; 19—Wyoming and Idaho; 20—Utah; 21—North and South Dakota; 22—Montana; 23—Washington, Oregon and Alaska.

stoutly insisted it was necessary under the express provisions of the new law. Both market history and use standards, however, were rejected by the Commission in an order dated Aug. 16. These, it said, "clearly deal not with coal itself but with questions of marketing policy which become pertinent when minimum prices are proposed and coordinated."

For purposes of coordination, the law groups the 23 producing districts into ten Minimum-Price Areas (see *Coal Age*, May, 1937, p. 225). In promulgating minimum-price schedules, the Commission set up 157 marketing areas. Some of these areas are limited to a single city, others include entire States or still larger territory. No producing district, of course, has prices to all areas. In the territory east of the Mississippi River, for example, District 5 has prices to only two market areas; District 8 is given prices to 110 market areas.

Typical base minimum-range prices for all districts east of the Mississippi River and for Iowa are shown in Table I. The spreads within the low and high ranges in each of the three size groups selected are due to different prices on the same coal in different market areas. As stated in the table, these quotations are exclusive of freight-rate adjustments and individual exceptions. For each market area or group of such areas named in the minimum-price schedule of a district, there also is a designated freight-rate base. Where the freight rate from the mine is higher than that base, f.o.b mine prices may be reduced by an amount not in excess of 35c. per net ton to equalize the actual rate within the indicated base. Where the actual rate is less than the base rate, the minimum price must be increased—subject again to the 35c. maximum—sufficiently to equalize the actual freight rate with the base rate.

Two of the producing districts east of the Mississippi River (Michigan and the West Virginia Panhandle) place all the mines in their respective districts in a single classification. In the other districts in that area, the number of separate classifications which in turn take separate price scales ranges from 4 to 20. The number of size groups in each district runs from 9 to 20. Specific modifications for individual mines, sizes or areas further complicate the schedules. Since the schedules were announced, the Commission has been deluged with complaints asking relief in specific situations. Under such circumstances and with the whole movement still in a state of flux, prices given in Tables I to VI must be considered only as indicative of the general price pattern as it existed on the morning of Dec. 16, 1937; nothing more is claimed for the figures quoted.

Table I—Base Minimum-Price Ranges for Producing Districts East of Mississippi River, and Iowa as of Dec. 16, 1937

(Exclusive of freight-rate adjustments and individual exceptions)

Producing District	Mine-Run		Large Lump		¾-in. Slack		Railroad Fuel*
	High	Low	High	Low	High	Low	
I	$2.35–$2.80	$2.05–$2.45	$2.90–$3.05	$2.45–$2.70	$2.05–$2.40	$1.60–$1.95	$2.15
II	2.35– 2.60	1.85– 2.10	2.63– 2.90	2.13– 2.50	1.81– 2.26	1.31– 1.76	2.15
III	2.25– 2.63	1.90– 2.25	2.75– 3.05	2.23– 2.60	1.85– 2.30	1.41– 1.86	2.15[1]
IV	2.30– 2.50	1.95– 2.15	2.50– 2.80	2.15– 2.45	1.61– 2.06	1.21– 1.86	2.15
V	3.55	3.55	4.65	4.65	2.80– 3.05	2.80– 3.05	3.60
VI	2.08– 2.30	2.08– 2.30	2.23– 2.60	2.23– 2.60	1.41– 1.86	1.41– 1.86	2.35
VII–*A*	2.16– 2.35	2.06– 2.25	2.80– 3.20	2.40– 2.90	1.95– 2.08	1.45– 1.58	2.35
B	2.20– 2.30	1.85– 1.95	2.90– 3.35	2.20– 2.40	1.85– 1.95	1.25– 1.35	2.15[2]
VIII–*A*	2.06– 2.25	2.06– 2.25	2.45– 2.95	2.35– 2.85	1.75– 1.88	1.65– 1.78	2.35
B	2.20– 2.30	1.85– 1.95	2.90– 3.40	2.20– 2.45	1.90– 1.98	1.30– 1.38	2.15[3]
IX	1.65	1.65	1.75– 2.35	1.60– 2.15	1.10– 1.60	.85– 1.20	1.95
X	2.15– 2.35	1.70– 1.95	2.75– 2.90	2.10– 2.20	1.75	1.20– 1.38	2.15
XI	2.10	1.90	2.40– 2.85	2.05– 2.35	1.25– 1.75	.95– 1.45	2.10
XII	3.00	2.65	3.80	2.65	2.50	2.00	[3]....
XIII–1	3.00	2.25	3.80– 4.85	2.35– 2.65	2.85	2.10	2.35[4]
–2	2.15– 2.45	2.15– 2.45	2.80– 3.45	2.45– 3.10	1.30– 2.05	1.00– 1.80	2.35[4]

* All coal except lump or double-screened sizes, which take prices 15c. per ton higher. Unless otherwise shown by footnotes, prices apply to both on- and off-line business.

VII–*A* is low-volatile coal; VII–*B* and VIII–*B* are high-volatile coals; VIII–*A* covers Buchanan County low-volatile mines and Red Ash mines in Virginia and Williamson districts.

XIII–1 covers Alabama mines; XIII–2, Tennessee and Georgia operations in District XIII.

[1] Off-line, $1.90. [2] Off-line, $1.95. [3] $2.70 to $3.55. [4] Off-line, $2.15.

Table II—Base Minimum-Price Ranges to Market Area No. 1 as of Dec. 16, 1937

(Tidewater and New England Markets)

Producing District	Mine-Run	Large Lump	¾-in. Slack
I	$2.25–$2.60	$2.55–$2.90	$1.95–$2.40
II	1.98– 2.38	2.13– 2.63	1.54– 2.04
III	2.03– 2.38	2.23– 2.78	1.64– 2.09
VII[1]	2.25– 2.35	2.80– 3.20	1.53– 2.03
VII[2]	1.85– 2.20	2.20– 2.90	1.25– 1.85
VIII[1]	2.25	2.75– 2.85	1.73– 1.83
VIII[2]	2.08	2.35– 2.45	1.65– 1.75
VIII[3]	1.90– 2.45	2.20– 2.90	1.25– 1.85

VII[1] covers low-volatile coals all-rail; VII[2] high-volatile coals via tidewater.

VIII[1] covers low-volatile coals all-rail;

VIII[2], low-volatile coal via tidewater.

VIII[3], high-volatile coals.

Table III—Base Minimum-Price Ranges to Market Area No. 1-A as of Dec. 16, 1937

(Coal dumped for transshipment at New York, Wilmington, Philadelphia and Baltimore; in the case of Baltimore for destinations outside Chesapeake Caper only)

Producing District	Mine-Run	Large Lump	¾-in. Slack
I	$2.25–$2.60	$2.55–$2.90	$1.95–$2.40
II	1.98– 2.38	2.13– 2.63	1.54– 2.04
III	2.03– 2.38	2.23– 2.78	1.64– 2.09
VII[1]	2.08– 2.18	2.40– 2.80	1.45– 1.95
VII[2]	2.06– 2.16	2.40– 2.80	1.56– 2.06
VII[3]	2.08– 2.18	2.40– 2.80	1.58– 2.08
VII[4]	1.85– 2.20	2.20– 2.90	1.25– 1.85
VIII[1]	2.06	2.35– 2.45	1.76– 1.86
VIII[2]	2.08	2.35– 2.45	1.78– 1.83
VIII[3]	1.90– 2.45	2.20– 2.90	1.25– 1.85
VIII[4]	1.90– 2.45	2.20– 2.90	1.38– 1.98

VII[1] Covers low-volatile coal for east of Port Chester, N. Y., and costal New England; VII[2], low-volatile coal for transshipment at Philadelphia; VII[3], low-volatile coal for transshipment at New York and Baltimore; VII[4], high-volatile coal.

VIII[1] covers low-volatile coal for transshipment at Philadelphia and Wilmington; VIII[2], low-volatile coal for transshipment at New York and Baltimore; VIII[3] covers high-volatile coal through Philadelphia harbor; VIII[4], high-volatile, New York harbor, Port Chester and Baltimore.

Table IV—Base Minimum-Price Range to Market Area No. 17 as of Dec. 16, 1937

(Indiana Destinations)

Producing District	Mine-Run	Large Lump	¾-in. Slack
I	$2.05–$2.45	$2.45–$2.90	$1.60–$2.05
II	1.95– 2.35	2.20– 2.65	1.31– 1.81
III	2.05– 2.25	2.30– 2.75	1.41– 1.85
IV	1.95– 2.30	2.15– 2.50	1.21– 1.61
VI	2.10	2.30	1.41
VII-*A*.	2.25– 2.35	2.80– 3.20	1.55– 2.05
VII-*B*.	1.95– 2.30	2.30– 3.25	1.30– 1.90
VIII-*A*.	2.25	2.85– 2.95	1.75– 1.85
VIII-*B*.	1.95– 2.30	2.40– 3.25	1.30– 1.90
IX	1.65	1.75– 1.90	1.00– 1.50
X	1.70– 2.35	2.20– 2.90	1.30– 1.75
XI	1.90– 2.10	2.30– 2.75	1.45– 1.75

A covers low-volatile coals; *B*, high-volatile.

Table V—Base Minimum Price Range to Market Areas Nos. 27 and 28 as of Dec. 16, 1937

(Lower Michigan Destinations)

Producing District	Mine-Run	Large Lump	¾-in. Slack
I	$2.05–$2.45	$2.45–$2.90	$1.60–$2.05
II	1.95– 2.35	2.20– 2.65	1.31– 1.81
III	2.05– 2.25	2.30– 2.75	1.41– 1.85
IV	1.95– 2.30	2.15– 2.50	1.21– 1.61
V[1]	3.20– 3.55	4.30– 4.65	2.45– 2.80
VI	2.10	2.30	1.41
VII-*A*.	2.25– 2.35	2.80– 3.20	1.55– 2.05
VII-*B*.	1.95– 2.30	2.30– 3.25	1.30– 1.90
VIII-*A*.	2.25	2.75– 2.85	1.75– 1.85
VIII-*B*.	1.95– 2.30	2.30– 3.25	1.30– 1.90
IX	1.65	1.75– 1.90	1.00– 1.50
X	1.70– 2.35	2.20– 2.90	1.30– 1.75
XI	1.90– 2.10	2.35– 2.75	1.40– 1.70

V[1] lower prices apply to Market Area No. 27; higher to Market Area No. 28.

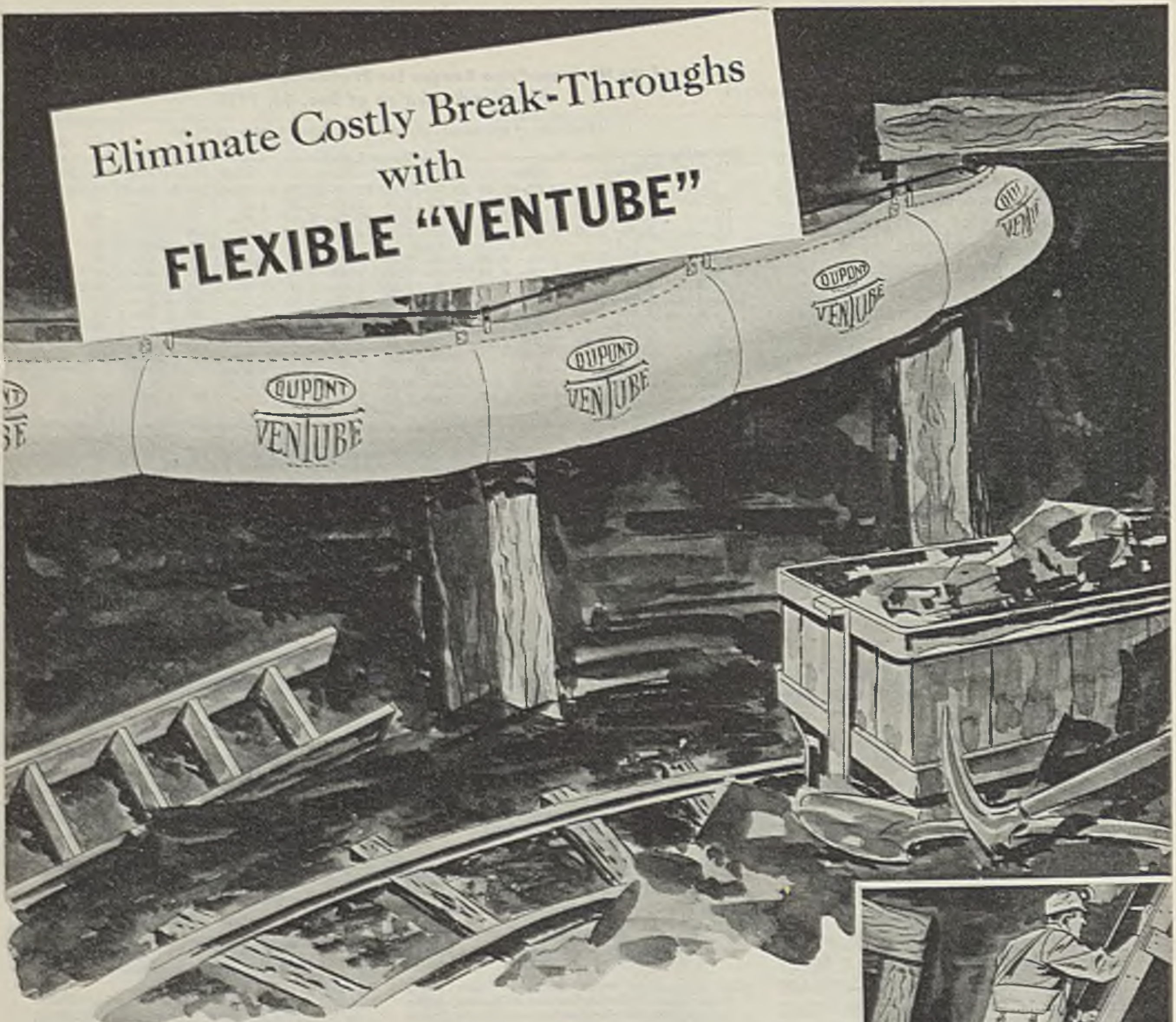
A covers low-volatile mines; *B*, high-volatile mines.

Table VI—Base Minimum-Price Range to Market Area No. 29 as of Dec. 16, 1937

(Chicago Switching District)

Producing District	Mine-Run	Large Lump	¾-in. Slack
I	$2.05–$2.45	$2.45–$2.90	$1.60–$2.05
II	1.95– 2.35	2.20– 2.65	1.31– 1.81
III	2.05– 2.25	2.30– 2.75	1.41– 1.85
IV	1.95– 2.30	2.15– 2.50	1.21– 1.61
VI	2.10	2.30	1.41
VII-*A*.	2.25– 2.35	2.80– 3.20	1.55– 2.05
VII-*B*.	1.95– 2.30	2.30– 3.25	1.30– 1.90
VIII-*A*.	2.25	2.75– 2.85	1.75– 1.85
VIII-*B*.	1.95– 2.30	2.30– 3.25	1.30– 1.90
IX	1.65	1.75– 1.90	1.00– 1.50
X	1.70– 2.35	2.20– 2.90	1.30– 1.75
XI	1.90– 2.10	2.30– 2.70	1.40– 1.70

A covers high-volatile coals; *B*, low-volatile coals.



"VENTUBE" *weaves in and out of irregular passages—and* SAVES MONEY!

"VENTUBE" ventilating duct is so flexible that it can turn sharp angles and still present a smooth interior for the unimpeded flow of fresh air. It can go up and down steep inclines . . . in and out of broken passages where it would be impossible to run other ventilating tubing. Since "Ventube" can be suspended from overhead beams, it takes up less space.

"Ventube" is tough! It is made of extra-heavy, long-fibered Hessian cloth that is *both coated and impregnated* with resistant rubber. It is highly resistant to acid water, damp or dry rot, fungus, mine gases and concussion. "Ventube" stands up under severest mining conditions.

See for yourself how "Ventube" saves time and money. A single test will show you how to remedy many dust and installation problems. And "Ventube" speeds up work by providing adequate fresh air at the most remote working faces. Inquire. For your convenience distributors are within quick and easy reach.

DU PONT

THE FLEXIBLE VENTUBE VENTILATING DUCT

E. I. DU PONT DE NEMOURS & CO., INC.

"Fabrikoid" Division, Fairfield, Connecticut

HERE'S A SHOCK-PROOF POWDER BAG!

It's safer to carry explosives in this du Pont SHOCK-PROOF powder bag because:

1. Every fiber in the sturdy material is impregnated with resistant rubber.

2. After impregnation, each side of the fabric is given several coats of rubber.

3. It will not conduct electricity.

4. It will last longer because the rubber coating *will not peel off*.

5. It is highly resistant to acid water, fungus, rot and powder fumes.

WRITE FOR COMPLETE INFORMATION ON SIZES AND CONSTRUCTION

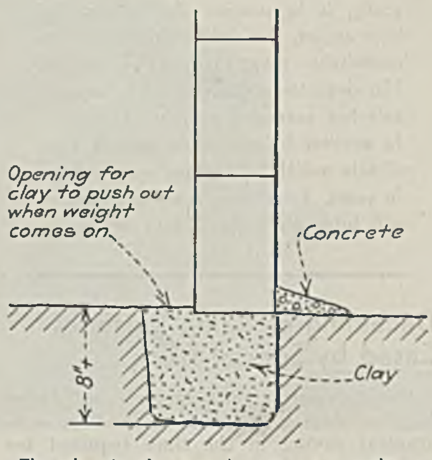
OPERATING IDEAS

From Production, Electrical and Mechanical Men

Stoppings Set on Clay To Prevent Damage

To prevent damage to tile or concrete stoppings where the roof is heavy and settlement is to be expected in the course of working out the territory, Anthony Shacikoski, mine foreman, Cochran Coal Co., Salina, Pa., suggests setting them on a clay footing. Settlement under a heavy roof, Mr. Shacikoski contends, will take place regardless of the size of the pillars between heading and aircourse, and if the coal is soft in nature the damage is more certain and the loss of air is increased.

Soft clay is used and to accommodate it a trench is dug in the bottom about 4 in. wider than the width of the tile used in the stopping. Depth of the clay should be at least 8 in., and the tile is set even with one edge of the trench. The 4-in. opening on the opposite side of the trench allows the clay to be squeezed out when weight comes on the stopping. Hitches, of course, should be cut into each rib to prevent the stopping from being blown out as a result of heavy falls or shooting, and the clay should be tamped in the trench before the tile are set so that the stopping will not settle and leave an opening at the top. Finally, to prevent air leakage, a layer of concrete should be placed at the bottom of the stopping on the side where the tile joins with the bottom.



The clay in the trench acts as a cushion and protects the stopping when weight comes on it

In addition to the normal settlement to be expected, the clay cushion also protects the stopping when ribs and stumps are being pulled, which usually results in a slight squeeze. The cushion also is a great help in the recovery of stopping material on the retreat, Mr. Shacikoski points out, in that the clay can be dug out from under the stopping and the tile split apart at the joints by wedges. Stoppings —especially new ones—naturally should be examined when the aircourses are traveled.

Strengthen Old Cutters For Heavy-Duty Work

Rebuilding old shortwall cutting machines to improve weak parts was one of the maintenance-department jobs when Zeigler No. 2 mine, Bell & Zoller Coal & Mining Co., Zeigler, Ill., was changed from hand to mechanical loading. Application of new and heavier cutting chains and reinforcing of anchors for the sheave-bracket bases are two of the latest improvements.

The bracket-base reinforcement is on the left-front feed-rope side, which is the one that suffers the greatest strain. The original 1-in. bolts, which were in the same position as the new longer bolts indicated by *A* (Fig. 1), often broke and, moreover, it was not uncommon for the pan to be split. The sheave base was reinforced by a steel plate, *B*, 1x3x9½ in., welded to it and drilled for the longer 1-in. bolts. As further reinforcement to

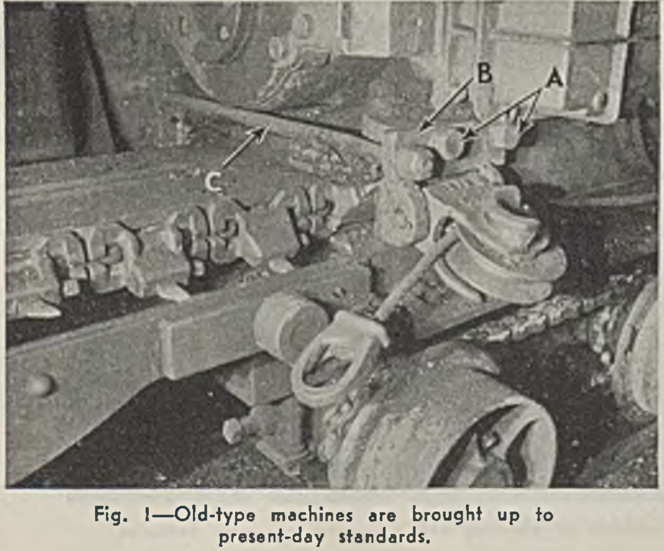


Fig. 1—Old-type machines are brought up to present-day standards.

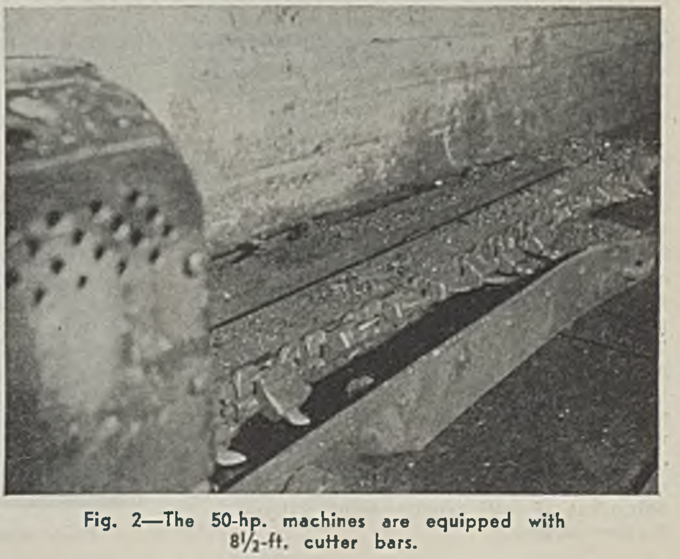


Fig. 2—The 50-hp. machines are equipped with 8½-ft. cutter bars.

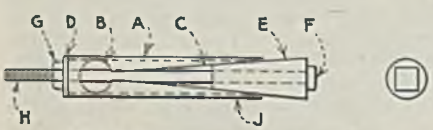
prevent tearing of the pan a 1x31-in. cross-tie bolt, *C*, was added.

Both Figs. 1 and 2 show the new Jeffrey No. 22F cutter chains with which the machines are equipped. The blocks have wearing-plate extensions, or gibs, which bear on the outside edge of the cutter bar. Fourteen of the machines in the mine have 50-hp. motors and 8½-ft. cutter bars. Twelve others have 35-hp. motors and 7½-ft. bars.

Expansion Plug Eases Wall Mounting

In mounting equipment on masonry walls, writes John E. Hyler, Peoria, Ill., it often is desirable to use an expansion device that will result in a mounting bolt being set tightly in the wall, the idea being simply to drill a hole in the masonry with a star drill and then to install the expansion device in this hole. Such an expansion member, adaptable to being made in any desired size and using a piece of pipe as the expanding member, is shown in the accompanying illustration.

Close to one end of the pipe member (*A* in the sketch) a hole is drilled through on centers. Diameter of this hole is approximately equal to the inside diameter of the pipe. A long V cut then is taken out of the pipe, as indicated by *C*. This permits the ends of the pipe member, *J*, to take on a spring action. A washer, *D*,



Details of expansion member for use in masonry walls

is used at the front end of the pipe and, if facilities are available, is lightly welded in place. To expand the pipe member, a cone, *E*, is turned from cold-rolled shafting and drilled through the center to receive the mounting bolt, *F*, with an easy slip fit. The mounting bolt is threaded through the cone and the pipe member as indicated. The largest diameter of the cone should be about the same as the outer diameter of the pipe, so that the assembly can be slipped into the hole in the wall easily.

Length of the mounting bolt, *F*, should be predetermined so that it will project out sufficiently from the wall for the equipment to be mounted on it. Nut *G* is run up on the threads until it comes in light contact with the washer, *D*. The assembly then is placed in the wall, and the nut, *G*, is run up with a wrench, pulling the cone forward and expanding the pipe member. As the cone taper is gradual, great power is available and the assembly may be expanded until it never will loosen. When tight, Nut *G* may be tack welded to the washer if desired; usually, however, once the equipment is mounted on the end of the bolt, Nut *G* will remain tight without further attention.

"Blow Over"

MINING terms vary from region to region. In at least one field, to "blow over" means to bring the working shift to a halt. Consequently, "blowing over" may mean a shift brought to a successful conclusion or, on the other hand, a cessation of work due to equipment breakdown, fall, wreck or other cause. The latter, of course, results in the mine cost for the day jumping skyward. All too frequently the cause of a stoppage may be small in itself, although the repercussions are widespread. The best remedy, naturally, is to prevent the failure. But if it occurs, the right steps, taken immediately, may save many dollars. This department is designed to present selected examples of the steps taken to prevent failures or to remove their effects quickly when they occur. Send in yours. Each acceptable contribution will bring its author $5 or more.

Decanting of Lamp Batteries Eased by Special Truck

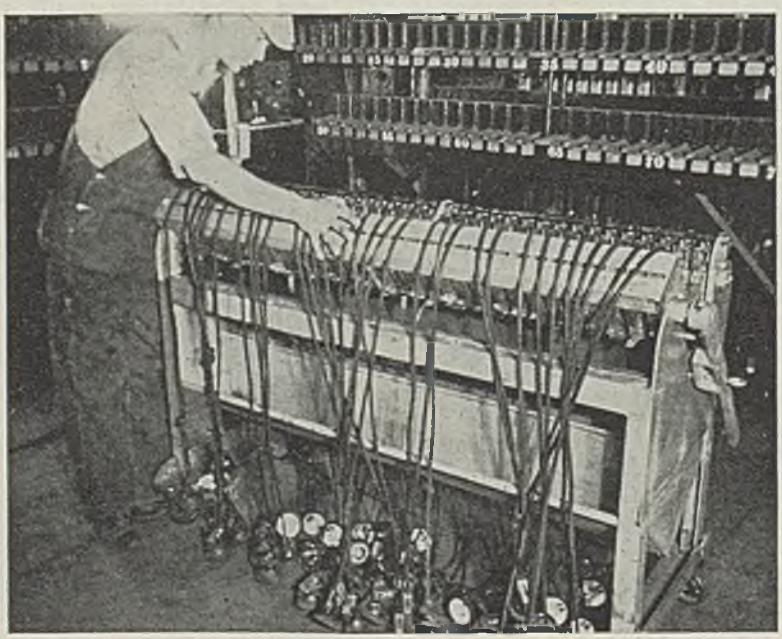
Greater convenience, less risk of dirtying or damaging contacts and a substantial saving in the time required for watering and decanting cap-lamp batteries or in filling battery cells are the major features of a portable truck used at the Zeigler No. 2 lamp house of the Bell & Zoller Coal & Mining Co., Zeigler, Ill. The truck, shown in use in the accompanying illustration, has a capacity of 64 batteries in two racks of 32 batteries each. Batteries are held in the racks by fiber-covered rods passed across the top, and each rack is mounted on a pivot so that it can be turned over by a lever on the end. A pin in each lever permits fastening the rack in overturned position to permit the batteries to drain.

In operation, the batteries are set in the racks and filled with water. Also, cells may be filled in the same fashion, when necessary. After watering, the racks are turned over to permit excess water and any solution which may have boiled out in service to drain off into a central trough provided with a drain cock. Racks are installed below the drain trough on each side, in which the headpieces may be placed in case it is desired to move the truck around.

Sealing Joints Cuts Pipe Losses

Unless protected, threads are the first to feel the effects of corrosion in pipe lines, points out E. A. Smith, chief engineer, Central Elkhorn Coal Co., Estill, Ky., in urging proper sealing of joints. Frequently, runs of pipe must be sacrificed because the threads have corroded and the pipe will not bear rethreading, even though it still has considerable service left in it if the original threads could be used.

Sealing of joints in suction lines usually receives the attention it deserves around coal mines. Most discharge lines, however, are installed without the use of a sealing compound, leaving the threads exposed to the effects of both air and water. Leakage through unsealed joints may be very small, but even this is sufficient to bring water in contact with the threads and thus facilitate corrosion. "Our experience has been that aged pipe lines can be disconnected to reveal threads in brand-new condition where joints have



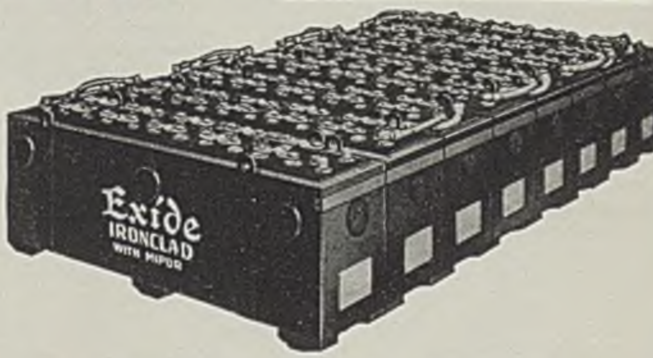
Truck eases problem of watering and decanting cap-lamp batteries

"Doesn't a mechanized operation present quite a haulage problem?"

"Not if you use battery locomotives equipped with Exide-Ironclad Batteries"

"HERE is the way it works out. The whole problem is to get the loaded cars away and to keep empty cars moving up, in order to prevent the loading machine from standing idle. Battery locomotives are ideal for this fast switching service because they accelerate quickly and respond instantly to the controls. Equipped with Exide-Ironclad Batteries, we have found them speedy, powerful and highly economical."

Mine operators have found that the use of battery locomotives and Exide-Ironclad Batteries enables them to obtain the utmost efficiency from mechanization. These batteries provide the essentials for underground haulage service—high power ability, extreme ruggedness, and long life. Write for free booklet, "The Storage Battery Locomotive for Underground Haulage."



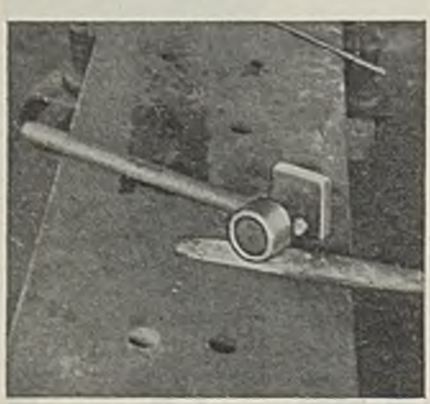
THE ELECTRIC STORAGE BATTERY COMPANY, Philadelphia

The World's Largest Manufacturers of Storage Batteries for Every Purpose

Exide Batteries of Canada, Limited, Toronto been made with an ordinary sealing compound, such as white or red lead. However, each operator," Mr. Smith concludes, "should choose his own insolvent compound for thread preservation in accordance with conditions."

Head Spalling Prevented By Hose Guard

Short lengths of railroad air-brake hose are placed on the heads of cold cutters, flatters and other tools intended to be struck with a sledge at the Crescent Nos. 1 and 6 mines of the Crescent Mining Co., on LaMarsh Creek, near Peoria, Ill. The



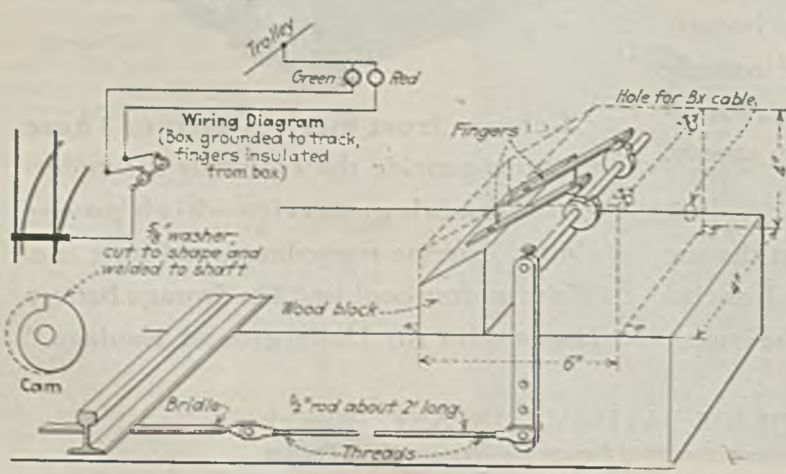
The hose keeps steel splinters from flying

method of applying the hose is shown in the accompanying illustration. It projects over the tool head approximately ½ in. and keeps pieces of steel which may be knocked off in use from flying through the air, with consequent possibility of injury.

Position Signal Works From Track Switch

A signal switch box worked from the bridle on a track switch is offered by R. H. Edwards, acetylene and electric welder, Pocahontas Corporation, Bishop, Va., with the comment that once installed it is trouble-proof and free from maintenance. The switch mechanism, as indicated in the accompanying diagrammatic sketch, consists of two cams made from ⅝-in. washers welded to a shaft. Two used contactor fingers mounted on a block of wood are conntected through the red and green indicating lights to the trolley wire. These fingers make contact with the cams to complete the circuit from trolley to rail and thus light one lamp or the other, depending upon the position of the switch. Cams are set on the shaft so that when one light is turned off, the other is turned on.

Camshaft and wood block carrying the contact fingers are mounted in a sheet-steel case which is fastened to the end of a tie and grounded to the track. The top of the case may be arranged either with hinges or bolts for access to the interior mechanism. An arm on the camshaft is attached by a connecting rod to the switch bridle; thus the movement of the bridle is transmitted to the camshaft, switching the circuit from one indicating lamp to the other.



Details of switch mechanism, also wiring diagram and cam detail

Electrical Detector Locates Missing Shells in Mine

With the use of over 1,200 Cardox shells per day in the Zeigler (Ill.) mines of the Bell & Zoller Coal & Mining Co. it was necessary to institute an exact daily check on shells delivered to and returned from each mining section. But when this check indicated a shell missing there remained the problem of finding it, for, as a rule, the shell would be buried under refuse, loose coal or perhaps under timbers piled along the rib. This problem was solved by building an electrical detector and placing it at the disposal of a man whose principal duty is to hunt for lost shells when any are reported from either mine.

As indicated by the illustrations, the detector consists of earphones and a power box with extended handle having a loop antenna attached. When the antenna is within a foot or so of a metal object a normal buzzing of the earphones dies down. The power box contains batteries, oscillating tubes and other electrical parts

Earphones, power box and loop antenna weigh but 25 lb.

The "bloodhound" has indicated to the hunter that a shell or other metal object is buried in the refuse near the pile of props.

somewhat similar to those in a radio set. The antenna, consisting of 26 turns of wire, is wound on the wood rim of a 26-in. bicycle wheel.

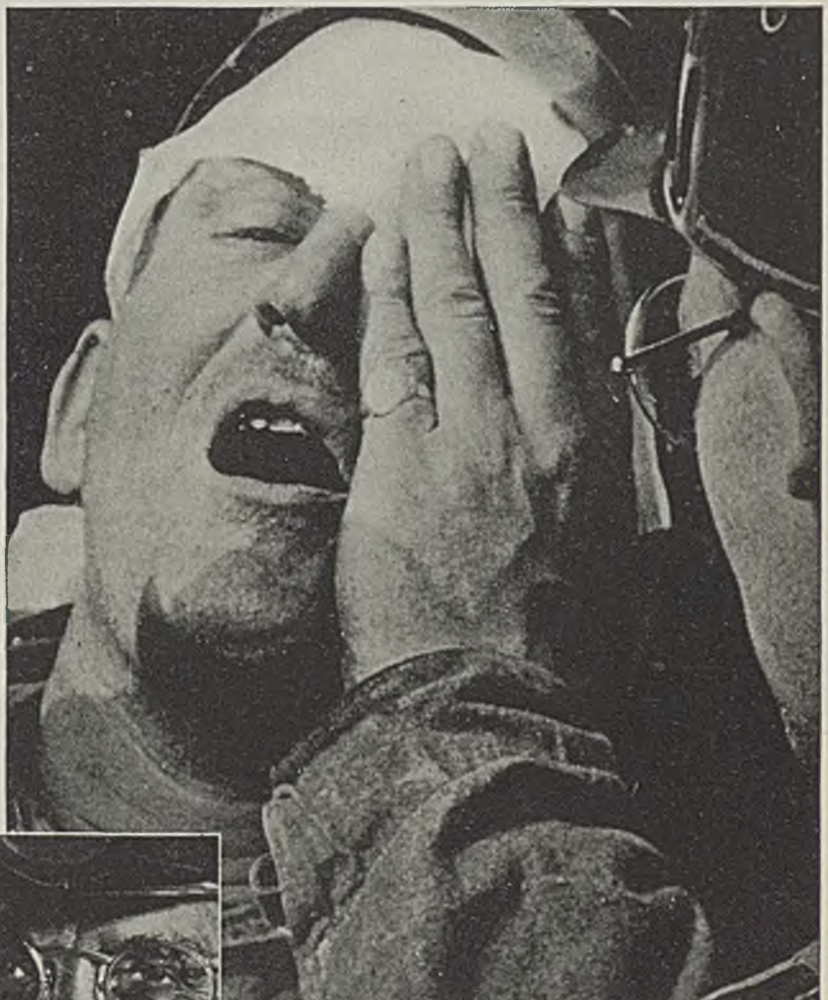
Scale weight of the detector is 25 lb. Many times when the instrument "indicates," and the buried "treasure" is dug up, it turns out to be some other metal object—perhaps a valuable tool, track equipment or supply part. The instrument is so sensitive that the hard-toed shoes of the hunter will give an indication if the loop is placed down close to them.

Stoker Supplies Heat For Sand Drying

Convenience, capacity and ability to operate with a minimum of attention mark the sand-drying installation at the Talleydale mine of the Snow Hill Coal Corporation, Terre Haute, Ind. The installation consists of a T. W. Snow Construction Co. dryer with a capacity of 2 cu.yd. and providing a double pass of the hot gases through the sand. This dryer is fitted with an auxiliary fire pot which fits over the regular retort of a

You can't sell coal at a profit.. if...

YOU BUY EYES ON THE SIDE



Your costs go up when one of your miners gets a chip in his eye. For an eye comes high when you have to buy it back . . . high enough to add as much as 5¢ to your production cost per ton. That's your *known* liability. There's no measuring your *hidden* losses . . . like production slowdowns from lowered morale.

Against such losses, many modern mines have adopted this simple cost-control measure: Add 1/20¢ to cost per ton . . . put goggles on *all* miners . . . write off potential eye-liability. What is more, insurance savings frequently write off the cost of the goggles.

Enlist the help of your MSA representative in installing effective American Optical eye-protection. He has behind him a complete service, a complete line of equipment. And he will fit the goggles, adjust them, show your men how to wear them for greatest comfort and safety. *Call him in today on your eye-protection problem.*

F-3100 Ful-Vue goggles (patented) are cool, comfortable, good-looking. High endpieces remove "blinders" to side sight. 6-Curve Super Armorplate Lenses (patented) provide far more strength than standard lenses.

AMERICAN OPTICAL COMPANY

REPRESENTED IN THE MINE INDUSTRY BY MINE SAFETY APPLIANCES COMPANY

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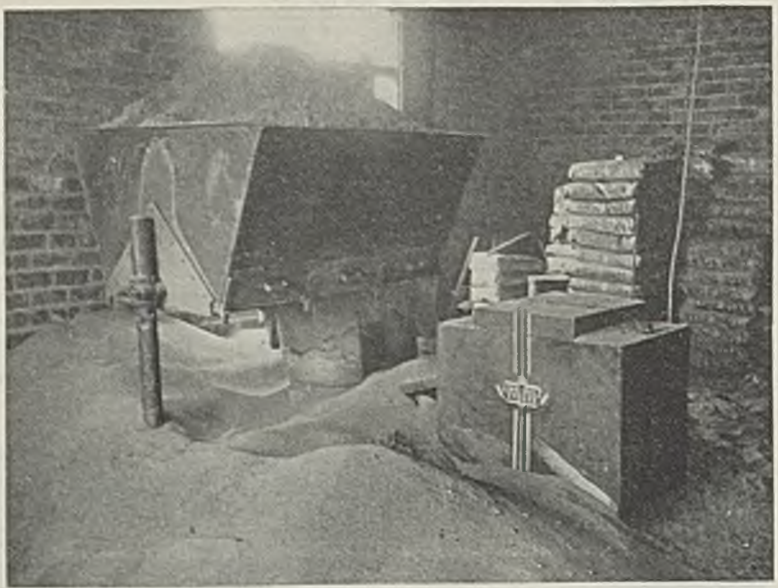


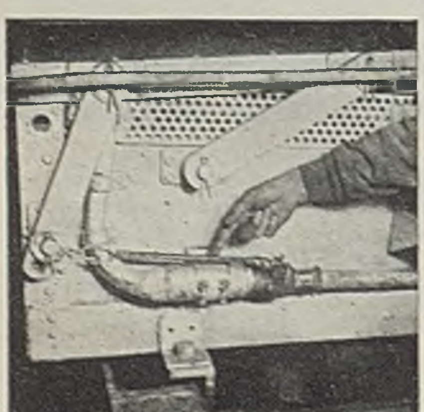
Snow Hill sand-drying installation. The dryer is at the left, with the auxiliary fire pot underneath the far end.

Link-Belt household stoker. Use of the stoker permits reducing attendance to a minimum, while at the same time assuring a uniform supply of heat.

Coil Spring Holds Plugs On Battery Box

Even receptacles and attachment plugs of the non-locking type hold remarkably well on battery-locomotive service, but if the cable attached to the plug is heavy and unsupported for a few feet next to the plug there is a continuous sagging which tends to loosen the plug gradually with each severe bump or jar. Once in a while this effect, on battery locomotives in Zeigler No. 1 mine, Bell & Zoller Coal & Mining Co., Zeigler, Ill., would cause damage to the plug or a complete opening of the circuit.

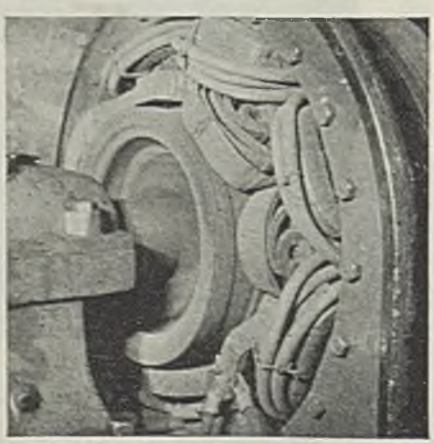
Instead of building an expensive locking device a mine electrician suggested the simple expedient of a coil spring of the heavier type sold for screen doors. This performed remarkably well, so all of the six battery locomotives were so fitted. A large open hook at one end of the spring permits easy uncoupling for pulling the plug, an operation seldom necessary because batteries are charged without removing from the chassis. The tension spring has the desirable effect of pulling the plug tighter with each jar and so may even correct an incomplete insertion of the plug.



Pointing to the coil spring which insures against vibration loosening a plug.

Degree of Compounding Cut Without Hurting Commutation

To reduce the degree of compounding on a compensated-wound 200-kw. generator without disturbing the commutation, No. 4 Tirex cables were used in applying two series turns to the main field poles of a motor-generator in Zeigler No. 2 mine, Bell & Zoller Coal & Mining Co., Zeigler, Ill. This alteration was necessary to obtain satisfactory parallel operation of that substation with other substations with generators of the plain commutating-pole type. Use of a shunt to adjust compounding on a compensated-type machine would affect the interpole winding as well as the series winding because both are combined.



Series turns added to the compensated generator changed compounding without affecting commutation.

The eight-pole Ridgway compensated generator in question, with its Tirex turns, is shown in the accompanying illustration. Two 4/0 Tirex cables are used in parallel and the pair is wound two turns around each main pole. The cost of this revision was comparatively small, but the method proved effective in changing the voltage characteristics.

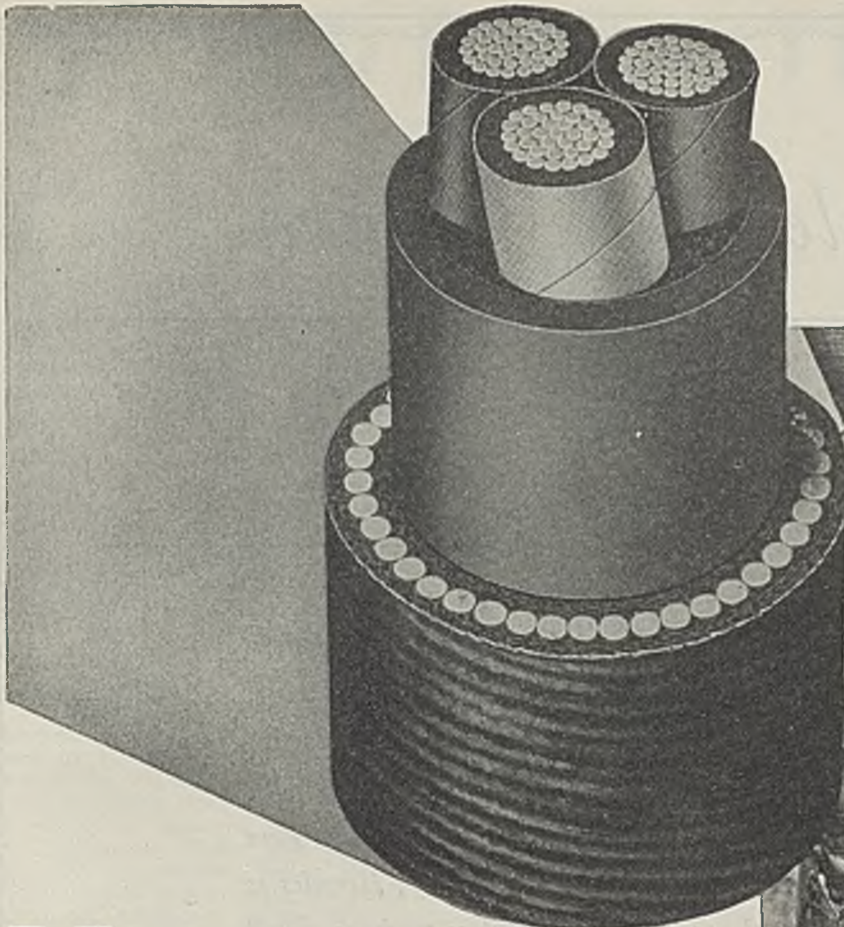
Steps Promote Safety In Testing High Seal

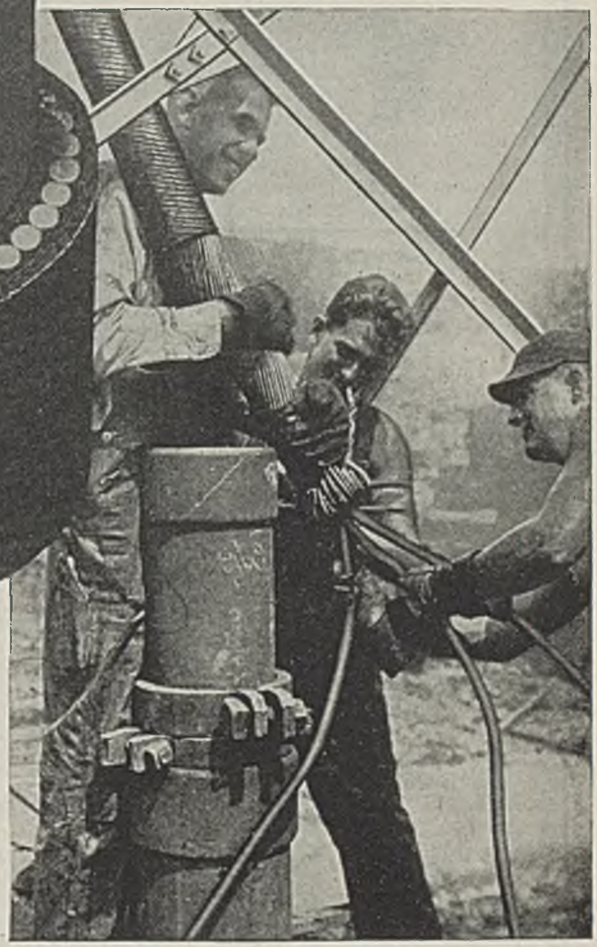
Safe inspection of an extra-high seal in Zeigler No. 2 mine, Bell & Zoller Coal & Mining Co., Zeigler, Ill., was provided for in the construction plan by including steel steps cast into the concrete. These steps are fitted with a railing and provide a much safer means than a ladder for the inspector to reach the top to make daily tests for gas.

This unusual seal, shown in the accompanying illustration, is $22\frac{1}{2}$ ft. high and 34 ft. wide, rib to rib. The steps are 2x8-in. channels 30 in. long taken out of discarded mine cars. They are set with the flat side up and project 24 in. from the wall. A landing consisting of three channels set close together forms a turning point from which a flight of several steps leads to the top.

Building a high seal like the one pictured results from the squeezing or caving of a panel area from the breaks extend out on the entry. Ordinarily, the seals of worked-out panels are built where top coal is still in place on the entries and these seals are not much over 10 ft. high, including a footing extending about 24 in. down through the bottom fireclay to hard shale. The wall thickness is 18 in. or more, depending upon the height and width.

Climbing up to inspect high seal can be done in safety.





Hazard Steel Armored Borehole Power Cable being lowered through an 8" borehole and supported by steel tower.

HAZARD

BOREHOLE POWER CABLE

This 3 conductor 400,000 C.M. 5000 volt cable has a tough rubber jacket enclosing the separately insulated conductors.

This jacket replaces the usual heavy lead sheath, making a lighter, less costly and more easily handled cable.

Galvanized steel armor wires, cushioned and covered with asphalted jute, provide suspension and protection.

The combination of high grade rubber insulation, the tough rubber jacket and the highly efficient coverings, make this cable installation a permanent job.

HAZARD for over quarter of a century has specialized on electrical cables for the Mining Industry.

Hazard engineers will be glad to help you with your problem.

HAZARD INSULATED WIRE WORKS

DIVISION OF THE OKONITE CO.
WILKES-BARRE PENNSYLVANIA

WORD FROM THE FIELD

To Ask Federal Regulation Of Anthracite

Harrisburg, Pa., Jan. 18—A request that the Federal Government assume ownership of Pennsylvania's anthracite industry will be made by Governor Earle of the Keystone State, according to an announcement by the executive tonight following a conference with operators, representatives of the United Mine Workers and members of the Anthracite Industry Commission. The program, which it is planned to present to President Roosevelt next week, calls for government regulation as well as ownership, with private operation, of the industry.

By the plan to be proposed, the Government would purchase all of the State's hard-coal resources and improvements at a "fair price," if possible—otherwise by condemnation. A possible alternative suggested by the Governor would be purchase of the coal lands alone, with provisions for leasing them back to the present owners for operation under government regulation. Under this arrangement, it was contended, bootleg mining would disappear because, with allocations and quotas determined on the basis of geographical location and other factors, the areas where bootlegging now are regarded as necessary to human existence would be properly supervised.

Regulation as proposed, said Mr. Earle, would mean cheaper anthracite for the consumer in the long run, would take up the unemployment slack and hold out a promise of a return of prosperity to blighted districts.

Following a conference yesterday with President Roosevelt at the White House, the Governor said the President gave assurances of his sympathy and support of whatever remedial steps seemed necessary to break up alleged monopolistic practices among anthracite producers. The Department of Justice thereupon started an investigation to determine the applicability of anti-trust statutes to meet the situation. Others who participated in the White House conference were Charles F. Hosford, Jr., chairman of the National Bituminous Coal Commission; Senator Guffey; Harry E. Kalodner, economist, Anthracite Industry Commission; Attorney General Cummings, and Attorney General Jackson.

To Expand Anthracite Course

Development and expansion of the anthracite merchandising school at Primos, Pa., is to be one of the most important activities of Anthracite Industries, Inc. A new building has been erected, more comfortable facilities have been provided, additional executives have been interested in the work and have agreed to address the classes, and the course itself has been expanded to include additional information of value to coal merchants.

Progressives Win at Mine B

Certification of the Progressive Miners, Local No. 54, as the exclusive representative for production and maintenance employees of the Mine B Coal Co., Springfield, Ill., was announced on Jan. 5 by the National Labor Relations Board. This action was based on results of a secret-ballot election held on Dec. 5, when 404 employees voted for the Progressives, 25 for the United Mine Workers, 2 signified a desire for neither organization, and 34 did not vote.

Keeping Step With Coal Demand

Bituminous Production

Week Ended	1937 (1,000 Tons)	1936* (1,000 Tons)
December 4	8,080	10,581
December 11	10,014	10,882
December 18	8,860	10,622
December 25	6,150	8,104
January 1, 1938	6,065	8,995
January 8	6,480	10,679
Total to Dec. 31	440,265	434,070
Month of November	**36,255**	**41,879**
Month of December	**36,226**	**45,756**

Anthracite Production

Week Ended	1937 (1,000 Tons)	1936* (1,000 Tons)
December 4	859	1,298
December 11	1,141	1,216
December 18	1,185	1,035
December 25	930	852
January 1, 1938	979	855
January 8	815	1,157
Total to Dec. 31	50,091	54,760
Month of November	**4,302**	**4,334**
Month of December	**4,752**	**4,947**

* Outputs of these two columns are for the weeks corresponding to those in 1937, although these weeks do not necessarily end on the same dates.

Bituminous Coal Stocks

(Thousands of Net Tons)

	Dec. 1 1937	Nov. 1 1937	Dec. 1 1936
Electric power utilities	8,957	8,944	6,859
Byproduct coke ovens	8,115	8,067	8,146
Steel and rolling mills	1,257	1,290	1,103
Railroads (Class 1)	6,824	6,747	5,138
Other industrials*	14,863	14,581	10,422
Total	40,016	39,629	31,668

Bituminous Coal Consumption

	Nov. 1937	Oct. 1937	Nov 1936
Electric power utilities	3,433	3,908	3,506
Byproduct coke ovens	4,573	5,723	5,911
Steel and rolling mills	841	928	1,196
Railroads (Class 1)	7,099	7,649	7,665
Other industrials*	11,210	11,176	11,372
Total	27,156	29,384	29,550

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

Morrow Blames Recession On Washington

The present business recession was created in Washington, said J. D. A. Morrow, president, Pittsburgh Coal Co., testifying on Jan. 14 before the Special Committee of the U. S. Senate to Investigate Unemployment and Relief. Furthermore, he said, "it will have to be cured in Washington by a frank acknowledgment of some mistakes that have been made; by a clear and unequivocal statement of future policies without any intimations of suspicions of concealed and different purposes, and by prompt, affirmative executive and legislative action to dispel the doubt, the apprehension and the distrust that have frozen the potential purchases of millions of people in this country."

Showing the inroads of competition on bituminous coal, Mr. Morrow said that in 1913 the total heat and energy used in the United States required the equivalent of 600,000,000 tons of soft coal, of which that industry supplied 478,000,000 tons, or 70 per cent of the total. In 1936, however, out of a requirement of 920,000,000 tons, the coal industry supplied only 434,000,000 tons, or 47 per cent of the total. Increased used of substitute fuels between 1923 and 1936, he said, caused 210,000 soft-coal miners to lose their jobs; from 1933 to 1937, 68,000 miners were displaced because of such competition.

Increasing wages and shortened work days and weeks during those years necessarily forced up prices, providing additional opportunities for inroads by competing fuels. The recent advance allowed in freight rates, it was pointed out, will add further to such losses, with prospects for similar effects following the establishment of minimum prices by the National Bituminous Coal Commission.

The Pittsburgh Coal Co., said the witness, planned its production schedule a year in advance, but when the recession began to be felt last August, all estimates were thrown out of line; despite reduction in prices, production continued to decline. "We have endeavored to minimize the effect of this drastic loss of business upon our employees as much as possible," he added. "For the year 1937 the average number of employees on our mine payrolls was 12,319; on Dec. 15 it was 12,445; today it is 10,035, a reduction of 19 per cent, although our production has been curtailed by 63 per cent."

Extend Warrior River Channel

Brighter prospects for the Alabama coal industry are seen as a result of the extension of transportation on the Warrior River to the Black Creek coal fields in Walker County. A navigable 9-ft. channel which was extended 85 miles up the river by adding 12 ft. to the crest of Lock and Dam 17, was dedicated on Dec.

30 in the presence of Senator Bankhead and Major General Julian L. Schley, chief of U. S. Army Engineers. The work of extending the channel was done by the U. S. War Department at a cost of $449,880.

A river tipple already has been erected by the DeBardeleben Coal Corporation to load barges for shipment to Mobile and the Gulf coast. The first tow to go down the river following the dedication consisted of eight barges loaded with coal. According to H. T. DeBardeleben, president, DeBardeleben Coal Corporation, the new means of transportation will solve the coal industry's slack problem; in fact, he pointed out that it had placed the company's Hull and Empire mines on a full-time operating schedule, with prospects for the reopening of the Sipsey mine. To insure continuity of supply, the DeBardeleben organization also has leased a coal terminal, with a capacity of 50,000 tons, on Blakely Island, near Mobile.

New Preparation Facilities

Allburn Collieries Co., McCarr, Ky.: contract closed with Robins Conveying Belt Co. for feeding, screening and loading equipment including shaking feeder, double-deck Gyrex screen, two belt booms and auxiliary equipment for preparing lump, egg and slack; capacity, 150 tons per hour.

Carbon Fuel Co., Decota, W. Va.: contract closed with the Roberts & Schaefer Co., for Stump "Air-Flow" coal-cleaning equipment to handle ⅜x1- or ⅜x1¼-in. coal; capacity, 35 tons per hour.

Detroit Mining Co., Gordon, W. Va.: contract closed with Jeffrey Mfg. Co. for single-compartment diaphragm jig to replace existing washing equipment and treat 5x0-in. coal; capacity, 60 tons per hour.

Koppers Coal Co., Kopperston, W. Va.: contract closed with Koppers-Rheolaveur Co. for three-track tipple to handle 400 tons of mine-run per hour and equipped to produce lump, egg and nut-and-slack, preceded by headhouse with jury screen and picking table and lowering conveyor to tipple. Provision is made for expanding the operation to a six-track tipple for similar handling of 400 tons per hour additional from a second seam, via another lowering conveyor, or 800 tons from the first seam. Further provision is made for the future installation of a washing plant for each seam when needed.

New Plant to Start Soon

Operations are expected to begin early in February by the newly formed Panther Red Ash Coal Co., near Panther, W. Va. in the Sandy River district, under the direction of Marshall Whaley, superintendent, formerly of Hemphill. The company purchased 1,075 acres of land overlying the Red Ash seam and has obtained equipment from the Cardiff-Pocahontas Coal Co., Lex, W. Va. Dr. H. M. Coleman, of Iaeger, is president of the new company, and J. M. Allara, of Matewan, is vice-president and general manager.

Senate Probe on Coal Commission Looms; Price Data Opened to Carson

Washington, D. C., Jan. 20—Investigation of the National Bituminous Coal Commission is imminent with the Senate Committee on Interstate Commerce on Jan. 10 ordering reported Senate Resolution No. 200, introduced last November by Senator Davis of Pennsylvania. The measure provides that the Commission transmit to the Senate immediately "(1) a copy of the resolution introduced by a member of the Commission and transmitted to the President making serious charges against one of the Commissioners; (2) all information denied the Consumers' Counsel with respect to price fixing of coal; (3) the number of employees of the Coal Commission not under civil service; (4) copy of correspondence between the Coal Commission and the General Accounting Office relating to civil service; and (5) also such other information *relating to the foregoing specifications* as may be available for the use of the Senate" (the matter in italics is an amendment).

Late last November George E. Acret, acting director of the division of trial examiners and former member of the 1935 Commission, resigned and charged that members of the Commission feared, because of political pressure, they might lose their jobs, and also alleged there were differences in the Commission itself over prices for railroad coal (see *Coal Age*, January, p. 88).

Whether confidential data supplied by producers and used in establishing minimum prices should be made available to Consumers' Counsel was temporarily decided on Monday, when the Commission ordered all such information opened to Consumers' Counsel beginning two days later. Decision came during a hearing on the petition of the Association of American Railroads, the American Short Line Railroad Association and Consumers' Counsel asking that the order establishing minimum prices for railroad coal be set aside.

The question of opening the files to Consumers' Counsel had been active for several months. However, the Commission was confronted with a problem involving the intent of the Coal Act, which in several instances forbids disclosure of private cost data supplied by producers, all of which was essential in determining the weighted average cost of producing coals, upon which minimum prices as established are based. Court action to enjoin the Commission from disclosing such confidential data is considered likely.

Sentiment that the original rule of the Commission on crushed coal should be abrogated was quite general at a formal hearing which began Monday. With Commissioner Maloney presiding, witnesses appeared from Districts 1 (eastern Pennsylvania), 2 (western Pennsylvania), 3 (northern West Virginia), 4 (Ohio), 6 (West Virginia Panhandle), 7 (Southern No. 1), 8 (Southern No. 2), 10 (Illinois) and 11 (Indiana), and almost without exception they were opposed to the rule, which remains suspended (*Coal Age*, January, p. 86).

In the first court action brought against the Commission, a three-judge court was designated last Thursday by Justice Gordon, in the Equity Branch of the U. S. District Court of the District of Columbia, to hear the evidence. In its motion, filed Jan. 6 by the Indiana Gas & Chemical Co., the plaintiff contends that prices set by the Commission on coal which it uses for the manufacture of coke will result in an increase of $9,000 per month in the cost of its fuel. The company also alleges that the prices prevailing before the effective date of Commission minimums were as high as competitive and other conditions would permit and that any increases would mean the loss of customers to competing fuels.

Operators in District 1, in an informal hearing yesterday, asked the Commission to revoke an order granting temporary minimum price concessions to the Carter Coal Co. and other producers in District 7 on pea coal shipped into the New York market. Charles O'Neill, speaking for Board 1, said that the Carter company, despite a long rail and water haul, is able to undersell eastern Pennsylvania producers, for whom New York is a natural market. Furthermore, he said there was a shortage of pea in the New York market, showing an additional reason why the temporary relief was not necessary. Herbert L. Jacobi, for the Carter company, replied that the relief was asked because of the glut of anthracite buckwheat, which endangered the Carter company market unless relief was granted.

Byproduct Coal Prices Set

Minimum prices for byproduct, retort and water-gas coals sold in District 13 (Southeastern) have been established by the Commission, effective Jan. 24. Coals for byproduct purposes in Tennessee and Georgia are priced at $2.35; Alabama coals, depending on the market area, range from $2.60 to $3.85. Prices for coals for byproduct, retort and special-use classification were previously set as follows: District 1, all sizes for byproduct purposes, $1.70 to $2.45 without freight-rate adjustment; District 2, run-of-mine for byproduct use, $1.85 to $2.20 with a maximum absorption of freight-rate differentials of 35c. per ton; District 3, Sewell coal for byproduct purposes, $2.05 to $2.30; low-sulphur coals, $1.91 to $2.15, the prices including all sizes and without freight-rate adjustment; District 7, byproduct, $1.65 to $2.15 without freight adjustment; District 8, $1.95 to $2.45.

An order issued on Dec. 22 modifying prices in District 8 relating to freight-rate absorption on coals moving into Southern markets was rescinded by the

Coming Meetings

- American Institute of Mining and Metallurgical Engineers, annual meeting, Feb. 13-17, 29 West 39th St., New York City.
- Canadian Institute of Mining and Metallurgy: annual meeting, March 14-16, Royal York Hotel, Toronto, Ont., Canada.
- Mine Inspectors' Institute of America: 29th annual convention, St. Nicholas Hotel, Springfield, Ill., June 6, 7 and 8.

Commission on Jan. 6. The temporary order, issued on petition of the Virginia Coal Operators' Association, provided that code members in District 8 having freight rates in excess of the New River-Pocahontas base might absorb the exact amount of the differential, not to exceed 35c. a ton, into Market areas 40-42, located in Virginia and North Carolina. A hearing was held also on the latter date on a protest by the same association over minimum prices on steam coals produced in Districts 7 and 8, the claim being that seven competing fields are able to ship at a lower minimum price into competing markets in the Carolinas and Georgia. Reduction by the Commission of prices for other producing fields in the two districts, it was alleged by the petitioners, put them in danger of damage; therefore they asked that the minimum prices of their competitors be raised. The petition for an increase was opposed, however, by the Carter Coal Co. and District Board 7.

Trucking Rate Established

A schedule of fixed minimum prices for coal loaded in trucks or wagons at mines of code members in seven districts east of the Mississippi and in Iowa was announced by the Commission on Dec. 20. Published as supplements to the original and revised prices which went into effect on Dec. 16, the truck coal prices became effective on Jan. 3. Marketing rules and regulations previously promulgated for the various districts, it was directed, have equal force for truck coal. The price ranges for truck or wagon coal are as follows: District 1, \$1.66-\$2.50; District 2, \$1.66-\$2.60; District 3, \$1.66-\$2.40; District 4, \$1.66-\$2.40; District 6, \$1.66-\$2.40; District 10, 60c.-\$2.20; District 11, \$1-\$2.40; District 12, \$2.05-\$3.90. Being slightly lower than corresponding prices for coal sold for shipment by railroad or river in the same districts, the truck prices caused dissatisfaction in numerous instances.

On the same date the Commission approved marketing rules and regulations for Districts 15 (Southwestern), 16 (northern Colorado), 17 (southern Colorado), 18 (New Mexico), 19 (Wyoming), 20 (Utah), 22 (Montana) and 23 (Washington, Oregon and Alaska). These took effect simultaneously with minimum prices in these districts—Jan. 3.

The first order granting temporary relief from established minimum prices was announced by the Commission on Jan. 7 in favor of the Providence (R. I.) Gas Co. The company had explained that about 100,000 tons of its annual purchases originated in the low-volatile Beckley seam of District 7 (West Virginia), on which a minimum price of \$2-\$2.15 had been placed. As the Commission's establishment of minimum prices had equalized the cost of high- and low-volatile coals, and the company could better use the high-volatile type, it was argued that the low-volatile producers faced the probable loss of the company's purchases unless low-volatile coal consumed in the company's market area was exempted from byproduct classification. The Commission's decision said, in part: "Low-volatile coals sold and used for byproduct purposes moving through tidewater for delivery and consumption at Providence, R. I. (within Market Area No. 1), shall take a minimum price of \$2 per ton f.o.b. mine."

The Commission has ruled that intrastate commerce in bituminous coal has a direct effect on interstate commerce in the States of Iowa, Indiana, Illinois, Kentucky, Maryland, Pennsylvania and Michigan. Therefore such transactions have been brought under the regulation of the coal act, effective Jan. 3 in the case of the first five States named; Jan. 7 in Pennsylvania, and Jan. 26 in Michigan.

The numerous witnesses appearing at a hearing at Albuquerque agreed without exception that all intrastate shipments of coal in New Mexico should be placed under the jurisdiction of the Commission. Edwin O. Thornhill, of the legal division of the Commission, stated that he believed the evidence recorded would justify such action. Similarly, at a hearing held at Denver during the second week of January Douglas Millard, chairman of District Board 17 and sales manager of the Colorado Fuel & Iron Corporation, and F. O. Sandstrom, secretary of the district board, stated that Colorado coals should be subject to regulation. Truck-mine production, which is on the increase, it was stated, would, if unregulated, seriously affect price structures put into effect by the Commission. Hearings in relation to jurisdiction in other States are scheduled as follows: Wyoming, Cheyenne, Jan. 21; Utah, Salt Lake City, Jan. 31; Washington, Seattle, Feb. 8; Montana, Billings, Feb. 17.

Personal Notes

KARL F. ARBOGAST, superintendent of the Dorrance and Franklin collieries of the Lehigh Valley Coal Co., in Luzerne County, Pennsylvania, has taken over the duties of production superintendent for the company, vice SHELDON JONES, who has been granted leave of absence because of illness.

I. N. BAYLESS, hitherto assistant general manager, Union Pacific Coal Co., Rock Springs, Wyo., has been made general manager as of Jan. 1.

EDGAR BLACKWELL has been made superintendent at the Summerlee mine of the New River Co., Summerlee, W. Va., after absence of several years from the company.

BYRON BROWN, superintendent, Royalton No. 7 mine of the Franklin County Coal Corporation, has been promoted to general superintendent of the company's mines, with headquarters at Herrin, Ill., vice JOHN WHITE, retired.

WILLIS H. BROWN has been appointed foreman at No. 2 mine of the Central Pocahontas Coal Co., Anawalt, W. Va.

GEORGE CAIN has been made foreman at No. 9 mine of the Jamison Coal Co., Farmington, W. Va.

CHARLES CONNOR has been named foreman at Edwight No. 1 mine of the Raleigh-Wyoming Mining Co., Edwight, W. Va.

G. GORDON COOK, hitherto secretary and treasurer of Anthracite Industries, Inc., has been elected vice-president and treasurer. GEORGE W. BARNES has been made secretary and assistant treasurer.

LEM DOUGLAS has been appointed to succeed M. C. Hess as superintendent at the Collins, Macdonald and Scarbro operations of the New River Co., in Fayette County, West Virginia.

IVOR J. EVANS, assistant real estate agent for the Hudson Coal Co., Scranton, Pa., was advanced to real estate agent, effective Jan. 1. He succeeds Arthur I. Moulton, who resigned because of illness.

ROBERT GREGG, the new president of the Tennessee Coal, Iron & Railroad Co., who assumed his new duties on Jan. 3, is a native of Atlanta, Ga., and a graduate of Georgia Tech. His first 25 years in business was with the Atlanta Steel Co. and its successor, the Atlantic Steel Co., of which he became president in 1922. He joined T.C.I. in 1932 as vice-president, being called to New York a year later to become vice-president of United States Steel in charge of sales activities, and now returns as successor to John Lester Perry, recently made president of the Carnegie-Illinois Steel Corporation.

JOHN HARDY, for the last eight years mine manager at No. 9 mine of the Peabody Coal Co., at Langleyville, Ill., has been appointed superintendent there, succeeding J. W. STARKS, promoted.

H. F. HATFIELD has been appointed foreman at Stirrat No. 19 mine of the West Virginia Coal & Coke Corporation, Stirrat, W. Va.

P. S. HOLDREN has been made superintendent at Ingram Branch mine of the Koppers Coal Co., Wriston, W. Va.

W. C. HOOD, assistant general superintendent, H. C. Frick Coke Co., Pittsburgh, Pa., has been made general superintendent of the United States Coal & Coke Co., Kentucky and West Virginia operations, effective Jan. 16. He succeeds HARRY M. MOSES after serving twenty years in his former capacity with the Frick company.

R. L. IRELAND, JR., who has been executive vice-president of the Hanna Coal Co. of Ohio, has been elected president of that company, with headquarters at Cleveland Ohio.

HENRY KELLER, superintendent of Park colliery of the Lehigh Valley Coal Co., in Luzerne County, Pennsylvania, has been made superintendent also at the Spring-

Mechanical Stoker Sales In Slump

SALES of mechanical stokers in November last totaled 6,500 units, according to statistics furnished the U. S. Bureau of the Census by 108 manufacturers (Class 1, 69; Class 2, 43; Class 3, 46; Class 4, 33; Class 5, 15). This compares with sales of 16,976 units in the preceding month and 8,011 in November, 1936. Sales by classes in November last were: residential (under 61 lb. of coal per hour), 5,292 (bituminous, 4,505; anthracite, 787); small apartment-house and small commercial heating jobs (61 to 100 lb. per hour), 514; apartment-house and general small commercial heating jobs (101 to 300 lb. per hour), 573; large commercial and small high-pressure steam plants (301 to 1,200 lb. per hour), 181; high-pressure industrial steam plants (over 1,200 lb. per hour), 40.

GET MORE LUMPS from LOW SEAMS

MINE experience proves that a Goodyear-belted conveyor haulage system in low seam workings delivers from 12% to 20% more lump coal at the tipple with a corresponding reduction in screenings. There are two reasons for this: (1) *greater clearance between the top run of the conveyor and the roof.* (2) *more gentle handling.* Large lumps are easily loaded on the low-running belt and its smooth river-flow operation over pitches and rolls eliminates jamming and mashing.

In addition, as the sketch at the left shows, a conveyor belt installation requires no brushing in most seams—you leave your gob inside, reducing deadwork to a minimum. Lower power and maintenance costs, greater safety, fewer accidents, greater man-hour production are other advantages of conveyor haulage that are enabling many mines to produce coal competitively with gas and oil.

Why not get the complete story from the G.T.M.—Goodyear Technical Man. Let him show you why Goodyear Conveyor Belts out-perform others by millions of tons and last years longer. An inquiry to Goodyear, Akron, Ohio, or Los Angeles, California, will bring this authority on mechanized mining to your office for friendly consultation.

dale operation, vice JOHN C. MILLER, promoted.

E. C. LAMBER has been named foreman at the Alma Eagle mine of the Alma Eagle Coal Co., Logan, W. Va.

JOHN C. LOWRY, JR., assistant general manager, West Virginia Coal & Coke Corporation, Omar, W. Va., has resigned from that position.

CLEVE MAYNOR has been appointed foreman at the Willis Branch mine of the Hill-Anderson Coal Co., Willis Branch, W. Va.

O. O. MCCOMAS has been made foreman at No. 33 mine of the Pocahontas Corporation, Bishop, Va.

T. J. MCFARLAND, heretofore mine inspector, has been appointed assistant superintendent, United States Coal & Coke Co., Kentucky division, with headquarters at Lynch, Ky.

JOHN S. MCKEEVER, general superintendent, Kanawha & Hocking Coal & Coke Co., Longacre, W. Va., has severed his connection with the company.

FRED A. MILLER, formerly chief mining engineer, Franklin County Coal Corporation, Herrin, Ill., has been made assistant vice-president of the company.

JOHN C. MILLER, superintendent at Springdale colliery of the Lehigh Valley Coal Co., Luzerne County, Pennsylvania, and a former member of the company's engineering corps at Hazleton, has been promoted to division superintendent in charge of the Dorrance and Franklin collieries, succeeding KARL F. ARBOGAST, promoted.

FRITZ NYMAN, chief engineer, Utah Fuel Co., Salt Lake City, Utah, has been made president of the Rocky Mountain Coal Mining Institute, succeeding David Brown, deceased.

JOHN PRENTICE has been named foreman at Beckley Nos. 1 and 2 mines of the Leccony Smokeless Coal Co., Besoco, W. Va.

WILLIAM POWELL, formerly mine foreman at the Warrior River mine of the Brookside-Pratt Mining Co., Carbon Hill, Ala., has been appointed superintendent of the company's Lindbergh Mine, at Blossburg, Ala. The new tipple and preparation equipment at the latter plant went into operation on Jan. 17.

C. W. MCCREAKEN, formerly superintendent of No. 9 mine of the Peabody Coal Co., Langleyville, Ill., and of late years division superintendent in the West Frankfort area, has been named as divisional superintendent in the Midland area. He succeeds Ward C. Argust, who died in December.

GEORGE B. PRYDE, formerly vice-president and general manager of the Union Pacific Coal Co., Rock Springs, Wyo., has been appointed vice-president in charge of operation, effective Jan. 1.

GUY SAMPLES has been appointed foreman at No. 9 mine of the Carbon Fuel Co., Wevaco, W. Va.

J. E. SAMUELS, chief electrician for more than nine years at Champion No. 1 preparation plant of the Pittsburgh Coal Co., Champion, Pa., has relinquished that post to become shift foreman for the Pittsburgh Coal Carbonization Co.

Prof. David R. Mitchell

C. R. SANTROCK has been made superintendent at the Big Otto mine of the Raymond City Coal & Transportation Co., Inc., Raymond City, W. Va.

W. J. SINES has been named superintendent of the Whitesville mine of the Whitesville Mining Co., Whitesville, W. Va.

GILBERT SMITH, Fayetteville, W. Va., resident general manager of the Fire Creek Coal & Coke Co. and the Mason Coal Co., was elected president of the New River Coal Operators' Association at the annual meeting at Mount Hope. Other officers named are: vice-president, OWEN W. COX, vice-president, Laurel Smokeless Coal Co.; treasurer, P. M. SNYDER, vice-president, Koppers Coal Co.; secretary and traffic manager, S. C. HIGGINS.

J. L. SULLIVAN, hitherto mine superintendent, has been named assistant general superintendent of the United States Coal & Coke Co., West Virginia division, with headquarters at Gary, W. Va.

W. C. THOMPSON, formerly mine inspector, has been named superintendent at Cranberry No. 1 mine of the New River Co., Cranberry, W. Va. He succeeds C. F. Bloch, who resigned to accept employment with the National Bituminous Coal Commission.

ANDREW WHITT has been made superintendent at Omar No. 5 mine of the West Virginia Coal & Coke Corporation, Omar, W. Va. He succeeds W. W. Brewer.

JOHN W. WILLIAMS has been appointed foreman at No. 8 mine of the Jamison Coal Co., Farmington, W. Va.

L. E. WOODS, president, Red Jacket Coal Corporation, was reelected president of the Williamson Coal Operators' Association at the annual meeting on Jan. 8. Other officers chosen were: vice-president, C. A. HAMILL, president, Sycamore Coal Co.; treasurer, J. D. MCLAUGHLIN, general manager, Earlston Coal Co.; secretary, J. J. ARDIGO.

J. W. STARKS, for the last ten years superintendent of No. 9 mine of the Peabody Coal Co., at Langleyville, Ill., has been named division superintendent at West Frankfort, succeeding C. W. MCREAKEN, transferred.

JOHN H. COLLINS, Appalachian Power Co., has been elected president of the New River and Winding Gulf Electrical and Mechanical Institute for 1938. Other officers chosen are: first vice-president, G. E. VIA, Leccony Smokeless Coal Co.; second vice-president, E. A. MILLER, Koppers Coal Co.; secretary-treasurer, M. K. CLAY, Raleigh Coal & Coke Co.

CAREL ROBINSON, general manager, Kelleys Creek Colliery Co., Ward, W. Va., was elected president of the Kanawha Valley Mining Institute at its annual meeting. Other officers named were: first vice-president, D. D. MARTIN, general superintendent, Wyatt Coal Co.; second vice-president, ROY LONG, superintendent Powellton No. 5 mine, Koppers Coal Co.: secretary, W. F. WOLFE, superintendent, Kanawha & Hocking Coal & Coke Co.; treasurer, C. O. MORRIS, State Department of Mines.

I. W. ROUZER was reelected president of the Alabama Mining Institute at the annual meeting; WADE H. OLDHAM, manager of Southern operations for the Republic Steel Corporation, was chosen vice-president, and E. J. ROWE, president, Porter Coal Co., was named to the board of governors, replacing the late A. B. ALDRIDGE. Other officers are: vice-presidents, C. F. DEBARDELEBEN, president, Alabama Fuel & Iron Co., and R. T. DANIEL, president, Alta, Cane Creek and Franklin companies; secretary, JAMES L. DAVIDSON.

Recast Penn Mining School With New Head

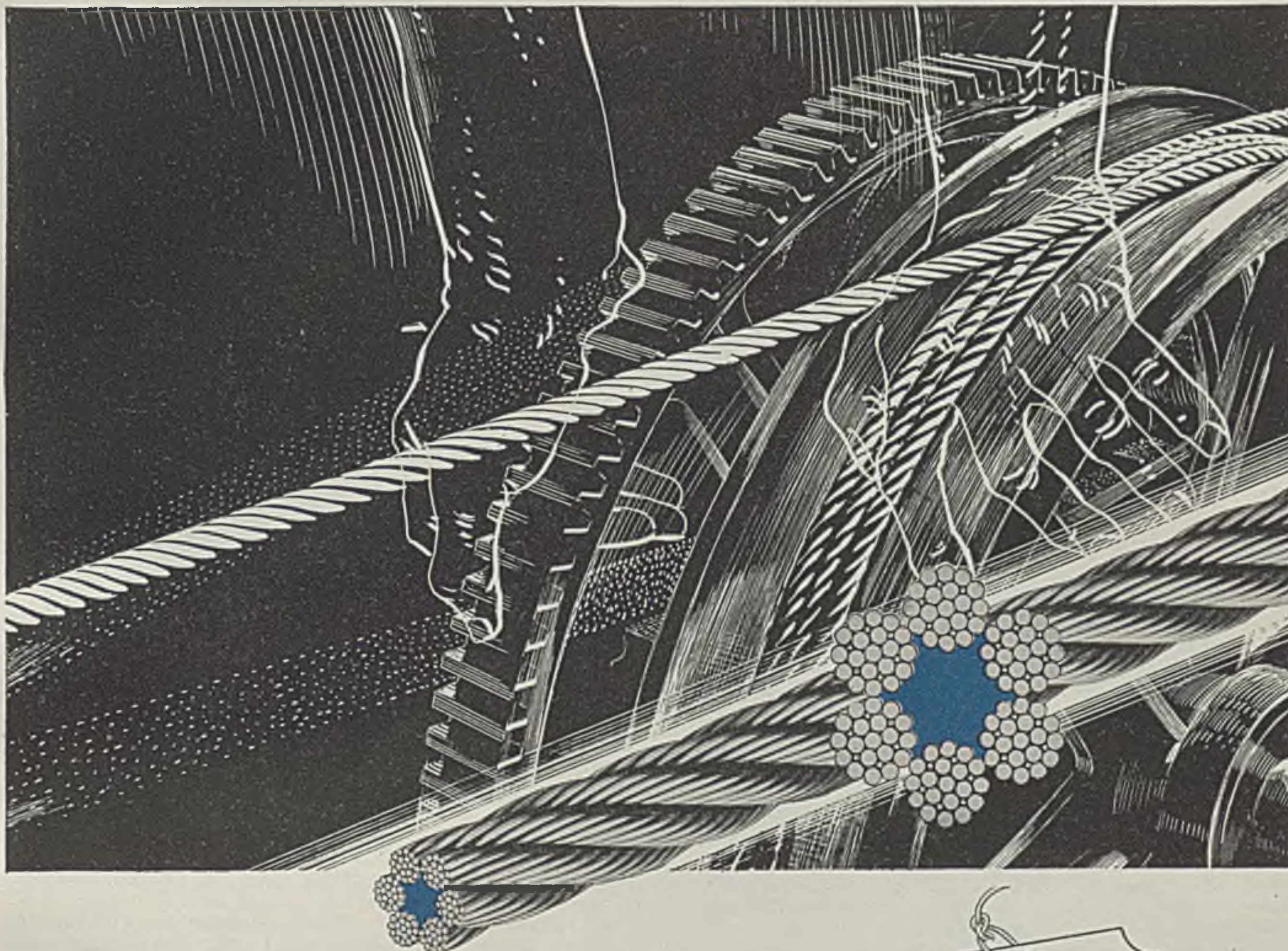
Reorganization of the department of mining engineering has been begun at Pennsylvania State College, State College, Pa., with a view to meeting future needs of the industry in the Keystone State. Under the new plan the work of the department will be carried on under the general classifications of mineral production, safety and health, and mineral preparation. Besides the primary function of undergraduate instruction, other divisions of service include extension, correspondence instruction and research.

A new professor of mining and head of the department, David R. Mitchell, will be installed at the close of the present college year. A graduate of Penn State, Prof. Mitchell also is a certified mine foreman and fireboss in the bituminous fields of the State, has had extensive teaching experience at the University of Illinois, and has carried on consulting work in the design and operation of mines and preparation plants, as well as the utilization of fuels, including carbonization. He succeeds Prof. William R. Chedsey, who resigned to accept appointment as director of the Missouri School of Mines and Metallurgy.

Another new appointee to the staff is John W. Buch, who will assume his new duties Feb. 1. He received a B.S. in mining engineering from Ohio State University, has had industrial experience in mechanization problems and is a certified mine foreman in the anthracite region, where he was employed by the Hudson Coal Co. In addition to teaching mining subjects he will be responsible for studies in coal-production methods and mechanization problems.

Equipment pushed to the limit

CALLS FOR EXCEPTIONAL WIRE ROPE ENDURANCE!



Roebling "Blue Center" provides it!

Rising costs in industry make economy essential. Many concerns are cutting costs by getting the utmost work out of production and handling equipment.

If you, too, are subjecting your wire rope rigged equipment to the acid test of extra severe operating conditions—be certain that the wire rope you use will give you safe, economical service.

Roebling "Blue Center" Wire Rope has been developed to meet severest service conditions. For a wide variety of tough service applications, *it has proved conclusively that it assures lowest general average operating costs.*

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Varied Program Scheduled by A.I.M.E. Coal Division

Preparation, safety and mechanization will be conspicuous subjects for consideration on the program of the Coal Division sessions at the 148th meeting of the American Institute of Mining and Metallurgical Engineers, to be held Feb. 15-17 at the Engineering Societies Building, New York City. The program will include the following papers:

"Burning of Various Coals Continuously and Intermittently on a Domestic Overfeed Stoker," H. F. Yancey and K. A. Johnson, supervising engineer and junior chemist, respectively, Northwest Experiment Station, U. S. Bureau of Mines, and A. A. Lewis and J. B. Cordiner, research fellows, University of Washington.

"Washing Coal on a Rheo Launder," J. T. Crawford, foreman, Banning preparation plant; C. P. Proctor, foreman, Champion No. 1 preparation plant, and M. J. Williams, preparation department, all of Pittsburgh Coal Co.

"An Investigation of the Mechanism of Launder Separations," A. C. Richardson, concentration engineer, Battelle Memorial Institute.

"The Pittsburgh Coal Bed—Its Early History and Development," Howard N. Eavenson, of Eavenson, Alford & Auchmuty.

"The Engineer in the Coal Industry," Newell G. Alford, of Eavenson, Alford & Auchmuty.

"Fifteen Years of Bituminous Coal Mine Safety Work," Eugene McAuliffe, president, Union Pacific Coal Co.

"Mechanization 30 Years After Prediction," Harry Gay, vice-president and general manager, Gay Coal & Coke Co.

"Mining Methods," L. E. Young, vice-president, Pittsburgh Coal Co.

"Mechanization in the Roslyn Coal Field," George Watkin Evans, consulting mining engineer.

"Expression and Size Interpretation of Size Distribution of Coal," M. R. Geer, scientific aid, Northwest Experiment Station, U. S. Bureau of Mines, and H. F. Yancey.

"The Reaction of the Lungs to Different Types of Dust With and Without Infection," Leroy U. Gardner, Saranac Laboratory for the Study of Tuberculosis.

"Suggested Standards for the Control of Silicosis Hazards in Mining," Donald E. Cummings, assistant director, Saranac Laboratory.

"Definite Profits From Safety Equipment," Daniel Harrington, chief engineer, Safety Division, U. S. Bureau of Mines.

"Safety in Mining in the Pacific Coast States," S. H. Ash, district engineer, U. S. Bureau of Mines, and E. D. Bullard.

There also will be a symposium on "moisture in coal."

Harry Moses Guest of Honor At Pittsburgh Dinner

Harry M. Moses, recently promoted to the presidency of the H. C. Frick Coke Co., was the guest of honor at a testimonial dinner given by John T. Ryan, vice-president and general sales manager, Mine Safety Appliances Co., at the Pittsburgh Athletic Association, Pittsburgh, Pa., on Jan. 5. Eighty-four operators and other men closely identified with the coal industry attended. P. C. Thomas, vice-president, Koppers Coal Co., was toastmaster.

George S. Baton, president, Baton Coal Co., welcomed Mr. Moses to the Pittsburgh district on behalf of the engineers and operators in that area; Patrick T. Fagan, president, District 5, United Mine Workers, extended welcome on behalf of the miners and Patrick F. Nairn, deputy secretary, Pennsylvania Department of Mines, and D. Harrington, chief, health and safety branch, U. S. Bureau of Mines, spoke in a similar vein on behalf of their respective organizations.

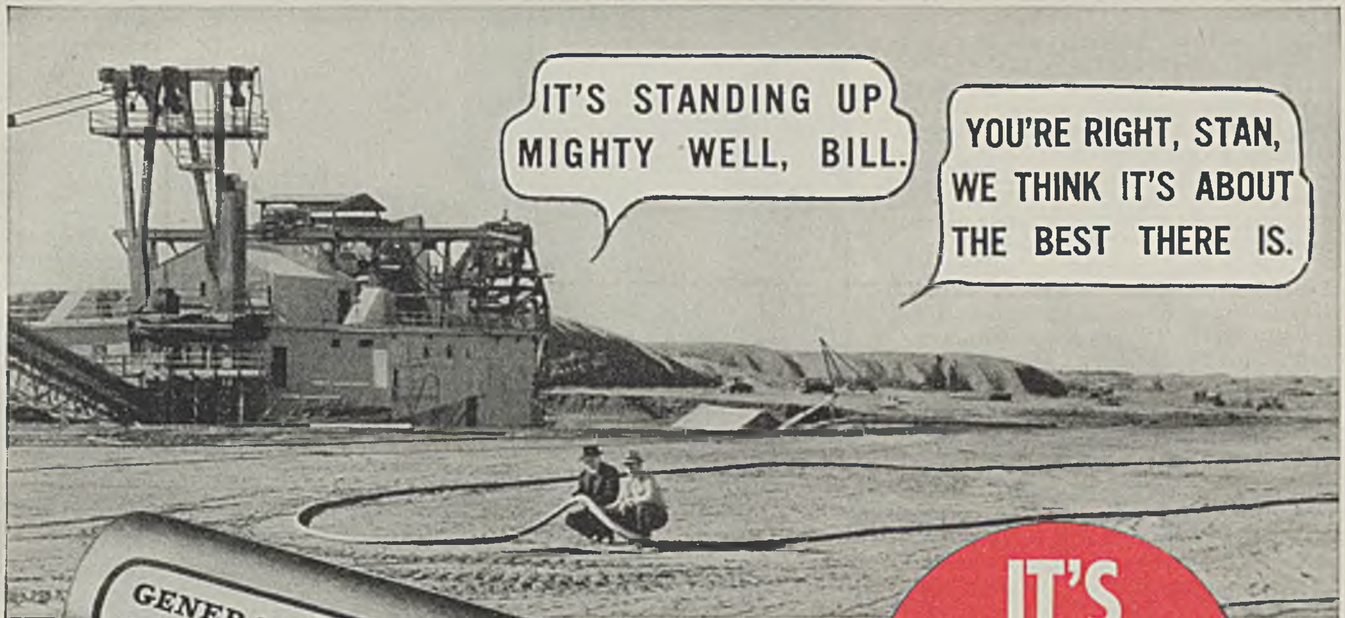
The work the guest of honor had done in safety when general superintendent of the United States Coal & Coke Co. at Gary, W. Va., was outlined by N. P. Rhinehart, chief, West Virginia Department of Mines. To W. E. E. Koepler, secretary, Pocahontas Operators' Association, fell the rôle of spokesman for southern West Virginia in relinquishing the guest of honor to western Pennsylvania. Welcome on behalf of the Frick employees was voiced by Charles Albright, vice-president and secretary of the Frick company. Mr. Moses responded with an inspiring talk and the speech-making came to a dramatic close with an address by Thomas Moses, vice-president, United States Steel Corporation, and father of the new president, which left few dry eyes.

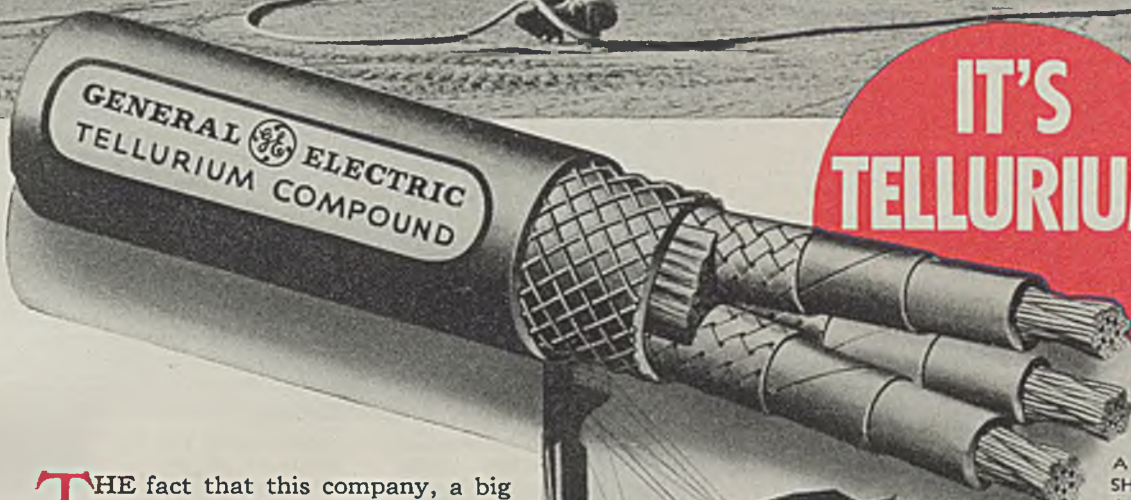
Other guests at the dinner were: W. L. Affelder, vice-president, Hillman Coal & Coke Co.; A. F. Allard, chief engineer, United States Fuel Co.; Milton C. Angloch, president, Vesta Coal Co.; R. C. Beerbower, district manager, Goodman Manufacturing Co.; Matthew Blair, general manager, Vesta Coal Co.; P. J. Callaghan, Pennsylvania State mine inspector; L. C. Campbell, assistant to vice-president, Koppers Coal Co.; A. N. Cartwright, vice-president, and J. M. Connor, general superintendent; Allegheny-Pittsburgh Coal Co.; M. D. Cooper, division general superintendent, Hillman Coal & Coke Co.; Guy Corrado, general manager, Crawford Coal & Co.; C. E. Cowan, consulting engineer, Jamison Coal & Coke Co.

George H. Deike, president, Mine Safety Appliances Co.; Walter M. Dake, research manager, *Coal Age;* A. F. Dodd, general superintendent, United States Fuel Co.; Frank B. Dunbar, general manager, Pickands, Mather & Co.; Thomas G. Frear, assistant to president, H. C. Frick Coke Co.; J. B. Fleming, district manager, Mine Safety Appliances Co.; J. J. Forbes, supervising engineer, safety division, U. S. Bureau of Mines; J. H. Fulford, district manager, Jeffrey Manufacturing Co.

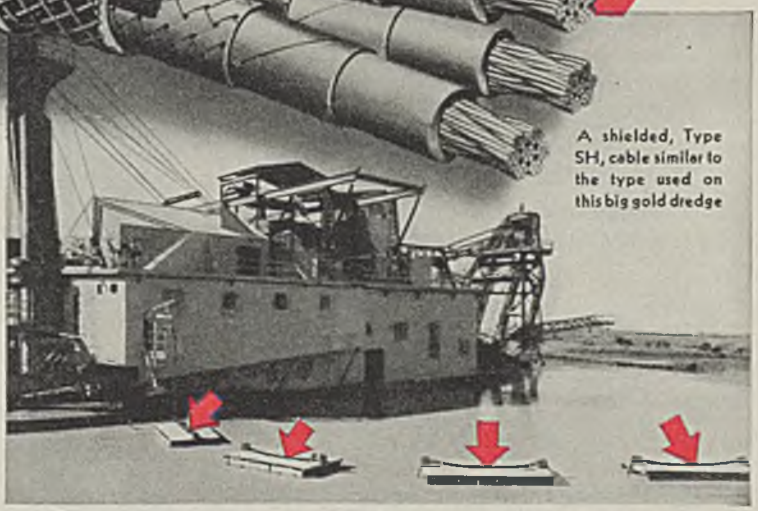
W. H. Gates, superintendent, Buckeye Coal Co.; George W. Gehres, general superintendent, Consumers Mining Co.; C. W. Gibbs, general manager, Harwick Coal & Coke Co.; H. L. Good, vice-president, Westmoreland Coal Co.; H. P. Greenwald, supervising engineer, U. S. Bureau of Mines; Sydney A. Hale, editor, *Coal Age;* B. F. Hoffacker, consulting engineer; E. A. Holbrook, dean, schools of engineering and mines, University of Pittsburgh; W. C. Hood, assistant general superintendent, H. C. Frick Coke Co.; F. W. Howarth, Pennsylvania State mine inspector; L. W. Huber, district manager, Mine Safety Appliances Co.; L. W. Householder, vice-

Coal industry welcomes Harry M. Moses to Western Pennsylvania at testimonial dinner tendered new president of H. C. Frick Coke Co. by J. T. Ryan





A shielded, Type SH, cable similar to the type used on this big gold dredge



THE fact that this company, a big gold-mining property on the Pacific Coast, has selected G-E tellurium-rubber cable for its dredge No. 5 testifies to the ability of this cable to stand up under such severe service. The cable shown in the pictures is a shielded-type (Type SH), 3,000 volts, three-conductor, 350,000 cir mils, 1200 feet long.

Ideal for Service

This cable is flexible and does not readily kink; it is light in weight and small in diameter. It has a smooth surface and is little likely to pick up weeds, trash, dirt, or other foreign material. All these features save time in moving the dredge or shovel.

The tellurium-rubber jacket is tough and capable of resisting much abrasion and has long-aging qualities.

Toward Long-term Economy

The constant increase in size of electric shovels and dredges has made the task of selecting a type of trailing cable difficult. Voltage, loading cycles, heating, regulation, protection to workmen, economics — all these factors must be taken into account.

You profit most when the cable is right for each job. To this end, make full use of the services of a G-E cable specialist and get the most for your cable dollar. He can help in the selection of the *right* type—for long-term economy. Address nearest G-E sales office or General Electric Company, Dept. 6-201, Schenectady, New York.

ALWAYS THE RIGHT TYPE FOR EACH JOB

GENERAL ELECTRIC

520-139

president, Rochester & Pittsburgh Coal Co.

R. L. Ireland, Jr., president, Hanna Coal Co.; T. R. Johns, general manager, Industrial Collieries Corporation; Dr. Webster N. Jones, dean, college of engineering, Carnegie Institute of Technology; W. W. Keefer; A. B. Kelley, general manager, Humphreys Coal & Coke Co.; Ralph Kelly, vice-president, Westinghouse Electric & Manufacturing Co.; M. D. Kirk, vice-president, Vesta Coal Co.; Arthur Knoizen, vice-president, Joy Manufacturing Co.

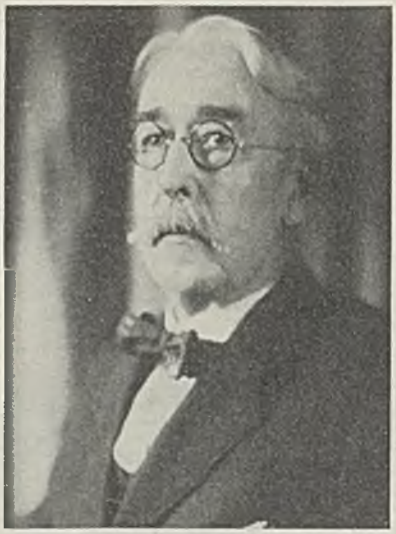
T. P. Latta, general superintendent, Crucible Fuel Co.; Charles E. Lawall, dean, school of mines, West Virginia University; Lewis O. Lougee, mining engineer; Dr. H. H. Lowry, director, coal research laboratory, Carnegie Institute of Technology; Clyde L. Lutton, safety director, and Clay F. Lynch, general superintendent, H. C. Frick Coke Co.; R. H. Magee, district manager, Mine Safety Appliances Co.; Richard Maize, Pennsylvania State mine inspector; George H. Morse, vice-president, Union Collieries Co.; George T. Mose, vice-president, Union Supply Co.; Gordon MacVean, manager, mining department, Mine Safety Appliances Co.; George S. McCaa, Pennsylvania State mine inspector; John D. McCreery, treasurer, United States Coal & Coke Co.; George C. McFadden, assistant vice-president, Peabody Coal Co.; W. T. McGee, and John V. McKenna, Pennsylvania State Mine inspetors; H. H. McMullin, H. C. Frick Coke Co.

James Patterson, general superintendent, Youghiogheny & Ohio Coal Co.; Eugene Ruch, H. C. Frick Coke Co.; J. T. Ryan, Jr., assistant secretary, Mine Safety Appliances Co.; E. A. Siemon, division general superintendent, Hillman Coal & Coke Co.; Edward Steidle, dean, School of Mineral Industries, Pennsylvania State College; J. T. M. Stoneroad, president, Carnegie Coal Co.; George E. Stringfellow, vice-president and division sales manager, Edison Storage Battery Division, Thomas A. Edison, Inc.; W. P. Vance, general superintendent, Butler Consolidated Coal Co.

James D. Walker, Pennsylvania State mine inspector; W. J. Whitaker, general manager, Crucible Fuel Co.; W. W. Wilkinson, Pennsylvania State mine inspector; George Wilson, general superintendent, National Mining Co.; E. B. Winning, manager of mines, Republic Steel Corporation; Robert Wood, assistant to president, W. J. Rainey, Inc.; F. G. West, general manager, Butler Consolidated Coal Co.; W. P. Yant, director of research and development, Mine Safety Appliances Co.; Dr. L. E. Young, vice-president, Pittsburgh Coal Co.

Harwick Mine Blast Kills 10

An explosion in the Harwick mine of the Harwick Coal & Coke Co., seventeen miles east of Pittsburgh, Pa., on Jan. 12 resulted in the deaths of ten men and injury to four others. Normally about 500 men are employed in the mine, but the workings were idle that day and only 46 employees, composed of foremen and repairmen, were underground at the time of the blast. It was estimated that the explosion occurred about two miles from the main shaft and a half mile from an air shaft known as the "Kissick shaft."



The late Eli T. Conner

Eli T. Conner Passes

Eli T. Conner, 73, dean of mining engineers in the anthracite region of Pennsylvania, died Jan. 3 at a hospital in Scranton, Pa., after a week's illness. Born at Mauch Chunk, Pa., his industrial career began in 1882, followed by various technical positions with coal companies until in 1896 he became superintendent of the Shamokin division of the Lehigh Valley Coal Co.; from 1902 to 1907 he was general superintendent of the Webster Coal & Coke Co., which later was merged with the Pennsylvania Coal & Coke Corporation, of which he became general manager. He became a consulting engineer for coal-mining interests in Philadelphia, New York and Scranton in 1909, was made a member of the John Hays Hammond commission on underground repair problems, and was an early disciple of hydraulic backfilling to protect the surface over mine workings.

Industrial Notes

Electric Hose & Rubber Co., Wilmington, Del., announces that A. B. Dougall, general sales manager, has moved his headquarters to the company's new Eastern sales office, 9 Rockefeller Plaza, New York City.

General Electric Co. has elected Charles E. Wilson, vice-president in charge of its appliance and merchandise department since 1930, to a new position, that of executive vice-president of the company. Philip D. Reed has been made assistant to the president. Nathan R. Birge, formerly assistant to the president, has been elected a vice-president.

Graton & Knight Co., Worcester, Mass., has appointed James E. MacMahon, formerly assistant sales manager, to be general sales manager. He succeeds C. O. Drayton, resigned.

Simplex Wire & Cable Co. has opened a branch office at 231 Healey Building, Atlanta, Ga., under the management of A. Kenneth Felix.

Worthington Pump & Machinery Corporation, Harrison, N. J., has acquired an interest in the Moore Steam Turbine Corporation, Wellsville, N. Y.

Atlas Powder Co. has opened a new sales office in the Field Building, 135 South La Salle St., Chicago, with J. H. Buchanan in charge.

Linn Manufacturing Corporation, Morris, N. Y., announces that F. R. Van Rensselaer, formerly vice-president, has been elected president, vice George Whitman, resigned. Philip W. Sloan succeeds Mr. Van Rensselaer as vice-president.

Hard-Coal Exhibit in Boston

With the most modern anthracite-burning equipment produced by 26 manufacturers displayed, a permanent exposition has been established by Anthracite Industries, Inc., at 644 Beacon St., Boston, Mass. Architects, contractors, builders, bankers and heating engineers, as well as householders, are thronging the showrooms.

Included in the exhibits are modern kitchens with anthracite-burning ranges, ice refrigerators, linoleum floors and built-in cabinets; automatic stokers, automatic hot-water equipment, air conditioners, anthracite-burning fireplace, manually operated heating equipment, semi-automatic heating equipment, all types of temperature-control devices and regulators, and modern domestic hot-water devices. An information booth is maintained for the convenience of visitors, where all questions concerning heating are answered and specific recommendations given on request. Allen H. Bearse, Jr., is in charge of the exposition.

Obituary

H. H. Taylor, 61, chairman of the board, Franklin County Coal Corporation, operating in southern Illinois, died Dec. 28 at Tucson, Ariz., after a long period of ill health. During his long career in the coal industry he was associated for ten years with the New Kentucky Coal Co., of which he became secretary-treasurer; in 1909 formed the Taylor Coal Co., subsequently merged with the Bickett Coal & Coke Co., and later became president of the Franklin County company, being made chairman of the board in 1935.

G. D. Etter, 63, superintendent of the Howard mine of Moss & McCormack, Howard, Ala., died at a Birmingham hospital on Jan. 4 following a heart attack. For a number of years he had been an operator in Jefferson and Walker counties, Alabama, and at one time was mayor of Warrior.

William H. Thomas, 80, who played an important part in early coal-mining operations in the Birmingham (Ala.) district, died Dec. 29. A native of Oldham, England, he went to Alabama in 1887, where he opened the mines at Brookside for the Sloss-Sheffield Steel & Iron Co. Later he had charge of the initial developments at Blossburg for Major E. M. Tutwiler. Around 1900 he became superintendent of coal mines for the Woodward Iron Co., a post he held for fifteen years. Subsequently he was connected with the DeBardeleben Coal Corporation at Payne's Bend and still later was superintendent at Corona until his retirement in 1930.

In this large turbine unit Gulfcrest Oil proves its resistance to deterioration. The Gulf engineer and plant engineer note the very slight rise in the temperature of Gulfcrest Oil after it has been circulated through the bearing.

New Standards OF TURBINE OIL QUALITY

FROM many power plants where Gulfcrest Oil is in service come reports of the remarkable performance of this turbine oil . . . but Gulf's research staff has not been content with the usual service tests for Gulfcrest Oil. They have devised accelerated oxidation tests at least 100 times as severe as the test of actual service.

The stability demonstrated by Gulfcrest under these grueling tests is phenomenal. Where a nominally good commercial turbine oil begins to oxidize rapidly at about 200 hours, Gulfcrest Oil shows practically no deterioration in 7200 hours of continual punishment in the testing apparatus. The results of these tests are clearly shown in the graphs at the left.

Gulf scientists have perfected in Gulfcrest Oil a turbine lubricant which multiplies by many times the service hours that can be secured by any other known oil of which we have record. The marked superiority of Gulfcrest has been so definitely established that there is practically no basis for comparison between this Alchlor processed turbine oil and others. (Gulfcrest is refined by the same exclusive process as Gulfpride — the world's finest motor oil.)

We suggest that you talk with a Gulf engineer about Gulfcrest Oil at your first opportunity.

GULFCREST OIL MAKES ALL TIME RECORDS FOR STABILITY AND RESISTANCE TO OXIDATION

Fig. 1 shows the effect of accelerated oxidation at 210° F. in the presence of copper, iron and water on the *neutralization numbers* of three different turbine oils. Curve C shows the marked superiority of Gulfcrest Oil. (This test was made in the laboratory of the Gulf Research & Development Company.)

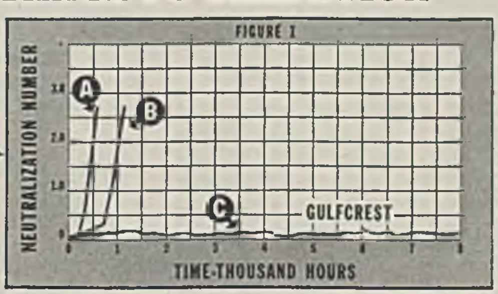
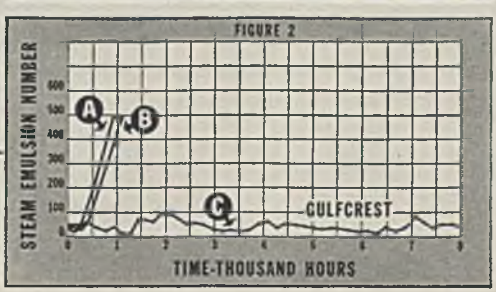


Fig. 2 shows the effect of accelerated oxidation at 210° F. in the presence of copper, iron and water on the *steam emulsion numbers* of three different turbine oils. Curve C — representing Gulfcrest Oil — shows the marked superiority of this Alchlor treated lubricant. (This test was made in the laboratory of the Gulf Research & Development Company.)



Gulf Oil Corporation ★ Gulf Refining Company

GENERAL OFFICES: GULF BUILDING, PITTSBURGH, PA.

GULF INDUSTRIAL LUBRICATION

James D. Matthews, 42, mine foreman for the Pocahontas Fuel Co. at its Amonate mine, Amonate, Va., died Jan. 11 in a sanitarium at Bluefield, W. Va., after an illness of ten days.

Leo P. Sicard, 25, associated with the Lake Purdy Coal Mining Co., of Alabama, of which his father is the owner, died Dec. 24 at Birmingham, Ala.

David J. Griffiths, 71, identified with the coal industry in Colorado for many years, died Jan. 5 at San Rafael Hospital, Trinidad, Colo., as the result of a heart attack. Born in Wales, he came to this country 46 years ago; served as State coal-mine inspector, 1903-10; general superintendent, Victor-American Fuel Co., 1917-25; and was with the Employers' Mutual Insurance Co., 1925-29, when he retired because of failing health.

Samuel Andrews, 62, former Colorado State coal-mine inspector and mine foreman for the Colorado Fuel & Iron Co., died Jan. 11 at Canon City, Colo., after several years of ill health. He was appointed deputy inspector last October, but was unable to accept because of poor health.

TVA Quiz Asked by Norris

Resolutions seeking investigation of the Tennessee Valley Authority were introduced in the Senate at Washington by Senator Norris on Jan. 3, and in the House two days later by Representative May of Kentucky. The measure presented by the Nebraska senator, father of TVA, provided for a sweeping inquiry by the Federal Trade Commission. The resolution, which was referred to the Agriculture Committee, would make $200,000 available for the investigation. The Kentucky Congressman proposed an inquiry by the House Military Affairs Committee into charges of extravagance, wastefulness and discord within the organization. He asserted that the Norris resolution would mean "a further expedition into the affairs of private power companies and the courts rather than an investigation of TVA."

1937 Is Best Safety Year For Union Pacific

With only two fatalities and 38 non-fatal injuries, the Union Pacific Coal Co., Wyoming, experienced the best safety year in its history in 1937. Production per injury reached an average of 82,891 tons; man-hours worked per injury, 92,680. These results are the culmination of fifteen years of intensive safety work, in the first ten years of which, reports Eugene McAuliffe, president of the company, $1,019,176.35 was spent on safety payrolls and safety materials. Even with this money and effort, results were none too heartening, but the turning point came in 1932, after which the injury rate rapidly decreased to the 1937 level.

Union Pacific Coal Co. employees were thanked for their cooperation in an advertisement in the Jan. 14 issue of the Rock Springs (Wyo.) *Daily Rocket*, signed by the company and its operating and safety personnel. At the same time, the goal for the future was set at "no deaths and not to exceed two non-fatal injuries per month." The trend of injuries at Union Pacific mines is shown in the accompanying table, taken from the *Daily Rocket* advertisement.

TREND OF INJURIES AT UNION PACIFIC COAL CO. MINES

	1923–1927	1928–1932	1933–1937	Year 1937
Fatal injuries	48	35	22	2
Non-fatal injuries	1,319	1,045	241	38
Total injuries	1,367	1,080	263	40
Output per injury, tons	10,511	12,393	53,192	82,891
Man-hours worked per injury	15,617	16,329	61,165	92,680

Permissible Plates Issued

APPROVALS of permissible equipment issued by the U. S. Bureau of Mines since the last preceding announcement are as follows:

Vulcan Iron Works Co.: Type SCP 15/25 shaker conveyor; 15-hp. motor, 500 volts, d.c.; Approval 332A; Nov. 12.

Vulcan Iron Works Co.: Type SCC 25/30 shaker conveyor; 20-hp. motor, 500 volts, d.c.; Approval 333A; Nov. 12.

Ingersoll-Rand Co. (Cameron Pump Division): 2CRVP pump; 7½-hp. motor, 230 volts, d.c.; Approval 334; Nov. 24.

Joy Manufacturing Co.: Type T-3 caterpillar truck; two 4-hp. motors, 250-500 volts, d.c.; Approvals 335 and 335A; Nov. 26.

Burgess Battery Co.: B3RT dry-cell-type blaster; Approval 1210; Nov. 26.

Burgess Battery Co.: F2RT dry-cell-type blaster; Approval, 1211; Nov. 26.

Burgess Battery Co.: D2RT dry-cell-type blaster; Approval 1212; Nov. 26.

Sullivan Machinery Co.: Type 9-B top cutting machine; 20-hp. motor, 250 volts, d.c.; Approval 336; Dec. 6.

American Mine Door Co.: Type "VD Dustributer" (rock-dusting machine); two motors, 5 and 2½ hp.; 230 volts, d.c.; Approval 337; Dec. 18.

Automatic Stokers Ordered

Coal-burning steam locomotives used by the railroads in fast or heavy service must be equipped with automatic stokers or other mechanical means of supplying fuel to the fire, according to a decision by the Interstate Commerce Commission on Dec. 27. The rule does not go into effect, however, until July 1 next, when passenger locomotives weighing 160,000 lb. or more and freight engines of 175,000 lb. or more built thereafter are ordered to be so equipped. Units built prior to that date but to be used in the future in fast or heavy service are to have such equipment applied at the rate of not less than 20 per cent annually.

The decision, brought in Docket No. 24049, an action instituted by the Brotherhood of Locomotive Engineers, charging the railroads with violation of the Interstate Commerce and Locomotive Inspection acts, found that such locomotives used in fast or heavy service, when hand fired, caused unnecessary peril to life or limb of employees or travelers. Commissioners Eastman and Miller dissented; Commissioners Meyer and Mahaffie did not participate in the proceeding.

Seek to Lift Canadian Tariff On Anthracite

That the Canadian tariff on Pennsylvania anthracite be removed in the new trade agreement to be negotiated with Great Britain was urged on Jan. 13 in a letter from the Anthracite Institute to the Committee for Reciprocity Information, an agency of the State Department in Washington. Louis C. Madeira, 3d, executive director of the institute, said in the letter that the Dominion represents a potential market for 5,000,000 tons of anthracite annually, but that since the trade treaty of 1931 the tonnage dropped to a low of 1,430,000 in 1933.

Canada is wholly dependent for her supplies of anthracite "on sources beyond her borders," said the letter, and no valid reason is apparent why tariff barriers should prevail with respect to a natural resource of the United States which is much needed and widely used in Canada and which does not compete with any similar resource produced within the Dominion. "The continued imposition on Pennsylvania anthracite of a duty of 50c. a ton plus an excise tax of 21c. a ton seems all the more unfair in view of the fact that competitive anthracites from the United Kingdom are received in large quantities in this country entirely free of duties or excise taxes, whether delivered directly by vessel or reshipped by rail across the border from Canadian docks."

Republic Leases Mine

Republic Steel Corporation has leased Crescent No. 2 mine, Roscoe, Washington County, Pennsylvania, from the Pittsburgh Coal Co. The mine, which operates in the Pittsburgh seam, normally employs about 450 miners daily and has a capacity of 3,000 tons per day.

Union Wins Again in Harlan

The Green Silvers Coal Co., Harlan, Ky., has been ordered by the National Labor Relations Board to "cease and desist" alleged unfair labor practices and to offer 21 discharged employees reinstatement and back pay, according to an announcement by Philip G. Phillips, regional director of the Board. The decision, which followed a complaint by the United Mine Workers, District 19, declared that the company, by discharging and refusing to employ the men, and thus discouraging membership in the U.M.W., and "by interfering with, restraining and coercing its employees in the exercise of rights guaranteed in Sec.