COAL AGE

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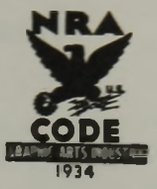
DEVOTED TO THE OPERATING, TECHNICAL AND BUSINESS PROBLEMS OF THE COAL-MINING INDUSTRY

SYDNEY A. HALE, *Editor*

New York, June, 1935



No Time for Tears

FEW BITUMINOUS PRODUCERS swept into the flight to chaos in 1925-33 will join the jubilee chorus with which so many industrialists and politicians have greeted the Schechter poultry case decision of the United States Supreme Court declaring the NRA code system unconstitutional. Despite rising criticism of coal-code operation and enforcement, operators as a whole frankly and freely recognize the outstanding, if temporary, stabilization NIRA brought to the industry. Although proposals for permanent regulation, such as embodied in the Guffey-Snyder bill, divided the operators into two camps, what should have been a united front was breached only by disagreement as to the form and extent which supplementary legislation should take.

In wiping out the code system, the court decision gives an answer which should close that breach and once again give the industry a common platform. Up to the time that opinion was handed down on May 27, there was much to be said in favor of throwing the full support of the industry behind the administration proposals for a two-year extension of the original law—especially as those producers who favored something more could have joined in this movement without in any way sacrificing their convictions that a simple extension of the existing law was an inadequate answer to the special problems of the bituminous coal industry. That program commended itself because it promised to close one door against an immediate collapse on June 16.

But code enforcement activities already have been suspended and June 16 is now merely another date on the calendar. Even should the administration forces continue with NRA extension plans, it is extremely doubtful if an omnibus bill could be drafted which would conform to the limitations laid down by the Supreme Court. Setting up definite standards of fair practice for myriad industries would be no mean task. And beyond that lies the question of controlling intrastate transactions "affecting" interstate commerce, for which, as Chief Justice Hughes points out, "the precise line can be drawn only as individual cases arise," although "the distinction is clear in principle."

Special legislation for coal presents fewer drafting difficulties and would be free from the dangers inherent in attempts to write a bill which would apply equally to all industries, however diverse their nature and their problems. When the legislative functions have been properly discharged by Congress, delegation of administrative authority to a subordinate agency long has been sanctioned and the Schechter decision in nowise eliminates or curtails these sanctions. Moreover, while it is always dangerous to predict how the court will view any particular set of facts, the flow of coal represents a high degree of commingling of interstate and intrastate commerce.

Necessity for a plan which will command the indorsement of a substantial majority of the industry, of course, is paramount. This the Guffey-Snyder bill in its original form could not do. But the amendments suggested in the past

fortnight and the evident willingness of its proponents to make further compromises promise to remove most of the fundamental objections to that measure. Production control is made the subject of study for future report and action. The highly debatable Title II creating a national bituminous coal reserve is deferred.

Legislation is admittedly necessary. And speedy action to prevent the destruction of gains already achieved under the dead code is essential. If the Guffey-Snyder bill can be amended along the lines suggested and can be so rewritten as to allow reasonable experimentation while the industry is determining from experience what is and what is not desirable as fixed practice, it now offers the most convenient framework upon which the industry can build for future protection and public service. In the interim of perfecting the necessary changes in structure, the situation created by the Supreme Court is a compelling challenge to the self-restraint of every member of the bituminous coal industry. If producers throw away the gains of the past two years in an insane scramble for tonnage at any price and make their employees unwilling partners in the degradation, the industry will invite not sympathetic government cooperation in working out its problems but straitjacket control.

Research and Resurvey

NOT ONLY does the coal industry need research but a disposition to survey the progress of other fields, for from those fields it already has taken as much as it has given to them and might abstract still more, if it would broaden its viewpoint and overcome its insularity. Two immediate possibilities may be mentioned. By the use of a selective oil and a concentration table, sylvite and halite—two non-metallic minerals—recently have been separated from sylvinite by the U. S. Bureau of Mines. These two non-metallics have specific gravities differing only by 0.16, and yet a concentrate of 96.7 per cent potassium chloride is being obtained. The method seems suitable for all kinds of non-metallics, including coal, provided an effective reagent for any given case can be found cheap enough, with or without recovery and with or without other advantages, to clean the product with reasonable cost.

Again, by photo-electric methods derived from the steel industry, P. B. Bucky seems likely to obtain approximations to the strains in mine roof, pillars and floor which have never been determined or approached hitherto by mathematical calculations. The tests, unfortunately, have to be made of elastic materials, but their indications throw a bright light on matters hitherto wholly dark. These are two of many possible adaptations—some chemical, some physical and some electrical.

Treated Timber

BY HAVING timber peeled and cut by machinery at the shipping point, the cost of framing can be greatly reduced, the accuracy of framing can be enhanced and the cost of freight can be lowered. Timber can be properly treated at the same point. Not infrequently treated timber can be delivered at the plant for a lower cost than would be involved in purchasing the timber delivered and preparing it without treatment for use at the mine plant.

Lighter timbers will suffice if they are treated, because they do not have to be made oversize, with the intent that they will be strong enough after decay has set in. They will last if properly treated for seven times as long as untreated timber. Any timber that has to stay in place more than two years should receive treatment. Properly cut, it will not resist the travel of the air as much as timber not so framed, and it will take up less of the roadway or airway. Replacements, expensive as they are, are rendered more so by the quantity of roof rock that has to be loaded out and by the quantity of timber that often has to be used to fill in the space between the collar of each set and the unfallen rock.

When timber for ties is treated, the spikes hold longer and more firmly, and wrecks are not so likely to occur. The hazard of rotting timber sets and ties is an element in the safety program which cannot be overlooked, for weak timbers jeopardize the men traveling roadways. Weak ties slow down transportation and cause derailments. Spikes withdrawn can rarely be replaced. Straightening them is time-destroying and unsatisfactory. Yet for want of a little imagination and foresight the industry continues to use untreated material without consciousness of the losses being sustained.

PRESSURE GROUTING

+ Prepares Strata for Main Headings Driven Under the Creek

TO PROVIDE advance protection for main headings driven 70 ft. below the bottom of a creek bed, pressure grouting from the surface through core-drill holes was employed at No. 3 mine of the Pond Creek Pocahontas Co., Bartley, W. Va. Conditions encountered in driving the headings through the area indicate that the grouting probably shut off a large percentage of the water which otherwise would have entered. As it was, considerable water found its way into the headings, but mostly through the mine bottom, and this influx is being successfully curbed by secondary pressure grouting carried on underground.

Holes drilled into the mine bottom at locations in the headings where water was appearing illustrated the uncertainties that attend dealing with rock strata. In several instances a 1½-in. hole drilled 4 ft. straight down into the bottom would tap a flow of water which would spurt continuously 2 to 3 ft. into the air, and another of the same dimensions and less than 2 ft. away would bring no increased flow of water. Appearance of grout at unexpected places further illustrated the uncertainties.

The headings are those of a main-haulage entry being projected to haul the coal from a large acreage which, in relation to Dry Fork Creek, is on the opposite side from the main slope and surface plant. Contrary to its name, the creek is characterized by a large flow most of the year and does not go dry. No. 3 mine is in the Beckley seam, which in that vicinity averages 52 in. in thickness and is practically level.

To do the core drilling and grouting from the surface the Mott Core-Drilling Co., Huntington, W. Va., was engaged. Eleven 1½-in. holes (1-in. core) were drilled from the surface down to and 2 ft. into the coal seam. For the most part these holes were located upstream from the center lines of the entries to be driven, on the assumption that any water flow in the rock strata would in general be in the same direction and parallel to that of the creek. The farthest that any one hole was drilled from the heading line was 150 ft.

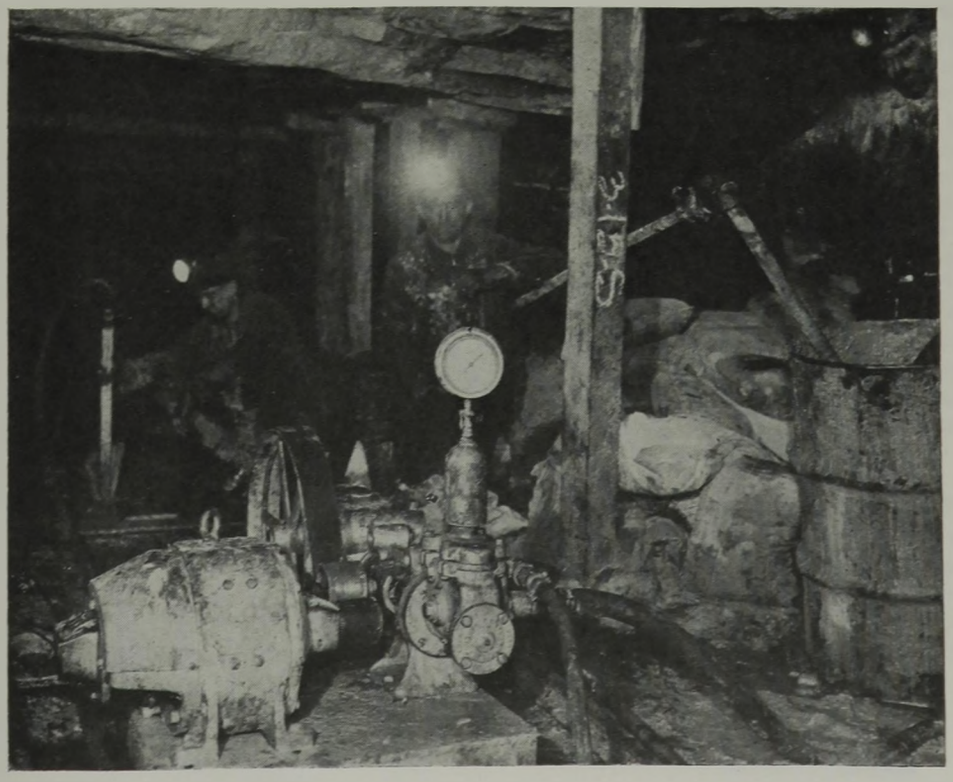
One heading was driven through the center of the general location of the group of eleven holes and thus was protected by downstream holes as well as upstream holes, yet the water encountered in driving this heading was but slightly different in quantity from that in the other heading. This would indicate that little water came from the downstream direction into that heading which was not flanked on both sides with grouted holes.

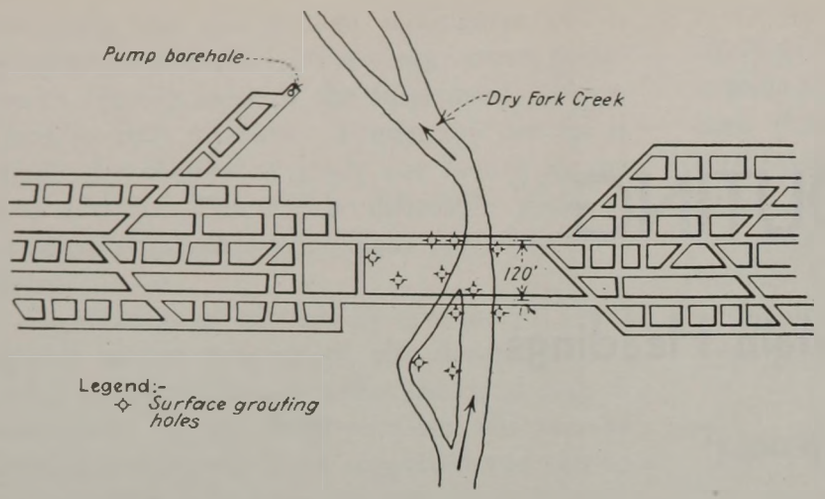
Without preliminary pumping of any lubricating agent into the holes, plain grout made by mixing portland cement and water was used and the pumping was continued until a terminal pressure of 500 lb. per square inch was reached. Cement totaling 6,000 bags (100 lb. each) was pumped into the eleven holes, and the maximum taken by one hole was 700 bags and the minimum 25 bags.

The elevation or depth in the hole at which the grout was forced into the crevices was controlled by adjusting a packer at the desired point. The coal seam would take none of the grout; practically all was taken by a 2-ft. stratum of shale that lies on top of the coal. In applying the grout the packer never was adjusted to a point farther above the coal than the top of a 20-ft. stratum of sandy shale immediately above the 2-ft. stratum which took most of the grout.

How far horizontally the grout traveled is not known because but little of

Grouting Bottom Holes in a Heading Under the Creek.





Location of Core-Drill Holes Grouted From the Surface.

the cement was found in the mine top in the headings which were driven. In one case some of the cement was found in a roof crevice at a point 50 ft. from the nearest grouted hole. Based, however, on observations made when grouting on the inside was under way, the grout probably traveled hundreds of feet.

Up to the vicinity of the creek six parallel headings had been driven. At that point four headings were dropped and two headings 18 ft. wide on 160-ft. centers were driven 600 ft. to a point where no more water was encountered. Here the entry was expanded to seven headings.

Contemplating that a certain quantity of water would be encountered, an 8-in. borehole was drilled from the surface down into the end of a spur heading near the creek, and in this hole was installed a 6-in. pump discharge pipe and a three-conductor lead-sheathed cable for 440 volts. This installation proved a necessity because when both headings had been driven through the wet area, the water influx totaled 600 gal. per minute. As protection against the remote possibility of a flow of flood proportions, the two headings were equipped with concrete side abutments and gates of 3-in. plank which would swing down to a closed position against the abutments if two supporting posts were knocked out.

It was evident that practically all of the 600-g.p.m. flow was coming up through the mine bottom and that to shut off that water permanently would warrant spending a considerable sum. Accordingly, the coal company, using its own employees, set about grouting on the inside of the mine.

The only equipment purchased for the job was a Myers 2¼x4-in. belt-driven single-cylinder high-duty grouting pump rated 250 lb. and fitted with cylinder liners and valves of bronze. A spare 3-hp. motor was utilized for the pump drive and a 9x8-in. 25-hp. portable mine air compressor was drafted into service to supply air for mixing and agitating the grout.

The first step was to drill a number of 1½-in. holes 4 ft. deep vertically into the bottom over the area where the water seemed to enter. Those of the holes which spurted water indicated the location of the crack through which the water was coming. The next step was to take up 2 ft. of bottom and lay a mat of concrete of the same thickness in that space. This mat was hitched under or into the coal at the sides of the heading. Pipes extending through the mat and down into those holes which had struck water were cast into the mat to provide the connections into which the grout was to be pumped.

These same pipes and a number of others, some laid horizontally but all installed before the mat was poured, provided means for draining away the water while the concrete of the mat was hardening. Those pipes not to be used for conducting grout were plugged before grouting began.

The first experience in pumping grout through the pipes of a 12x20-ft. slab resulted in the grouting pressure heaving the bottom rock at one end of the slab. As a result, the size of slab was increased to 20x20 ft. and a number of heavy roof posts were installed and tightly wedged to hold the slab down against the grouting pressure.

Under one of the mats grout was pumped into four pipes and the maximum taken by one hole was 90 bags. That the grout traveled long distances was indicated by its appearance through the mine bottom 70 ft. from the hole where it was forced in. In that travel of 70 ft. it had to pass under the 20x20-ft. concrete mat through which pumping had been completed. The hole into which the grout was being pumped was 20 ft. to one side of the slab.

In the case of the holes drilled 4 ft. into the bottom, most of the grout went in at pressures below 50 lb. per square inch. When the pumping resistance exceeded that amount it usually increased rapidly to the ultimate of 500 lb. Abrasion to the pump caused by the cement made it necessary to renew the bronze liners and valves of the pump after about ten hours of pumping.

Mixing and agitating by air proved far more satisfactory than doing it by hand. An air jet submerged at the bottom of the mixing barrel kept the water and cement violently agitated.

At the time of this writing, when the work was still under way, the total inflow of water had been reduced to 350 g.p.m. and mine officials felt certain that they would be able to shut off practically all of the remainder.

Dry Fork at the Point Where the Headings Cross Underneath.

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LOW COST AND SAFETY

+ Feature Entry Timbering With the Hitch Drill

At Indiana Coal-Mining Operations

PERMANENT, safe protection for roadways at a material reduction in cost were the major factors in the adoption of the hitch drill and steel-rail crossbars for timbering entries at mines in the Clinton and Sullivan fields of Indiana. At each of the operations employing this system of timbering, extremely difficult roof conditions made the usual methods of supporting crossbars on legs or in hitches cut into the rib by hand both costly and dangerous. With the hitch drill, legs are eliminated; hitches can be made deep enough to avoid the weaknesses encountered in the necessarily shallow type cut by hand, and the direct cost of timbering, experience at the various operations has shown, is reduced from one-half to two-thirds. Among the companies which have adopted hitch-drilling for entry timbering are: Binkley Mining Co., Walter Bledsoe & Co., and the Glendora and Templeton coal companies.

All of the mines now employing the hitch drill have experienced to a greater or lesser degree the advantages enumerated above. Credit for pioneering hitch-drilling in Indiana goes to the Binkley Mining Co., which developed at its No. 8 mine the type of drill upon which those used by other companies in the region were modeled. No. 8 mine, near Clinton, operates the No. 3 seam, which averages 5 ft. in thickness. The immediate roof consists of 10 to 15 ft. of crumbly gray slate which cuts badly and must be timbered to hold it in place. Originally, timbering of entries at No. 8 was based on the use of legs to support the crossbars or hitches cut by hand into the rib. Maximum depth to which hitches could be cut with a pick was 6 in. Even when carefully done, timbering with legs or hitches was unsafe.

Where legs were used, wrecks almost invariably resulted in several of them being knocked out, bringing down a heavy fall of slate and, in turn, endangering life, damaging equipment, delaying production and adding a clean-up expense to the mine cost. Decay of legs also was a relatively frequent cause of timber failure, and where hand-cut hitches were employed they were constantly breaking out because of the limited depth to which they could be sunk.

With existing conditions becoming intolerable from both the cost and safety standpoints, the Binkley management began a search for a new timbering method in 1929, finally deciding on the hitch drill as offering the best possibilities, and following this up by designing a machine, later patented, to meet the requirements of flexibility, speed and cost considered essential for maximum efficiency. The original machine (*Coal Age,* December, 1931, pp. 621-622) was later supplemented by an improved model and a third drill was installed at the No. 10 mine of the company when it was taken over in 1933.

No. 10 also is a shaft operation in the No. 4 seam, which varies from 4 ft. 9 in. in thickness to 5 ft. 4 in. Immediately over the coal is a gray slate varying from 4 to 9 ft. in thickness, which makes a fairly good top if taken care of within a reasonable time. If timbering is neglected, however, or is poorly done, falls are frequent and extend to considerable heights, and one of the first tasks when the mine was taken over was to clean up the main entries, which had fallen shut to the shaft bottom, and retimber with the hitch drill. In all, approximately eight miles of entry has been timbered with the three machines at the two mines at one-third the cost under the old system.

The latest Binkley drill (Fig. 1) consists of a boom carrying a double-ended thread bar and mounted on a turntable which revolves on roller bearings around a king pin holding the assembly on a heavy bedplate. The bedplate rests in guide channels mounted on the truck, and can be moved from side to side by two ropes winding on a windlass shaft under the truck. This permits the boom assembly to be moved from one side of the truck to the other to allow drilling a deeper hole. Power to operate the drill is supplied by a

Fig. 1—Binkley Hitch Drill Set Up to Show Working Position. The Holding Jack Is Shown Under the Boom Carrying the Thread Bar and the Horizontal Jack Appears at the Right.

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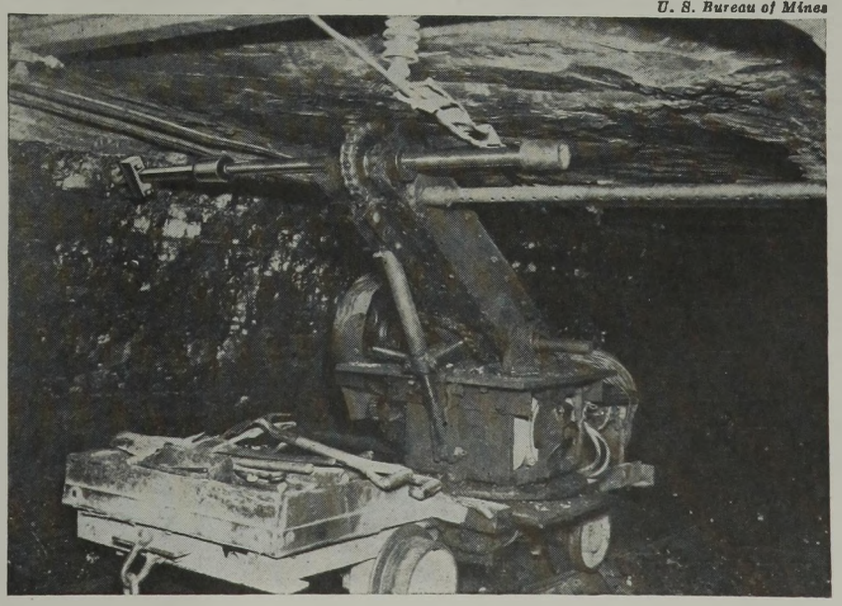

25-hp. mining-machine motor through a gear-and-pinion reduction to a sprocket and chain. A 7-hp. propelling motor is installed for short moves.

During moves, the boom is lowered to a horizontal position and, if necessary, is rotated up to 20 deg. to the right or left to negotiate sharp curves. Upon arriving at the working place, the boom is raised to position by a wire rope operating over a hand-operated worm-driven reel, and when in position is supported by a screw jack. The boom assembly then is slid over to the side of the truck and the boom is braced in position by a horizontal telescopic jack. The pilot auger carrying the cutting bit is then placed on the end of the thread bar and drilling proceeds at an average rate of 120 r.p.m. To drill the corresponding hole on the other side of the entry, the bit is placed on the opposite end of the thread bar, the boom is slid over to the other side of the truck, the horizontal jack is set against the opposite rib, rotation of the drill is reversed and the second hole is started.

The boring unit on the Binkley drill consists of a pilot auger made of a square steel bar and a cutting head. The auger point is forged on one end of the pilot auger and the other fits into a socket on the thread bar. Intermediate sections may be employed to extend the reach of the drill. The cutting head, which slips over the shank of the pilot auger and is fastened on by a setscrew, is made of a rectangular block of steel (Fig. 1) with recesses to accommodate ordinary machine bits, which are held in place by setscrews. For the usual type of work at Binkley operations, the cutting head is designed to make a hole approximately 7 in. in diameter.

Most of the timbering done in entries in the past consisted of individual crossbars, the ends of which rest in holes drilled on opposite sides of the entry (Fig. 2). One hole is drilled 36 in. deep in this system of timbering and the other 18 in. One end of the bar is then pushed back to the bottom of the long hole, and the bar is then pulled back until it strikes the bottom of the short hole, thus giving an 18-in. bearing on both ribs. As the final step, the crossbar is blocked up by wedges made of split props. These wedges are beveled on the inner end and then are driven into a tight fit. In timbering across breakthroughs, 6-ft. pins and stringers are installed as shown in Fig. 2, the pins being concreted or wedged into place.

On stub and room entries with a comparatively short life, legs are used under the crossbars unless the entry is drilled, in which case pins and stringers are employed. Preparations are now under way, however, for the general adoption of pins and stringers, particularly in short-lived openings, as the most economical in the long run, due to the fact that the crossbars can be placed and recovered more easily, even though the pins would require more steel.

Timbering on main entries is regulated to give a clear height of 6 ft. over the rail; on room entries which require timbering—practically always the case at No. 8 mine—standards call for a minimum of 4½ ft. over the rail. Height is gained in all cases by taking top, which in turn means drilling hitch holes in the slate in the majority of cases. Crossbars are put up on 4-ft. centers, which permits the use of the regular 5-ft. split room props as lagging. Where a medium amount of cribbing is required, the system used in Fig. 5 is employed. This serves the double purpose of reducing the quantity of material required and transferring any weight which may come onto the structure out to the ends of the crossbars and close to the rib.

Pit-car loaders are now employed for driving entries at both Binkley mines. These units were first installed at No. 8 in 1929 to eliminate the cost of deadwork involved in taking roof, as well as the cost of narrow yardage,

Fig. 2—Individual Crossbar System of Timbering With the Hitch Drill at Binkley Mines. Fig. 3—Pin-and-Stringer Timbering System Employed at Dresser Mine. Fig. 4—Alternative Method of Timbering Across Breakthroughs Used at a Mine Near Terre Haute. Fig. 5—Cribbing System Used at Binkley Operations.

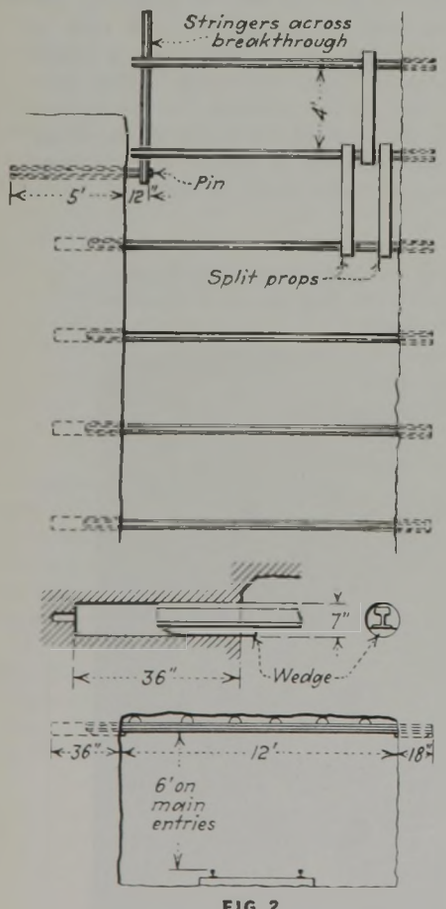

FIG. 2

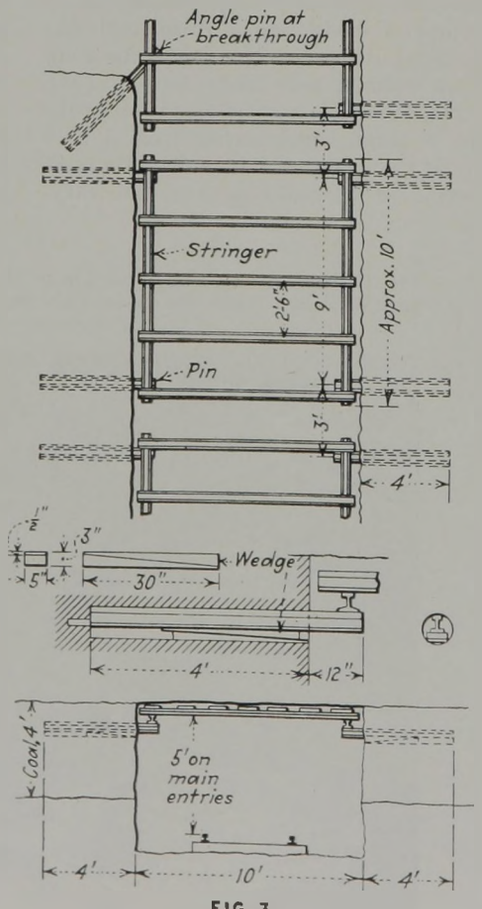

FIG. 3

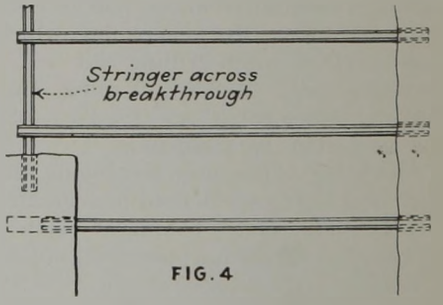

FIG. 4

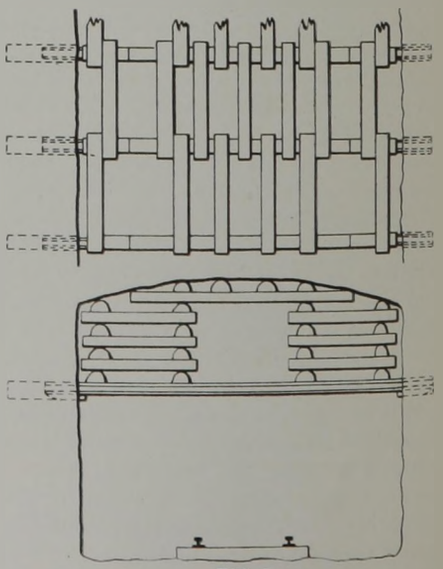
FIG. 5

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Fig. 6—Entry Timbering at Binkley No. 8, Showing Use of Individual Crossbars.

Fig. 7—Pin-and-Stringer Timbering at Dresser Mine, Walter Bledsoe & Co.

the two items together amounting to 25c. a ton on entry coal and 8c. per ton on the entire output of the mine. An entry-driving crew comprises three men, each receiving $6.75 a day. Equipment includes a Northern pit-car loader, short-wall cutter, drill, mule or locomotive for pulling cars to the parting and other necessary equipment and supplies, and the crew does all the necessary work involved in driving the entry and preparing room necks, if on a room entry. Slate shooting is kept two or three cuts behind the coal face and advances in step, the slate being loaded with the pit-car loader. Where the roof is taken, as in all entries at No. 8 and in main entries at No. 10, average performance of a pit-car unit is two cuts of coal 12 ft. wide and 6 ft. deep and 4 or 5 cars of rock in seven hours. At No. 10, loader units in coal only advance from 3 to 4 cuts of approximately the same specifications per shift. Timbering, where required, follows closely on the heels of the entry crews.

Crossbars employed at Binkley mines consist of 70- to 90-lb. relaying rail costing approximately $16 per long ton. Pins and stringers generally are made of 90-lb. steel because of the extra load they are called upon to bear. A hitch-drill timbering crew consists of two men, and under average conditions a pair of holes (one 36 and the other 18 in. deep) can be drilled in from 3 to 5 minutes. Provided materials are at hand and neither cribbing nor an unusual amount of lagging is required, two men can timber 100 ft. of entry per shift with the hitch drill.

The hitch drill also eliminates much of the difficulty involved in widening entries, as the holes can be drilled to the required depth and the crossbars installed in advance, after which it is only necessary to cut back to the desired width. Application of the hitch drill at Binkley operations also is extended to cutting hitches in the rib for seals or any other horizontal boring work which may be necessary. Holes up to 24 in. in diameter have been drilled with the machine, and the management has under consideration the possibility of narrowing down chain pillars and using the hitch drill to bore large-diameter openings for ventilation while advancing. A more solid chain pillar and easy sealing of the openings, with resultant improvement in ventilation, are possible advantages. For drilling high holes at Binkley operations, the drill is run up on an auxiliary truck. Another company in the northern field, however, has provided two booms of different lengths.

Pins and stringers are used exclusively at the Dresser mine of Walter Bledsoe & Co., Terre Haute, which adopted this system in 1932 after about six months of drilling sets of holes for each individual crossbar. While timbering with pins and stringers requires about 25 per cent more steel, fewer holes are necessary and the bars to be handled are shorter. To secure the 5-ft. pins in the holes, which are drilled 4 ft. deep, two wedge-shaped blocks, made by running a diagonal saw cut through a rectangular piece of wood, are employed. With this system (Fig. 3), the pin is first inserted in the hole; the bottom wedge is placed and the top wedge is laid on it and pushed up by hand to hold the pin; the stringer is then laid on the pins; the crossbars are then laid on the stringers; lagging is placed, if necessary; and, finally, the top wedges are driven home, raising the entire structure up tight against the roof. In timbering across breakthroughs, the pins are put in at an angle to insure a solid support in unbroken coal.

Fig. 8—Dresser Bits and Augers.

The No. 5 seam worked at Dresser averages 4 ft. in thickness, and sufficient bottom is taken on main entries to insure a clear height of 5 ft. over the rail; minimum clear height on cross and room entries is 4 ft. Immediately over the coal at Dresser is a black slate stratum consisting of 1 ft. of hard material and about 1½ ft. of softer slate. Where the black slate falls, which usually is the case after exposure without support, the place must be timbered almost immediately to avoid heavier falls of material which may continue up for quite a distance unless checked by timbering.

Originally, the leg-and-collar system of timbering was used at Dresser, legs consisting of 6-in., or larger, posts, and crossbars, or collars, of 60-lb. rail. Experience with this type of timbering closely paralleled that at Binkley, and was responsible for the change to the hitch drill. Under the present system, pins, stringers and crossbars are made of 70-lb. rail, except that in timbering across breakthroughs or other openings where the span is greater than 12 ft., 90-lb. pins and stringers are employed. Stringer length generally is approximately 10 ft., although longer and shorter lengths are employed at times to use up odd pieces of material or to meet special conditions. With a 10-ft. stringer, the two pinholes are drilled 9 ft. apart and the distance between adjacent holes in succeeding sets is 3 ft. Crossbars, however, regardless of the length of stringers, are spaced abso-

(Turn to page 244)

STARTED IN 1922

+ Kathleen Mechanization Program

Accounts for Entire Output in 1935

MECHANIZATION of loading at the Kathleen mine, of the Union Colliery Co. goes back to December, 1922, when a Conway rock loader was put to work in a tunnel through a fault area. This machine was started in coal in 1924, and later was supplemented by a track-mounted mobile loader, which remained in service for some time. In October, 1924, the first power shovel installed in a coal mine was received at Kathleen, and from this beginning the number of loading machines in use at the mine has risen to sixteen, of which four are double-shifted in entry work. These sixteen machines account for a normal daily output of 4,600 to 4,700 tons. A spare machine in each of the two classes of equipment in use is kept on hand as an essential item in the company's maintenance program.

The panel system is used exclusively at the Kathleen mine, which is a shaft operation in the No. 6 seam lying 60 to 350 ft. below the surface. Shaft depth is 260 ft. The average rise to the west of the shaft is 6 per cent; to the east, the dip is 3 per cent. Local gradients up to 15 per cent are encountered. Thickness of the No. 6 seam ranges from 6 to 12 ft. and averages 7½ to 8 ft. Top coal is left to protect the roof, however, with the result that mining extends only to the natural parting under the "six inch" layer found in the region, thus leaving an average of 18 in. of coal in place, although occasionally the top coal may run as thick as 3 ft., in which places the seam is 12 ft. thick. The seam carries the characteristic No. 6 "blue band" about 14 to 16 in. above the fireclay bottom.

Panels consisting of two groups of ten rooms each turned from both sides of the panel entry comprise the working sections at Kathleen. As indicated in Fig. 1, each panel is surrounded on three sides by a solid pillar of coal. Partings between every other pair of panel entries are driven off the cross entries, one parting taking care of a total of 80 rooms on four panel entries.

Rooms are driven 26 to 28 ft. wide on 45-ft. centers. Depth is 280 ft. in power-shovel sections and 250 to 300 ft. in Joy loader sections. Necks are started 18 to 20 ft. wide on an angle, and widen gradually to full room width at the first crosscut, which is driven 50 ft. from the center of the entry. Succeeding crosscuts generally are staggered slightly and normally are driven not over 60 ft. apart, measuring from rib to rib. Sight lines are carried in the center of the rooms in Joy sections and 8 ft. from the left-hand rib in power-shovel sections.

Loading equipment used in the mine consists of six Goodman power shovels, with one spare, and ten Joy 5BU loaders, also with one spare. Four of the latter, as indicated above, are double-shifted in entry work. The power shovels are made up into three loading units, each consisting of two shovels; two Goodman 6-ton cable-reel locomotives, one serving each shovel; two Goodman shortwall cutting machines with 9-ft. cutter bars; two Chicago Pneumatic post-mounted portable electric coal drills; and one Joy caterpillar-mounted shearing machine. This equipment operates in a single panel of 20 rooms, one loader and its attendant equipment following the other in a closed circuit up one side of the panel, across the entry at the top and down the other side to cross over at the bottom. Power shovels generally are put to work in entries developed by Joy machines, which start room necks and otherwise prepare the panel for full-scale production.

Coal in the Left-Hand Corner Being Loaded by a Goodman Power Shovel to Complete Work in a 26-Ft. Room.

Standard crews for power-shovel sections are made up as follows: two loader operators, each receiving $7 per shift of seven hours; two helpers, $6.25; two motormen, $5.40; two tripriders, $5; one shearing-machine operator, $6; one helper, $6; one tracklayer, $5; one helper, $5; four hand loaders, who clean up places, $5.70; one bugduster and shothole loader, $5.75; one timberman, $5; two drillers, who start late and fire shots after the regular shift, $5.75; four cutting-machine men, $7; one mechanic and repairman, $6; two "toppers," who remove the upper layer of coal from the cut after it is shot down, to allow the shovel to slice off the coal without too much breakage, $5.70; and one foreman, paid by the month. In addition, two maintenance men are employed at night

to look after the six power shovels in use.

Loading and advancement of the timbers go together at Kathleen, and upon completion of the shovel work two hand loaders come into the place to clean up scattered material on the bottom, take down loose top and face, and clean up and square up the face. This operation generally yields one car of coal. The place is next undercut, drilled and bug-dusted, and then sheared. Two shear cuts are made in each place approximately 6 ft. from the ribs (Fig. 3). Upon completion of the shear cut on the left of the place, the machine is moved backward with the tip of the bar in down position to make a cut in the bottom left by the shortwall machine, so that it can be dug up more easily for extending the track. The remainder of the bottom is left in place as a firm working floor for the shovel. Upon completion of shearing, the track is extended.

Rooms are laid with 20- and 25-lb. rail on wood or steel ties. Entry track, switches and turn rails are laid with 30-lb. steel on wood ties. Standards in power-shovel sections provide for carrying the track on the left side of the place, with the right rail on the sight line. This allows a double row of posts to be set in the center of the place, leaving an 8-ft. traveling way on the right for the power shovel and shearing machine.

Loading the shotholes is the last operation in a place on the day shift. Six holes are employed in a 26-ft. place, located as in Fig. 3, which also shows the average number of sticks of powder used per hole. Seven sticks of Black Diamond 5A permissible running 100 sticks to the 50-lb. box are required per cut under normal conditions. Shots are fired by the drillers after the end of the regular shift, and the toppers then prepare the cut as described above for loading.

Loading starts in the right-hand corner of a place, the shovel first digging to the back of the cut and then working across the face to the left-hand rib, taking the coal off in layers from the top to the bottom. Each 26-ft. place normally yields from 55 to 60 tons of coal, and one power shovel generally cleans up four to five places a day.

Both A.C.F. steel cars with Timken-bearing wheels holding an average of 4.5 tons when mechanically loaded and wooden cars holding 3.5 tons are used at Kathleen. Empty trips brought in by the main-line locomotives are left on the partings. Here the gathering locomotives secure trips of seven to nine cars, which they take into the entries, spotting half in the nearest rooms to the loaders and taking the rest to the shovels. As soon as the front car in a trip is loaded, it is placed on the entry where the loaded trip is made up. Trips to the parting or to storage are made

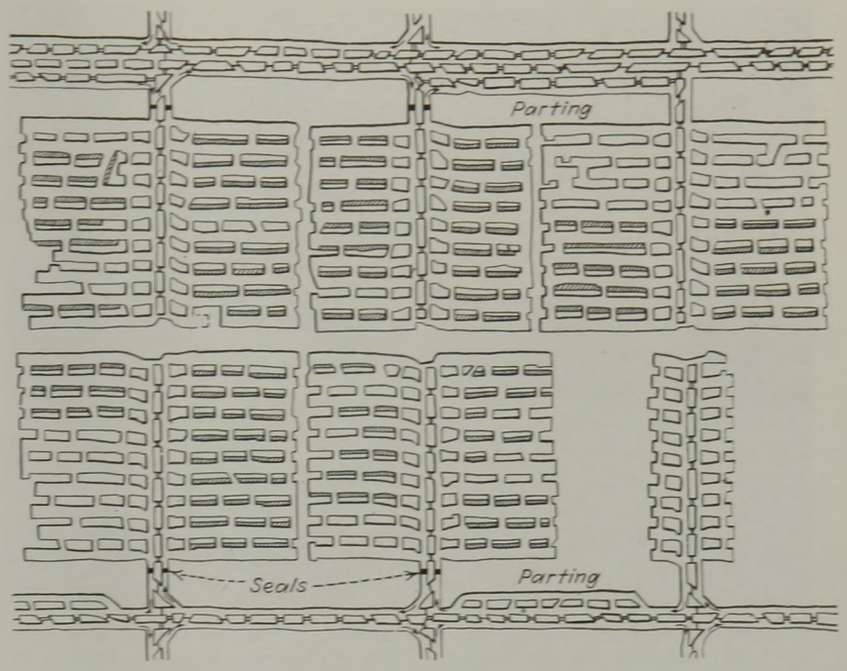


Fig. 1—The Panel System of Mining Is Standard at Kathleen Mine. In the Panels Shown, Which Were Worked With Power Shovels, the Pillars Generally Have Been Slabbed.

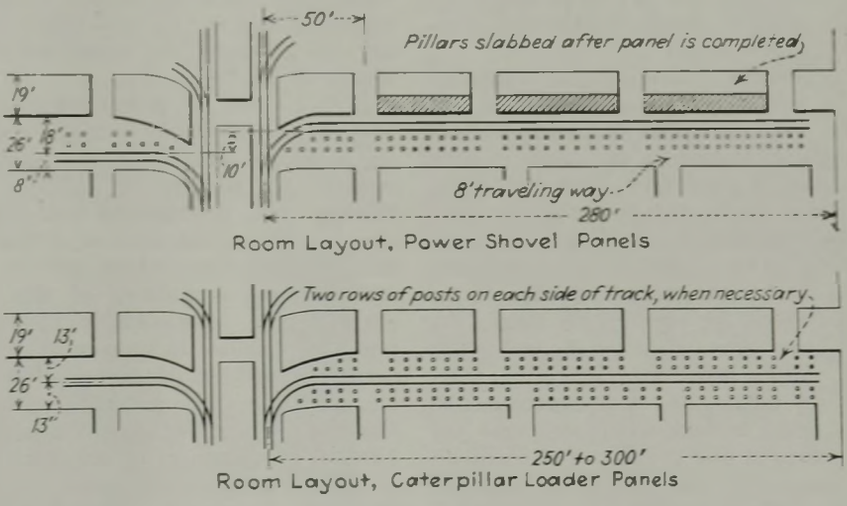


Fig. 2—Room Working Plans Differ to a Degree in Goodman Power-Shovel and Joy Loader Panels.

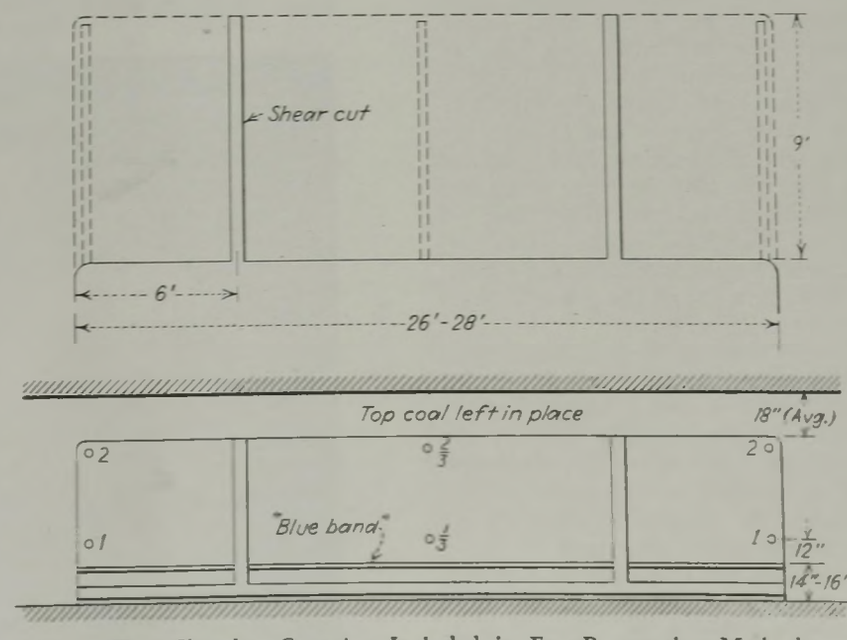
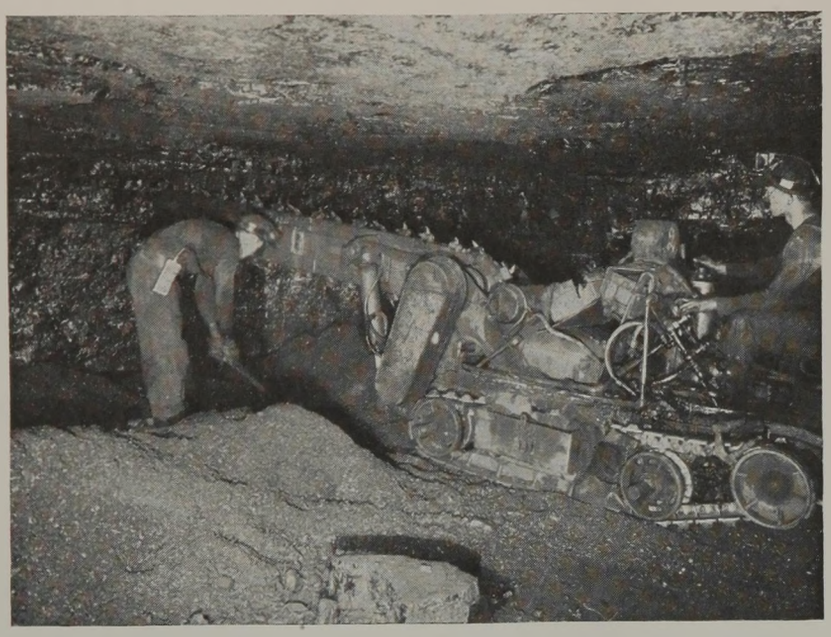


Fig. 3—Two Shearing Cuts Are Included in Face-Preparation Methods at Kathleen. Sticks of Explosive Normally Used Per Cut Are Shown in the Lower View.



Caterpillar-Mounted Shearing Machine Starting a Vertical Cut at Kathleen. A Second Cut on the Opposite Side Completes Shearing Operations. Bugdust From Bottom Cut Has Been Thrown Back.

while the last car is being loaded or, where possible, while the shovel is moving to a new place.

Joy loaders at Kathleen, as compared to the power shovels, are employed in a wider range of types of territories and are subject to greater variations in crew personnel in accordance with conditions. As noted above, one of the major tasks of these machines is driving entries and opening up room panels, either for themselves or for the power shovels. If development is for themselves, single Joy units may open room panels and work them on the way up. Generally, however, the entries are first driven up and room necks turned, whereupon one Joy unit starts in one group of ten rooms in the panel and another in the opposite group, with one shearing machine for both.

Room units therefore consist, under the latter system, of one 5BU loader, Goodman shortwall cutter with 7-ft. bar, Chicago Pneumatic drill and common shearing machine. Crews generally consist of loader operator and helper; two drillers, who also bugdust, load holes and shoot after the shift is over; motorman and triprider; trackman; timberman (if required); two hand loaders; two cutting-machine men; mechanic and repairman (part time); and the pro-rata share of the shearing crew.

The operating cycle in a single room in a Joy section is substantially similar to that described above, except that the bugduster's task is taken over by the drillers, and toppers are not employed. Track is carried in the center of the place and two rows of timbers are set on each side where necessary.

Joy loaders are employed also to slab pillars in the power-shovel sections after the rooms are driven up. General practice is to make one cut 7 ft. deep along the left-hand rib, along which, as indicated above, the track is laid. Completed panels, in both the Joy and power-shovel sections generally are sealed across the mouth of the panel entry.

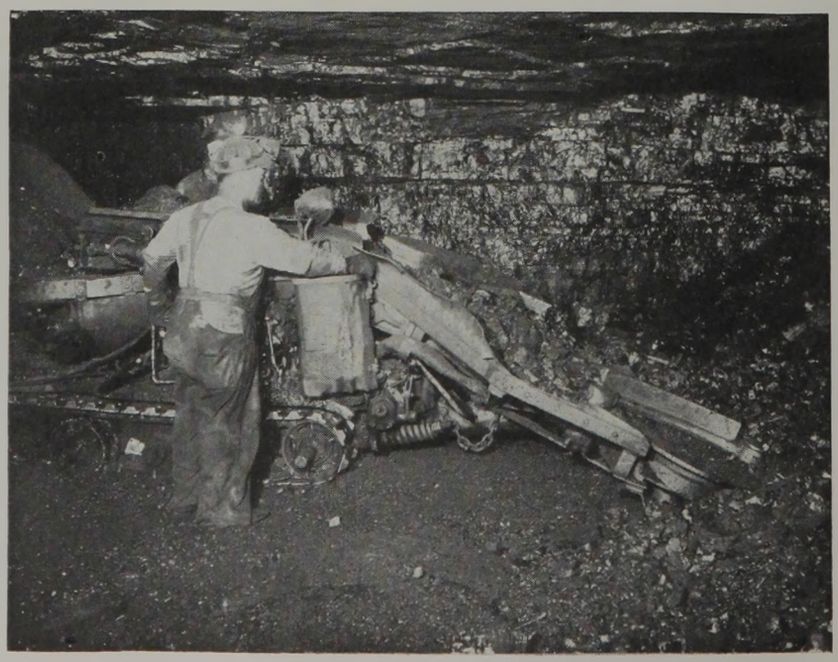
Both a.c. and d.c. power are employed in working sections, as four of the shearing machines and all of the shortwall cutters are driven by 220-volt a.c. motors. D.c. distribution methods are based on the maintenance of a minimum of 220 volts in the working sections. To assist in the attainment of this goal, portable and semi-portable conversion units are installed to supplement the one permanent 300-kw. converter set in service. Portable equipment consists of two General Electric and one Westinghouse 150-kw. motor-generator sets, each made in two truck-mounted units, one unit consisting of the m.-g. set proper and the other of the switching equipment. One semi-portable 200-kw. converter set (made at the mine) also is in use, the converter being taken off the truck for mounting in the station.

Primary a.c. power at 2,300 volts is brought to both the conversion equipment and the underground service transformers supplying the a.c. equipment by Parkway cables hung along the rib. This type of primary distribution has been adopted instead of the lead-sheathed cable lines formerly employed, which were buried in trenches with concrete junction boxes at intervals. Secondary a.c. transmission is based on the use of a 220-volt 3-wire system. Both transformers and rotary conversion equipment are mounted in tile substations.

Loader maintenance at Kathleen is based on inspection and repair each day after the regular shift ends and on having one machine of each class always in the shop for a general overhauling. When the latter is completed, this machine is sent back to a working section to replace another, the selection falling on the machine showing the greatest evidence of wear.

Normal output at Kathleen, as noted above, averages 4,650 tons per day from the ten Joy units, four of which are double-shifted, and the six power shovels. Average number of employees for this tonnage is: day shift underground, 290 to 300; night shift underground, 90; surface, 110. By classes of work, output per unit in a typical month in which the average daily production was 4,634 tons, was as follows: double-shifted Joys, entry work, 211 tons per machine per shift; room Joys, 226 tons; Goodman power shovels, all room work, 262 tons. Power shovels as a rule are installed in the best territories at Kathleen.

Entries at Kathleen Are Driven by Joy Loaders. This Machine Is Starting a Fresh Cut in a Room Neck.



CHEMICAL RESEARCH

+ Opens New Market Opportunities

For Production of Anthracite Mines

HARD COAL for sintering, culm for asphalt filler and for concrete, gas distilled from anthracite for welding purposes, a new type of hard-coal furnace, fusion of mineral matter and ash of anthracite, relation of color of ash to carbon percentage, identification of seams by spores, air pollution and minimum temperature of sustained combustion were subjects considered at a symposium held in the afternoon of April 26 at the Pennsylvania Hotel, New York City, under the auspices of the Division of Gas and Fuel Chemistry of the American Chemical Society. This symposium was under the chairmanship of Louis C. Madeira, 3d, executive director, Anthracite Institute.

Many tests have been made of the fusion temperature of the ash of coal, but rarely is the action of the mineral matter of coal under heat made the subject of inquiry. C. G. Schantz, chief chemist, Weston Dodson & Co., presented a paper by T. M. Dodson, vice-president, describing tests made of samples from fourteen of the coal beds of the Pottsville Series using the refuse above 1.85 specific gravity as removed by float-and-sink methods. The "ordinary" refuse vitrified over its entire area at from 2,650 to 2,800 deg. F., escaping gas creating surface holes, leaving the ash pockmarked. Pyrite refuse broke down at a temperature of 2,550 deg. F., melted and was absorbed by the fireclay base. Soft, shaly refuse was vitrified at 2,450 deg. F., when the mass expanded at right angles to the planes of stratification until a temperature of 2,550 deg. F. was reached. Then expansion ceased. At 2,600 deg. F. the ash particle collapsed, and the viscous slag was absorbed by the clay base. Such refuse was designated in the paper as a "puffer." The last two forms of mineral matter, said the author, caused clinker to form. H. G. Turner, consulting chemist, suggested that the presence of chloritic micas might explain the unusual expansion, but Mr. Schantz said that the analysis had not been conducted so as to reveal any such materials in the puffer rock.

Several new uses for anthracite products were described by E. L. Buller, Hudson Coal Co., including: (1) water filtration, (2) sintering iron ore, (3) filler for asphalt, and (4) aggregate for concrete. For filter work, coal between ⅜ in. and zero was being used. Coal with a minimum ash percentage is preferable because the ash is not reactive and adds to the weight, whereas lightness in backwashing is one of the advantages in using coal instead of sand,

and because in purifying hot solutions the ash is attacked.

Certain odors, dyes and tastes are removed by anthracite, but at the end of six weeks, anthracite ceases to remove chlorine. It will serve, said Dr. Turner, to purify drinking water, sewage effluent, and acid and alkaline waters. Fifteen municipalities are testing it. The hardness of coal is, like that of marble, 3, whereas sand has a hardness of 6, so coal is not readily abraded. Replacement will be about 5 or 10 per cent. About 600 tons of coal has been sold for this purpose, said Dr. Turner. Each filter bed will require 40 to 50 tons and will have to be replaced in from 5 to 10 years. Anthracite for filters should be of high quality, added Mr. Buller.

Anthracite is being used at Chateaugay, N. Y., for sintering magnetite ores to ferrous iron on Dwight-Lloyd equipment, and is giving satisfactory results, said Mr. Buller. Slaty wastes have been much used in Europe for asphalt filler, and should be of value here. Minus 40-mesh anthracite slate has too laminated a structure. This is corrected by grinding to minus 200-mesh. The main objection to the use of anthracite slate is that its sulphur percentage causes weathering. When used for concrete, after sintering for 30 minutes and reduced to minus 8-mesh it makes a light filler, the concrete weighing about 40 lb. per cubic foot. In Russia, anthracite has been used on the top of cotton fields, said Mr. Madeira. The Russians find it advances the growth of cotton about a month, for it heats up during the day and keeps the ground warm and favorable to growth at night.

Anthracite furnaces, strange to say, after years of use and consideration, are outmoded, declared A. J. Johnson, Anthracite Institute. As there is a long range between the temperature of sustained combustion and clinkering, anthracite can be burned at a temperature so low as entirely to preclude the formation of clinker. By building a cylindrical water tank in the heart of the furnace through which the flue is passed, the furnace temperature has been lowered to about 1,300 deg. F., about 1,000 deg. below that of the ordinary furnace, more heat is abstracted by radiation, a magazine effect is obtained between the water walls of the tank and the outside of the furnace, so that the fire can be left unattended for some days. A solid grate is provided, the air being drawn in above it and the ashes discharged around its periphery. A draft of from 0.03 to 0.06 in. of water suffices for operation. Even with Lykens coal no clinker results.

The coal fills the furnace space, no need being found for space above the coal, nor are any passes needed through

the water, as all the heat is removed by radiation. Consequently the furnace is low and can readily be fed from the floor, far more satisfactorily than with other magazine furnaces. The ashpit is made capacious enough for a week's firing. Nut or pea can be used. No more than one per cent of carbon monoxide is formed on banking. As the air does not pass through the coal in the magazine section of the furnace, coal remains unconsumed until it reaches the combustion zone.

By distillation of anthracite with air excluded, a gas without illuminants can be obtained, said Dr. Turner, that is 80 per cent hydrogen. This gas would be well suited for welding, but no tests have been made of the readiness with which the carbon residue could be burned. The quantity of gas varies with the volatile matter in the coal but runs with a high-volatile anthracite up to 10,000 cu.ft. per ton.

Ash produced by combustion of the coal in the Northern Anthracite Field is composed mainly of alumina and silica with low base and alkali content, declared D. J. Jones and Mr. Buller. It is therefore much more refractory than Welsh or Scotch anthracite. Cupric oxide ran 0.09 and 0.04 in two samples. Manganese also was present. Titanium oxide ran 1.82, 1.32, 1.10, 1.52, 0.96 and 1.22 in six samples and phosphorus pentoxide 0.13, 0.10, 0.11, 0.8, 0.8 and 0.14 respectively. The titanium may be in the form of a phosphate. Copper and manganese may have a catalytic effect on combustion and gasification. Ferrous iron is more easily fusible than ferric iron, and metallic iron is more fusible than either. On the condition of the iron depends its effect on fusibility. No arsenic had been detected in the coal. About 0.6 per cent of the sulphur was organic and the other 1.2 per cent pyritic.

Percentage of unburned carbon in finely ground ash cannot be satisfactorily determined by visual inspection even with proper apparatus for such examination, declared P. A. Mulcey, Anthracite Institute. The temperature of combustion modifies the condition of the iron. If the black oxide is formed it will darken the ash and cause it to give indications similar to those where a large percentage of carbon remains unburned.

Efforts that had been made to determine the beds from which anthracite has been derived were described in another paper presented by A. J. Johnson and written by R. C. Johnson, E. G. Locke, J. W. Peoples and I. M. Symonds, Philadelphia & Reading Coal & Iron Co. Chemical analysis will not give such identification, but studies of Holmes bed samples from the Western Middle Anthracite Field with Dr. Turner's flame etching methods has revealed a certain two-winged spore of great length which proved to be characteristic of this bed at both ends of the field. A coke structure appeared in some slides which was due not to carbonization but to the etching of the pyrite in the treatment of the slide.

Temperature at which ignition of anthracite occurs is profoundly influenced by the type of the test apparatus, the physical condition of the sample and the quantity of reacting materials, declared a paper by O. P. Byrsch, J. H. Lum and A. W. Gauger, Pennsylvania State College. Anthracite shows much inequality in this respect. Temperature for sustained combustion increased roughly with increased specific gravity and decreased calorific value, volatile and hydrogen content.

Low Cost and Safety Feature Hitch-Drill Use

(Concluded from page 239)

lutely on the selected centers—generally 2½ ft., with a maximum of 3 ft.

During 1933 and 1934, the hitch drill was employed in timbering 6,000 ft. of new main entry, using the pin and stringer system. In all, approximately two miles of entry has been timbered with the drill at Dresser. Wherever possible, the holes are drilled in coal, but in grading for the roadway in the new entry considerable rock work had to be done. One result was the adoption of a new form of cutter head designed to provide more cutting points in a smaller space. This was accomplished by forging out a cross-shaped head with four points and the pilot bit and drilling a hole approximately 6½in. in diameter. While designed primarily for rock, this bit also proved to be superior to the older type in coal.

With the smaller hole, however, difficulty was encountered in removing the cuttings, and this resulted in the development of augers made of 2-in. triple-strength pipe to which a spiral of 2-in. strap iron and the cutter head are welded (see Fig. 8). The pilot bit is inserted in a hole in the center of the head, and is held in place by a setscrew in the rear. Bits also are held in place by countersunk setscrews, as indicated. Two lengths of augers (3 ft. and 6 ft.) are employed, the shorter one generally being used as a starter. Under normal conditions, twelve holes 4 ft. deep can be drilled easily in an hour in either coal or the black slate.

The short life of timber legs at the Peerless mine of the Templeton Coal Co. and the Baker mine of the Glendora Coal Co., near Sullivan, forced the management of these two properties to the use of hand-cut hitches several years ago in spite of the expense. In addition to the fact that the life of the timber legs rarely averaged over six months and the legs were particularly subject to decay in return air currents, falls were continually occurring as a result of wrecks knocking down the legs and bringing down the gray, chalky slate over the Glendora seam operated at the two mines. Thickness of the seam, which occurs at practically the same horizon as the No. 5 but is entirely different in character, varies from 6 to 7½ ft. The chalky slate immediately over the coal runs from 12 to 15

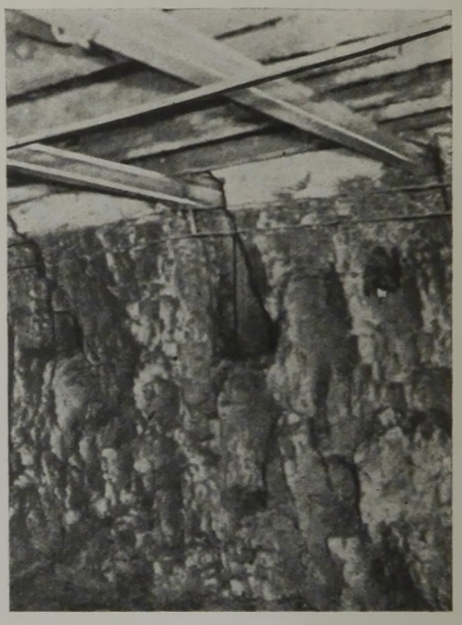


Fig. 9—Examples of Hand-Hitching Methods at Baker Mine, Glendora Coal Co.

ft. in thickness and is overlaid by the black slate normally accompanying the No. 5 seam.

To eliminate the troubles encountered with legs and hand-cut hitches, a hitch drill was installed at Baker in 1932, and its sphere of usefulness has since been extended to cover the Peerless mine also. One of the major tasks at Baker was drilling a mile of entry that had previously been timbered with leg-and-collar sets. Width of the entry was 12 to 15 ft., and crossbars of 60- and 70-lb. rail individually supported in separate sets of holes were employed. Hole size was 8 in., and the bars were spaced from 5 to 6 ft. apart and were wedged or concreted in place.

At Peerless, in addition to such new work as is required, the drill is being used to improve the condition of a mile of entry timbered with hand-cut hitches about ten years ago. As about three hitches 12 in. deep are about all that can be cut by one man with a pick per shift under Peerless and Baker conditions, the Peerless project was quite expensive and, in addition, the hitches break out from time to time. With the 18-in. bearing on both ends with the drill, crossbars are considered permanent when once in place.

TREATED TIES

+ Show Savings in Rooms as Well as Entries

At Royalton and Energy Mines

TREATED TIES have proved their worth on main roads at a number of coal mines throughout the country, but their use in rooms is as yet limited to the operations of a relatively small group of companies, of which one is the Franklin County Coal Co., Inc., with mines at Energy and Royalton, in southern Illinois. Wood ties have been standard at these operations for a number of years, although some steel ties are employed, and prior to the adoption of the treated type, the hewed or split variety then in use had an average life of only nine to fifteen months before decay rendered them useless. In contrast, treated main-line ties have been found to have an average life of six years, while the number of times a treated room tie may be installed in the track, experience has shown, ranges from three to five, after which it generally still is good for several years' service in cribbing.

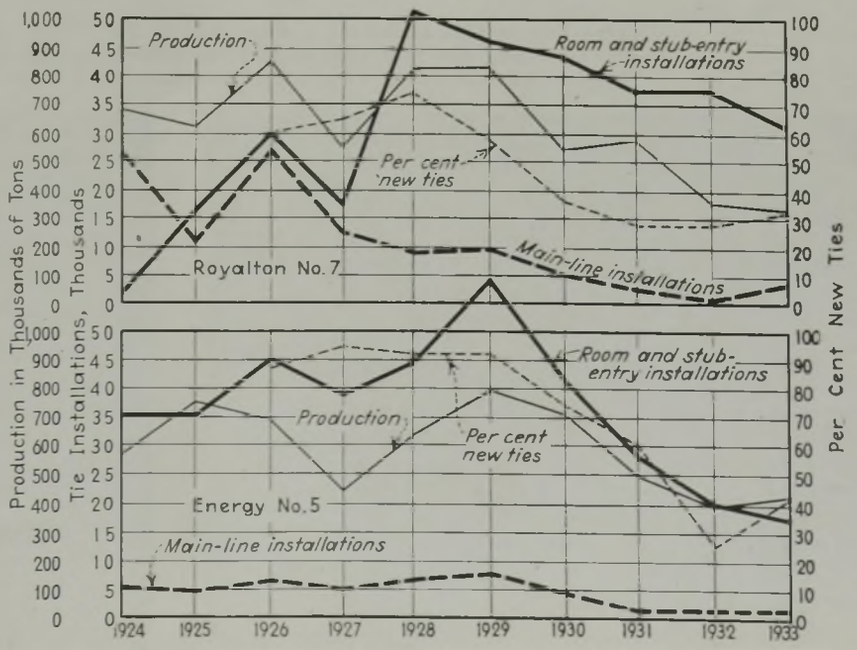
Under the hand-loading system, by which 50 per cent of the Royalton No. 7 and all of the Energy No. 5 tonnage (except for the output of a few pit-car loaders at the latter operation) is produced, nine to fifteen months is required to work out a 300- to 350-ft. room. This meant that with untreated ties the majority in a place were not fit for reuse because of decay. With mechanical loaders at Royalton, time required to work out a similar place is cut to 2½ to 4 months, with the result that untreated ties could be used twice, as a rule. Additional installations would be impracticable in general in spite of a life of nine to fifteen months in hand-loading places. This life, however, is based on leaving a tie undisturbed in the track, in which condition it will continue to give satisfactory service, whereas attempts to respike a six to eight months old tie in new track would be unsatisfactory in most cases, as a result of deterioration. Consequently, treated room ties, which retain their ability to hold spikes, are able to show an advantage even in mechanical loading sections, where mechanical damage resulting from repeated spiking and other causes would at first glance seemingly nullify most of the advantages inherent in the potentially longer life of the treated type.

After a preliminary investigation demonstrating the possibilities in the use of treated ties, the replacement program at the two mines got under way in earnest in 1926 and was largely completed in the next two years. In the case of main-line ties, average life expectancy was set at five years for the treated type, against an average of one year for the untreated type. Cost of an untreated tie of the hewed or split variety, nominally 5x6 in. x 5½ ft. in size, was 30c., against 60c. for the zinc-chloride tie sawed exactly to standard dimensions. Average cost of labor for replacing a tie was found to be $1. Assuming replacements only, the cost of an untreated tie for five years' service came to $6.50, against $1.60 for the single treated tie, a projected saving of $4.90.

Experience has demonstrated, however, that an average life of six years can be expected from treated main-line ties. At present prices of 25 and 49¼c. for treated and untreated types, respectively, and with a replacement labor cost of approximately 80c., comparative costs of untreated and treated ties for six years of main-line service are respectively $6.30 and $1.29, a saving of $5.01 per tie due to treatment.

With room ties, replacement labor is not an important factor because of the relatively short life of the track, and the limiting factor in the working life of a tie, in the absence of decay or ac-

Decline in the Percentage of New Ties Sent Underground, Particularly in the Case of Room Ties, Reflects Adoption of Treated Ties at Franklin County Coal Co., Inc., Mines in 1926. Relatively High Number of Room-Tie Installations at Royalton Since 1928 Reflects Increase in Mechanical Loading With Attendant Shorter Life of Working Places. Curves Based on Data in Table on Succeeding Page.



cidental mechanical damage, is the number of times it can be spiked. With treated tie cost approximately double that of the untreated type (31 against 15c.—now 24¾ against 10 to 15c.) it was felt that if one treated tie would give the same service as two or more untreated ones, a saving would result which would increase with the number of untreated ties replaced. Even if a treated tie replaced only two untreated ties on the average, some possibilities for profit would exist through a cut of 50 per cent in the quantity of material to be received, stored and put down the shaft for distribution to the working places.

Treated room-tie dimensions have been standardized at 3x5 in. x 5½ ft., giving a cubical content half that of the standard main-line tie. This size and shape provides a wide bearing surface on each face of the tie and sufficient depth to hold spikes, and yet is small enough to be reasonable in price. Larger ties, it was felt, would be too costly for room service. New room ties sent in to replace those with no further useful life in track are first installed in turnouts as a general rule, and thereafter are diverted to general room service. When shifting spike holes and sliding the tie back and forth have exhausted the possibilities of spiking on one face, the tie is turned over and the process is repeated until further spiking is impossible. Six times is about the maximum for installation of a single tie, or three times on each face. The general average for the two mines, however, is approximately four installations per tie.

Service which room ties are called upon to withstand varies widely between the two Franklin County mines. With Energy No. 5 on a hand-loading basis, except for a few pit-car loaders, the maximum load which room track is called upon to bear is a pit car holding an average of 3 tons of coal (total weight, car and coal, 4½ tons). Other equipment operating over room tracks consists of shortwall and breast machines. Mules are used exclusively for gathering, and ties therefore are subject to considerable mechanical wear from this source.

At Royalton No. 7, room track in mechanical-loading sections is called upon to withstand a much heavier traffic made up of 7-ton track-mounted cutters, mine cars holding an average of 7,000 lb. and weighing 5,700 lb., 5-ton track-mounted compressors used in air shooting and 5- to 8-ton gathering locomotives, as well as 7-ton caterpillar-mounted loading machines when they find occasion to travel along or cross the tracks.

Room-track standards at both mines are based on the use of 30-lb. rail on ties spaced 2½ ft. apart. Switches are equipped with throws and No. 2½ frogs are employed. Stub and room-entry track standards are the same. Spaces between ties are allowed to fill up with loose material to check sliding. Sixty-pound rail is standard on main lines, with ties also on 2½-ft. centers. No. 3 frogs are used at the entrances to partings, and No. 4 frogs on turnouts. Curves are driven on a minimum radius of 150 ft. Mine material has been found satisfactory for ballast, and the entries, driven 12 to 16 ft. wide, are filled from rib to rib level with the ties.

Dry mines allowed the use of the zinc-chloride method of treatment with its advantages of lower cost, greater resistance to fire and reduced likelihood of either real or imaginary injuries. Creosoted timbers, however, are employed in shafts and certain other structures where water is encountered. Tie treatment is based on a retention of 2 lb. of zinc chloride per cubic foot, and the ties are purchased treated from the Wyoming Timber & Tie Co.'s plant at Metropolis, Ill.

Longer life and reduced inventory and distribution expense, it has been found, are not the only advantages of treated ties. Additional benefits include a reduction in wrecks as a result of better track conditions, as well as a reduction in number of tracklayers required for maintenance from two to three to one per section. Being sawed, the ties are more uniform in shape and therefore are easier to lay and require less blocking. In addition, fewer trips by the supply truck are required, as more ties can be hauled at one time.

Gum ties are first choice at Royalton and Energy, largely because trackmen were brought up in the hardwood tradition. Pine, on the other hand, is less costly and easier to obtain in the area in which the mines operate, and retains spikes as tenaciously as gum. It is, however, more easily shattered in case of wreck.

Tie Installations at Franklin County Coal Co., Inc., Mines, by Years

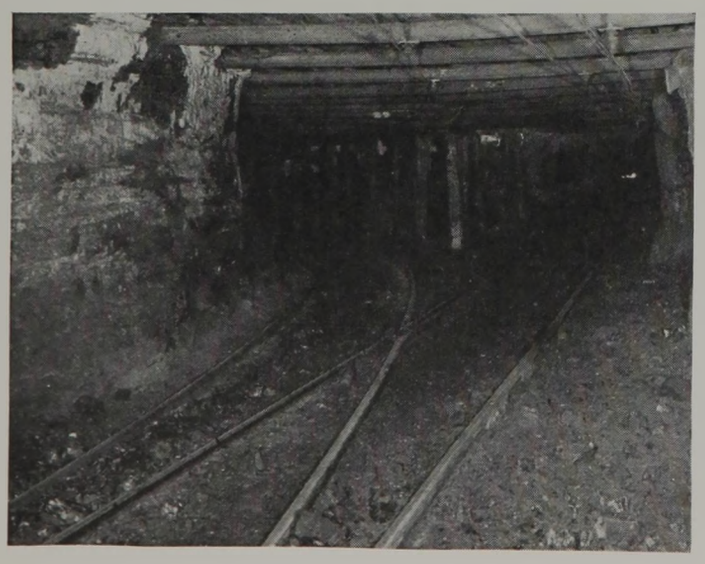
(Use of Treated Ties Started in 1926)*

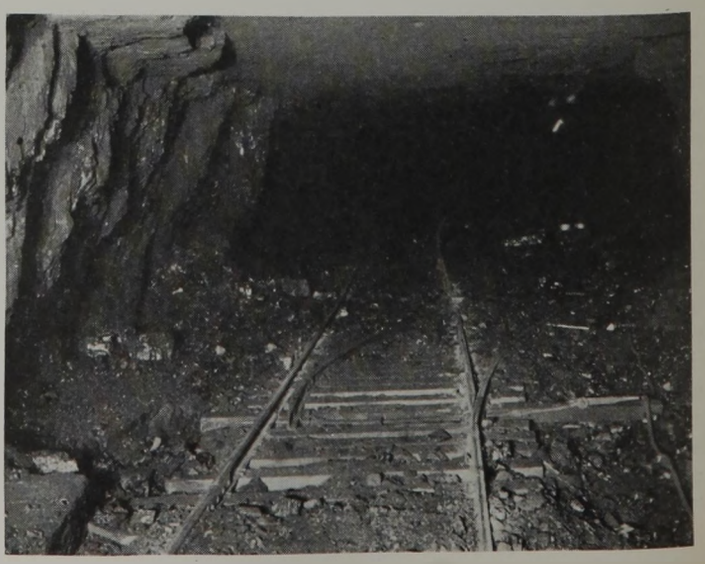
	Production Tons	Installations* Main Line	Installations* Room and Stub Entry	Per Cent New Ties*
Energy No. 5				
1924	573,439	5,358	35,225	†
1925	756,404	4,810	35,225	†
1926	692,762	6,305	44,898	88
1927	439,638	4,915	38,242	95
1928	626,437	6,630	44,400	92
1929	796,919	7,386	59,346	92
1930	707,895	4,479	41,444	73
1931	498,747	1,108	27,914	60
1932	389,744	1,075	19,553	26
1933	414,491	1,439	16,699	41
Royalton No. 7				
1924	681,080	26,097	2,041	†
1925	618,436	11,182	16,330	†
1926	863,519	26,976	30,083	60
1927	562,647	12,780	17,422	64
1928	819,797	9,141	51,586	73
1929	821,188	9,900	46,602	58
1930	546,576	5,126	43,583	37
1931	588,362	2,683	37,229	28
1932	443,852	638	37,681	28
1933	423,763	3,335	31,057	33

*Figures in this table represent installations of ties, including ties recovered and relaid, as distinguished from number of ties sent into the mines. Percentage of new ties used includes not only replacements but also ties employed in extending track to reach new working places.

†No record of recovered material available for these years.

Left—Ties in This Main-Line Turnout Are 5½ Years Old. Right—New Treated Room Ties Generally Are First Laid in Switches Which Are Equipped With Throws. Before Being Discarded, These Ties Will Have Been Used From Three to Six Times Each.





CINCINNATI CONVENTION

+ Weighs Future of Coal-Mining Industry

While Reviewing Improvements in Technique

HOW IS KING COAL going about his job of reducing costs and increasing the salability of his wares? What does the future hold? These questions, in one form or another, dominated the 12th Annual Convention and Exposition of the Coal Division of the American Mining Congress at Cincinnati, Ohio, May 13-17. While production men discussed specific achievements and possibilities for further operating improvements or considered the broader problems inherent in rapidly changing economic and industrial relations, top executives sought counsel on future merchandising and legislative trends.

This concern with future trends came to a sharp focus in the closing session. Outlining the present status of the industry, Howard N. Eavenson, president, Eavenson, Alford & Hicks, first charted the post-war losses through shifts to competitive fuels and increasing efficiency in utilization by larger consumers. Although sanguine on the long-range outlook, he saw little hope for a complete check of the decline in unit consumption for five or ten years. The growth of air conditioning probably is the brightest spot in the immediate picture. Figures for thirteen cities showed that more air-conditioning units had been installed in the past two years than in all the years preceding. The domestic stoker also is making great strides, but still has far to travel to overtake the oil burner in the number of installations.

Coal, however, will have its greatest opportunity, said Mr. Eavenson, when the decline in petroleum resources makes it necessary once more to turn to coal as a source of oil. When that day comes, he asked, will the industry be ready to control the manufacture of coal byproducts or will it let the control slip to others, as it did in the case of the mine-mouth power plant? In the meantime, as necessary steps toward permanent stabilization, he urged further mine consolidations, particularly the creation of large units with operations in several fields.

Recommendations of the Natural Resources Board (*Coal Age,* January, 1935, p. 38) were reviewed by Dr. C. K. Leith, vice-chairman of its planning committee on mineral policy. The flattening out of the curve of mineral consumption since 1918 without corresponding curtailment in production capacity, he said, had created new problems which call for cooperative remedy. Such concerted action is clearly necessary in the case of bituminous coal, but no mineral industry can expect freedom from anti-trust laws merely to increase profits; where voluntary price-fixing is permitted, it should be subject to government control over maximum prices.

Further cooperative effort is essential, admitted J. D. A. Morrow, president, Pittsburgh Coal Co., but it is equally important to place definite limits on government supervision. Without such restraints, government agencies develop an appetite for more power. Let the government set up the standards which are in the public interest, said Mr. Morrow, but give no discretionary power to supervising government agencies.

NRA, remarked Eugene McAuliffe, president, Union Pacific Coal Co., has tried more to save the industry from itself than to govern coal mining. The greatest need is for facts, and these the government alone—preferably through the Bureau of Mines—can properly collect and disseminate. Given the facts, the industry can work out its own salvation. Mr. McAuliffe forecast increased railroad fuel consumption. Diesel trains, he insisted, were being put into service to recapture traffic already lost; speeding up freight and passenger schedules and decreasing the number of cars per train meant greater total and higher unit locomotive fuel consumption.

But actual and contemplated increases in coal prices, declared Hubert E. Howard, president, Binkley Mining Co., are hurting the industry by making the railroads "other fuel" conscious. Two years of NRA, he added, is too short a time in which to effect stabilization; if any further stabilization is to be considered, it must be on the basis of permanency. While willing to go along with further experimentation, R. C. Allen, vice-president, Oglebay Norton & Co., was frankly dubious of cooperative efforts.

No producer, asserted M. L. Garvey,

Cincinnati Ringmasters

Charles F. Hamilton, vice-president, Binkley Mining Co., as national chairman of the program committee, headed the group responsible for the technical sessions of the 12th Annual Convention and Exposition at Cincinnati. E. J. Newbaker, vice-president, Berwind-White Coal Mining Co., as national chairman of the Coal Division, which sponsored the meeting, was another member of the directing group, while the exposition end headed up under George R. Delamater, assistant vice-president, W. S. Tyler Co., chairman of the Manufacturers' Section. The nine technical sessions of the convention were presided over by the following chairmen:

T. J. Thomas, president, Valier Coal Co., Monday morning.

M. D. Cooper, division general superintendent, Hillman Coal & Coke Co., Monday afternoon.

Peter F. Loftus, consulting engineer, Tuesday morning.

C. J. Sandoe, vice-president, Gillespie Coal Co., Tuesday afternoon.

P. C. Thomas, vice-president, Koppers Coal & Transportation Co., Wednesday morning.

W. W. Dartnell, manager of mines, Valley Camp Coal Co., Wednesday afternoon.

George B. Pryde, vice-president, Union Pacific Coal Co., Thursday morning.

C. W. Gibbs, general manager, Harwick Coal & Coke Co., Thursday afternoon.

John W. Finch, director, U. S. Bureau of Mines, with Eugene McAuliffe, president, Union Pacific Coal Co., pinch-hitting when Dr. Finch had to leave to keep another engagement, Friday morning.

Pocahontas Fuel Co., Inc., fresh from a Washington conference of operators opposed to the Guffey bill, wants to return to pre-NRA conditions. Extension of NIRA in strengthened form will prevent such a return. Enactment of the Guffey bill, he argued, means monopoly by government fiat, increased prices with loss of tonnage to competitive fuels, and decreased employment in the mining fields.

Hard coal is unalterably opposed to NRA, announced Louis C. Madeira, 3d, executive director, Anthracite Institute. Imposition of a code would increase costs and further decrease markets and employment. Turning to the "bootlegging" situation, Mr. Madeira declared that 20,000 men are stealing coal, timber and other materials in Pennsylvania. The situation, still unchecked, has become a State menace, and other areas may face the same danger. The Southwest, said K. A. Spencer, vice-president, Pittsburg & Midway Coal Mining Co., has consistently opposed government interference because it believes any such interference inevitably means increased costs, which will put the industry at a greater competitive disadvantage.

Government officials have made few departures from the letter of code and these only at the insistence of the industry itself, declared Fred E. Berquist, NRA coal statistical section. Coal, he added, probably has benefited more than any other industry under NRA.

Installation of hot-water heaters in homes not now supplied and substitution of anthracite-burning equipment for more expensive gas, oil and electric heaters was suggested by Allen Johnson, director, Anthracite Institute Laboratory, as load builders for the industry. A survey of 500,000 homes, he said, showed 38 per cent without running hot water. The appeal of comfort and convenience could be made to the small home, while economy over competitive fuels could be stressed with owners of larger residences.

A truckload of coal moves out of the anthracite region every 17 seconds, at times of peak production, declared N. F. Patton, Anthracite Institute. Last year 6,300,000 tons was trucked; nearly 50 per cent of this tonnage, it was estimated, was "bootleg" coal. This haulage by men who work long hours for meager wages and, in some instances, not only "bootleg" their supply but also shortweigh the consumer, is economically unsound and injurious to producers, retailers, railroads and the public.

Three Thousand Say "Great!"

From the standpoint of interest and attendance, the 1935 Cincinnati convention and exposition was one of the most successful ever held. Over three thousand coal men and representatives of manufacturers of coal-mining equipment were present. When the last registration card had been counted, the tally showed 1,859 coal operators and 1,150 representatives of manufacturers on the lists. And every registrant interviewed was an enthusiast!

Face Preparation Scrutinized

METHODS of breaking down coal without blasting must be almost free of mechanical hazards to better the improved safety record established during the past decade in handling explosives, declared K. L. Marshall, associate mining engineer, U. S. Bureau of Mines. Use of black blasting powder in compressed pellet form, he said, has steadily increased since it first became available in 1928, while granular powder is declining in use. From 1912 to 1927, there was a marked decrease in the percentage of black powder used compared with detonating explosives; since 1927, the ratios of the two types have shown little change. The most significant change in the field of permissible explosives in recent years has been the introduction of high-count "bulky" explosives which have seven to nine sticks per pound. With other changes, reduced strength and reduced detonation speed, permissible explosives are now better adapted to meeting a wide variety of conditions.

Adoption of Cardox shooting increased the 8-in. lump yield from 18 to 31 per cent, cut slack from 39 to 32 per cent and added 19c. per ton to sales realization at Standard Coal Co. operations in Utah, according to R. R. Kirkpatrick, superintendent, whose discussion reviewed the experiences outlined earlier in the year before the Rocky Mountain Coal Mining Institute (*Coal Age*, April, 1935, p. 173). Based on extensive tests over four months at a 1,300-ton Illinois shaft mine, said J. Barab, Hercules Powder Co., shooting costs with permissibles and black powder were 1.57 to 2.5c. per ton, as against 10c. for Cardox. Permissible explosives with a count of 135 and rated 5,800 ft. per second, gave a cost of 2.5c.; higher count and lower speed with a more bulky permissible cut this to 1.67c. Compared to pellet powder, a permissible explosive, of a type suited to conditions and properly loaded, produced coal of equally desirable size characteristics.

FOR THOSE who believe that the place to start cleaning and preparation is at the face, the Cincinnati convention offered much in the way of practical experience by men who have been doing the job. Among the phases of the subject discussed were:

- **Changing Trends in Blasting**
- **Comparative Costs and Yields for Different Systems of Shooting**
- **Need for More Light at the Working Face**
- **How to Keep Seam Impurities Out of Mine Cars.**

The gist of the papers and floor comments on these subjects are summarized for you in this section of the convention report.

That higher-count explosives will effect a saving, asserted John L. Romig, Atlas Powder Co., is not always true. Depth, position, pitch and diameter of the holes must be adjusted to suit local conditions. The type of stemming is highly important. There is great advantage in mixing sand with clay stemming. Slow-acting explosives, such as black powder, require more stemming than permissibles; the approximate ratio is 5 to 4.

More light at the working face is needed for proper cleaning, said Carel Robinson, manager of mines, Kelleys Creek Colliery Co. Substitution of electric cap lamps for carbide lights at Ward has practically eliminated complaints on coal preparation. The vision of all workers has been tested and, where necessary, corrective goggles have been issued. Better air also has been provided both by increasing the volume and by loading and cutting in different air splits.

A man discharged for dirty coal, continued Mr. Robinson, had complained that the light was so bad he could not distinguish between coal and dirt. Loaders in certain places then were told off to load coal alternately by the light of electric cap lamps and carbide lamps. Though they took 30 per cent more time to load with the carbide lights, cars loaded with electric cap lamps had 25 per cent less impurities. Experiments made by West Virginia University showed that freshly charged carbide lamps gave almost equal foot candles with electric cap lamps, but in a few minutes the light given diminished notably, whereas the electric cap lamps sustained their illuminating power practically without loss for five hours.

Dust-and-smoke laden air also interferes greatly with vision. Fifteen minutes after undercutting, the light in a working face was reduced 72 per cent from normal. In another room receiving the dust-laden air from undercutting in the first room, illumination was 32 per cent of normal 12 minutes after undercutting had ceased. In a New River mine 12 minutes after shoveling had ceased, illumination was 83 per cent below normal; in the next room, it was 70 per cent below normal. Cardox greatly reduces the dust in the air due to breaking down of the coal; if a cupful of water is thrown in the hole before the Cardox cartridge is inserted, further improvement is noted.

Tests with a 750-watt Mazda lamp showed that three minutes after each shot visibility was reduced 86 per cent, said Eric Gertz, Safety Mining Co. With Cardox, it was reduced only 46 or 14 per cent, depending on the blasting pressure.

Many companies have such limited tipple facilities that they are obliged to clean at the face; others have mechanical loading of a type which makes cleaning at the face impracticable, stated M. H. Forester, preparation manager, Consolidation Coal Co. Finer sizes have grown in importance and, as these cannot be cleaned on the picking table, it is imperative for those without mechanical devices to exclude impurities at the face. Mr. Forester illustrated with slides the method of bench

mining by which impurities either are cut or exposed by cutting so they can be scaled off by the miners; cleaning of shale cuts by raking out by machine or by a broad scraper and brooms; use of planks on the floor and brooms to collect bug-dust and broken shale for loading; leaving roof coal where soft to prevent roof from scaling down or being shot down; leaving bottom coal to prevent its being shoveled up or loosened in cutting to be shoveled up later with the coal.

Join Mechanization Round-up

EAST and WEST joined in the convention round-up of recent developments in mechanization. Car handling to conveyors, said M. A. Evans, general superintendent, C. C. B. division, Koppers Coal & Transporation Co., not only is not costly but helps materially to reduce loading delays, which are a serious and costly handicap. Several short delays are more detrimental than longer stoppages of the same aggregate time because in the latter cases ways can be found to keep the men busy. With five conveyors temporarily delivering coal from five different working places directly to a single road, traffic was so congested that all conveyors operated at minimum efficiency. Later, when several conveyors delivered to one mother conveyor and this in turn to cars, the work proceeded without hitch and all units worked at high efficiency.

More cars are needed with mechanical loading than with hand loading, said P. L. Donie, vice-president, Little Betty Mining Corporation. At his mine the goal is to keep the track parting for gathering within 200 ft. of the working face. As many as 227 car changes have been made at the Little Betty mine by one gathering locomotive in a single shift. Speaking for H. M. Ferguson, president, D. W. Hayes, mine superintendent, Clinton Coal Co., described the conveyor system used at that operation (see *Coal Age*, March, 1935, p. 104).

With the introduction of 11 more shaking conveyors, the Union Pacific Coal Co. raised the number to 110 this year and completed the mechanization program started nine years ago. Progress had been deliberately slow, explained George B. Pryde, vice-president, because management had been unwilling to discharge men or shift them to work for which they were unfitted. Every shaking conveyor has a duckbill, without which, he felt, mechanization could not have been as readily accomplished.

Today, continued Mr. Pryde, a 300-ft. room and pillar is finished in three or four weeks. Abandonment of the working follows so closely on the heels of beginning it that only half as much timber is required as before, no maintenance is necessary, no falls have to be cleaned up and about 60 per cent of the timber can be recovered. Development also has been speeded. As much as 9,500 ft. of double heading has been driven in 450 machine shifts, with a maximum advance of 22 ft. per man-shift. All this has made retreating operation possible and less costly in interest and maintenance.

In earlier days, said Mr. Pryde, shaking chutes were hung from timber; now metal props with screw jacks which can be tightened on occasion are used. This more costly method pays because the better support keeps the pans in better alignment and prevents injuries to pans and drives. Timber frames under drives have been followed by banked timber frames under cradles, and experience proves that banking pays. With no facilities for picking on the tipple, boys and old men are employed to pick coal along the pan line. Increasing depreciation charges have made it possible to replace machines as soon as progress renders them antiquated.

Equipment used in driving 800 ft. of 20- to 25-deg. slope in 30 days (triple shift) was described by Gomer Reese, general superintendent, Kemmerer Coal Co. To facilitate loading rock and coal, a large-capacity tipping scoop was mounted on a weighted truck moved up and down the slope track by the hoist. Loading was accomplished by lowering the scoop and dropping the truck into the loose material at the face; the loaded scoop was then raised and the truck pulled back and dropped onto a short spur track. Here the scoop was dumped into a pit-car loader which elevated the material into the mine car for transportation to the outside. Dumping rock from mine cars on the surface was effected at the rate of one car in 25 seconds by a portable turning and tilting device operating by electric power and making use of a Ford truck hydraulic cylinder.

In addition to the 800 ft. of main slope, the face machine also turned 200 ft. of entry. When the machine is used for coal, the smaller scoop, which holds about one ton of rock, is removed and a large scoop attached. Maximum distance of haul to the back-switch spur track where the material is discharged from the scoop is 400 ft. While a trip of loaded cars is being hoisted to the surface and dumped, the face is drilled and shot. The coal is about 5½ ft. thick and is not undercut in this slope-driving work.

On the outside fill track, about twelve 4-ton cars of rock can be dumped for each position of the dump. Changing position is done by sliding the dump turntable and its approach rails along the track for a few feet and requires only three to five minutes. Ordinary lift-endgate type cars are used. The height of the refuse fill is approximately 60 ft. The slope sinker and car dumper, Mr. Reese declared, have saved hundreds of dollars, increased the speed of driving and reduced accident hazards. Approximately 3,000 tons of material was handled in 30 days. P. H. Burnell, superintendent, Owl Creek Coal Co., also contributed to the Western symposium with a description of the modified longwall methods used at his mine (see *Coal Age*, April, 1935, p. 173).

England uses one ton of timber for 65 to 67 tons of coal mined; in the Pittsburgh region, said L. E. Young, vice-president, Pittsburgh Coal Co., the ratio is 1 to 300. Steel-arched roadways with double track are on their way to almost universal acceptance abroad; no clearance is allowed between passing cars. Diesel locomotives designed to make backfiring impossible are being used extensively on

Charles B. Officer

Charles B. Officer, Sullivan Machinery Co., was elected chairman of the Manufacturers' Section, Coal Division, American Mining Congress, at a meeting of the board of governors of the section at Cincinnati May 14. He succeeds George R. Delamater, W. S. Tyler Co.

Bruce G. Shotton, Hendrick Manufacturing Co., was advanced to the post of first vice-chairman; William E. Goodman, Goodman Manufacturing Co., moved up to the second vice-chairmanship, and E. A. Williford, National Carbon Co., was elected third vice-chairman. E. F. Carley, E. I. duPont de Nemours & Co., and H. G. Marsh, Carnegie Steel Co., were made members of the board of governors.

WOULD YOU like to know more about such important phases of the broad problem of mechanization as:

- **Car Handling for Conveyors and Mobile Loaders**
- **Complete Conveyor Mechanization**
- **Mechanized Rock- and Coal-Slope Sinking**
- **European Developments in Mechanization**
- **Mining in Steep Pitching Beds**
- **Maintenance of Mechanical Equipment?**

These questions were thoroughly aired during the technical sessions of the Cincinnati convention and the high spots in the presentations are summarized in this section of the convention report.

the Continent even in gassy mines. No direct current is used underground and switchboards are moved up toward the working face. Large numbers of riveted steel pipes have been installed to carry air.

In one German mine, Dr. Young noted 90 men with pickhammers individually connected to the air line on a 1,300-ft. longwall face. Another 90 men service these miners, and the face moves forward 6.56 ft. every two days. In a Saar mine, a 2,700-ft. face is being carried forward, with six belts—each in a separate mother gate—to handle the coal. Great Britain has 2½ times as many conveyors as in 1928. Concentration has so changed German mining methods that there are only 30 per cent as many working faces as in 1927; with triple shifting, an advance of 14½ ft. per day is made in these places.

Great Britain, continued Dr. Young, is using the bottom-belt loader, which saves lifting coal so high in loading, is more easily advanced, carries timber along the face and keeps roof spallings out of the coal. The upper strand of the belt, however, somewhat hinders loading and as the roof sags it may crowd the rollers of the upper strand and even pinch them, making recovery difficult. Roof action is being closely studied; British investigations show that maximum pressures are not over the face but 30 to 40 ft. back in the solid. Some German mines have substituted steel for rubber belts.

Operation of the pitching Lykens beds in the southwestern end of the anthracite field were described by W. B. Geise, mining engineer, Susquehanna Collieries Co. The Lykens or Pottsville Conglomerate coals there dip until 3,000 ft. below sea level, but the deepest slope now worked is only 1,291 ft. below tidewater. Because roadways cannot long be maintained in the No. 2 bed, which is 8 to 10 ft. thick, all work is conducted from rock roadways in the Pottsville Conglomerate. In the short time the 900-ft. sections in the seam are standing, timber has to be renewed an average of 2½ times because of the severe pressure. For a distance of 100 ft. above the headings a fair percentage of large coal is recovered, but above that the crushing and grinding which occur cause much degradation. This operation was described in detail in the October, 1932, issue of *Coal Age*, p. 336.

Every Pittsburgh Coal Co. mine, said T. W. Gray, superintendent of mechanical equipment, has its own shop, but a central establishment is maintained at Library, Pa., for work these mine shops cannot handle. Shop foremen meet monthly to discuss the best methods for doing the work. Monthly costs are kept for each important unit, such as cutting, loading and conveying machines, and individual service cards give the complete history of each machine.

Special precautions are taken to prevent damage to repaired equipment while en route from shop to mine. Armatures, for example, are securely bolted in tank-like cylinders before leaving Library and are not removed from these containers until the actual point of assembly is reached. Mycalex gradually is being substituted for other insulation to escape the swelling and loss of resistivity which takes place with some insulating material when permissible equipment contactors flash and convert atmospheric nitrogen and oxygen into nitric acid. Use of Thyrite, continued Mr. Gray, has cut inductive surges, registering as much as 4,000 volts on the oscillograph, to one-half or less of the line voltage.

Sparks From the Electrical Delegation

POWER REQUIREMENTS per ton of coal probably will be 2¾ to 4 times greater in a fully mechanized mine than in a hand-loading operation, according to James Hyslop, chief engineer, Walter Bledsoe & Co. He advocated small substation units (100- to 150-kw. synchronous converters) for each mining section and saw no advantage in an elaborate sectionalizing circuit-breaker system of interconnection. Despite concentration, haulage will use more power than in a hand-loading mine because there is more handling of cars. With 250-volt distribution, current requirements of a section will be between 500 and 1,000 amp. Mr. Hyslop felt that the time had come when 2,300-volt a.c. distribution should be kept within 1,000 to 1,500 ft. of the face and that d.c. voltage at the points of utilization should be regulated within 10 per cent.

The converter was favored by Mr. Hyslop for portable and semi-portable units feeding mechanical sections because of its smaller dimensions, higher efficiency and mechanical and electrical ruggedness. Comparative full-load efficiencies of a 150-kw. converter and a motor-generator of the same size, he said, are 90.9 and 86.0 per cent, respectively; the no-load losses are 5.75 kw. and 15.6 kw. For underground a.c. distribution, Bledsoe mines use non-inductive taped cable. So far, they have found no satisfactory fused device for connecting trailing cables to the lines.

Power consumption of 8.2 kw.-hr. per ton for a fully mechanized mine, as contrasted with 6.4 and 6.95 kw.-hr. for three comparable hand-loading operations in the same district—an increase of only approximately 30 per cent in consumption at the mechanized mine—was cited by A. E. Lee, consulting engineer. The small area with concentrated mechanical mining eliminates many of the losses because of the superior attention given to bonding and wiring. Haulage demand usually is the determining factor in substation capacity. Mr. Lee advocated paralleling because of the better diversity factor.

From the standpoint of power factor when the power company meter is ratcheted, the synchronous motor-generator set is preferred, said Mr. Lee. Pull-out torque of a modern synchronous motor with 0.8 leading power factor is 225 per cent, as compared with 200 per cent for a synchronous converter. To simplify control equipment, attention should be given to using linestart motor-generators.

Coal operators should build test and demonstration steam-generating plants at their own mines and assemble and furnish design and operating data on these plants to users and potential users of coal, declared F. N. Becker, director of research, Jeddo-Highland Coal Co. His company recently built a high-pressure steam plant burning anthracite culm on chain-grate stokers. This plant carries a basic mine load of 1,500 kva. and has materially reduced the purchased-power requirements of the company. Before the plant was built, purchased power cost averaged 1.4c. per kilowatt-hour. Nine 300-hp. low-pressure boilers formerly were in use at the mine furnishing steam for hoisting, breaker equipment and other topworks duties. The new plant generates steam at 450-lb. pressure and 625 deg. F. to drive turbo-generators and also to supply the low-pressure topworks equipment. The company now contemplates adding to its high-pressure capacity to take over the steam load of another plant of nine 300-hp. boilers situated 9,000 ft. distant.

Many electrical savings still are available in most mines, asserted W. H. Lesser, James H. Pierce & Co. One is by increasing power factor; in one case, an expenditure of $5,000 for static condensers increased the power factor from 73 to 85 per cent and saved $3,600 annually. Instead of three single-phase transformers one company is using three three-phase transformers; if, in the first installation a single transformer would give sufficient capacity, only one could be disconnected and the other two must be connected in delta, but with three-phase equipment a single transformer might be able to carry the load and the losses would be cut in two. This would save $1,500 annually. A rotary converter has greater efficiency than a motor-generator set; it may cost $500 more, but where it saves $1,000 annually it is well worth the difference.

The anthracite region has a number of 21-ft. Guibal fans adapted to slow steam operation. Some mines are buying motors for them, but it would be cheaper, Mr. Lesser insisted, to buy a new fan and a motor suited to it than to equip the antiquated device. The initial outlay would be no greater, but a saving of $1,500 annually is possible. Some pumps are called upon to pump only a tenth of their capacity much of the year, so they are throttled down, with consequent waste of power. Another small pump might be purchased

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HOW MUCH GREATER are the power requirements per ton in a fully mechanized mine than in a hand-loading operation? James Hyslop says 125 to 300 per cent; A. E. Lee puts the figure much lower. Both sides of the case are presented in this section of the Cincinnati convention report. This section also includes a story on power generation in the anthracite region by F. N. Becker in which the author suggests that mine power plants be used as laboratories to develop data for coal salesmen. And W. H. Lesser has a budget of ideas on how the average mine can save money on its power bills by judicious investment in equipment.

for $3,000 to pump water in times of normal inflow and save, perhaps, $1,500 annually. Anthracite haulage costs 2 to 14c. per ton-mile; dispatching would raise the tonnage and make for steadier running, thus appreciably reducing costs. Chromium alloys are saving replacement costs in screens. Three times as much coal can be cut per bit replacement with Stellited points as with plain steel. Wooden cars cost 6c. per ton to maintain; use of steel car parts would cut this to 1c.; while the initial investment would be substantial, it could be spread over many years.

Spotlight Fine-Coal Cleaning

THE MORE we know about surface preparation of coal the more there seems to be that we should know. If this statement sounds too paradoxical, consider how many phases of the preparation question were discussed at the Cincinnati convention last month. The list, embodied in the topical treatment in this section of the convention report, includes:

- **Growth of Mechanical Cleaning**
- **Washing and Settling Fine Coal**
- **Traveling Crushing Plants for Coal Sampling**
- **Vibrating vs. Shaker Screens**
- **Meeting Demands for Better Prepared Fine Coal**
- **Layer Loading to Give Buyer Greater Uniformity**
- **Briquetting to Turn Low-Price Slack Into Higher Priced Domestic Coal**
- **What Dustless Treatment Has to Offer.**

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SMALL SIZES played a big part in the discussions on surface preparation problems at the Cincinnati convention. N. G. Alford, Eavenson, Alford & Hicks, set the stage for the broad subject by reviewing the several cleaning methods now in operation and presenting data just released by the U. S. Bureau of Mines on the growth in mechanical cleaning of bituminous coal. The government figures (see Table I) showed an increase from 36,799,120 tons in 1929 to 39,720,000 tons in 1934. East of the Mississippi River the percentage of coal cleaned mechanically has been growing; west of the river, however, there has been some decline.

In washing, asserted H. F. Hebley, Allen & Garcia Co., impurities inevitably build up in the water, increase its specific gravity and viscosity, and lengthen the time needed for fine coal to drain. Hard, sandy shale particles, however small, seldom cause trouble, but fine fusain and clay are difficult to settle. Each particle in minus 200-mesh material coats itself with water so that the particles cannot come together to make a mass large enough to sink.

The greater part of the fine-coal solid matter, said Mr. Hebley, can be settled by sedimentation in a cone with sides about 60 deg. to the horizontal, but, when trapped out, the water often will channel through the sediment and the settled solids will come out in slugs. With a series of sloping baffle plates side by side, the solids will fall onto the top of a baffle and slide down the plate, setting up a current which will displace other water which will flow up on the underside of the adjacent baffle, creating a convectional current, established by the weight of the dirty water, that will promptly carry the solids down and aid the water in coming up (see *Coal Age*, March, 1932, p. 112).

Coal also can be settled by flocculation, but, if the reagents carry the contents of the settling tank beyond the neutral point, the flocculent will act as a stabilizer to hold the particles in place and prevent settlement. Starch, which is used with other flocculents, has an outer skin which must be broken before the starch can aid in the action. M. A. Henry broke this skin by freezing, but the Koppers Co. effects the same result by heating the starch to 70 deg. F.

With 43 per cent of ash, said D. R. Mitchell, University of Illinois, certain coals have no efficiency for raising steam. Efficiency drops off rapidly as the percentage of ash increases. For himself and D. A. MacWhirter, district inspector, O. O. Malleis, manager, inspection division, Appalachian Coals, Inc., described a portable laboratory hammer-mill type crusher. This unit can be loaded into an automobile and assembled without foundation wherever needed for crushing samples.

Pointing out that the introduction of the small stoker has increased the demand for fine coal and made the public less tolerant of inaccuracy in sizing, H. L. Griffin, division engineer, Koppers Coal & Transportation Co., declared that different sizes respond best to different mechanisms for their screening. A definite trend away from the heavy shaker screen is apparent in bituminous sizing. Screens lightened by the use of alloys, giving equal strength with less weight, are favored. Vibrator screens with balls under those for preparing slack are giving good results at Koppers. As all working places are well sprinkled, the coal is damp and needs somewhat vigorous treatment. Mr. Griffin recommended the use of vibrating screens on all minus 2-in. coal.

Although increasing demand for small coal is widening the field for vibratory screens, said T. A. Stroup, chief engineer, West Virginia Coal & Coke Corporation, shakers will continue to find a place in modern tipples because they handle coal with minimum breakage. Because the weight of the coal was a more important factor than screen weight, he doubted the advantages of using lighter metals. Medium-size coal is well handled by Parrish screens, but vibrating screens must be used for the smaller sizes, and some mines use vibrators on larger coal with good results. Slow-moving shaker screens may be passing badly shattered coal over their surfaces without breakage, only to have the coal disintegrate and make undesirable undersize during shipment. If such shattered lumps are reduced to their ultimate size on vibrating screens, there will be less consumer complaint and more even combustion in the furnace.

A definite trend to Hum-mer type screens was seen by T. A. Garwood, Chicago, Wilmington & Franklin Coal Co. Experience has shown that holding undersize down to 3 per cent brings congratulations, 5 per cent causes no complaint, but 8 per cent undersize starts a flood of reprobation. His company stations at each loading point an inspector who promptly warns the plant operator if the product is below standard.

In Germany, remarked one delegate, revolving screens with bolts break up shattered coal so that the product reaches the market without further degradation. Unless there is correct synchronization, coal on the lower deck of a vibrating screen will be catapulted to the underside of the upper deck or may even bound to the floor. Attention must be paid to direction of rotation, speed and inclination of screens. Comparisons of lump and egg yields suggest that vibrating-screen degradation cannot be excessive. This type of screening can be made either rough or easy. Vibrating screens also require less power. At one plant where power was short, a tipple was designed with grizzlies and vibrating screens that saved 75 hp.

Coal has been screened down to 20-mesh on a 4x8-ft. vibrating screen at the rate of 40 tons per hour despite high moisture, stated George R. Delamater, W. S. Tyler Co. With some of the fine dust first removed by aspiration, the screen can handle 86 tons per hour when screening down to 10-mesh and eliminating half the minus 20-mesh material. Screening down to ⅜-in., capacity rises to 170 tons. Rapid vibration, a short stroke and a thin bed are necessary to secure these results. M. R. Kelce, general superintendent, Delta Coal Mining Co., described the preparation plant recently completed for his company (see *Coal Age*, May, 1935, p. 188).

Since 1929, Koppers Coal & Transportation Co., said A. F. Castanoli, preparation engineer, has been progressively introducing layer loading. Coal as it comes to the tipple varies in characteristics, structure, analysis and wetness; some is from cutting machines, some from pillars, some from rooms. The larger coal in a mine-run shipment stays on top, rolls to the bottom or is stopped by the crossbars and the small coal is found in the center. One

Table 1—Tonnage of Bituminous Coal Cleaned Mechanically

Wet Methods	1929 Net Tons	1934* Net Tons
Jigs	18,914,604	13,769,000
Concentrating tables	3,532,378	1,115,000
Jigs in combination with concentrating tables	1,214,265	1,153,000
Launders and upward current classifiers	7,103,086	15,190,000
Unspecified	190,808	5,000
Total wet	30,955,141	31,232,000
Pneumatic methods	5,843,979	8,488,000
Grand total†	36,799,120	39,720,000

*Preliminary estimates.
†Does not include Bradford breakers or spiral separators.

end of a railroad car loaded by the usual method may be largely lump; the other, largely slack.

To avoid this segregation, five or six cars are loaded together, a layer in each car at a time until all are filled. Provisions are made for taking care of surges in the travel of coal to the car, and loading booms are lowered to deliver coal below the level of the crossbars. This loading method evens ash and sulphur percentages and equalizes fusion temperatures of the load. It also facilitates more effective chemical treatment. Slack requires more spraying than lump; if the product is unequal, spraying is excessive in some places and inadequate in others. With this loading method, the quantity of lump or slack in any car can be varied at will. The plan has helped the retailer by reducing yard trouble and lowering sales resistance.

Opened in 1931 and an increase in production to over 50,000 tons last year is the record of an Ashland (Wis.) briquetting plant described by P. F. Herrly, vice-president, Panda Briquet Co. An asphalt binder treated with sulphur and constituting about 5.5 instead of the usual 9.0 or 10.0 per cent of the briquet weight is used. Labor costs approximate 30c. per ton, but, with the present binder, total costs cannot be brought under $1. Roll-type presses are used to make a 2¼-oz. briquet. Any coal from Pittsburgh No. 8 to Pocahontas slack can be used. Breakage in transit is less than 3 per cent. Scientific control of the binder makes summer storage in 25- to 30-ft. piles possible.

Mineral oil for dustless-coal treatment costs less and has several other advantages over calcium chloride, according to D. Jamieson, Jr., superintendent, Lincoln Coal Co. Oil treatment costs 4 to 6c. per ton, he said; calcium chloride, 6 to 10c. Two to three quarts of straight oil per ton is sufficient for western Pennsylvania coals. A rotary-geared pump capable of generating 600 lb. per square inch forces the oil to the nozzles at 250 to 300 lb. pressure. The pump has excess capacity and maintains a circulation through 1-in. lines to the nozzled manifolds; the excess returns through another 1-in. line to regulating relief valves at the pump.

Oil-treated coal, continued Mr. Jamieson, flows more readily through chutes and the oil retards corrosion of the metals in contact. Experiments by his company indicated that proper treatment will eliminate approximately 75 per cent of the objectionable dust. More dustless coal was sold during 1934-35 than in any previous season. Chemical treatment, said A. E. Shaw, Columbia Alkali Co., increases ash-fusion temperatures and thereby contributes to greater combustion efficiency. He believed centrifugal pumps were preferable to mechanical paddles for circulating the liquid in the mixing tank.

How Old Ben Coal Corporation adapted its calcium-chloride equipment to oil was told by George A. Strunck, electrical engineer of the company. New nozzles were applied and, for large coal, atomizing air jets were added. As steam heating along the oil lines and up to the nozzles was necessary, oil, air and steam lines were grouped in the same heat-insulating jacket. To reduce loss of oil by wind, the ends of the booms are inclosed and pieces of old belting hang down to give added confinement. Although carbon (minus ⅜-in. coal) has been treated, the economic advantages are questionable. Sizes between ¾- and ⅜-in. require about 7 pints per ton; 6-in. lump, about 3 pints.

Basing his conclusions on experiences with Fifth Vein Indiana coal, Max Tuttle, combustion engineer, Knox Consolidated Coal Co., asserted that in general calcium-chloride treatment had a detrimental rather than a beneficial effect upon combustion. He scoffed at the idea of adding a fluxing agent to coal which already contains too much calcium. Dustless treatment, he remarked, might be compared to the sliced bread loaf and the parchment-wrapped cigar, which have not increased sales but have added considerably to manufacturing costs.

Tests reported by J. D. Doherty, research engineer, Koppers Coal Co., indicated that calcium-chloride treatment raises the ash-fusion temperatures of coals with a normal ash-fusing temperature below 2,400 deg. F., but has the opposite effect upon coals with normal ash-fusing temperatures above 2,400 deg. Household furnace tests showed no change in burning or clinkering characteristics as a result of treatment. Last year his company treated 394,000 tons of low-volatile coal, using 3 to 5 gal., or an average of 3.4 gal. per ton, at 1.2 to 1.225 specific gravity.

Dust-allaying effect of the treatment was measured by dropping 50-lb. samples 2 ft. in an 18x18-in. inclosed chute and then inserting slides to catch the dust which settled. In 2 minutes, 210 grams of dust settled from the untreated coal and 90 grams from the treated coal; at the end of 10 minutes, the figures for additional settling were 12 grams and 1 gram, respectively. Steel completely immersed in a calcium-chloride solution suffered less corrosion than when immersed in ordinary tap water; with intermittent immersion, however, the corrosive effect was several times that of tap water. Adding chromates to the solution appeared valueless as a corrosion arrestant.

Management Problems to Fore

MANAGEMENT PROBLEMS were featured at several sessions of the Cincinnati convention. These problems, discussed in the following section and also on page 247, included such live questions as:

- **Economic and Legislative Future of Bituminous Coal**
- **Anthracite Merchandising Opportunities**
- **Cost of 30-Hour Week**
- **Human Engineering**
- **Multiple-Shifting**
- **Cooperation Between Operator and Manufacturer in Machine Design.**

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ADOPTION of the 30-hour week theoretically would add $80,000,000 to the national coal bill, but actually, declared J. S. Luse, Algoma Coal & Coke Co., the public, through economies and resort to other fuels, would avoid the increase, and the industry would suffer. Engineers appointed by NRA to study the effect of shorter hours, he said, had recommended that running time be regulated in each district by seasonal demand (*Coal Age*, April, 1934, p. 137). Even at the peak of demand, the industry cannot employ all the men available.

Numbering hours consecutively, remarked T. J. Thomas, president, Valier Coal Co., one operator found greater efficiency in the last four than in the first four hours of the shift, proving fatigue did not occur in the present work period. There had been some increase in output per man under the 7-hour day at Union Pacific mines, said Mr. McAuliffe, but this was due to a 14.5 per cent increase in tonnage and a 7.7 per cent increase in mechanized loading. Another hour off the day would add 16.66 per cent to labor cost, increase other costs to a large extent and further handicap coal in the struggle against competitive fuels. It was wrong to say that 200,000 mine workers are idle; many former miners have been absorbed into other industries. When tonnage revives, as it must, men will be difficult to get.

Industry destroys itself when it lets machinery destroy human efficiency, declared R. B. Gilmore, office manager, Knox Consolidated Coal Co. Workers whose choice of pleasures and associates show enlightenment and a zest for better things are the men to employ and advance. Illiterates are undesirable because they can follow only oral instructions. Proper wage and promotion incentives must be provided to lighten the treadmill character of modern industry. Bigness of operation is squeezing out individual interest, making the foreman who has personal contact and is the confidant of his men more important than ever.

If only we gave foremen the same special training in the psychology of approach that we give to salesmen, we would overcome many of our industrial difficulties, said W. S. Harris, president, Bicknell Coal Co. Mental attitudes must meet modern conditions, observed W. D. Northover, preparation engineer, Rochester & Pittsburgh Coal Co. The day of the "lone wolf; is ended; individual achievement must yield to departmental accomplishments which involve mutual efforts for a common end.

Speed in new development, retreat recovery, straightening break lines and increasing output and quality were the principal advantages claimed for multiple shifting by C. F. Keck, safety director, Jamison Coal & Coke Co. Use of two complete sets of working places, he said, is desirable when double-shifting to increase output. But it is practicable and economical to multiple-shift in a hand-loading mine with one set of working places, declared John H. Richards, chief mining engineer, Hanna Coal Co. Under such operation, saving in rail and other materials is an important factor.

Describing multiple shifting at the Fairpoint No. 9 mechanical mine (*Coal Age*, December, 1934, p. 462), Mr. Richards

stated that the mine had been changed from double to triple shift in May, 1934. Mechanical delays accounted for 2.4 per cent of the working time in January, 1935; a year later the figure was 1.01 per cent. Proper maintenance is achieved by having one spare machine for each five working.

Operators should cooperate with manufacturers in the improvement of machinery, said R. H. Morris, general manager, Gauley Mountain Coal Co., in a paper read by J. J. Rutledge, chief mining engineer, Maryland Bureau of Mines. Close observation of defects was needed to improve methods, and mine management should pass on the experience thus obtained to the manufacturer. Unlike automobile makers, mining equipment manufacturers cannot establish "proving grounds" but must rely upon the experiences of the mines.

Clocking Safety and Efficiency

TIME AND ACCIDENT CLOCKS installed five years ago at a cost of $1,400 at the Dehue mine of the Youngstown Sheet & Tube Co. have more than proved their value in eliminating shortage complaints, preventing overpayments and controlling minor injuries, said E. B. Agee, superintendent. Besides punching a time card, every employee must punch another card at the end of the shift definitely stating whether he was injured that day. If the man punches the "yes" button, an electric bell rings until the lamp-house attendant stops it. This attendant hands the man a slip instructing him to report immediately to the doctor. The system has proved advantageous to the company, and the men also have come to regard it as a protection to themselves. In several cases of dispute over injuries, the State compensation commission has decided in accordance with the clock-made record.

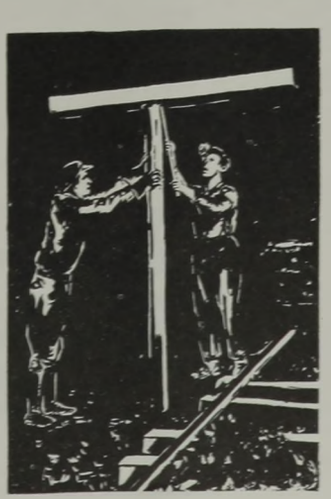
Time clocks also have been installed at the Nellis Coal Corporation, stated Charles W. Connor, superintendent of mines. All workers are required to enter the mine through the main drift, where they must punch the clock, instead of entering through other drift openings which may be nearer their homes. Accident clocks are not included in the installation, but the time clocks have made it easier to maintain safe conditions. If a man leaves the mine at an early hour, that fact is known; if he leaves because of an unsafe working condition, the matter can be attacked immediately. Time cards provide basic data for determining the exact number of man-hours of exposure for every class of employee and also for keeping a graphic record of absenteeism.

The Gay Coal & Coke Co., said H. S. Gay, general manager, first installed time clocks in 1918, but took them out after five years because they were not located where they could be properly supervised. Following frequent complaints of shortages after their removal, the clocks were put back into service. They are used as money savers rather than sources of statistical data. During the past year, the time records punched by the men prevented overpayments of $148 which would have been made on the basis of an efficient foreman's time records. Dial-type clocks without individual cards are used.

Efficiency and safety go hand in hand, asserted P. G. Conrad, superintendent, Knox Consolidated Coal Corporation, reviewing the accident-reduction campaign described in the May issue of *Coal Age*. Too many operators and superintendents are afraid that safety work will slow up production, said G. N. McLellan, safety engineer, Butler Consolidated Coal Co., but there will be no success in raising productive capacity and no economy if there is no safety. The safe way must be determined, taught and practiced until it becomes a habit. If he wills it, the manager can have safety established, but it must be understood that he demands results in safety as he does in production and economy.

To increase and broaden interest in safety, declared E. F. Stevens, manager, Union Colliery Co., the officials decided to share equally with their employees any saving in compensation costs effected by increased safety. The mine, which employs about 500 men, is divided into 17 district teams, each headed by a foreman, and 50 per cent of all compensation savings is given to the winning team or teams. The foreman of the winning team receives 15 per cent, but not in excess of $100, and 85 per cent goes to the other team members. A three-month period was chosen as the basis for awards. With too long a period, an accident to any member of a team which would prevent that team from hoping to win an award would result in indifference for the rest of the period; too short a period would result in awards too small to be attractive.

Determination of awards is based on lost man-hours, with the proviso that man-hours are figured as lost even though a man who has had a compensable accident is not laid off thereby. In such cases, the accident is rated as man-hours lost in proportion to the compensation which would have been paid. Teams also are handicapped according to occupational hazards, because otherwise some teams with more favorable working conditions, such as daylight operation and non-hazardous work or locations, would win without effort. So, some teams are assessed 2½ hours for every actual man-hour lost and some only ¾ hour.



If an injured man cannot immediately resume his regular job but can work at another, his time lost is figured at one hour for each day he works at the less strenuous occupation. Contest rules permit the company to distribute prize money to as many teams as seem desirable. The company has had 11 contests and distributed $24,000 in awards, with individuals sometimes receiving as much as $20 for the three-month period.

When a fan has its volume reduced to 70 per cent of its rated volume as expressed by 100, said A. W. Hesse, chief engineer of coal mines, Youngstown Sheet & Tube Co., its delivered pressure will rise to 132 if the fan is of propeller type, to 120 if full backward-blade type and will fall to 99 if it has forward blades. Thus when the volume is reduced to 70 per cent of the rated volume and brake horsepower at the rated volume is expressed by 100, brake horsepower at the reduced volume is 104 with a propeller unit, 92 with a full backward-blade unit and 77 with a forward-blade fan. Decrease in volume with an increase in pressure, therefore, characterizes the propeller type and, in lesser measure, the full backward-blade fan where the air is restricted, while the forward-blade fan plugs along giving 70 per cent of the air at just about the same pressure. With the propeller fan, as the brake horsepower remains reasonably constant regardless of the volume passed, the fan cannot run away. When the volume decreases, the pressure increases, and when volume increases, pressure decreases, making the demands on the fan reasonably uniform.

Many generally accepted ventilation beliefs were challenged by Raymond Mancha, Goodman Manufacturing Co. Rubbing friction, he asserted, is a small element in the determination of mine resistance. Closing off one side of a mine may not increase the quantity of air received by the other side. Short-circuiting air will not excessively relieve the work required of a fan. Generally, as a mine develops, a smaller, not a larger, fan is desirable, for the smaller fan gives the higher air pressure. Wet mine air is lighter, not heavier, than

TIME CLOCKS were first used in coal mines about thirty years ago, but the accident-record clock is a younger development. Clocking both for time and for accidents and the many uses which can be made of time-clock data engaged the attention of both management and safety men at the Cincinnati convention. Other safety and related topics discussed at the meeting and summarized in this section of the convention report include:

- Partnership Between Efficiency and Safety
- Sharing Safety Savings With the Mine Workers
- Rating Ventilation Performance
- Are We All Wrong in Our Ventilation Ideas?
- Dewatering Bituminous Mines.

dry air. The formula for loss at regulators, as commonly used, is wrong because it represents the whole loss, of which a part is recovered.

Mr. Mancha objected to any fan-efficiency curve which took into account both static and velocity pressures. With forward-blade fans, he said, the duct is smaller than the shaft in cross-sectional area and most of the velocity pressure is lost in negotiating the turn and expanding into the shaft. The fan should be rated on its static pressure only—the pressure obtained when a straight tube pushed through the duct is left with its end open with the air brushing past that end. There are no conversion losses with the backward-blade fan because the air does not pass from a big cross-sectional area to a small one.

How $7,000 spent for excavating a 700-ft. tunnel and a 110-ft. open cut to replace an inadequate pumping installation was recovered in less than a year was described by Ellsworth H. Shriver, mine superintendent, Raleigh Coal & Coke Co. Faced with the alternatives of adding two more units to a four-pump installation then costing $4,800 annually to operate or driving a drainage tunnel in the rock strata beneath the seam, the company chose the latter as the answer to its dewatering problem. Tunneling was done when labor costs were 30 to 35c. per hour and the contract prices were 40c. per cubic yard for power-shovel work in the open cut and $6.50 per lineal foot for the tunnel.

In another case, said Mr. Shriver, two pumps operating in series were moving water at a cost of over 2c. per thousand gallons. A test showed only 24 per cent efficiency for the combined pumping plant. A single pump which showed a 60 per cent efficiency on test was substituted for the two units and pumping costs dropped to less than 1c. The power saving in dewatering that section of the mine was $147 per month.

Turbine deepwell pumps have been installed to advantage in replacing underground pumps in the Beckley and Sewell seams. With power costing 1.6c. per kilowatt-hour, the turbine pumps working from a depth of 125 ft. should lift water at a power cost of less than 1c. per thousand gallons. Tests on a Deming 1,600-g.p.m. turbine deepwell pump showed an efficiency of 72 per cent. Another deepwell pump of the same make powered by a 60-hp. motor and operated only at night saved $3,800 annually over the pumps formerly used inside the mine. Mr. Shriver also showed how the selection of a 6-in. discharge line in place of a 4-in. line for a new installation at an additional cost of only $250 would save over $1,200 annually in power costs.

S. Austin Caperton, general manager, Slab Fork Coal Co., said his company has a 300-ft. turbine deepwell pump in a borehole which is showing large monthly savings. Oiling has been the only maintenance charge in six years. Experience with a 75-hp. 250-ft. deepwell turbine pump installed four years ago in a borehole in western Pennsylvania and with another pump of the same type installed 18 months ago in a 250-ft. airshaft were briefed by E. R. Jones, superintendent, Kinloch mine, Valley Camp Coal Co. The borehole pump is in a 12-in. casing cemented in a 16-in. hole and is lubricated by oil carried in small pipes down to the guide bearings. About every nine months, the pump, which handles acid mine water, must be pulled up to renew certain parts. If the effect of the water on the pump had been known at the time of purchase, all parts would have been specified "anti-acid metal." The second pump is a 50-hp. unit which operates in alkaline water.

Full Speed on Transportation

ONE OF THE MOST RECENT developments in mine transportation has been the use of trucks and trailers to haul coal from strip pits to cleaning plants. The Sinclair interests, as related in these pages some months ago, have pioneered in this development, and L. R. Kelce, vice-president, Hume-Sinclair Coal Mining Co., presented the underlying theory of this development to the transportation-minded at Cincinnati. An unusual job of rebuilding underground haulage to modern standards was related by W. W. Dartnell, manager of mines, Valley Camp Coal Co., and John G. Crawford, general manager, Valier Coal Co., set forth means to attain the objective of maximum tonnage per man-hour.

SOME STRIP PITS perhaps should use locomotives and cars, and some tractors and trailers, but the latter form of transportation promised the best results at the operations of the Hume-Sinclair Coal Mining Co., declared L. R. Kelce, vice-president. The average haul is 4.12 miles and the trucks and trailers must traverse winding roads with adverse gradients, but the company has been able to operate over these roads without difficulty in bad weather when railroad traffic would have been restricted. Moreover, coal always comes to the tipple in a steady flow. Coal could be hauled four miles for only about double the cost of a one-mile haul. A complete description of this installation was published in the October, 1934, issue of *Coal Age*, p. 373.

Material and labor costs for modernizing main haulage tracks in mines where untreated ties had been used and track maintenance had suffered were reduced by an unusual type of construction described by W. W. Dartnell, manager of mines, Valley Camp Coal Co. At each rail joint two pieces of 60-lb. scrap rail were welded across the track to hold the rails to gage, reduce side thrust on spikes and serve as electrical bonding. These cross members were positioned on each side of the joint just beyond the wood ties supporting the joint. They were turned upside down from normal position and arc welding was applied to the contacting bottoms of the rail sections. Electrically the effect was to parallel the two rails of each 16-ft. lengh of track which had no rail joints. The electrical connection of adjacent 16-ft. parallel sections consisted of the continuous rail of the side of the track opposite the joint. Thus the continuous electrical paths (in parallel with the joints) were alternately on one side of the track and then on the other.

Worn-out 60-lb. rail was replaced with good 75-lb. rail taken from an abandoned interurban railroad. Two shifts of 20 men each rebuilt as much as 900 ft. of main haulage track each 24 hours. Labor cost of taking up old track and laying the new was 23 to 35c. per foot. Four miles of this new track has been in service in three mines over a year and no defects have appeared. Joint bolts are tightened at frequent intervals. The treated 4x6-in. ties are spaced 18 ties to a 35-ft. rail without tie plates. No ballast is used because the proper tamping of it under the ties is considered impracticable. Haulage equipment consists of 20-ton locomotives and 3-ton cars. Grades vary from 0.5 per cent with the loads to 3.0 per cent against them. Speeds of 20 miles per hour are attained at times and over one of the lines 2,500 tons is transported per day.

To secure maximum tonnage per man-hour, main haulage should be designed to keep hoisting equipment supplied continuously with coal, said J. G. Crawford, general manager, Valier Coal Co. Attainment of that objective will be facilitated by using overweight rails, electrically operated switch throws, automatic signaling, dispatching and automatic reclosing circuit breakers.

SPEEDING COAL'S RECOVERY

+ Through Mechanization of Mining

Keynote of Cincinnati Exposition

WITH COAL on the upgrade, interest in equipment for cutting costs, increasing efficiency and raising the quality of its product as a means of holding and extending recent gains was reflected in the exhibits offered by 120 manufacturers and distributors of mining equipment and supplies at the Twelfth Annual Convention of Practical Coal-Operating Men and National Exposition of Coal-Mining Equipment, held at Cincinnati, Ohio, May 13-17, under the auspices of the Manufacturers' Section, Coal Division, American Mining Congress. Higher capacity, greater efficiency, longer life and safer operation were the principal points emphasized in the various displays of equipment for all phases of mining, preparation and safety.

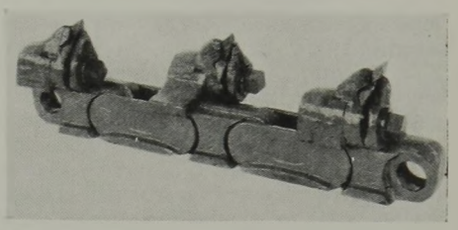
INCREASING interest in mechanization of mining and loading was reflected in displays of drilling, cutting and loading equipment at the Cincinnati exposition. Permissible and open-type electric coal drills in mounted and hand-held types, air-operated rotary hand-held drills, pneumatic percussive sinkers, rock drills and auger drills, coal and rock augers and portable pneumatic and electric drills, grinders, wood borers and other maintenance tools were displayed by Chicago Pneumatic Tool Co., New York City.

In addition to the "Duplex" bit and cutter chain, and standard cutter chain, Cincinnati Mine Machinery Co., Cincinnati, Ohio, offered a cutter bar of solid alloy-steel plates heat-treated throughout and assembled with alloy-steel bolts for rigidity and permanence. Cincinnati company also displayed a special coal-saw chain allowing use of the "Duplex" bit and presenting practically the same features as the "Duplex" cutter chain.

Goodman Mfg. Co., Chicago, exhibited the 260-B permissible-type mobile loader with a height of 46 in. and a new reversible shaker conveyor with 7½-hp. motor and Size 0 troughing. In addition to the reversible feature, this conveyor, according to the company, offers three different motions—soft, medium and hard—in each direction. Changing from forward to reverse and from each degree of motion is accomplished by a handwheel. Also new was the chain-and-flight Type 91D15 reversible face conveyor and drive and the Type 412 low-vein permissible shortwall with universal control. Features of the cutter, according to the company, include: design in three units—feed, motor and cutting; contactor control, giving automatic motor acceleration; power on both drums, either alternately or together at either high or low speed with the same control wheels; sheave arrangement giving universal joint effect on both front and rear sheaves; locked-type safety bit clutch (clutch falls out but cannot fall in); full reversibility; and wrench-operated tilting device for rotating entire cutting unit. Traveling height on straight-axle truck is 27 in.

Shaker conveyor pans were displayed by Hendrick Manufacturing Co., Carbondale, Pa.

Mechanization equipment shown by Jeffrey Mfg. Co., Columbus, Ohio, included: Types 61AM and 61W chain-and-flight room conveyors; Types 61HG and 61L chain-and-flight face conveyors; 38-lb. one-man and A-6 post-mounted permissible coal drills; "Arcshear" cutting head for



Jeffrey Thin-Kerf Cutter Chain With Star Bit

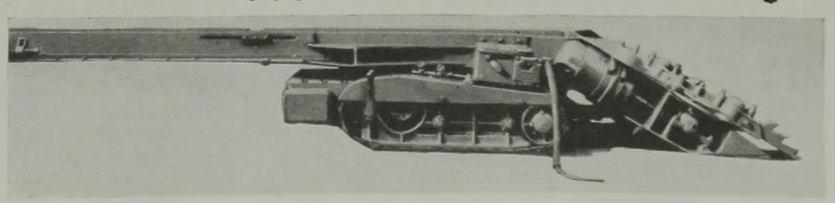
29C and 29L cutting machines for bottom, top and shear cutting; 29L arcwall coal cutter; 35L shortwall coal cutter; and 35BB shortwall cutter with thin-kerf cutter bar on Jeffrey standard "Handitruck." Kerf thickness with the thin-kerf bar is 4 in., made possible by development of a special three-point star bit and chain. Jeffrey also offered a special holder to allow use of the star-bit on standard chains.

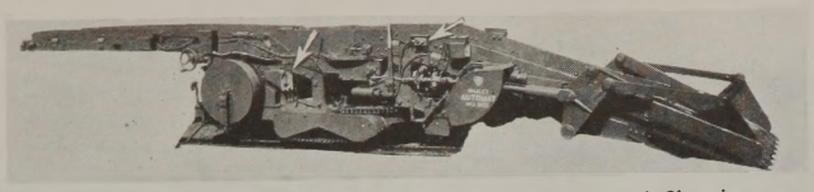
Chief feature of the exhibit of the Joy Mfg. Co., Franklin, Pa., was the "Joy, Jr." loader with a height of 26 in., rated capacity of ½ ton and maximum capacity of 1 ton per minute. Weight is 7,000 lb. Dimensions are: total width, 52 in.; total length, 17 ft. 9 in. Caterpillar speeds of 20 ft. and 60 ft. per minute are available. Maximum reach of gathering arms is 4 ft. 10 in., and the loader is powered with four 2½-hp. motors. Crankpin "digging force" is 3,300 lb.

The "Joy Jr." loader, according to the company, is for seams down to 32 in. Essential elements are a caterpillar chassis driven by individual motors; the gathering head and elements, driven by two motors in tandem; and an articulated conveyor of the single-chain type which can be swung horizontally 45 deg. to each side of the center line of the loader. All controls are on the right side near the center of the machine.

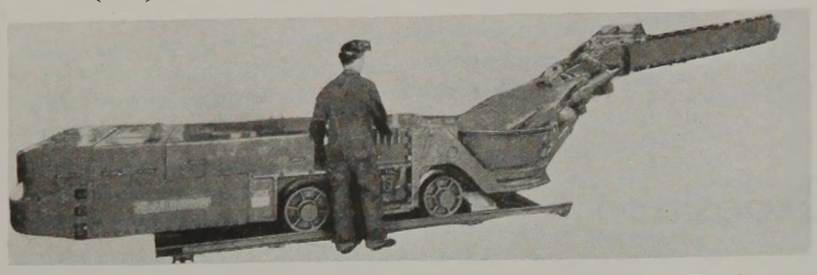
At the other end of the scale, Joy offered the 10BU loader with rated capacity of 4 tons and maximum capacity of 6½

Joy Jr. Loader for Thin Seams





Whaley "Automat" Loader With Time-Starter Control Showing (Left) Main Control Handle and (Right) Pushbutton Station



Sullivan 7-AU Cutting and Shearing Machine With Cutter Bar in Shearing Position

tons per minute. Other features are: weight, 19,000 lb.; height, 54 in.; width, 7 ft.; length, 25 ft.; caterpillar speeds, 54 and 178 ft. per minute; maximum reach of gathering arms, 7 ft. 4 in.; one motor, 50 hp.; crankpin "digging force," 7,900 lb.

Joy M. & C. shaker conveyors and the new Gerdetz shaker conveyor pan and connector, said to eliminate entirely use of wrenches in connecting pan lines, also were shown. The connector includes the wheels carrying the pan line, thus bringing them under the pan joints.

Use of special shaker-conveyor trough sections to allow turns of 360 deg. (four 90-deg. turns in series) was stressed by La-Del Conveyor & Mfg. Co., New Philadelphia, Ohio.

Lorain sectional face and room conveyors and elevators were displayed by Lorain Steel Co., Johnstown, Pa.

Myers-Whaley Co., Knoxville, Tenn., displayed a Whaley "Automat" No. 3 size loader with new electrical control. These loaders, either the open or permissible types, are now equipped with Westinghouse two-step automatic time starters and push-button "start" and "stop" stations to permit the motor to come up to speed before full power is thrown on it, prevent sudden reversal and consequent damage to contacts, etc., and prevent leaving the controller partially "on," damaging the resistors. The control provides for "jogging" in reverse. Overloads are taken care of by an automatically reset overload relay. Another feature is a field resistor to permit two-speed tramming by field control with open-type machines. Capacity of the resistor, operated by a Type ML limit switch interlocked with the main clutch lever, is sufficient to change the motor speed from 1,150 r.p.m. (normal) to 1,700 r.p.m. (no load) and 1,500 r.p.m. when tramming on a level track. Position of the main clutch lever automatically determines whether field resistance is in or out, and in addition the selective feature of the control allows a tramming speed of 120 or 160 f.p.m.

The "Automatic" mine bit was demonstrated by Frank Prox Co., Terre Haute, Ind. Weight of the bit, a double-ended type giving two points, is slightly over 1 oz. Material is a special heat-treated steel, and the bit is machined to fit in a special replaceable jaw in the cutter chain. The jaw embraces the bit and the impacts of cutting cause it to yield sufficiently to form a solid wedge lock, making it impossible, it is pointed out, for either bit or jaw to be dislodged from place. No screws are used, and a slight pull with a cam-shaped wrench is sufficient to fasten the bit in the jaw or loosen it for removal. Bits are discarded when both points are dull. Features claimed include: automatic gaging; uniform, perfectly formed and sharp bit points; and elimination of bit breakage and setscrew difficulties, all tending to reduce power cost and dust in cuttings, and insure a steady machine while working. On test under hardest Illinois conditions, according to the company, an average of 28 "Automatic" bits were required per day, against an average of 200 to 300 hard-surfaced bits. The new "Invincible" nickel-chrome-molybdenum alloy steel cutter chain was another Prox product. Features noted include a machined interlock between links to prevent back drag and provide an unvarying angle of attack; drop-forged bit blocks; and elimination of bulky link heads or steel parts to be dragged through the cuttings.

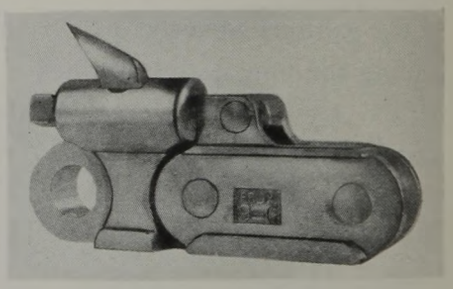
Examples of mine conveyors were offered by Robins Conveying Belt Co., New York City.

The new 7-AU heavy-duty universal coal cutting and shearing machine was demonstrated by Sullivan Machinery Co., Chicago. This machine, it is stated, can cut straight ribs 10 ft. 8 in. from the center of the track, top cut 8 ft. over the rails and bottom cut 1 ft. below the rails without the main frame swinging outside the track. Other features include: full-hydraulic boom control; "fixed-loading" factory-adjusted safety clutch to guard the cutter; and adaptability to either saw or standard chains for various kerf thicknesses. Weight is 12 tons; length with bar in traveling position, 25 ft. 4½ in.; width, 56 in.; height, 33½ in.; kerf, 2½ to 5 in.; traveling speed, 3.9 m.p.h.; sumping feed, 0 to 22½ f.p.m.; swinging speed, 0 to 50 f.p.m.; track gage, 36 to 48 in. Sullivan also displayed saw blades and cutter bars for various kerf thicknesses down to 2 in., and offered the improved A-211 scraper hoist.

The Conway loader for rock work was presented pictorially by St. Louis Power Shovel Co., St. Louis, Mo.

Timken detachable bits for rock work were shown by Timken Roller Bearing Co., Canton, Ohio.

A new rivetless chain for cutting machines and a special setscrew to prevent loss were exhibited by Bertrand P. Tracy Co., Pittsburgh, Pa. The setscrew is made with a milled slot, which spreads slightly during heat-treating to give the screw a slight barrel shape which holds it in the hole by spring action.



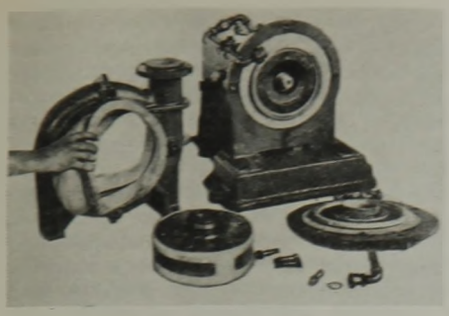
Prox Invincible Cutter Chain With Interlock to Preserve Angle of Attack

Utility Mine Equipment Co., St. Louis, Mo., presented pictorially the "Umeco" coal loader and exhibited "Umeco" adjustable and standard double-strength aluminum jack pipes, which, it pointed out, have the same strength as steel with but one-third the weight.

Stripping equipment was stressed by Bucyrus-Erie Co., South Milwaukee, Wis., and Marion Steam Shovel Co., Marion, Ohio. Caterpillar Tractor Co., Peoria, Ill., emphasized the use of Caterpillar traction and offered the Caterpillar diesel engine for powering excavating machinery.

Pumps and Pipe for Mine Use

DEWATERING and pumping equipment for both underground and surface service was shown by seven exhibitors at the Cincinnati exposition. Allen-Sherman-Hoff Co., Philadelphia, Pa., displayed the "Hydroseal" sand pump with "Maximix" rubber protection, for which it notes the following features: efficiency in the handling of abrasive materials resulting from the Hydroseal principle of introducing clear liquid to prevent leakage of abrasives back to the pump suction or stuffing box substantially equal to that attainable in clear-water pumps, thus reducing power consumption one-third to one-half; reliability of performance (initial capacity and head maintained throughout pump life without adjustment or change of speed); durability, achieved by the Hydroseal principle and Maximix rubber parts, with consequent reduction in maintenance to a fraction of the conventional sand pump figure, as none of the abrasive material pumped can wear, or even touch, any part of the pump; and adaptability of installation resulting from the ability of the Hydroseal pump to produce suction lifts up to 20 ft. It is not necessary to maintain a positive head on the pump inlet. Hydroseal liquid varies from 2 to 5 per cent of the total discharge, depending on discharge head. Impeller and pump casing are made



Hydroseal Pump With Suction Side Plate, Impeller and Metal Pump Shell Removed—Maximix Rubber Liner Being Inserted

of Maximix rubber, and Maximix rubber sheets are applied to other pump parts which might come in contact with the abrasive liquid being pumped. Maximix parts, the company points out, can easily be replaced in the field, as no vulcanizing is required.

The Type SSU centrifugal pumping unit was shown by the Allis-Chalmers Mfg. Co., Milwaukee, Wis.

American Cast Iron Pipe Co., Birmingham, Ala., offered for coal-mine use "Simplex" and "Doublex-Simplex" cast-iron pipe and "Acipco" cement-lined cast-iron pipe and fittings.

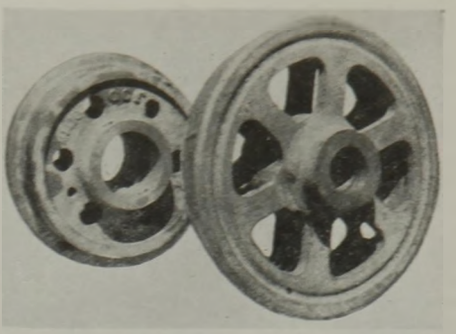
The "Austin-Brownie" totally inclosed self-oiling piston-type mine gathering pump, Austin brass and bronze strainers, multiport check valves and "Duraloy" and bronze pump parts were exhibited by Brown-Fayro Co., Johnstown, Pa.

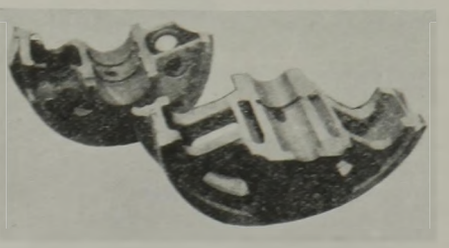
Deming Co., Salem, Ohio, exhibited the standard Deming-Mueller mine gathering pump equipped with V-belt drive for quietness, safety, low maintenance and easy inspection; Deming deepwell pumps; and Deming-Mueller side-suction centrifugal pumps with self-priming equipment; double-stage side-suction centrifugal pumps and double-suction centrifugal pumps. A feature of the side-suction units, according to the company, is interchangeability of parts, facilitating addition of either self-priming equipment or another stage.

LaBour Co., Elkhart, Ind., showed a 2-in. self-priming centrifugal gathering pump with cantilever-bearing back construction developed to reduce corrosion to external parts in acid-water service. LaBour also offered a pump of "Elcomet" high chrome-nickel metal for corrosion resistance.

National Tube Co., Pittsburgh, Pa., offered "Duroline" cement-lined pipe for acid water service and National copper-steel pipe, seamless and welded boiler tubes, scale-free pipe and seamless service pipe.

Central Foundry Co. "Universal" cast-iron pipe was displayed by Post-Glover Electric Co., Cincinnati, Ohio.





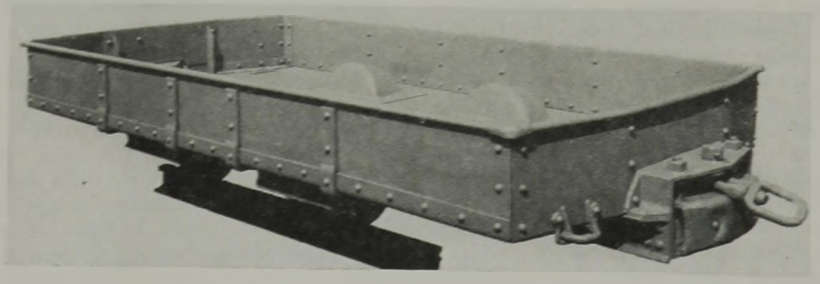
A.C.F. Wheels of the Double-Plate and Double-Spoke Types for Uniformity of Tread Chill

More Per Car in Transportation

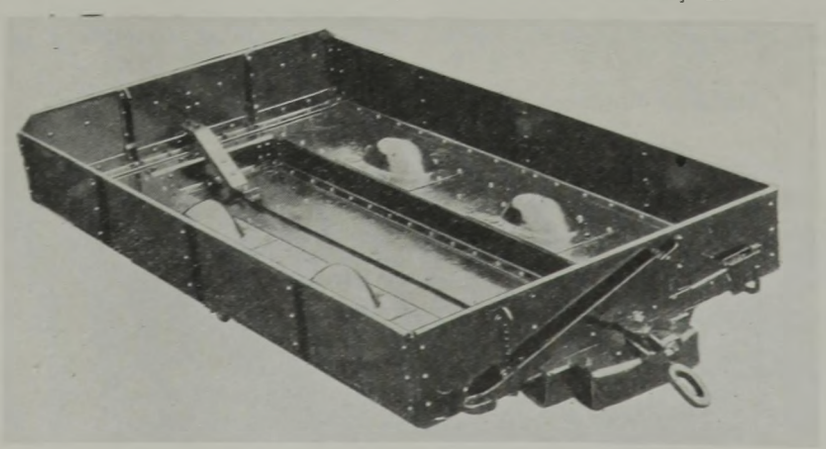
MINE CARS were the principal items of rolling stock in the Cincinnati transportation exhibits, with wheels, car-pulling hoists and track work rounding out the displays. The Inland Steel Co. mine car was featured by American Car & Foundry Co., New York City. Designed for rotary-dump service, although it can be furnished in the endgate type, level-full capacity is 90 cu.ft. with the following dimensions: inside length, 11 ft. 3½ in.; width, 6 ft.; height over rail, 24 in. Construction features include: four axles for four bearing points and better distribution of the load; chilled-tread, heat-treated combined plate-and-spoke-type anti-friction-bearing wheels (A.C.F. heat-treating process of manufacture) designed for greater resistance to breakage on the one hand and to wear on tread and inside surface of flange on the other; A.C.F. spring draft and buffing gear; all-through side sills; and bumper castings riveted through side sills to spread strains throughout the frame. Wheels of different designs to show application of various types of ball and roller bearings were another A.C.F. feature, in addition to the new single- and double-plate and double-spoke wheels developed to facilitate a uniform chill on the tread by removing the heavy concentrations of metal involved in the usual type of spoke from the center of the tread.

Bethlehem Steel Co., Bethlehem, Pa., offered a "Mayari R" high-tensile-strength rust-resisting all-welded alloy steel car. Capacity is 5 tons with a weight of 2,800 lb., compared with 4,400 lb. for a corresponding car of the conventional riveted construction. Height is 27 in. Construction features include: stub axles, forged-steel wheels and Miner draft and buffing gear. Bethlehem also showed new forged-steel mine-car wheels, stressing the following advantages: elimination of breakage; wheel life equal to car life; less susceptibility to flat spots; uniform quality of metal clear to the hub; and adaptability to rolling to save 25 to 30 lb. per wheel. Further Bethlehem products included a heavy-duty Bethlehem-Keystone steel-tie turnout for main-line service; Fairmont, Bethlehem Nos. 1 to 6 and Keystone No. 6 steel ties; and switch throws, manganese-steel frogs, pins and hitchings.

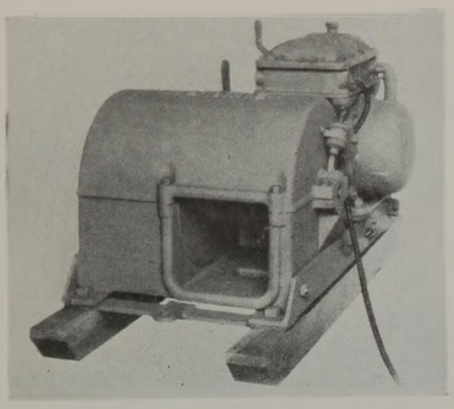
Two new hoists were displayed by Brown-Fayro Co., Johnstown, Pa. The "Brownie" Model HGd hoist, according to the company, is designed for hauling and lowering cars where rope pull does not exceed 2,000 lb. at 75 to 150 f.p.m. Moving parts are mounted in Timken bearings. A band friction clutch and brake provide variable-speed control. The hoist is driven by a 5-hp. a.c. or open or permissible d.c. motor. The "Brownie" HKh hoist is a triple-geared model for handling trips of cars past loading points, and has a maximum rope pull of 12,000 lb. at 20 to 50 f.p.m. An automatic mechanical brake on the motor shaft and a high-speed rewinding drum are provided. The unit is designed to operate from the loading point with ropes working through sheaves mounted

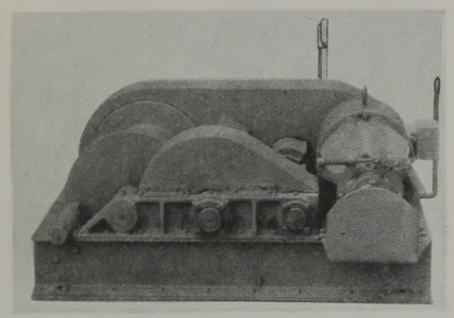


Inland Steel Co. Mine Car by American Car & Foundry Co.



Enterprise Car for the H. E. Harman Coal Corporation





Top, "Brownie" HGd Car-Pulling Hoist; Bottom, "Brownie" HKh Hoist for Handling Trips

at both ends of the hoist. Other transportation equipment included: Type TRC Timken-equipped chilled cast-iron roller primarily for slope service; 10-in. ID Timken-bearing sheave and base for rope haulages; web- and spoke-type mine-car wheels; "Brownie" rerailers; and "Anglin" rerailers for use at switch points to prevent locomotives or cars being pulled through an open switch.

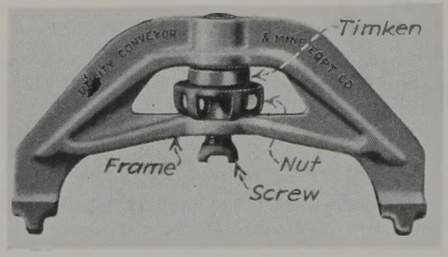
Carnegie Steel Co., Pittsburgh, Pa., exhibited Carnegie steel ties for room and main-line service and, in connection with the Illinois Steel Co., Chicago, rails for room and main-line service and rolled-steel wheels for locomotives and mine cars. Rails and track materials also were stressed by the Tennessee Coal, Iron & R.R. Co., Birmingham, Ala., another subsidiary joining in the United States Steel Corporation exhibit. A "Cor-Ten" steel mine car was displayed by Lorain Steel Co., Johnstown, Pa., which pointed to lightness, strength and resistance to corrosion as the major advantages.

Wheels were the major display of the Duncan Foundry & Machine Works, Alton, Ill., including types made by the electrical-furnace process for longer life and greater efficiency; cast-steel wheels; and two types of demountable-rim cast-steel wheels, allowing removal of the rim without disturbing bearings adjustment.

The H. E. Harman Coal Corporation car was displayed by Enterprise Wheel & Car Co., Bristol, Va.-Tenn. With a height of 25 in. and inside dimensions of 7x12 ft., level-full capacity is 122 cu.ft. Average loading is 5.3 tons. Weight is 4,575 lb. The car is equipped with stub axles, Timken-bearing wheels, cast-steel axle boxes, and a two-wheel double-band brake.

The permissible 5-hp. friction-clutch-type room hoist was shown by Flood City Brass & Electric Co., Johnstown, Pa. Weight complete with motor is 1,140 lb. Rope capacities are: ½-in., 675 ft.; $\frac{7}{16}$-in., 880 ft.; ⅜-in., 1,175 ft. With a car resistance of 30 lb. per ton, the hoist develops a rope pull of 1,200 lb. at 140 f.p.m. and handles loads from 40 tons on the level to 4 tons on a 15-per cent grade. Construction features include: Westinghouse "Deion" permissible starter mounted on a Type RH permissible motor; cut gears; totally inclosed drum; and frame sufficiently sturdy to withstand a heavy roof fall. The hoist is 46 in. long, 25½ in. wide, and 21⅛ in. high.

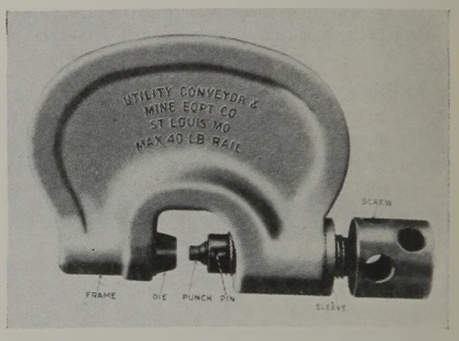
To demonstrate ability of the cast-steel underframe to resist wear and corrosion, General Steel Castings Corporation, Eddystone, Pa., exhibited a 213-cu.ft. mine car with twenty months of triple-shift service at Derby No. 3 mine, Stonega Coke & Coal Co. Weight of the car, equipped with Miner draft and buffing gear, is 25 lb. per cubic foot, and average loading is 7 tons.



"Umeco" Aluminum-Alloy Rail Bender

No expenditure for repairs has been incurred in the twenty months of service, the company points out.

Hockensmith Wheel & Mine Car Co., Penn, Pa., stressed four types of wheels manufactured with an alloy mixture for deep chilling, strength and toughness as follows: spoke type, New Departure ball bearings; web-spoke wheel, cast-iron cap closure, Tyson tapered cageless roller bearings; web-spoke, disk closure, Timken tapered roller bearings; double-plate, plain bearing, double bore, pushbutton oiler. Web and double-plate types, the company points out, give maximum strength with minimum weight. Other Hockensmith equipment included: 4-in. plain-bearing pipe rollers; 13-in.-rope-diameter chilled-rope-base loose-running self-oiling sheaves; 12-in. Timken-equipped steel-pipe rollers; 8-in. rubber-covered rollers of the same type; heavy-duty track sheaves with chilled or unchilled wearing faces and cold-rolled steel axles pressed in revolving boxes fitted with Hyatt bearings; and Timken-equipped cast-iron grooved sheaves 10 in. long and 10 in. in outside diameter, also available without grooves with flanges on end.



"Umeco" Aluminum-Alloy Rail Punch

Irwin Foundry & Mine Car Co., Irwin, Pa., showed the Allegheny-Pittsburgh Coal Co. solid-end rotary-dump mine car, featuring Toncan copper-molybdenum iron in an all-welded construction. No body bands are employed, the car consisting of plates, angles and Z-bars. Bumpers, drawbar and brake rigging are the only parts hot-worked. This construction reduces fastenings, the company states, to 30 bolts and 8 rivets. Weight is reduced 600 lb., making the total 3,900 lb. for a capacity of 130 cu.ft. Height is 42 in.; width, 68 in.; inside length, 9 ft. 1 in.

"Mechanite" metal mine-car wheels formed part of the display of the Kanawha Mfg. Co., Charleston, W. Va., which emphasized wear- and shock-resisting properties.

Mancha storage-battery locomotives were featured pictorially by Mancha Storage Battery Locomotive Co., Chicago.

Type D-4 double bumper, Type SL-4 single-bumper and T-3 friction-type draft and buffing gears for mine cars were featured by W. H. Miner, Inc., Chicago, which also offered a coupler yoke with key connection.

"Naco" steel mine-car equipment (wheels, pins, links, hitchings, Willison automatic couplers, draft and buffing gear and chains) were exhibited by National Malleable & Steel Castings Corporation, Cleveland, Ohio.

Mine hoists were stressed in a pictorial display by Nordberg Mfg. Co., Milwaukee, Wis.

Phillips Mine & Mill Supply Co., Pittsburgh, Pa., displayed a 5,590-lb. car from the No. 4 mine, Vesta Coal Co. With a height of 43½ in., length of 12 ft. 8½ in., and width of 6 ft. 2 in., rated capacity level full is 3½ tons. Average loading is 4½ tons; maximum, 6 tons. Other items were a Phillips open-cap wheel eighteen years old; other wheels of various types; links and hitchings; crossover, push-back and gravity rotary dumps; and caging equipment.

Pins, links and hitchings for mine-car service were displayed by Pittsburgh Knife & Forge Co., Pittsburgh, Pa.

The S. & D. "Floater" ball-bearing

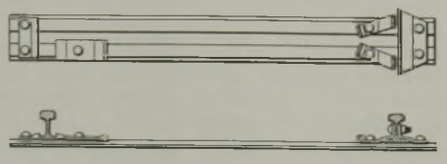
Allegheny-Pittsburgh All-Welded Toncan Iron Car by Irwin Foundry & Mine Car Co.

wheel for mine cars was featured by Sanford Day Iron Works, Inc., Knoxville, Tenn., together with models of bottom-dumping cars for underground and stripping service. Bottom-dumping trailers for strip mines rounded out the display.

The RHE-5 room hoist for car-pulling service was shown by the Sullivan Machinery Co., Chicago.

"Umeco" heat-treated aluminum-alloy rail benders and punches were exhibited by Utility Mine Equipment Co., St. Louis, Mo. With the rail bender, according to the company, one man can bend 30- to 60-lb. rail. Also the bender can be set by the spin of a nut, thus reducing set-up time by half. Light weight eliminates a motor for moving the bender from place to place. Weights of the various types are: No. 20-B, 15- to 25-lb. rail, 20 lb.; 30-B, 25- to 40-lb. rail, 24 lb.; 40-B, 40- to 60-lb. rail, 44 lb. Strength is said to be equal to that of steel, and Timken thrust bearings are employed. The "Umeco" rail punch was offered by the company to reduce the time required in drilling holes. Two models are available: No. 10, 12- to 40-lb. rail, weighing 24 lb.; No. 15, 12- to 60-lb. rail, weighing 26 lb. One die and punch are supplied with each unit.

In addition to a pictorial display of mine cars, Watt Car & Wheel Co., Barnesville, Ohio, offered the Watt-Dalton mine car bumper (*Coal Age*, February, 1935, p. 86) and its new drilling and shooting car with a weight of 600 lb. and the following dimensions: length, 9½ ft.; width, 52 in.; height, 26 in. The car is fitted with a cable reel with a female coupling at one end for attaching the drill or tool grinder, the latter being mounted on the opposite end of the car. Space is provided underneath the deck for spare drills and parts.



West Virginia-Cornett Steel Joint Tie for Room Track

Items from its line of track materials were shown by Weir Kilby Corporation, Cincinnati.

West Virginia reversible steel turnout ties made up into a switch were exhibited by West Virginia Rail Co., Huntington, W. Va., which also offered steel ties for various services and standard and heavy-duty manganese-steel frogs. Another exhibit was the new West Virginia-Cornett steel joint tie for room work, designed to take the place of splice bars at joints and thereby eliminate loss of bars and bolts. A new West Virginia safety plate frog, designed with inserts to prevent men catching their feet and also act as rerailers, was another featured product.

More Power at Lower Cost

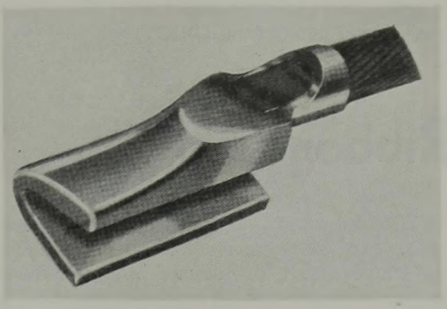
ELECTRICAL equipment was featured by sixteen manufacturers at the Cincinnati exposition. "Seal-Clad" protected-winding squirrel-cage motors (*Coal Age*, April, 1935, p. 179), direct-current motors and surgeproof transformers were shown by Allis-Chalmers Mfg. Co., Milwaukee, Wis.

Electrical wires and cables and BF-1 to BF-7 "Tigerweld" power bonds were featured by American Steel & Wire Co., Chicago. The BF-7 bond, a new type, is designed with the conductor—spot welded to a solid-steel head—under the base of the rail for maximum protection.

Type KSC inclosed automatic-reclosing sectionalizing circuit breakers, Type KSA magnetically operated and automatic reclosing circuit breakers and Type BT-4 industrial thermostat relays were offered by Automatic Reclosing Circuit Breaker Co., Columbus, Ohio.

Edison Storage Battery Division, Thomas A. Edison, Inc., Orange, N. J., offered nickel-iron-alkali cells redesigned with increased height to raise capacity with the same floor dimensions. In the C8 cell, ampere-hour capacity was increased from 350 to 450; C12, 450 to 675. The company also offered the A16 600-amp.-hr. cell for mine use where height governs.

In addition to "Elreco" trolley and line materials, Electric Railway Equipment Co., Cincinnati, Ohio, offered the new 10-deg. 350,000-circ. mil wire trolley frog, a reversible cable-terminal clamping plate for its quick-break manually operated mine switch, a new section insulator with reversible cable terminal clamping plate accommodating, in the 4-0 size, wire from 4-0 to 500,000 circ. mils and in the two 6-0 sizes, 350,000 to 500,000 and 500,000 to 1,000,000 circ. mils, and a new mine sectionalizing switch with quick-break feature.



Penn Machine Co. "Everlast Super-Weld" Rail Bond Cut Away to Show Terminal Construction

Electric Railway Improvement Co., Cleveland, Ohio, displayed "Erico" rail bonds and welding rheostats.

Exide-Ironclad cells for motive-power, stationary and automotive batteries were shown by Electric Storage Battery Co., Philadelphia, Pa., motive-power types including FL, TLM and MVM cells with "Mipor" separators (*Coal Age*, August, 1934, p. 332).

Electrical equipment displayed by Flood City Brass & Electric Co., Johnstown, Pa., included controllers for room hoists, conveyors, loaders, etc.; transfer switches for locomotives, sectionalizing insulators, Great Western renewable-cartridge and knife-blade-type fuses, American Steel & Wire Co. electrical cables and wheels, poleheads, frogs, harps, splicers and other line materials.

In addition to a pictorial presentation of mining products, General Electric Co., Schenectady, N. Y., displayed automatic transfer switches for locomotives, heavy-duty general-purpose linestart d.c. motor starters, armature and field coils, and insulated wires and cables for underground, surface and stripping work. The cable display included the new loom-woven-sheath cable for mining machines, cable-reel locomotives and other equipment where severe mechanical abrasion is a problem. Under the sheath, applied like carpet weaving, is a layer of Glyptal cement, the sheath being partially embedded in both the Glyptal cement and the rubber insulation. This construction, according to company, greatly increases abrasion resistance and, because of the Glyptal cement, is highly resistant to oil, alkali and acid.

The cable exhibit also included two new all-rubber shotfiring cords, both of which, because of their small diameter, flexibility and light weight, are advantageous when long lengths must be carried, the company states. The round-type cord is especially suited to battery shooting in wet places, the all-rubber construction making it re-resistant to abrasion and mechanical injury, as well as oil, alkali and acid. The parallel-type cord is of flat all-rubber construction and is designed as a low-cost product for satisfactory service under ordinary conditions.

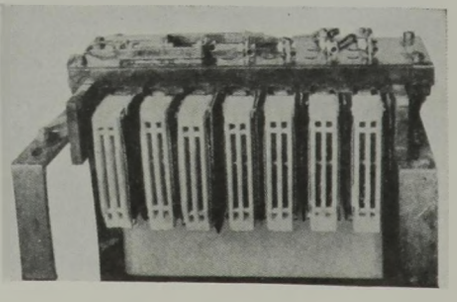
For heavy-duty d.c. service (stationary motors and generators) the "SA" series of electro-graphitic brushes of the National Carbon Co., Cleveland, was offered at the Union Carbide & Carbon Corporation booth. Exceptional uniformity is claimed, in addition to high contact drop and low coefficient of friction. Five grades are offered, all rated with respect to commutating properties. Capacity and other operating characteristics are as follows:

	Grade				
	SA-35	SA-30	SA-35	SA-40	SA-45
Carrying capacity, amp. per sq.in. . .	55	55	60	60	65
Maximum surface speed, f.p.m. . .	5,500	5,500	6,000	6,000	6,500
Brush pressure, lb. per sq.in. . . .	2-3	2-3	2-3	2-3	2-3

Grades bearing the higher index numbers are designed for more severe cummutating requirements.

Armature and field coils were featured by the National Electric Coil Co., Columbus, which offered "Armo Bond" slot paper. This paper, it was pointed out, is "Elweld" treated to make its surface resistant to water, oil, alkali and acid, and also is being laminated to varnished cloth or mica, thus permitting the use of one instead of two or three pieces for slots, phase insulation, banding, etc. A supple-

"Mycalex" Mine Locomotive Control Group, Front View



mentary product was "Armo Rex," consisting of "Armo" paper laminated to both sides of varnished cloth, giving, it is stated, a dielectric strength of 10,000 volts up.

Products of the Ohio Brass Co., Mansfield, Ohio, included: trolley- and feeder-line materials—clamps, hangers, expansion bolts, frogs, section insulator switches and insulators, trolley and feeder deadends, feeder clamps, splicers and feeder taps, trolley-wire splicers, including a new type with a setscrew arrangement preventing interference with the use of the wrench in close places, rail bonds of various types, and bond welders; car equipment—harps, poleheads, trolley wheels and shoes, Types MB and MS cast-steel headlights and headlight resistances; control and safety devices—AD, KD, DRT and KSD d.c. motor starters for service from 2 hp. up, fused trolley taps, and quick-make quick-break safety switches. Additional products included the O-B trolley-wire lubricator and porcelain insulators.

The "Everlast Super-weld" rail bond was featured by the Penn Machine Co., Johnstown, Pa. In this bond, according to the company, the development of weak spots due to mechanical distortion or oxidation of the strand is eliminated by a combination of steel ferrules—applied without changing the natural shape of the strand—and solid terminals of soft steel, which prevent oxidation of the strand by attaining welding temperature quickly without carrying heat to the condutcor. Additional features noted by the company include: practical indestructibility in normal service when properly applied; higher tensile strength; greater conductivity; easy installation, either under or over the base of the rail; and adaptability to reuse.

Field coils, armature coils and insulations constituted the display of the Pennsylvania Electrical Repair Co., Pittsburgh, Pa., which, with the Close Distributing Co., showed "Synthane" materials for gears, pinions, insulating purposes and switches, Mica Insulator Co. products, "Armo" products and the new "Mycalex" insulation for motors and controls on permissible mine locomotives, cutters, loaders and stationary motors. Made of a combination of finely ground India mica and glass with a potassium binder, Mycalex, according to the company, has a high dielectric strength, does not warp, can be machined and is not affected by oil or water. It is available in sheets, rods and washers.

Electrical equipment exhibited by Post-Glover Electric Co., Cincinnati, included locomotive transfer switches, starters, and steel resistances incorporating a new alloy giving greater capacity in smaller space.

Armature and field coils and electrical wires and cables of all types were shown by John A. Roebling's Sons Co., Trenton, N. J.

Miller cable connectors were offered by Sullivan Machinery Co., Chicago.

"Dual-Duty" combination splice bars and rail bonds, including a copper-beryllium model, were displayed by Bertrand P. Tracy Co., Pittsburgh, Pa.

Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., offered a new-type "Micarta" gearless vertical-axle cable reel; Type SK fan-cooled explosion-resisting motors; "De-ion" circuit breakers; Type CS splashproof motors; portable a.c. test sets; trolley wheels, shoes and poles; measuring and recording instruments; carbon brushes; trolley and feeder-line materials; and insulation materials.

Preparation for Blue-Ribbon Coal

PREPARATION equipment featured at the Cincinnati exposition ranged from complete plants down to single screening and crushing units. Allis-Chalmers Mfg. Co., Milwaukee, Wis., contributed a double-deck Style B centrifugal vibrator from its line of screening equipment.

"USS-18-8" stainless steel sizing and dewatering screens in various perforation were displayed by American Sheet & Tin Plate Co., Pittsburgh, Pa., and American Steel & Wire Co,, Chicago, featured its line of aerial tramways.

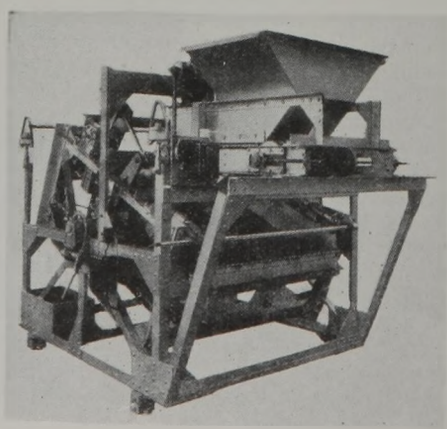
Columbia Alkali Corporation, Barberton, Ohio, offered "Col-Rec" for improving the clinkering qualities of coal.

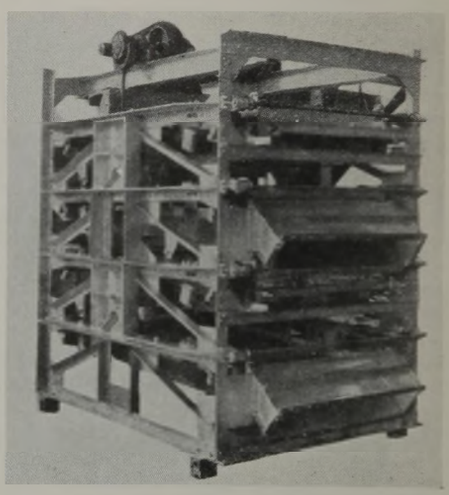
Use of the Leahy "No-Blind" vibrating screen with the Deister-Overstrom diagonal-deck coal-washing table and "Concenco" spray nozzles formed the exhibit of the Deister Concentrator Co., Ft. Wayne, Ind.

The "V-V" (variable-vibration) classifier and "V-V" screen were featured by Duquesne Slag Products Co., Pittsburgh, Pa. The classifier, according to the company, separates according to both density and shape of material without the aid of water, air or sand; cleans and classifies wet material; separates into two parts materials of different densities or different shapes, delivering one part at one end of the classifier and the other part at the other; separates or classifies material down to 20 mesh and up to 6 in.; makes complete separation in one pass without middlings; does not result in loss of fines; reduces power cost per ton of material handled in addition to being low in first cost; and can be adjusted in operation merely by turning a hand wheel and using a wrench.

Features of the "V-V" screen listed by the company include: variable vibration, kick and speed (325 to 900 vibrations per minute), adjustable while operating; variable length of stroke ($\frac{1}{4}$ to 1 in.) for each deck independently without changing eccentric shaft; controlled variable vibration on each deck, horizontal to nearly vertical, adjustable independently while operating; inclinations up to 20 deg.; adaptability to wet or dry materials from 100 mesh up; available in up to six decks in a single unit and up to twelve decks in a double unit; low headroom; low power consumption; large capacity per foot of screen area; adaptable to overhead suspension or floor mounting; lower and smaller screening buildings and shorter elevators possible; adjustments to meet changes in material made in a few seconds.

Duquesne Slag Products Co. "V-V" Classifier





"V-V" Multiple-Deck Variable-Vibration Screen

Sizing and dewatering screens, including perforated plates, lip, slot and milled slot screens, Perisertread screens and Weston testing screens, were offered by Hendrick Mfg. Co., Carbondale, Pa.

Jeffrey Mfg. Co., Columbus, Ohio, featured the Jeffrey diaphragm and Baum-type air-operated jigs; Jeffrey air launder; Jeffrey-Traylor vibrating screens, vibrating conveyors and "Conveyanscreens"; and Jeffrey "Flex-Tooth" and single-roll crushers.

Preparation services and refuse-disposal equipment, including hillside slate dumps, were stressed pictorially by Kanawha Mfg. Co., Charleston, W. Va.

Koppers-Rheolaveur Co., Pittsburgh, Pa., presented pictorially Rheolaveur coal washers, the Menzies cone separator (*Coal Age*, February, 1935, p. 59), Koppers-Birtley dedusters and Koppers-Waring dust collectors.

Link-Belt-Simon-Carves coal washer and "Electric Eye Auto-Constant" refuse-discharge control were featured by Link-Belt Co., Chicago, which also offered "Positive" self-aligning anti-friction idlers for troughed-belt conveyors, consisting of standard rolls mounted in an anti-friction pivotal-bearing frame carrying "actuating rolls" at each end. Gradual crowding of the belt sidewise, says the company, usually is corrected by swiveling of the idler. Sudden or continuous crowding in which the belt strikes the actuating roll results in immediate swiveling of the idler frame sufficiently to correct belt alignment.

"Black Diamond" coal crusher with automatic adjustment and "Steelstrut" toggle release for tramp-iron protection was presented diagrammatically by McLanahan & Stone Corporation, Hollidaysboro, Pa., now celebrating its 100th year of service.

McNally-Norton washer with automatic

reject control and McNally-Norton vertical pick breaker were featured by NcNally-Pittsburg Mfg. Corporation, Chicago.

Morrow Mfg. Co., Wellston, Ohio, offered a model of its standard shaker-screen unit for installation in existing structures.

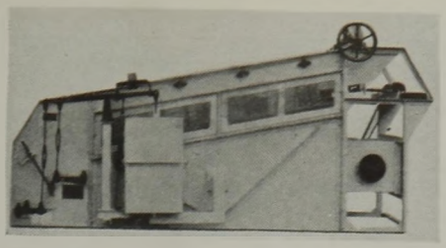
The Symons horizontal vibrating screen (*Coal Age,* January, 1935, p. 49) was demonstrated by the Nordberg Mfg. Co., Milwaukee, Wis.

The Stump "Air-Flow" combined coal cleaner and deduster was displayed by Roberts & Schaefer Co., Chicago. New features, it was pointed out, include a reciprocating feeder for steadier operation, enlarged cleaning area, simplified design and side windows to make the cleaning operation visible. The Roberts & Schaefer exhibit also featured the Wuensch "Differential-Density" separator, Menzies hydroseparator, and "Ro-Sieve" screen.

Included in preparation aids exhibited by Robins Conveying Belt Co., New York City, were the Chance sand-flotation coal-cleaning system, "Gyrex" screens, "Vibrex" screens (*Coal Age,* March, 1935, p. 139), "Super-Gyraloy" screen cloths, conveyor and elevator belts, belt idlers and belt-training idlers, and crushers.

John A. Roebling's Sons Co., Trenton, N. J., showed woven-wire cloths and screens in various types and materials for regular and special uses.

"Dustless-treating" oils for various services were offered by the Standard Oil Co. (Indiana), Chicago.



Stump Air-Flow Cleaner and Deduster

Models of the Redler continuous-flow conveyor-elevators (*Coal Age,* February, 1935, p. 77) and the air-sand cleaning system were exhibited by Stephens-Adamson Mfg. Co., Aurora, Ill., which also offered conveyor rolls and pictorial views of other preparation services.

Coalkotes "A" and "B" (water-emulsifying) and "C" and "CB" (non-freezing) for dustproofing coal were exhibited by Sun Oil Co., Philadelphia, Pa.

Type 400 Tyler and Type 300 Tyler-Niagara screens were shown by W. S. Tyler Co., Cleveland, Ohio, which also offered the "16 to 1" reducer for facilitating sample reduction and Tyler folding-frame sliding sieves for occasional testing of large samples where only one or two separations are required. Over-all dimensions of the sieves are 6½x26¼x24½ in. Weight of the unit is 100 lb.

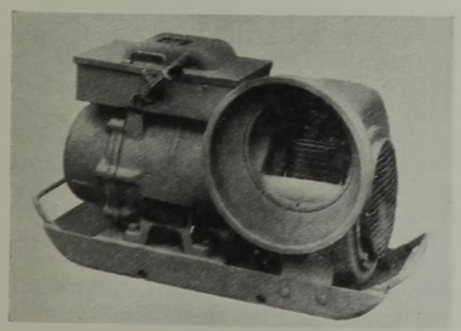
Materials Back Up Safety Work

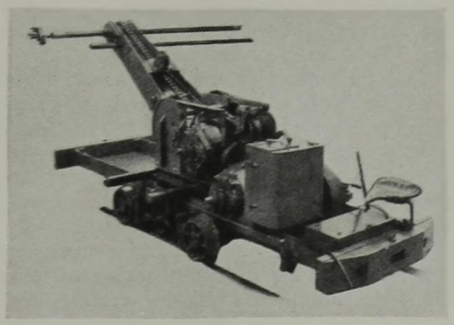
SAFETY MATERIALS, products and equipment constituted a major feature of the 1935 exposition, with twenty manufacturers exhibiting items in this classification. Three grades of non-inflammable jute and the same of duck brattice cloth were offered by American Brattice Cloth Co., Warsaw, Ind., as well as four grades of "Mine-Vent" tubing and tubing couplings.

Atlas Powder Co., Wilmington, Del., showed "Accordion-Fold" safety blasting caps and the new "Blakstix" divisible cartridge designed for separation by hand into various lengths down to quarters without cutting or unwrapping, each part remaining in the original wrapper. An additional feature is the perfected end crimp with special waterproofing, the company announces.

The new "Brownie" tubing blower was shown by Brown-Fayro Co., Johnstown, Pa., which stated that it will supply four to seven men and will develop sufficient pressure to force this air through long lines of tubing. Lightness and compactness are additional features noted, and tubing adaptors (for 8-, 10- and 12-in. tubing) have been designed to eliminate hooks or clamps to hold the tubing in place.

"Brownie" Tubing Blower, Brown-Fayro Co.
Joy Hitch Drill





Joy Hitch Drill

High explosives were featured by Burton Explosives Division, American Cyanamid & Chemical Corporation, Cleveland, Ohio; blasting powder by American Powder Division, Maynard, Mass.; and blasting accessories by General Explosives Division, Latrobe, Pa.

Permissible explosives, blasting materials and supplies and the new "Nitramon" explosive for quarry and strip-mine work (*Coal Age,* March, 1935, p. 140) were featured by E. I. duPont de Nemours & Co., Inc., Wilmington, Del.

The "Seal-Tite" dummy bag, Tamping Bag Co., Mt. Vernon, Ill., was shown by Flood City Brass & Electric Co., Johnstown, Pa. The major feature of this tamping bag, according to the manufacturer, is a seam which will not open in the presence of moisture. In fact, it is stated, the bag itself, available in any size or weight of paper desired, will give way before the seam.

Explosives and blasting supplies were the theme of the exhibit of Hercules Powder Co., Wilmington, Del.

International Business Machines Corporation, New York City, offered a master clock operating secondary clocks, program bell system and card recorders, and in addition displayed a "Yes" and "No" recorder with a signal system requiring someone in authority to approve a time card punched "Yes" by an injured man, thus insuring adequate records and attention to injuries.

"Aerovane" mine fans of the 4-ft. single-stage and 8-ft. double-stage types were shown by Jeffrey Mfg. Co., Columbus, Ohio.

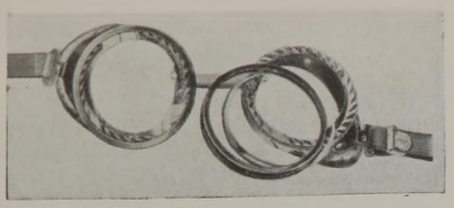
The new Joy hitch drill for timbering without legs was offered by Joy Mfg. Co., Franklin, Pa. With this machine, holes are drilled on opposite sides of the place to receive crossbars. Bars are installed by slipping one end to the bottom a 3-ft. hole, for example, and then pulling them back until they strike the bottom of the opposite 18-in. hole. Increased safety and decreased timbering cost are major features claimed.

In addition to all-leather safety shoes with steel toe boxes and other safety footgear, Lehigh Safety Shoe Co., Allentown, Pa., offered the new Lehigh all-rubber miner's pac with hard-rubber composition safety toe box vulcanized in place and genuine leather insole stitched in the pac to stop perspiring of the feet and, it was stated, prevent the rolling of the insoles frequently encountered in rubber footwear. In a compression test, according to the company, 250 lb. was required to compress the toe box sufficiently to pinch the great toe.

Lorain timber jacks and collapsible mine posts were featured by Lorain Steel Co., Johnstown, Pa.

Mine Safety Appliances Co., Pittsburgh, Pa., offered a new continuous methane recorder consisting of an M-S-A indicating element with recording device attached. The instrument is arranged for sampling one or several splits of air at one time and is equipped with an alarm bell which rings when the methane content reaches any predetermined point. Other M-S-A equipment included: the "ComfO-Cap (*Coal Age,* April, 1935, p. 179), Skullgards of

Lehigh Miner's Pac, Showing Safety Toe Box and Leather Insole



"Duralite-50" Chemical Goggles, American Optical Co.

all types, the ComfO respirator, safety shoes, Model K Edison electric cap lamp, first-aid kits and materials, Burrell all-service gas masks, McCaa oxygen apparatus, car stops, knee pads, safety shotfiring equipment, self-rescuers and American Optical Co. goggles, including the new Duralite-50 chemical goggle, described as effectively ventilated but giving protection from splashes of dangerous liquids and flying particles.

Features outlined for the Duralite-50 goggle include: eyecups molded to fit snugly the contour of the face and prevent entrance of liquids; air circulation through slots in the lens rings, radial slots in the eyecups and perforated side shields; solid baffle plate back of the side shield flared out on the edge nearest lens, permiting air circulation but isolating the eye from splashes; "Super Armorplate" case-hardened lenses for maximum protection from impact; and adjustable rubber-covered ball-chain nose bridge and adjustable one-piece headband.

Wheat electric cap lamps with side-cord outlet (*Coal Age,* March, 1935, p. 140), the "cafeteria" charging system, Koehler flame safety lamps, Franklin leather and Goodrich rubber safety footgear, standard and southwester-type "Cool-Caps," removable safety toe guard for shop work and Wilbur fire extinguishers were displayed by Portable Lamp & Equipment Co., Pittsburgh, Pa.

Robinson Ventilating Co., Zelienople, Pa., offered a man-cooling fan for hoisting engineers, mine-locomotive blowers, tubing blower with splashproof motor and a steel air-lock door for preventing leakage and loss of air underground.

Goggles were the major display of Safety Equipment Service Co., Cleveland. Ohio, including the 50-S "Drednaut" and "Super-Drednaut" types with new non-rubber (ball-chain and spring) adjustable headbands. Leggings, gloves, respirators, gas masks, welding masks and other safety equipment rounded out the exhibit.

In addition to its safety car-retainer (*Coal Age,* April, 1935, p. 179) and new blasting reel designed for carrying on a shoulder strap and with a handle shorting the cable as long as it is closed—an automatic safety feature—Safety First Supply Co., Pittsburgh, Pa., offered the "Justrite" trip lamp (*Coal Age,* March, 1935, p. 140), Bullard first-aid material and sirens, and Willson goggles and respirators.

Safety Mining Co., Chicago, featured the Cardox system of breaking down coal.

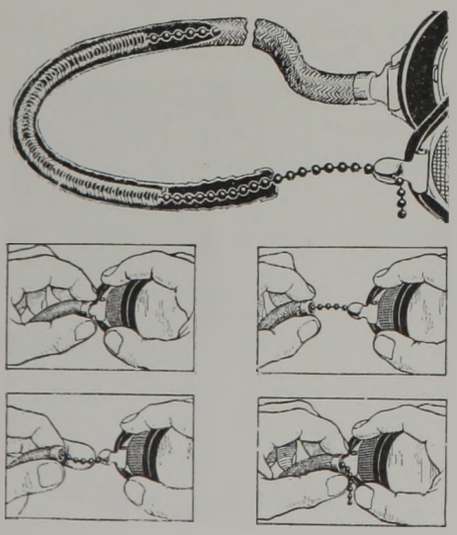
The Airdox "shooting" system was presented by Sullivan Machinery Co., Chicago.

A pictorial exhibit of safety, health, investigation and research services was the contribution of the U. S. Bureau of Mines.

Utility Mine Equipment Co., St. Louis, Mo., demonstrated the "Umeco" rail clamp and "Umeco" car stop for underground service. The clamp is designed primarily for locomotive use and weighs 8 lb. Weight of the stop is 3½ lb.

Two types of powder and detonator boxes—one with lift and the other with sliding lid—were exhibited by Watt Car & Wheel Co., Barnesville, Ohio. These boxes consist of a steel case, layer of asbestos and a wooden lining to hold the explosive or detonators. Capacity is 50 sticks of 1⅛-in. powder, and the boxes, according to the manufacturer, are short-proof, fireproof and moisture proof. The lid on the lift-lid type falls shut automatically when released.

Ball-Chain and Spring Headband Applied to Safety Equipment Service Co. Goggles



Keeping Equipment Efficient

MAINTENANCE and repair of coal-mining equipment was the theme of a number of exhibits at the Cincinnati exposition. Ahlberg ground bearings, CJB "Master" self-aligning ball bearings with solid-bronze retainers, and "EC" type light-duty pillow blocks were presented by Ahlberg Bearing Co., Chicago.

Alemite Corporation, Chicago, showed the Alemite mine-car lubricating system for delivering grease directly from container to wheel by electrically driven dispensers and mine-car guns. Features outlined include: pumping capacity of 15 lb. per minute, saving labor; adaptability to metering of lubricant, preventing waste; and adequate lubrication, reducing power for haulage. Other Alemite lubricators and lubricants rounded out the display.

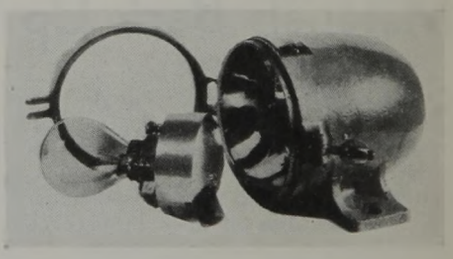
The Fafnir ball-bearing mine-car wheel was the chief item displayed by Fafnir Bearing Corporation, New Britain, Conn., which also exhibited locomotive-size replacement bearings, bearings for other mine applications and ball-bearing pillow blocks for mine fans.

Replacement parts for locomotives and mining machines, Ahlberg bearings, bronze pump impellers and Linde welding rods were shown by Flood City Brass & Electric Co., Johnstown, Pa.

Gulf coal mining and industrial lubricants were shown by Gulf Refining Co., Pittsburgh, Pa., which stressed new "Precision" greases for high-temperature conditions such as mine-locomotive armature bearings. Precision greases, it is stated, do not melt or separate at high temperatures and have exceptionally high resistance to oxidation.

In addition to other mining greases, Hulburt Oil & Grease Co., Philadelphia, Pa., offered the new 320 grease for inclosed gear boxes, which the company states, increases in density upon being agitated.

Renewal parts were featured by Jeffrey Mfg. Co., Columbus, Ohio. Included was the new Class 21 open-type headlight for inexpensive medium-weight service where good diffusion and reasonably long projection are desired. Weight is approximately 18 lb., and the headlight uses a 94-watt concentrated-filament lamp in a parabolic sheet-brass reflector chromium-plated and polished. Length is 8 5/16 in.; width of base, 8⅛ in. Other Jeffrey items included: Class 29 permissible headlight for track cutters; field coils; 35-B or BB gearing; locomotive blowers; C.S.S. mining-machine resistances; progressive series-parallel contactor-type control for main-line haulage; Class 33, 34 and 37 controllers; heavy-duty motor-driven cable reels; trolley poles; continuous steel strip resistances for locomotives; renewable-rim, split and solid locomotive gears; rolled-steel gear cases (three-piece construction for diagonally split field frames); steel-insert brake shoes; transfer switches for locomotives;



Jeffrey Class 21 Headlight

Class 11 contactors for gathering service; ground-potential control for gathering and haulage locomotives; hot-pressed armature coils; trolley harps and sockets, and anti-friction motor wheel and axle assemblies.

Keystone mine lubricants were stressed by Keystone Lubricating Co., Philadelphia.

Mine-car wheels with M-R-C double-shield "Lubriseal" ball bearings were featured by Marlin-Rockwell Corporation, Jamestown, N. Y., which pointed out the following: individual bearings permanently sealed, inclosed and lubricated by manufacturer, providing protection during handling; liberal grease space between bearings filled during assembly to provide gradual additional lubrication; inner race positively and tightly clamped endwise by locknut; nut tight on thread so that it cannot readily loosen; inner bearing outer race clamped tightly endwise to take thrust in both directions without adjustment; wheel and end cap in single piece, making outside permanently dust- and water-tight; assembly adaptable to removal of wheel from outside without disturbing bearings, thus preventing entrance of dirt.

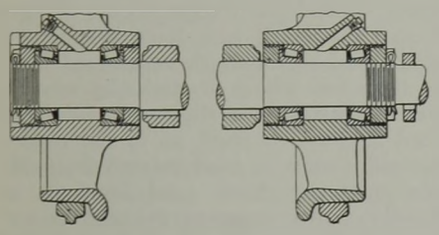
New Departure Mfg. Co., Bristol, Conn., stressed mine-car wheels and conveyor rolls equipped with "N-D-Seal" permanently sealed lubricated-for-life bearings.

In addition to ball and roller bearings and pillow blocks, Norma-Hoffman Bearings Corporation, Stamford, Conn., displayed a mine-locomotive motor with deep-grooved ball bearings with solid-bronze retainers at the commutator end for thrust in either direction and a standard bronze-retainer straight roller bearing at the pinion end for heavy radial loads. The roller bearing, it was emphasized, allows for expansion and contraction of the shaft, as well as inaccuracies in the distance between shoulders. Outer race is clamped in place, eliminating the possibility of pounding in service, with consequent peening of the housing requiring replacement of the bearing housing or framehead.

Penn Machine Co., Johnstown, Pa., offered examples of renewal parts for mining machines and locomotives.

Oils and greases, including "Poco" journal oil in various weights as a cheaper and equally satisfactory substitute for liquid greases, were offered by Pure Oil Co., Chicago.

SKF ball and roller bearings for mining applications comprised the exhibit of SKF Industries, Inc., Philadelphia, Pa.



Combined Nut and Lip Seal Applied to Tyson Cageless Tapered-Roller-Bearing Mine-Car Wheel

Mining lubricants, both oils and greases, were offered by the Standard Oil Co. (Indiana), Chicago.

Oils and greases for coal-mine use featured the exhibit of the Sun Oil Co., Philadelphia.

Texas Co., New York City, displayed "Texaco" mining greases.

Industrial lubricants, including "Green Cast" mine-car greases, were offered by the Tide Water Oil Co., New York City, which stressed its transformer oil service.

Application of Timken tapered roller bearings to various types of mine-car wheels and Timken tapered roller bearings for other mining and industrial applications were stressed by Timken Roller Bearing Co., Canton, Ohio.

Gears and pinions for mining machines, locomotives, loading machines and coal saws were featured by Tool Steel Gear & Pinion Co., Cincinnati, Ohio., in addition to the "K-B Redi-Set" bit wrench with a safety guard also serving as an automatic bit gage.

Bertrand P. Tracy Co., Pittsburgh, Pa., included gears and pinions for mining machines and locomotives in its exhibit.

Tyson Roller Bearing Corporation, Massillon, Ohio, offered a combined nut and lip seal and a labyrinth seal for Tyson cageless tapered roller bearings for mine-car wheels; either lip or labyrinth construction in the combined bearing nut and seal, designed primarily for stub-axle service. Advantages, according the company, are: stub- and extended-axle service—stronger construction resulting from shorter distance between axle supports, saving of 1 and 2 in. in axle length, use of one piece instead of two, and lower cost; through axles—elimination of hub caps and occasional hub-cap difficulties, cotterpin in plain view for inspection, thread same size as bearing bore, elimination of cap, bolts and lock and nut washers, and lower cost. The Tyson labyrinth seal, it is stated, is offered for use where operating conditions are severe, definitely establishing a permanent lubrication level in addition to forming a baffle against loss of lubricant. It is interchangeable with the standard lip seal and use does not require change in standard recommendations.

"Tulc" mining lubricants were featured by Universal Lubricating Co., Cleveland.

Coal-Mining Aids Smooth Operation

POWER-TRANSMISSION equipment, wire rope and other specialties were offered by a number of exhibitors at the Cincinnati exposition. Allis-Chalmers Mfg. Co., Milwaukee, Wis., displayed Texrope drives and sheaves, including the new variable-speed sheave giving a maximum speed variation of 20 per cent on each pulley, or 40 per cent per drive. "Ro-Twin" rotary air compressors were another new Allis-Chalmers product. Extreme compactness, according to the company, makes this compressor and the companion single unit adaptable for portable mine units and other applications where space is limited.

Keystone copper-steel culverts, siding and roofing sheets and other types of sheets were featured by American Sheet & Tin Plate Co., Pittsburgh, Pa., a subsidiary of United States Steel Corporation; wire and wire rope products and fittings, American Steel & Wire Co., Chicago; fences and fence materials, Cyclone Fence Co., Waukegan, Ill.; and "Multigrip" floor plates, Illinois Steel Co., Chicago.

"Teletypewriter" communication was featured by American Telephone & Telegraph Co., Cleveland, Ohio.

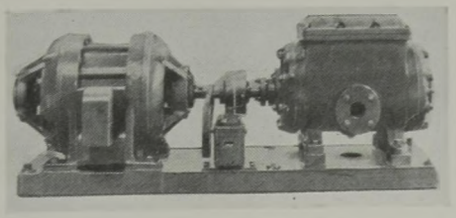
Steel and iron castings and two small domestic stokers were displayed by Duncan Foundry & Machine Works, Alton, Ill.

"Ground-Grip" traction tires for stripping work were shown by Firestone Tire & Rubber Co., Akron, Ohio, which noted the following advantages: tremendous grip, reducing slippage and loss of power; high resistance to clogging and smooth riding without bumping on highways.

Hazard Wire Rope Co., Wilkes-Barre, Pa., offered Keystone standard and "Lay-Set" preformed wire ropes, wire-rope fittings, "Korodless" stainless steel wire ropes (preformed) for industrial applications where corrosion is a factor and preformed "Spring-Lay" rope, consisting of preformed strands of galvanized-wire rope interlaced with specially treated manila strands, said to retain the good features of both steel and manila cables without their faults.

"Meehanite" metal castings for various purposes were offered by Kanawha Mfg. Co., Charleston, W. Va.

Allis-Chalmers "Ro-Twin" Air Compressor, 150 C.F.M., 100 Lb. per Square Inch Gage, 40-Hp. Induction Motor



Firestone "Ground-Grip" Tires in Service on Trailer Unit in Strip Pit

Hercules "Red Strand" wire ropes and Leschen aerial tramways were featured by A. Leschen & Sons Rope Co., St. Louis, Mo.

The Link-Belt P.I.V. variable-speed power-transmission unit, speed reducers and the Link-Belt domestic stoker were demonstrated by Link-Belt Co., Chicago.

Macwhyte Co., Kenosha, Wis., was represented by a full line of Macwhyte internally lubricated preformed wire ropes.

Brass and bronze valves were included in the exhibit of the Ohio Brass Co., Mansfield, Ohio.

Princeton Foundry & Supply Co., Princeton, W. Va., displayed the "Perfection" cone-stove sand dryer.

"Enduro" stainless-steel plates and shapes and "Toncan" copper-molybdenum iron products were offered by Republic Steel Corporation, Youngestwn, Ohio.

Roebling "Blue-Center" wire ropes, steel rope slings, flat wires and rope fittings, including the "NO-Pinch" wedge socket, were displayed by John A. Roebling's Sons Co., Trenton, N. J.

Streeter-Amet Co., Chicago, demonstrated the Streeter-Amet Type MT-14 weight recorder in gravity weighing of mine cars and explained also application of the recorder to weigh pans and baskets and to weighing cars coupled in trips.

Toledo Scale Co., Toledo, Ohio, exhibited a mine-car printing scale and featured the Toledo "Printweigh" with selective numbering system for printing on a tape all necessary information for a complete record of each car.

Treated timbers and treating materials formed the exhibit of the Wood Preserving Corporation, Pittsburgh, Pa., which also stressed termite protection.

Other equipment manufacturers and distributors represented at Cincinnati included Coal Mine Equipment Sales Co., Terre Haute, Ind., and Fairmont Mining Machinery Co., Fairmont, W. Va.

NOTES

. . . from Across the Sea

TESTIMONY as to silicosis, bronchial pneumonia and bronchitis in regard to the health of miners is extremely contradictory. Some say silicosis comes only from ingested free silica; some declare it comes from ingested combined silica also, or from it alone, and some are urging that bronchitis lays the ground for silicosis and that the disease may then be developed in the presence of an excess of dust of any kind, but with greater rapidity with some dust than with others. Some say that bronchitis prevents the lungs from disposing of dust, and one authority believes that bronchitis helps to rid the system of the dust it admits.

Coal dust, declared S. W. Fisher, (British) medical inspector of mines, in an article read before the Institution of Mining Engineers recently, is eagerly devoured by phagocytes—those dirt-and-harmful-bacteria-eating blood corpuscles by which the blood and tissues of the body are kept clean. This—and the fact that most of the coal-dust particles in the mine air are so large that they cannot enter the air cells of the lungs—prevent coal miners' lungs from being choked with dust. Silicotic fibrosis, said Dr. Fisher, is not due to the angularity, hardness or other physical properties of the dust but to the solution of the particles in the lung and to the harmful substances thus formed. Using only an X-ray film, an accumulation of dust in the lung cannot be distinguished from a massive silicosis with tuberculosis thereto added.

Some of the early inquests on deceased coal miners believed to be silicotics showed that many of the men were non-tubercular; in most cases the upper lobes of the lungs were affected; smooth cavities were often seen, and death in many instances was due to heart failure and not to tuberculosis. Later it was found that most of the coal miners who were declared to have died of silicosis were from South Wales mines. Of the records of about 40 deaths outside South Wales only one was that of a man who had never used a drill, and this man was shown by the post-mortem examination to have suffered from inflammation of the mitral valve of the heart and aorta, but a pathologist reported the presence of a sufficiently severe degree of anthracosis and silicosis to cause respiratory symptoms, stating however, that it was not possible to say that this was the cause of death.

Rock-dusting can hardly be the cause of silicosis, said Dr. Fisher, because many of the cases come from anthracite mines, which are not rock-dusted. Nor, he added, do statistics show that the disease is associated with rock drilling. Though South Wales has one-quarter of the whole number of mechanical picks and drills used in Great Britain's coal mines for other purposes than getting coal, it had nearly 90 per cent of the cases of silicosis. In the Swansea division particularly, the mechanical picks and drills used for other purposes than getting coal were only 5 per cent of those used in the whole of Great Britain, yet the number of silicosis cases was 54 per cent of those incurred by coal miners throughout the country. Statistics presented by Dr. Fisher also showed that, even at anthracite mines, the relation between the use of drills in hard ground and the occurrence of silicosis varied considerably.

However, it may be commented that few, if any, claim that drilling and picking in all kinds of rocks will cause silicosis or do it as speedily in one class of rock as in another. Consequently, a comparison between number of drills and number of certified cases of death from silicosis proves nothing unless the kind of rock, the medical particulars of the men who drill and the quality of the ventilation, as indeed Dr. Fisher affirms, are considered. Apparently, in South Wales, the rock becomes more favorable to silicotic affection toward the west.

Men being hauled from work long distances against the current of cold air passing down the slopes in anthracite mines—journeys taking 15 to 20 minutes—were taking great respiratory risks, said Dr. Fisher, and it has been suggested that the chilling from such journeys gives rise to bronchities, which in turn breaks down the natural mechanism by which dust is eliminated from bronchial tubes and lungs. Dr. Fisher quoted also the experiments of Dr. Irwin, of Toronto, Canada, which convinced the latter that the fine bronchial tubes may be damaged by the breathing of small quantities of gases, such as sulphur dioxide and nitrous oxide, which are liberated from the firing of shots. With this dust-eliminating mechanism impaired, dusts that are normally not hazardous, either because of the rapidity with which they are removed or because of their low silica content, tend to accumulate and may produce fibrosis with consequent diminution of the efficiency of the lungs. The facts led Dr. Fisher to believe that the "non-industrial" history of a youth who intends to work in dusty parts of a mine, such as at the end of a conveyor, in a rock heading or at a face being cut by machine should be given careful consideration, because bronchitis and broncho-pneumonia may facilitate the entry and retard the exit of fine dust particles.

Quoting the work of three groups of experienced doctors working under the auspices of the Welsh National Memorial Association, Dr. Fisher said that "industrially healthy" South Wales coal miners when examined by X-rays gave evidence of fibrosis of the lungs, which, in general, increased with the time each person had worked in the mines and which was most marked among men working in the anthracite field (where the mines are not rock-dusted). Coal hewers of 45 years and over, especially those in the western group of Welsh mines, had more bronchitis, it was shown, than the average of all occupied and retired males in the region. Coal hewers experience an excess death rate from pneumonia from ages 45 to 75. In Glamorganshire and Monmouthshire (eastern counties of South Wales) the excess occurs at ages 65 to 75. Death rate from respiratory tuberculosis is no higher for coal hewers than for others, though the western coal hewers have a slight excess. (The word "hewer" is used, as in the report, because it may be used only to designate men bringing down coal and not as broadly as we customarily use the expression "miner.") Radiological and clinical examinations of coal trimmers by doctors of the Medical Research Council showed that, despite their exposure to large quantities of anthracite dust, they had no disability attributable to dust.

In discussion, Prof. J. S. Haldane reiterated his belief that silicosis occurred only when men had worked in highly siliceous rock. Lung affections which simulated silicosis were primarily bronchitis or ordinary phthisis, and collections of dust with such extra fibrosis as found in post-mortem or X-ray examinations were due to paralysis of the normal process of elimination resulting from bronchitis. But Prof. E. H. Kettle denied that any evidence pointed to chronic bronchitis as interfering with dust elimination. Rarely did bronchitis change the lining of the small and large bronchioles in the lungs, even in those who had suffered from that affection for years. The pronounced secretion of mucus accompanying bronchitis entangles dust on the walls of the bronchioles, and continued expectoration keeps the lung clean. Dr. W. R. Jones declared that in Kent the miners were hoisted in shafts, a relatively short trip, but silicosis had developed nevertheless, as indeed he had predicted after finding that the rocks were petrologically similar to those in Somersetshire.

Sericite, declared Prof. J. S. Haldane, like other silicates, seems to protect the lungs from the effects of quartz, judging by the Toronto experiments. That silicate, according to Dr. W. E. Cooke, was present in large quantities in the mudstones and shales of Lancashire

mines, and, as in many mines shale dust was applied, sericite was constantly present in the mine atmosphere, yet there was no silicosis among Lancashire miners. Only the men employed in drilling rock containing free silica were affected with silicosis. Examination with nitric-acid extracts of lungs revealed in these cases not only numerous fibers of sericite but also minute quartz particles, which proponderated numerically. Quartz was known to be soluble and a potent protoplasmic poison, and it was found in the colloidal state in silicotic lungs. Sericite played no part at all in the production of silicosis. Dr. Cooke had seen but one case of silicosis in a miner who had not been employed in drilling rock, so far as could be ascertained from his meager industrial history. This man had always suffered from complete obstruction of his nose; he was a true mouth breather and had worked in a hot, dusty mine where sandstone was abundant.

R. Dawson Hall

On the ENGINEER'S BOOK SHELF

Requests for U. S. Bureau of Mines publications should be sent to Superintendent of Documents, Government Printing Office, Washington, D. C., accompanied by cash or money order; stamps and personal checks not accepted. Where no price is appended in the notice of a publication of the U. S. Bureau of Mines, application should be directed to that Bureau. Orders for other books and pamphlets reviewed in this department should be addressed to the individual publishers, as shown, whose name and address in each case is in the review notice.

Banded Ingredients of No. 6 Coal and Their Heating Values as Related to Washability Characteristics. Also Preliminary Report on Unit-Coal Specific-Gravity Curves of Illinois Coals, by L. C. McCabe, D. R. Mitchell and G. H. Cady. Reports of Investigations No. 34, University of Illinois, Urbana, Ill. 61 pp.

Two features seem to the reviewer as most interesting in this report: (1) the suggestion that in estimating the losses of washing the waste in thermal units should be considered rather than the loss in weight; (2) that the washing of coal produces a separation from the mass being washed of the various petrographic constituents; that is, with ordinary washing the coal washed at 1.30 specific gravity will consist, in a specific case, of 71.3 per cent vitrain, whereas the fractions between 1.35 and 1.70 per cent contain 91.7 per cent of the clarain. Much of the fusain appears in the minus 48-mesh material, which in the investigation was not tested by the float-and-sink method. Thus ordinary washing produces many of the petrographic separations obtainable either by flotation or by the flailing of the coal with revolving arms accompanied by screening. Mining the coal so breaks it down as to assist in separation of the four petrographic constituents—vitrain, clarain, durain and fusain—vitrain shattering into smaller fragments than clarain and durain, and fusain falling into the smallest of sizes.

In reference to the losses in washing, it was found that in cleaning the coals of the southwestern Illinois group to about 8 per cent ash, the average tonnage recovery was 87 per cent. The thermal recovery, however, was 94.2 per cent, and the heat value of the coal was increased to 12,671 B.t.u. (dry), as compared with 11,704 for the uncleaned coal, with improvement in the fuel by ash and sulphur removal. The cleaned coal had 8.3 per cent more heat than the uncleaned coal.

Cleaning the coals in the southern Illinois group to obtain a 90 per cent recovery provides a coal with 6.4 per cent ash, and 94 per cent of the thermal values is recovered.

In general, only 25 per cent of the total sulphur can be eliminated in southwestern Illinois coals by washing when cleaning with 85 to 90 per cent recovery, and in the southern group the sulphur can be expected to be only slightly reduced by mechanical cleaning.

Photographic cuts are shown of coal cleaned at various specific gravities. Micrographic sections follow, which show the type of coal obtained by this method of fractionation. The concluding paper is one that was read at the New York meeting of the American Institute of Mining and Metallurgical Engineers, February, 1934, but not published, being reserved for use in this report.

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Engineering Surveys, by H. Rubey. Macmillan Co. 428 pp., 4½x7¾ in. Price, $3.

Thoroughly practical in all phases, this new member of the Engineering Science Series will prove valuable to the mine surveyor, though surveys of mines get in it, of course, only the most incidental treatment. But mine surveyors quite generally overlook details which make for accuracy. Surveyors, for instance, are likely to overlook the errors which arise from the curvature of earth and refraction in taking long sights. The resultant error with average refraction, the author points out, is almost 7 in. in sighting a mile and increases as the square of the distance. To prevent abnormal refraction, he recommends that sights be taken on cloudy days or in the middle of the afternoon on sunny days when ground and air are uniformly warm, particularly if long sights are taken. On rare occasions, refraction may reach 0.1 ft. in a 200-ft. sight. Errors in adjustment and the adjustment of instruments are given careful treatment. However, the author says nothing about the operation of instruments over boggy ground or ground with buried roots and rubbish or frozen ground. Engineers seem a long time learning that accuracy can rarely be even reasonably attained without erecting the instrument on stakes driven several inches into the ground.

The volume discusses measurement of distances; field notes; compass surveys; leveling; transits; adjustment and care of instruments; the meridian; stadia surveys, topography; triangulation; land, route, area and city surveys; office work; computation; organization and costs. It also contains 100 pages of tables and formulas, which perhaps are better when bound separately because the surveyor who knows his profession does not want to lug such a manual into the field or use it on his drafting table. —R. Dawson Hall.

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The Ignition of Firedamp by Broken Electric Lamp Bulbs; the Appearance of the Filaments, by G. Allsop and R. V. Wheeler. Safety in Mines Research Board (British) Paper No. 89. British Library of Information, New York, N. Y. 15 pp. Price 33c.

Is there any way to determine whether a broken electric lamp might have ignited gas or was out before the firedamp reached it? The authors believe from experiments that there is such a way. Experiments with 2-volt vacuum and 4-volt gas-filled bulbs showed that tungsten filaments which had been broken (1) by a blow when cold, (2) by normal deterioration, or (3) by deterioration due to overcharging could readily be distinguished by their uniformly bright appearance and steel-gray color from filaments which had burned out in air or in firedamp.

The appearance of a filament which had burned out in air was not much different from that of one which had burned out in firedamp and had ignited it. Each had a yellow or greenish yellow deposit of oxide of tungsten on its supports. The ends of the filament at the gap where it had burned out in either case usually were pointed, but if the lamp was running at a voltage below that for which the lamp was intended, and if consequently it had remained glowing for some time before burning out, a thick accumulation of oxide of tungsten might incrust and so hide the pointed ends.

OPERATING IDEAS

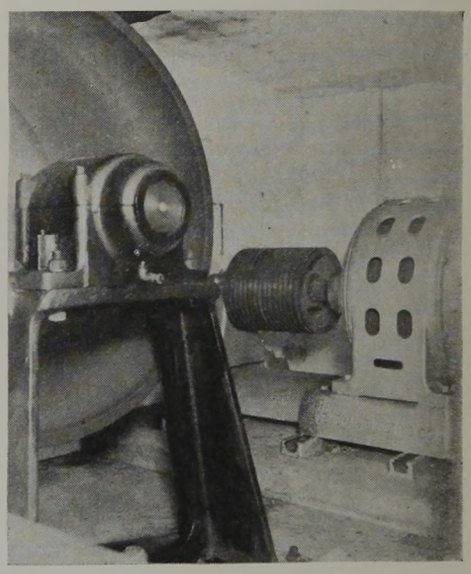
From Production, Electrical and Mechanical Men

Coal's Largest Synchronous Fan Motor Effects Savings of $1,000 Per Month

INVESTMENT will be offset within a year by savings effected through use of a 600-hp. synchronous motor recently installed to drive the 12x5-ft. fan at No. 1 mine of the Pond Creek Pocohontas Co., Bartley, W. Va. The saving, approximating $1,000 per month, is a power-factor bonus, or discount, on the bill for power which the company purchases through one metering point to operate its three mines. Power factor now averages unity (100 per cent) instead of about 85 per cent, which is the "no-discount no-penalty" base in the "Large Mine Power" rate schedule applying. This synchronous motor is the largest that has been installed in a coal-mine ventilating fan in the United States.

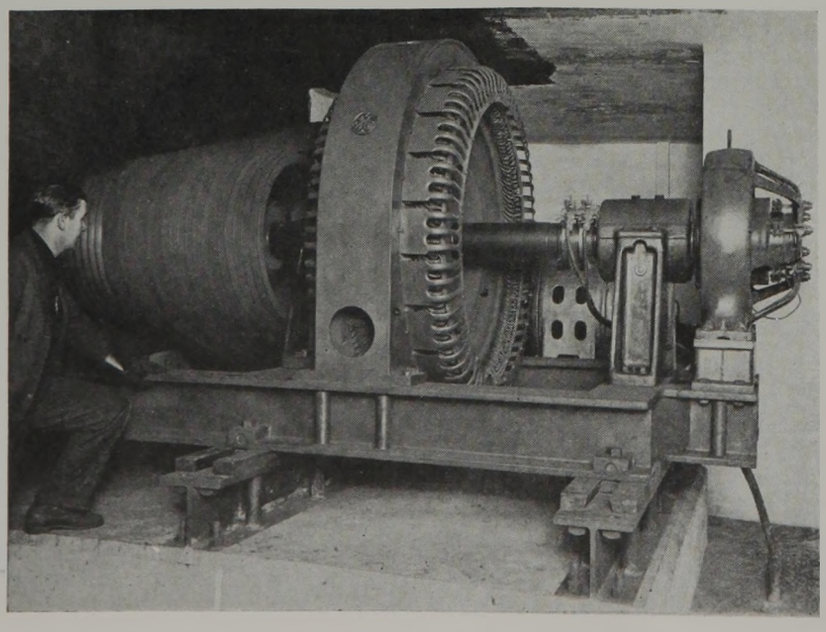
Before the change the fan was driven by a single-cylinder slide-valve engine operating non-condensing and supplied with steam by a plant consisting of four 140-hp. hand-fired horizontal-return-tubular boilers. A 300-hp. slip-ring induction motor connected to the purchased-power line constituted a standby drive. In addition to that required for fan operation the only other steam load was heating a few buildings, but there was urgent need for heating intake air to prevent ice accumulations in the skip and auxiliary shafts.

To supply steam for shaft heating would require adding to the boiler capacity or relieving the plant of the fan load. The latter, which was the plan followed, would allow complete shutdown of the boiler plant for seven or eight months of the year and thereby effect large savings in labor and fuel.



The Old Standby Motor Is Continued in that Duty.

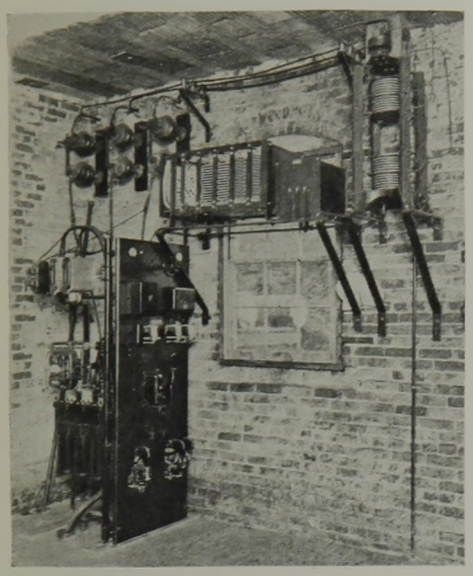
Driving the Fan and Correcting Plant Power Factor.



In accordance with a calculated reactive kilovolt-ampere requirement necessary to increase average power factor to unity, a motor of the following ratings was installed: 600-hp. 0.8 power factor leading; 360 hp., 425 kva. leading. This motor, built by the General Electric Co., is described as follows: Type TS, Form AL, 2,200 volts, 157.5 amp., 3-phase, 60 cycles, 450 r.p.m. A 10-kw. shunt-wound direct-connected exciter generates 125 volts, and the field currents for the two ratings of the motor are 48.4 and 58 amp., respectively.

Starting is across-the-line, and the equipment, a semi-automatic panel, also was furnished by General Electric. The 2,200-volt oil switch is closed manually, but the field excitation is applied automatically when the motor reaches constant speed.

Mechanical connection to the fan is by twenty V-belts each 1½ in. wide, and the pulleys have sufficient extra grooves to allow adding seven more belts if changed conditions should warrant. Diameters are: motor pulley, 34½ in.; fan pulley, 79 in. The 300-hp. induction motor which con-



Starting Panel, Field Rheostat and Lightning Arrester.

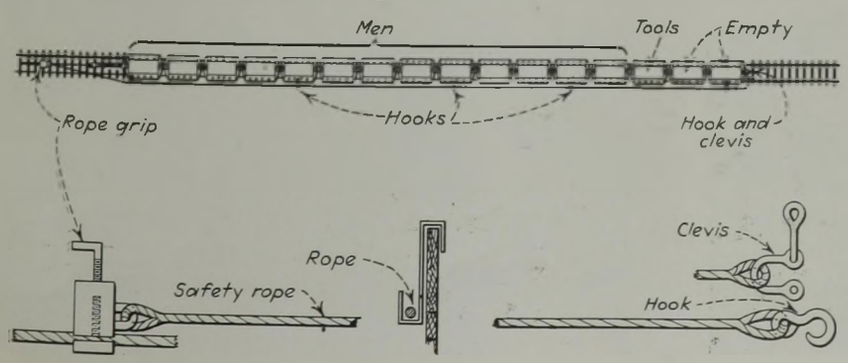
tinues to serve as a spare motor for the fan is equipped with a 15-groove pulley. To change the drive to this spare requires shifting the belts by removing the pedestals of the outboard pulley bearings of both motors.

The fan operates at 192 r.p.m. and delivers 285,000 cu.ft. of air against a pressure of 5.3 in. water gage. Motor input averages 274 kw. (367 hp.), the monthly energy consumption is 197,000 kw.hr. and the cost of the power is approximately $2,000 per month. This cost is offset for the most part by the fuel and boiler-room labor savings. A reduction of somewhat over $1,100 per month in the net cost of the block of power equivalent to that used at the three mines before the fan load was added represents the benefit of power-factor correction and is largely net gain.

Safety Rope Laid in Hooks On Sides of Cars

To facilitate the attachment of safety ropes on man-trips on slopes, Burrell L. Curry, Wyano, Pa., suggests the use of hooks on the sides of the cars, as indicated in the accompanying sketch. Using the hooks, two can attach or detach a safety rope in only a few minutes. The safety rope, Mr. Curry points out, may be selected from the best part of a discarded haulage rope, and should be cut about 20 ft. longer than the usual trip length so that an exact number of cars will not be required. A strong hook or clevis should be employed to attach the rope to the end of the trip opposite the hitching.

Hooks to Hold the Safety Rope Are Hung on the Sides of the Cars.

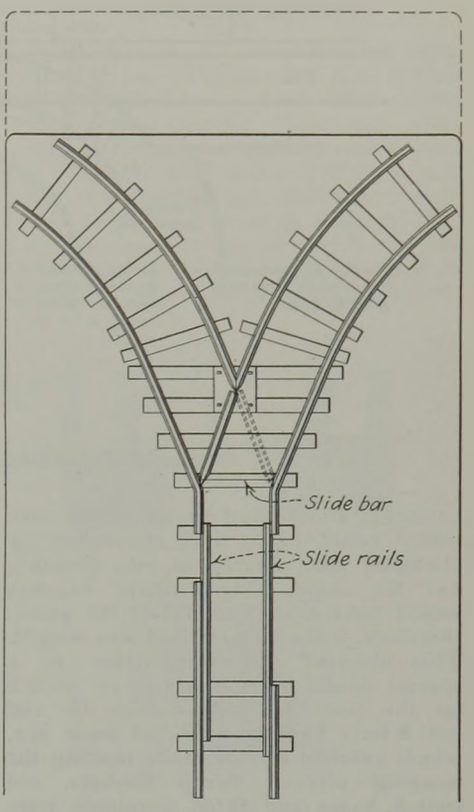


Special Switch to Facilitate Placing Two Cars

To facilitate placing two cars at the face of a place at a time, the special switch shown in the accompanying illustration has been developed by Harry Barlow, night foreman, Arlington Coal & Coke Co., Worth, W. Va. The switch is designed as a unit, as indicated, and instead of the usual filler rails and latches employs only a single latch attached at the point of the "frog." This latch is moved from one side to another to allow cars to be placed on one or the other of the curved tracks ahead of the frog. The switch is connected to the permanent track in the place by balled rails, which permits moving it up the face after each cut. Another feature is the fact that curves already are available when breakthroughs or crossuts are to be turned.

Stitch

"A stitch in time saves nine" applies not only in preventing possible accidents to essential attire but also points a moral for almost every line of activity. Taking early steps—and the right ones—will eliminate much of the grief in coal mining and also insure a smoother-running operation and pleasanter working conditions for both the supervising force and the men. What steps to take will vary according to conditions, but in these pages, as well as in the feature section, *Coal Age* strives to offer a wide variety of cost-saving and safety- and efficiency-promoting ideas for the use of operating, electrical, mechanical and safety men. If you have developed such an idea, this is the place for it. Send it in, together with a sketch or photograph if it will help to make it clearer. Acceptable ideas are paid for at the rate of $5 or more each.



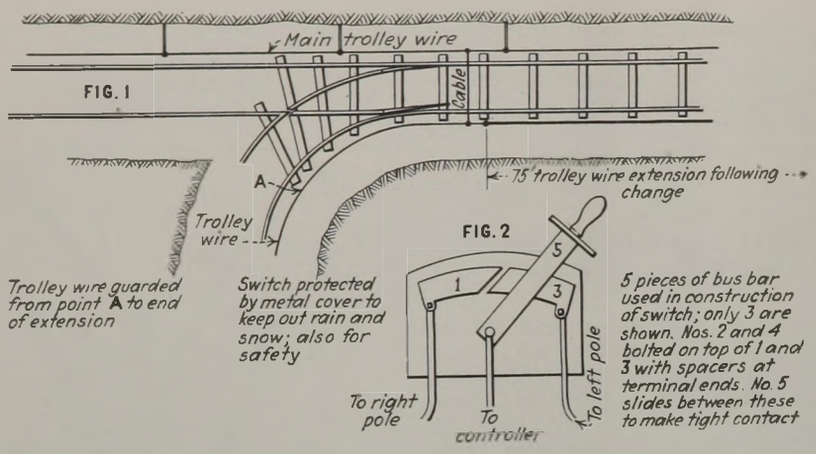
Details of Special Switch to Permit Placing Two Cars at Face.

With this switch, according to Mr. Barlow, two cars of the usual dimensions can be placed in a room 18 ft. wide; also, the switch facilitates cleaning up a bigger cut and also offers the other advantages of a double track in a place, including reduction in track and haulage costs through lightening the work of the track crews and increasing the tonnage which can be gathered by a single locomotive.

Transfer Switch Eases Change From Trolley to Trolley

To eliminate stopping and starting of trips on steep grades in the main heading at the Vindex (Md.) mine of the Manor Coal Co., the transfer switch and trolley-wire system shown in the accompanying sketches were developed two years ago by Walter Iman, Kitzmiller, Md., then mine foreman. In this mine, the trolley wire originally was hung on the right side of the roadways, except on left main haulways, where it was carried on the left. The main heading was driven up the grade, which ranges from 8 to 12 per cent, and right and left entries were driven so they would drain to the main. Trolley poles were installed on both sides of all locomotives.

Prior to the installation of the system here described, it was necessary for empty trips to the left headings to come to a full stop to permit changing poles. This involved starting on a switch leading into a curve on an adverse grade, with consequent increase in power con-



Details of Pole-Changing System and Switch.

sumption and loss of time. While such losses could have been eliminated by changing wire, clearances, etc., throughout the mine, the resultant expense would have more than offset the gains; therefore, a cheaper method was sought. This involved the construction of a special double-pole, single-throw switch for the two locomotives (one 10- and one 8-ton) hauling over the main line, which extends to sidetracks nearing the working places. Scrap busbars, old switch bases and three terminals were employed in constructing the switches.

With the switches installed, the wire was then rearranged at the turnouts into the left headings, as in Fig. 1, this process involving etxensions of 75 ft. outbye the turnouts and the installation of guards, inasmuch as this was the clearance side. When the locomotive on its way in arrives at the end of the extension, the motorman unhooks the left-hand pole and lets it up until it makes contact. Then, without shutting off the controller, he throws the special switch, thus putting power on the left pole and cutting it off the right. For an instant, while the swich is being thrown, power is on both poles, thus eliminating arcs. The rght pole is then hooked down. Both poles, Mr. Iman points out, could be connected directly to the controller, but this would not only be dangerous but contrary to law.

With this system, the controller can be left full on while changing poles, or in any intermediate position. Coming out of a left heading, the track switch always is aligned by the brakeman so that a stop is not necessary on the return. The system has been in use for two years, and, in addition to the savings in sand, power and time, it has been possible to pull a bigger trip.

Low Height and Portability Feature Converter Set

In common with an increasing number of operations, the Dresser mine of Walter Bledsoe & Co., Terre Haute, Ind., employs a portable converting unit to maintain proper voltage and power conditions in its working sections. To be applicable under Dresser conditions, however, such a unit had to meet relatively strict limitations on height and length to enable it to be handled on the cage and transported along the roadways in the mine. With these limitations in mind, the 150-kw. synchronous converter set now used to supplement the main underground d.c. substation was made in two units, one unit consisting of the converter and d.c. panel and the other consisting of three special low-type transformers and an a.c. panel. General details of the design were developed by the Dresser management and the units were assembled at the mine shop.

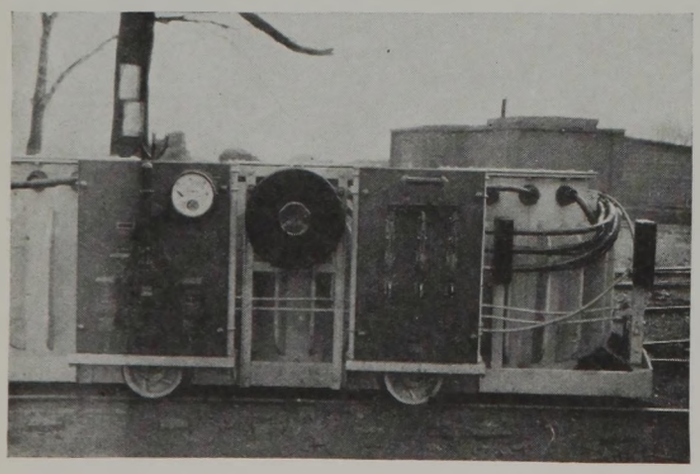
Converter and transformers were supplied by the General Electric Co., the converter—Type HCC, delivering 275 volts, d.c.—being mounted on a drop-floor bedplate at the factory to bring the unit down until it would just clear the track. Wheels were then installed and the panel mounted in the Dresser shop. The truck on which the transformers (Type HJ, Form KF) and a.c. panel are mounted also was made at the mine, where the assembling was done. Length of the transformer unit is 10½ ft., which just clears the 11-ft. shaft; length of the converter unit is 8 ft. Overall height to the top of the d.c. panel, the highest point on either unit, is 39 in.

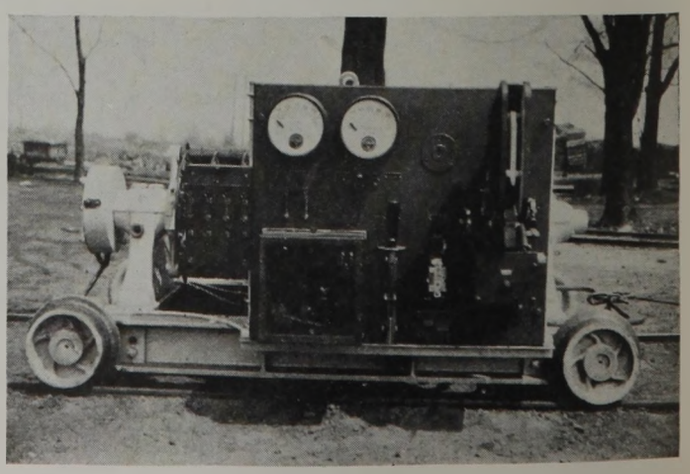
Both the main substation and the portable unit at Dresser are supplied with alternating current at 2,300 volts through a three-conductor Trenchlay cable suspended from the roof. Each conductor consists of a No. 4 wire.

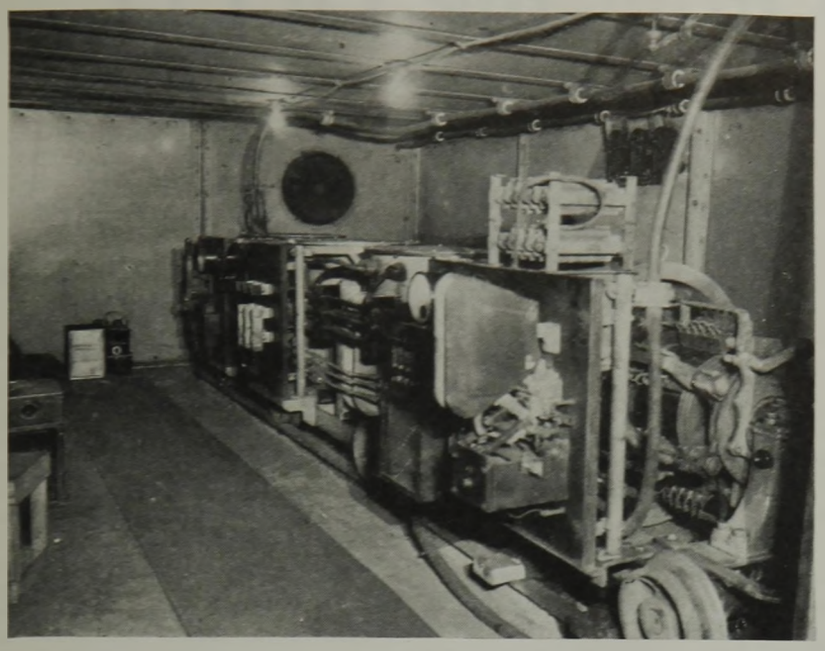
Portability at Dresser also is applied to the room housing the converter set. Sides and top, as shown in an accompanying illustration, are made of steel plates to which angles are riveted to allow them to be bolted together. Dimensions of the room are 12x22 ft. and a fan is mounted in the back wall to ventilate the unit and keep down the temperature. The only permanent part about the station is a 4-in. concrete floor slab, which is poured in advance of the move. In general, tearing the unit down, moving it a reasonable distance—one mile, for instance—setting it in place, connecting it up and erecting the sectional-steel walls and roof requires three men one shift. Pouring the floor slab, extending the 2,300-volt cable and otherwise preparing the new place naturally is done in advance of the actual move.

One unusual feature of the Dresser unit is a provision for cutting the power off automatically if it should be necessary to use a fire extinguisher on the equipment or in the station. This is accomplished by hanging the extinguisher on the main disconnect switch mounted on the outside of the front wall of the room. As long as the extinguisher is left in place, it holds the switch in by its own weight. If the extinguisher is re-

Left—Transformer Unit From the Panel Side. Incoming Leads Can Be Seen Above the Left-Hand Panel. Leads for Connecting to the Converter Unit Are Taken Off at the Right. Right—Converter Unit From the Panel Side.







Interior of Converter Station Underground, Showing Units in Working Position and Construction of the Room.

moved, however, a spring kicks the switch out, rendering everything inside the station dead. This prevents the possibility of a man forgetting to turn off the power in case it should be necessary to use the extinguisher and, incidentally, makes the possibility of unwarranted removal of the extinguisher rather remote.

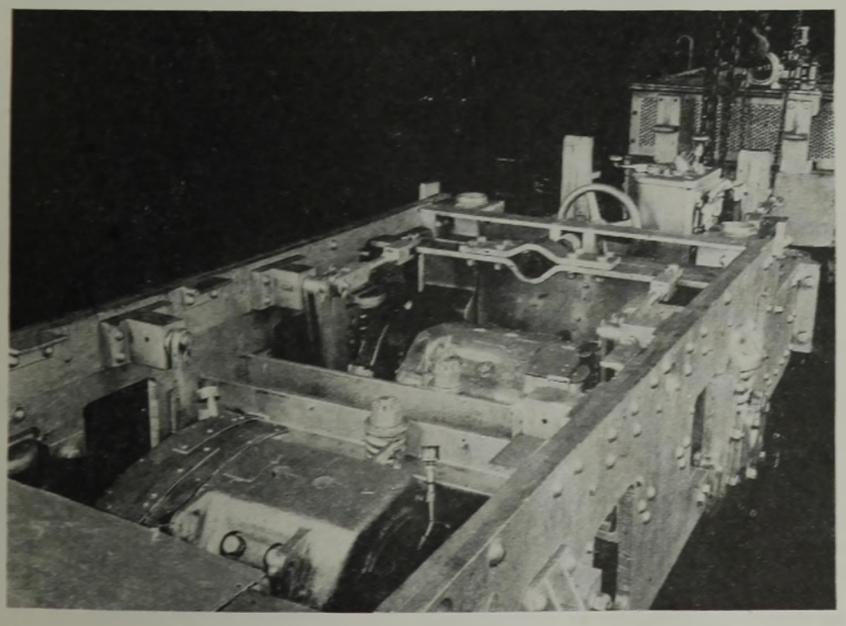
Aluminum Paint Improves Locomotive Maintenance

Inspection of mine locomotives is facilitated by the cleanliness made possible by finishing the locomotives inside and out with aluminum paint. That is the experience of The Hudson Coal Co., with operations in the northern anthracite field of Pennsylvania. Now all locomotives overhauled in the central shop at Scranton are sprayed with aluminum paint, including all surfaces excepting wheels, insides of motor frames and controller cases, and any wiring which is not protected by metallic conduit, raceways or armor.

The practice was started as an experiment to determine if outside painting with aluminum would increase safety by making the locomotive more strikingly visible. Advantages from that standpoint proved questionable, but the advantages of greater cleanliness and increased illumination for inspection were unmistakable. The paint cost per locomotive is less than it was with the high-grade black engine varnish formerly used.

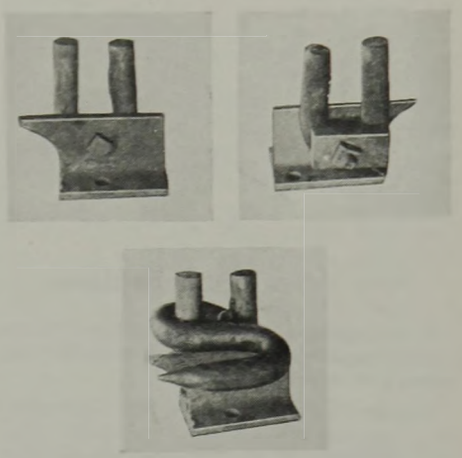
Waxing the painted surface has been found to protect it materially from abrasion and to decrease the rate of accumulation of dirt. This final touch, which consists of rubbing with a cloth saturated with automobile polishing wax, is now the regular practice at the central shop.

Aluminum Painted Chassis of a Six-Ton Battery Locomotive.



Bending Eyes

For bending eyes and hooks in bars, Walter Baum, Gillespie Coal Co., O'Fallon, Ill., has developed the tool shown in the accompanying illustration, consisting essentially of a short round steel rod bent into a U and bolted to a base made of a short T-bar, which in turn is bolted to a stand or anvil when in use. The principal feature on which the use of the tool is based is a lip formed in one of the legs of the U by a hot cutter.



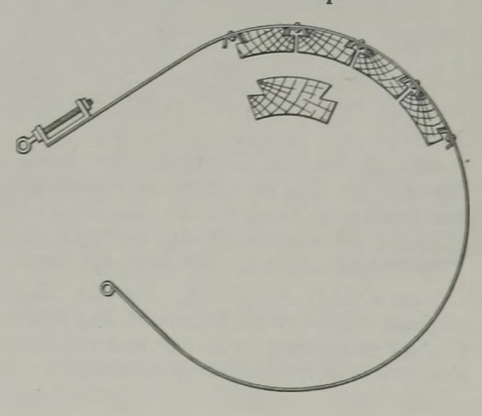
Details of U-Tool for Bending Eyes or Hooks.

To bend an eye, the end of the heated bar is placed between the legs of the U so that it will catch on the lip. The bar is then pulled around the other leg to make the eye. The lip holds the bar fast and thus enables the operator to make a neater job.

Brake Blocks Changed Quickly

Changing of brake blocks is quickly accomplished at the Petros (Tenn.) mine of the Diamond Coal Co., writes A. W. Evans, chief inspector of mines for Tennessee, by the use of special clips, as shown in the accompanying sketch. These clips are riveted to the brake band, and to renew blocks the old ones are simply slipped out and the new ones slipped in. This system has been in satisfactory use at the Diamond mine for nine years, Mr. Evans notes.

Renewal Involves Only Slipping New Blocks Into the Clips.



WORD from the FIELD

Wagner Bill Passes Senate

The Wagner Labor Disputes Bill passed the Senate May 16 by the overwhelming vote of 63 to 12. This somewhat surprising victory, in the opinion of many observers, was largely robbed of significance, however, with the announcement of the U. S. Supreme Court's decision in the Schechter case. This ruling renders the provisions of the Wagner bill of doubtful constitutionality.

New Preparation Facilities

New contracts and construction of preparation-plant facilities were reported as follows in April:

Carrolltown Coal Co., St. Benedict, Pa.; contract closed with Fairmont Machinery Co. for new shaker screen and loading equipment; capacity, 325 tons per hour.

Harvey Coal Corporation, Inc., Harveyton, Ky.; contract closed with Jeffrey Mfg. Co. for complete tipple equipment, including feeders, shaker screens, picking tables, and rescreening, loading and mixing facilities for handling mine-run, lump, egg, nut and slack; capacity, 300 tons per hour.

Heisley Coal Co., Nanty-Glo, Pa.; installation of a complete coal washery for 1¼x5-in. coal with a capacity of 100 tons per hour reported by Roberts & Schaefer Co. Menzies hydroseparators are employed.

Heisley Coal Co., Nanty-Glo, Pa.; contract closed with Roberts & Schaefer Co. for complete coal-cleaning plant employing Stump "Air-Flow" coal cleaners for cleaning and dedusting ¼x0-in. coal; capacity, 300 tons per hour; to be completed July 15.

Kentucky Jellico Coal Co., Kayjay, Ky.; contract closed with Roberts & Schaefer Co. for coal-cleaning plant employing Stump "Air-Flow" coal cleaners for cleaning and dedusting 2x0-in. coal; capacity, 70 tons per hour; scheduled for completion June 1.

Monroe Coal Mining Co., Revloc, Pa.; contract closed with Roberts & Schaefer Co. for coal washery employing Menzies hydroseparators for 1¼x5-in. coal; capacity, 100 tons per hour; installation completed.

New River Co., Cranberry No. 1 mine, Macdonald, W. Va.; contract closed with the Pittsburgh Coal Washer Co. for Llewellyn jig installation for nut coal; all-steel construction; capacity, 70 tons per hour.

North-East Coal Co., Thealka, Ky.; contract closed with Fairmont Machinery Co. for screening, crushing and remixing plant; capacity, 150 tons per hour.

Northern Illinois Coal Corporation, Wilmington, Ill.; contract closed with Koppers-Rheolaveur Co. for washing plant adjacent to present No. 10 mine tipple. Capacity of the plant is 435 tons of 3x0-in. coal per hour, including crushed pickings from the plus 3-in. sizes. Equipment includes: two-launder Rheo coarse-coal plant, fine-coal Rheo unit for recleaning ¼x0-in. coal, two AR-4 Carpenter centrifugal dryers and heat dryers for ¾x$\frac{5}{16}$-in. and $\frac{5}{16}$-in.x48-mesh sizes, screening and mixing equipment for making 3x2-, 2x1¼-, 1¼x¾-, ¾x$\frac{5}{16}$-in. and $\frac{5}{16}$-in.x48-mesh sizes and combinations, including combinations with plus 3-in. sizes, storage bins for ¾x$\frac{5}{16}$-in. and $\frac{5}{16}$-in.x48-mesh sizes in addition to two truck-loading bins, and a rotary car dumper for handling incoming raw coal. The plant is scheduled for operation Nov. 1.

Adds to Power Plant

Adding to the capacity of its Clymer (Pa.) power plant, the Clearfield Bituminous Coal Corporation has purchased a Combustion Engineering Co., Inc., bent-tube boiler, 10,050 sq.ft. of heating surface, 75,000 lb. of steam per hour, water-cooled side and rear furnace walls. The unit will be fired with screenings on a Detroit stoker.

B. & O. Boosts King Coal For Fast Trains

Reaffirmation of its policy of adherence to coal as fuel is shown by the Baltimore & Ohio R.R. in developing its two new high-speed, lightweight locomotives, Lord and Lady Baltimore, which will furnish the motive power for the new streamlined passenger train "Abraham Lincoln," recently out of the shops. The new engines, which are coal burners, have been undergoing tests for service on the Alton road, the B. & O. line between Chicago and St. Louis, Mo. The tenders of the Lord and Lady Baltimore hold 16 and 14 tons, respectively.

The B. & O. also will take delivery soon on one of the latest model diesel electric locomotives, which will be used for test purposes in comparison with the two new steam units.

Telling Story of Anthracite

For popular use, the Anthracite Institute offers, in catechism form, "The Formation and Characteristics of Pennsylvania Anthracite." Largely devoted to problems connected with utilization, this 34-page booklet takes up the formation and production of anthracite, its use in domestic equipment, selection of the proper size to fire and methods of firing, service hints and maintenance of heating equipment, auxiliary equipment, anthracite in comparison with other fuels, and production and distribution from the statistical standpoint. Copies of the booklet are priced at 15c. each and are available from the institute's laboratory at Primos, Pa.

Consolidation to Reorganize

A reorganization plan for the Consolidation Coal Co., which has been in receivership since June, 1932, was announced May 10 under the direction of Howard Bruce, John J. Nelligan and Acosta Nichols, reorganization managers. Under the terms of the plan a new company would be formed having 70,000 shares of 5 per cent noncumulative convertible preferred stock and 675,000 shares of common, of which 305,378 would be used in exchange for existing obligations. Holders of new common and preferred stocks would have equal voting rights.

Securities of the old company would be exchanged for securities of the new as follows: For $4,000,000 of outstanding secured gold notes, holders would get new notes for an equal amount; holders of refunding mortage 4½'s would receive for each $1,000 bond $500 in new bonds, three shares of preferred stock and nine shares of common; holders of first and refunding 5's would receive for each $1,000 bond $400 in new bonds, three shares of new preferred and twelve shares of new common; holders of old preferred would receive one share of new common for each share of old preferred and accrued dividends; holders of old common would receive for each four shares of old common one warrant to buy one new share at $25 at any time within ten years after reorganization.

Expand Bureau of Mines Work

Resumption of important services that have been discontinued or curtailed because of cuts in appropriations in past years, as well as the undertaking of important new work, has been made possible by increased appropriation to the U. S. Bureau of Mines. The allowance to the Bureau for the fiscal

year beginning July 1 is $1,970,311, an increase of approximately $600,000 over that for the preceding year.

The additional funds will permit expansion of economic and statistical studies, resumption of investigations of health hazards and increased promotion of safety education. Further studies on safe and efficient methods of handling, storage and use of "permissible" explosives, as well as of data regarding flame temperatures and explosion pressures, and the movement of flames as a means of better understanding the propagation of mine explosions also are planned. There also will be increased activities at the Experimental Mine, Bruceton, Pa., in studying mine ventilation, roof support and explosions of gas-air mixtures or mixtures of coal dust and air.

Other studies will include low-temperature carbonization and tests for data on comparative fuel values of delivered coal and for a suitable classification of the different American coals; whether coal cakes in the fuel bed; how easily it can be pulverized; whether it is suitable for making gas or coke, and what chemicals can be derived from it.

Financial Reports

Consolidation Coal Co. and subsidiaries—Profit for the quarter ended March 31, $620,243 after expenses, interest on 5 per cent secured notes and loans, parent company's capital expenditures charged to expense in lieu of depreciation, depletion and federal taxes but before interest and amortization on funded debt in default. This compares with profit of $524,952 in the first quarter of 1934.

Crow's Nest Pass Coal Co., Ltd. (Canada)—Net income for the quarter ended March 31, $54,707 after depreciation, depletion and other charges but before federal taxes. For 1934 the company showed net income of $239,845, compared with $105,874 in 1933.

Island Creek Coal Co.—Net profit for quarter ended March 31, $355,507 after depreciation, depletion, federal taxes and other charges, compared with profit of $454,753 in the corresponding quarter of 1934.

Pittsburgh Terminal Coal Corporation—Net loss for the quarter ended March 31, $69,375 after depreciation, depletion and other charges, against $82,181 loss in the first quarter of 1934.

Pittston Co.—Consolidated net loss for quarter ended March 31, $368,544 after depreciation, depletion, amortization, interest, provision for subsidiary dividends and federal taxes. This compares with a net profit of $521,699 in the corresponding period of 1934.

Pond Creek Pocahontas Co.—Net profit for the quarter ended March 31, $125,829 after taxes and other deductions, compared with profit of $170,912 in the first quarter last year.

Rochester & Pittsburgh Coal Co. and subsidiaries—Net income for 1934, $626,884 after depreciation, depletion, federal taxes, interest and other charges, but before subsidiary preferred dividends. This contrasts with net loss of $273,920 before the same deductions in 1933.

Supreme Court Nullification of NIRA Puts Guffey Bill in Limelight

WASHINGTON, D. C., May 27—A unanimous decision of the U. S. Supreme Court this afternoon wiping out the NRA code system wrecked the administration's chief recovery measure and intensified the drive for special legislation for the bituminous coal industry. The opinion, handed down in the Schechter poultry case—selected by NRA as a test proceeding—not only ruled that the code-making authority conferred on the President by Sec. 3 of NIRA was "an unconstitutional delegation of legislative authority" but also held that, even if the act specified standards, listed objectives and provided a definite range of action, any delegation of authority would be invalid when applied to industries engaged in intrastate commerce not "directly" affecting the current or flow of interstate commerce.

Congress, said the court, "cannot delegate legislative power to the President to exercise an unfettered discretion to make whatever laws he thinks may be needed." Sec. 3, it continued, "instead of prescribing rules of conduct, authorizes the making of codes to prescribe them. For that legislative undertaking, Sec. 3 sets up no standards aside from the statement of the general aims of rehabilitation, correction and expansion described in Sec. 1."

NRA's bow to the mandate of the court was swift. Although intimating that early action to repair the damage done by the decision might be expected, Donald R. Richberg, the chairman of NIRB, announced this evening that all "methods of compulsory enforcement of the codes will be immediately suspended." At the same time, he appealed to management and labor to "cooperate in maintaining those standards of fair competition in commercial and labor relations which have been written into the codes with practically universal sanction and which represent a united effort to eliminate dishonest, fraudulent trade practices and unfair competition in overworking and underpaying labor."

Coming during a recess in the meeting of the National Conference of Bituminous Coal Operators, the Supreme Court decision threw those conferees solidly behind recommendations of their legislative committee made earlier in the day favoring enactment of the Guffey coal control bill, with important revisions. The conference adjourned late in the day after unanimously voting to direct the legislative committee to conform its recommendations on the Guffey bill with the Supreme Court's decision.

Shortly after the court decision was made public, Senator Guffey declared that he was going to have his bill rewritten to remove the objections of "unconstitutionality" raised by the Schechter opinion. He was unable to state just what specific changes would have to be made. Probably the outstanding change in the Guffey bill, recommended by the operators' legislative committee, would defer creation of the National Bituminous Coal Reserve (*Coal Age*, March, p. 132) until that matter has been studied and reported on to Congress not later than Jan. 6, 1936, by a National Bituminous Coal Commission.

The recommendations further provided that the proposed commission study all other questions concerning control of production and make a report to Congress for supplementary legislation. The commission also would be given authority to function as a governing body for the industry in enforcing price correlation and control and an operating code similar to the industry's NRA pact, but containing sharper enforcement teeth, including jail sentences as well as fines.

General supervision over labor relations would be provided for the commission under the recommendations, although specific controversies would be handled by an independent labor board, to be composed of three members. The minimum and maximum prices recommended by the committee would be based on average production costs in nine price areas. Rulings of the Coal Commission could be appealed to the courts.

The United Mine Workers and Senator Guffey were expected by the operators to accept the recommended revisions, which they hope will also eliminate some of the other opposition in the industry to the proposed legislation.

Efforts for stabilization of the coal industry by legislation had been marked during the last month by still sharper cleavage between those favoring the Guffey bill and those opposing this measure but supporting President Roosevelt's plan for a two-year extension of NRA. The situation was complicated by the sudden action of the Senate on May 14 in approving a resolution by Senator Clark extending NRA for only 9½ months. This resolution, in the light of the expressed desire of President Roosevelt and Mr. Richberg for a two-year extension, caused some hectic sessions at the hearings before the House Ways and Means Committee on the administration's two-year plan.

The group calling itself the National Conference of Bituminous Coal Producers, claiming to represent an annual production of more than 175,000,000 tons, met in Washington May 20 and announced itself in favor of legislation along the lines of the Guffey bill for a four-year period, subject to amendments to be submitted later. Speakers at this conference, at which Clarence W. Watson, receiver, Elk Horn Coal Corporation, presided, urged that unless prompt action was taken to obtain some form of stabilizing legislation at this session of Congress, the industry would see a return of the chaos which preceded the creation of the bituminous code. A committee headed by Charles O'Neill, vice-president, Peale, Peacock & Kerr, Inc., reported that because of the short time before Congress will adjourn and in view of the practical impossibility of obtaining new legislation, "the efforts of this committee would be directed to the amendment of pending legislation. There must be stabilization of hours, wages and working conditions."

Thirty-six Pennsylvania producers designating themselves as "small companies" filed with Congress suggested amendments to the Guffey act with the following state-

ment: "We believe that S. 2481 can be an enactment of great stabilizing and constructive value, but in order to accomplish such purpose the bill should be amended so that fair representation is assured to the public, to labor and to producers; that the inherent right to property should be protected; that prices and distribution of coal should be equitable; and that the right of appeal should be guaranteed."

Coal interests opposed to the Guffey bill got busy early on plans for concerted action on their objective: defeat of the measure. At a meeting in Washington late in April this group appointed a committee known as the National Committee in Opposition to the Guffey Coal Monopoly Bill and for the Extension of a Strengthened NRA, including representatives from Alabama, West Virginia, Kentucky, Indiana, Missouri and Wyoming, with H. R. Hawthorne, vice-president, Pocahontas Fuel Co., as chairman. Claiming to represent an output of more than 225,000,000 tons annually, the committee asserted that the coal industry as a whole is opposed to the Guffey act. Such legislation, says the committee, would put a straitjacket on the industry; taxing consumers in order to buy up the poor coal lands, it is contended, would give present operators a monopoly.

Repeated affirmation of belief in NRA as a "life saver for the bituminous coal industry" was climaxed with the presentation by the committee at the White House on May 16 of a statement strongly urging two-year extension of the recovery act in a strengthened form. "This group," said the statement, "strongly opposes the Guffey bill because it will create a tight monopoly of coal by government fiat; greatly increase the price of coal to the consuming public, and thereby decrease the use of coal and the quantity produced by stimulating the greater use of high-efficiency equipment and transferring business to competing sources of energy; substantially reduce employment and total wages paid to labor by decreasing demand and transferring transportation from railroads to pipe lines, power lines and foreign ships; promote inefficiency in mining; increase the cost of manufacturing generally; diminish exports of coal; substantially increase prices of all manufactured goods, due to increases in freight rates which will inevitably follow reduced coal production, and increases in cost of manufacture and distribution; and deprive the owners of all functions of management."

NRA Strikes Thorny Path

NRA began to find the going rough on May 14, when the Senate, without a record vote, approved the Clark resolution to extend the recovery act only until April 1, 1936. As passed, the resolution eliminated control over intrastate business, as well as price fixing except in mineral-resource industries.

President Roosevelt had called a meeting at the White House on April 30 of opposing elements on NRA in an effort to reach an agreement for a two-year extension. Twelve Senators, Mr. Richberg, Secretary of Labor Perkins, and Chairman Doughton, of the House Ways and Means Committee, attended the meeting. The conference failed to reach a compromise satisfactory to the President and NRA critics. Senator Harrison suggested extension for a year, to which Senator Nye countered with a plan for eight months' limitation. Mr. Richberg insisted that two years should be allowed, objected to elimination of provisions for price fixing and was unwilling to surrender jurisdiction over the entire intrastate field.

Harris & Ewing

Donald R. Richberg

Chairman of NIRB championed House resolution to extend NRA for two years more.

More than a score of industrial leaders on the Business Advisory and Planning Council of the Department of Commerce, including James D. Francis, president, Island Creek Coal Co., visited the White House on May 2 and assured the President of their support of two-year extension of NRA in modified form. The act, it was stated, "has not been in effect long enough to demonstrate whether or not it will be effective for its purpose." Its accomplishments in connection with maximum hours, minimum wages and collective bargaining were declared to be noteworthy, and further progress could best be brought about by its continuance rather than by the enactment of other legislation.

The executive council of the American Federation of Labor, led by William Green, president, called on President Roosevelt May 3 and presented a statement pledging support "in your efforts to secure a continuation of NRA for two years, with the suggested amendments which experience has shown are necessary." The Clark resolution, if adopted by Congress, said the statement, "will take the heart out of the recovery act. . . . It will deprive 75 per cent of working people of the benefits of Sec. 7a."

As the result of a two-hour conference with Mr. Richberg on May 7, Democratic members of the House Ways and Means Committee agreed to support the administration plan for a two-year extension. Mr. Richberg later characterized the Clark resolution as "complete folly." A seven-point program embodying Mr. Richberg's recommendations was approved by President Roosevelt on May 16 for presentation in the House as a substitute for the Clark resolution. The House substitute measure was presented May 20. Appearing before the Ways and Means Committee in support of the new resolution, Mr. Richberg denounced the Senate resolution as "administratively impossible" and almost certain to defeat its very purpose. As introduced, the House resolution would have the following effects:

Prohibit price fixing irrespective of government supervision, except where necessary in the discretion of the President to prevent discriminatory price cutting, protect small enterprises or deter growth of monopolies, but with specific safeguards on right of low-cost producers to sell at fair competitive costs.

Prevent drawing of any codes not subject to the federal power to regulate interstate commerce, with provision for exemption of small, local enterprises not calculated to affect interstate commerce.

Make it mandatory rather than permissive with the President to "approve or prescribe codes" necessary to effectuate NRA policy.

Delegate to the Federal Trade Commission the enforcement of fair trade practices not previously adjudicated by the courts or adopted by popular esteem.

Require the inclusion of hours and labor provisions in all revised codes, and renew the ban on child labor and collective bargaining guarantees.

Provide a period of six months after June 15, 1935, during which all existing codes are to be reviewed and revised as may prove advisable.

Despite the dissatisfaction of Senate leaders with the House measure, including a prediction by Senator Harrison that upper house members would "filibuster the issue to a standstill" rather than recede from the original Senate position, Mr. Richberg said the action of the House might persuade the Senate that its resolution did not embody "the summit of wisdom" and that something better might be done. "If NRA were abandoned," he added, "I would hate to estimate the number that would be thrown out of employment, since the full effect would depend upon the extent of collapse of hours and wages provisions of codes and on general market conditions. But I think it conservative to say that you might find 2,000,000 additional wage earners on the relief rolls."

Workers Benefit; Consumers Unharmed

Appearing before the House Ways and Means Committee as spokesman for "a national committee of approximately 50 operators representing a majority of the national production of bituminous coal and a majority of the operators in 21 of the 26 coal States," W. G. Crichton, chairman, executive committee, Smokeless Coal Code Authority, strongly urged continuance of NRA for two years. In support of his stand he cited such benefits from NRA as decreased hours of labor, with increased employment and wage increases in excess of $200,000,000 per year—without injustice to consumers. Living conditions of employees and their dependents, he said, had been greatly improved as a result of higher earnings. Without monopoly or restraint of trade, the witness stated, unfair competitive practices had been reduced under the establishment of code prices and, with strengthening of enforcement provisions, he predicted that abuses could be further curtailed.

D. A. Thomas, president, Montevallo Coal Mining Co., emphasized improved conditions in the industry under NRA and argued that 9½ months' extension would be insufficient time to iron out wage agreements, contracts, etc., without confusion. L. E. Woods, president, Crystal Block Coal & Coke Co., stressed increased earnings of the miners and stabilization results as reasons for two years' continuance of NRA.

Extension for only 9½ months, as provided for in the Senate resolution, said

Eugene McAuliffe, president, Union Pacific Coal Co., "would effectively kill NRA." In the bituminous industry before the codes, he declared, "there were starvation wages; in some sections there was practically civil war. Without the guidance of the federal government through NRA we would have to return to that." With the fate of this agency hanging in the balance, he averred, it is impossible to negotiate coal sales contracts.

C. T. Carney, president, Scandia Coal Co., urged two years' extension of the recovery act in the hope of preserving the good relations between operators and union miners in Iowa, which have lasted 35 years. On the other hand, H. L. Findlay, vice-president, Youghiogheny & Ohio Coal Co., speaking on behalf of the National Conference of Bituminous Coal Producers, while conceding that the coal code had done much for the industry for fourteen months, contended that there had been a breakdown late last year. At the present time, he declared, there is little observance or enforcement of the code; therefore he believed special legislation was needed. If special legislation were unavailable, he believed his associates would prefer NRA for two years—but not for 9½ months.

"One of the greatest acts ever put on the statute books," was the way William Green, president, American Federation of Labor, described NIRA. He announced that he stood squarely with the United Mine Workers for two years' extension. "We had better face the issue and abandon it now rather than extend it for ten months only. . . . I think the principles involved in NRA should become part of our permanent law."

John L. Lewis, president, United Mine Workers, pointed out the improvement in conditions under NRA, stating that it had helped put millions of men back to work. He deplored inadequate enforcement of the code, for which reason his organization strongly favored enactment of the Guffey bill. He reiterated a statement by Duncan Kennedy, chairman of the Appalachian joint wage conference, that a wage agreement was not possible until the legislative situation had been cleared up. Failing passage of the Guffey bill, the union would be willing to accept a continuance of NRA for two years. A nine or ten months' extension, he believed, would amount to abandonment.

Clarification and extension of NRA for two years were advocated by General Hugh S. Johnson, former recovery administrator. He saw no reason for confining price fixing to natural-resource industries nor for turning enforcement over to the Federal Trade Commission and eliminating the power of NRA to revoke Blue Eagle rights. NRA might be killed, he said, but the issue will not die; in fact, to kill the act would do more than anything else to emphasize its necessity.

A delegation 1,500 strong, known as the Industry and Business Committee for NRA Extension, led by Ward Cheney, Connecticut silk manufacturer, staged an orderly demonstration in Washington May 22 in favor of two years' continuance of NRA. They visited the offices of Representatives and Senators in an effort to impress them with the dire consequences that would result in the way of increased unemployment, wage reductions and bankruptcies if the Clark resolution were adopted.

Appalachian Wage Negotiations Broken Off; Insurgent Outbreaks Continue

WASHINGTON, D. C., May 28—Negotiations for a new Appalachian wage contract came to a standstill today, when representatives of the operators and United Mine Workers voted, 44 to 9, to break off the conferences. The vote came after the joint scale committee reported that it could make no progress in working out an agreement on wages and hours for a new contract to take place of the pact which expires June 16. The union asked a 6-hour day, 5-day week and higher pay (*Coal Age*, March, p. 135). The old agreement, which was to have expired March 31, was extended on March 30 for 2½ months.

When a group of operators suggested at today's conference that negotiations be broken off, James D. Francis, president, Island Creek Coal Co., urged a recess to consider the best way to proceed. He warned against hasty action when everyone was "all at sea."

Following the meeting of May 20, Duncan C. Kennedy, chairman of the joint conference of operators and miners, issued this statement:

"The joint sub-scale committee of nine representatives of the operators and nine representatives of the mine workers of the Appalachian area resumed conferences today pursuant to the recess taken from April 9. A canvass of the situation by representatives of both sides revealed such a breakdown of stable competitive relationships and such increasing confusion and uncertainty in the industry that the operators are in no position to make definite commitments for wages, hours and conditions of employment. The committee has therefore decided to summon the full membership of the Appalachian joint conference to meet May 27 for the purpose of reporting to that conference the inability of the scale committee to reach any agreement, together with the recommendation that the conference adjourn *sine die*.

Insurgent Violence Flares Up

Intermittent outbursts of violence have marked the labor situation in Illinois during the last month. A local leader of the Progressives shot and dangerously wounded a mine worker May 3 at the Peabody No. 9 mine, near Taylorville. The Progressive leader said he shot the wrong man, mistaking him for a boss at another mine. Another battle of United Mine Workers and Progressives occurred near Pana late in April. The insurgents stoned United Mine Worker members on their way to work, and eventually firearms came into action. No one was wounded, however.

The "state of unrest" noted in eastern Kentucky by Governor Laffoon has been in evidence from time to time in rceent weeks. Field workers for the United Mine Workers reported to Adj. Gen. Denhardt May 7 that they had been assaulted with pistols and blackjacks by deputy sheriffs at Lynch. This happened only a few days after a miner had been seriously wounded by shots fired at the tipple of the Barrowman Coal Corporation, in Pike County. Charles Barnes, chairman of Division I Bituminous Coal Labor Board, testified before the Governor's investigation committee that Harlan County was the "sore spot" of his division.

The insurgent United Anthracite Miners of Pennsylvania seem to be steadily losing ground, as evdienced by fifteen of their former officers applying for reinstatement in the old union. There was a clash of insurgent pickets and State troopers on May 14 at the Nottingham colliery of the Glen Alden Coal Co. following a hail of missiles from the insurgents at miners on their way to work. The troopers fired on the pickets, wounding about a score. An equal number of troopers needed first aid.

Mine workers at four collieries of the Lehigh Navigation Coal Co. in Panther Creek Valley returned to work May 24 after a strike lasting nearly a week. The men quit because of a dispute over the car-conversion rate of pay. At a conference between J. B. Warriner, president of the company, and Hugh V. Brown, district president, United Mine Workers, it was agreed to settle the grievances between the company and union executives.

Personal Notes

C. E. Bockus, president, Clinchfield Coal Corporation, and former president, National Coal Association, has been unanimously reelected a director of the Chamber of Commerce of the United States.

W. G. Crichton, executive secretary of the Smokeless Coal Code Authority, received a commission as colonel May 13 from Governor Ruby Laffoon of Kentucky. Announcement of the appointment was made at a dinner at the Black Knight Country Club, Beckley, W. Va.

Nathan Hayward was elected acting president of the Philadelphia & Reading Coal & Iron Co. on May 27 to succeed the late Andrew J. Maloney. Mr. Hayward, who is president of the American Dredging Co., will also head the Philadelphia & Reading Coal & Iron Corporation.

Otto Herres, assistant general manager, United States Fuel Co., Salt Lake City, has been reelected chairman of the bituminous coal code authority for the Utah subdivision.

Ralph J. Hines has succeeded H. W. Showalter as president of the Continental Coal Co. Other officers elected by the company are: Thomas D. Heed, chairman of the board; D. J. Carroll, vice-president and general manager of mines; J. G. Badger, secretary-treasurer. Mr. Carroll succeeds Frank E. Christopher.

J. F. Lake, vice-president and general manager, Charleston Coal Co., Charleston, Ark., was elected president of the Arkansas-Oklahoma Smokeless Coal Bureau May 14 at a meeting of the new board of directors held at Fort Smith, Ark. Other officers elected by the bureau are: vice-president, B. H. Bedwell, E. D. Bedwell Coal Co., Fort Smith; treasurer, R. W. Winn,

vice-president and general manager, Mack Coal Co., New Shockley Coal Co., and Sullivan Coal Co.; executive secretary, S. A. Bramlette, Fort Smith.

John B. Marks, vice-president and general manager, Independent Coal & Coke Co., Salt Lake City, Utah, and formerly identified with the Colorado Fuel & Iron Co., has resigned. Formerly president of the Utah Coal Operators' Association, Mr. Marks is a member of Division No. 5 of the coal producers' code authority.

C. N. McLellan has announced his resignation as safety engineer for the Butler Consolidated Coal Co., Wildwood, Pa., to accept appointment as chief engineer with the Coal Operators' Casualty Co.

William Schenler has been appointed chief engineer of the mines and quarries of the Colorado Fuel & Iron Co., vice Doyle A. Stout, deceased.

J. J. Sellers, vice-president, Virginia Iron, Coal & Coke Co., was elected president of the Virginia Coal Operators' Association at the organization's seventeenth annual meeting, at Norton. J. L. Osler, general manager, Blackwood Coal & Coke Co., was chosen vice-president, and C. B. Neel was renamed secretary-treasurer.

H. W. Showalter has resigned the presidency of the Continental Coal Co. to devote his entire time to the direction of the Monongahela Rail & River Coal Corporation, of which he is president. The latter company recently opened the Emily mine in Monongalia County, West Virginia. A. D. Showalter also resigned as purchasing agent of the Continental company, but will continue as secretary-treasurer of the Monongahela corporation.

Charles N. Sweet, formerly president of the Sweet Coal Co., has been made vice-president and general manager of the Standard Coal Co., Salt Lake City, Utah.

W. H. Sweet and Victor W. Sweet recently were elected president and general manager, respectively, of the Sweet Coal Co., Salt Lake City, Utah.

Howard J. Thomas has been appointed general superintendent of mines by the National Coal & Coke Co., Birmingham, Ala. Operating subsidiaries of the company include the Cane Creek Coal Mining Co., with two slopes at Bankhead; Alta Coal Co., with operations at Summit, and the Franklin Coal Mining Co., at Powhatan. Mr. Thomas formerly was superintendent of mines for the Sloss Sheffield Steel & Iron Co. and more recently was connected with Division III code authority.

New Firm to Make Motorstokors

Hershey-Motorstokor Corporation, New York City, has been incorporated under the laws of New York State to manufacture and sell Motorstokor automatic coal burners. This company is owned jointly by the Hershey-Machine & Foundry Co., Manheim, Pa., and the Pacific Coast Co., Seattle, Wash. The last-named company developed the Motorstokor from its earliest days, and the Pennsylvania concern manufactured it for a number of years.

Officers of the new corporation are: Henry M. Brooks, president; J. H. Nissley, vice-president, and J. H. Simpson, secretary-treasurer.

TVA and Texas Gas Projects Strike Snags; To Reconsider Illinois Gas Tax

PLANS to broaden the powers and activities of TVA ran into a snag when the House Military Affairs Committee, by a vote of 13 to 12, decided on May 24 to table the McSwain bill, framed along lines similar to the Norris TVA bill passed by the Senate on May 14. Unfavorable action by the House committee followed presentation by Representative May, of Kentucky, of a summary of an audit by Comptroller General McCarl showing, it was charged, excessive write-downs in the value of properties taken over by TVA, disregard of government regulations controlling purchases, and expenditures far in excess of returns.

As introduced in the Senate, the Norris bill was designed to frustrate further attempts to cripple TVA plans by federal court injunctions. The measure doubled the original $50,000,000 bond-issuing power of TVA, but limited the use of the funds to a five-year period and the fulfillment of contracts made during that period. An amendment proposed by Senator Logan, and approved, would extend all the provisions of TVA to the Cumberland River and basin. The Kentucky Senator said it was advisable to bring the Cumberland within TVA scope because both streams coursed through the same general area and development of the Tennessee could not be completed without including the Cumberland.

Other amendments to the measure, chiefly clarifying, were framed to guard against such decisions as that of Judge W. I. Grubb in Alabama granting an injunction against TVA plans to buy power systems in Alabama and against PWA proposals to lend funds to municipalities to construct plants that would use TVA power. Though Judge Grubb did not rule on the constitutionality of TVA, he declared that it had exceeded the authority given it by Congress.

An amendment offered by Senator Couzens, and approved, requires TVA to adopt a uniform accounting system. Senator Austin and several others alleged that TVA had exceeded its spending authority fivefold without utilizing any of the $50,000,000 bonds authorized.

When hearings before the House Military Affairs Committee got under way, TVA activities got a raking over the coals. Comptroller General McCarl, testifying on May 21 and 22, labeled the TVA act "haphazard legislation." In many instances, the Comptroller charged, bids were called for, and contracts were awarded to persons whose bids were not lowest. The properties operated by TVA, he said, cost $132,792,294, but are listed on the books at only $51,000,000. Expenses of the agency were listed at $12,438,346 and receipts at $1,345,065. Dr. Arthur E. Morgan, TVA chairman, attacked the audit as showing lack of complete investigation of facts and making unjust comparisons.

Representative Montet, a member of the Military Committee, announced on May 23 that he would propose an amendment to the act which would prohibit the sale of power by TVA at less than cost of production. David E. Lilienthal, a director of TVA, agreed that assurance should be written into the law that power development in TVA territory would not become a burden on the taxpayers.

The proposal to construct a gas pipe line from Texas to St. Louis and Detroit, with the aid of PWA funds, received a setback on May 11, when the Texas Legislature adjourned without creating a corporation to act in the capacity of borrower. Governor Allred's scheme to obtain $50,000,000 for construction of the line having failed, the project is in abeyance pending the next session of the Legislature.

At a conference in the offices of the National Coal Association, Washington, D. C., during the second week in May, Z. C. Wagoner, gas engineer, Appalachian Coals, Inc., and H. W. Wright, assistant to the vice-president, Semet Solvay Co., were appointed a committee to estimate costs of construction, operation and maintenance; potential revenue and the coal tonnage that would be replaced or seriously threatened by the proposed Texas gas line. Representatives of the New York Central, Chesapeake & Ohio and Pennsylvania railroads, attending the conference, were important recruits to army of opponents of the scheme. The Stoker Manufacturers' Association, Chicago, recorded its opposition May 15 in a letter of protest to President Roosevelt and various PWA officials.

When the Monroe-Lewis bill proposing a tax of 5c. per thousand feet on natural gas in Illinois came up for a vote in the State Senate May 22, there were 13 negative votes and 21 in the affirmative, three less than necessary for passage. Senator Monroe moved for reconsideration, and it is probable that the measure will again come up for action soon. The bill is sponsored by the Southern Illinois Reciprocal Trade Association (*Coal Age*, May, p. 228).

Coming Meetings

- Mine Inspectors' Institute of America: 26th annual convention, June 3-5, Beckley, W. Va.
- Illinois Coal Mining Institute: 17th annual boat trip on Str. "Golden Eagle," leaving St. Louis, Mo., at 11 p.m., June 7 and returning to St. Louis June 9 at 10 a.m.
- National Mine Rescue Association: sixth annual meeting, Saturday evening, June 15, Hotel Altamont, Hazelton, Pa.
- Short Course in Coal Utilization: College of Engineering, University of Illinois, Urbana, Ill., June 11-13.
- Credit Executives of the Solid Fuels Industry: third semi-annual meeting, sponsored by the National Coal Credit Corporation, Cincinnati, Ohio, June 7.
- National Retail Coal Merchants' Association: annual convention, June 21 and 22, Traymore Hotel, Atlantic City, N. J.
- American Society for Testing Materials: 38th annual meeting, June 24-28, Book-Cadillac Hotel, Detroit, Mich.
- Mining Society of Nova Scotia: annual meeting, June 26 and 27, Pictou Lodge, Pictou, N. S., Canada.

Illinois, Seeking New Ways of Using Coal, Holds Conference at State University

IMMENSE possibilities in the processing of fuels, clays and rocks of Illinois were outlined at the sessions of the Third Annual Mineral Industries Conference of Illinois held May 17-18 at the University of Illinois, Urbana, Ill., under the auspices of the Illinois State Geological Division and the Engineeringing Experiment Station of the university. Demonstrations were made of several developments, including briquetting and petrographic separation by sizing without flexible crushers. Complete gasification of coal and the making of a treated coal product were suggested by M. M. Leighton, chief, Illinois State Geological Survey, as a means of widening the opportunities of the coal industry.

Recent improvements listed by G. R. Lewis, consulting mechanical engineer, Chicago, included the removal of dust from coal to free the flues and other parts of the furnace from dust deposits with their corrosive action, the oiling of coal to prevent dust, preparation of coal by washing and the processing of coal. Unfortunately, the fine dust is lost, no system of use having commercial application. To oil coal with hot sprays, an oil of low surface tension is required which will spread in a thin film over the coal. This oil must not vaporize or cause particles of coal to adhere. One firm was adding cedar oil to give in combustion the aroma of the woods. Oil treatment costs from 7 to 10c. per ton, and washing with water adds 15 per cent to the cost. Processed coal does not arch or clog air spaces and prevents blowholes forming with fusion of the ash around the edges of such openings in the fire bed.

With hand-firing Mr. Lewis advocated that the hot coals be raked into a long heap on one side of the fire bed and the raw coal be placed in another long heap beside it, with the two heaps touching at their bases. The raw coal heated by the furnace would emit gas and smoke, which would be burned by the flame from the live coals until the raw coal devolatilized would itself begin to burn. Too many schools and other institutions with twin hand-fired boilers had been induced by high-pressure salesmen to discard one boiler and install a stoker in the other. The old boiler has rusted out and the other, operated at too high a rating, has been badly burned out, demanding in a short while an entirely new installation. Both boilers should have been fitted with stokers and run at low rating. He advocated the spreader type of furnace where the demand for heat and power is constant.

Coal Keeps Even Heat

When gas, which is shut off and started by a thermostat, is used, declared Mr. Lewis, the heating system loses and gains heat rapidly, causing ghostly noises as the pipes contract and expand. With coal the pipes never become so completely cooled and the heat with thermostatic control is increased less promptly. Many of the larger early oil installations have been scrapped, because with preheating heavy and cheap grades of oil can be used. Nevertheless, one hotel went back to coal and saved the cost of the conversion in a single year. Where the product of the combustion of gas passes into a stack above the level of the building, the temperature lowers and the large quantity of steam condenses to water, and, being filled with corrosive gas, it rapidly eats out the mortar, permitting the waste products to escape, thus blackening the stack and ultimately wrecking it. With a lining of non-corrosive metal, however, this undesirable effect can be obviated.

Synthetic products have a value of $100,000,000 per annum, and yet nearly all these products have been developed since the War. The American Gas Association has spent as much as $200,000 in a single year on research, declared G. H. Cady, senior geologist, Coal Division, State Geological Survey, in a paper in which F. H. Reed, chief chemist, collaborated. Up to 96 per cent of the coal is clarain and vitrain. The department has had in mind the difference in character of the several bands in the coal and has been studying these and the separation of them by sizing.

Opportunities for Research

Nature of the slag formation on boilers, economizer and preheater tubes can be materially changed by chemical treatment of coal before combustion, asserted D. B. Keyes, head, Chemical Division, University of Illinois. Efficiency of coal in domestic service would be increased with such improved combustion, as it would prevent chimney fuel losses. Sulphur dioxide should be removed from escaping industrial boiler gases. Experiment indicates that by a combination of coking and hydrogenation sulphur may be removed from coal. Experiment may develop that coal can be oxidized and hydrogenated to produce a superior product, possibly a liquid fuel. Destructive chlorination of coal and coal ash may produce valuable organic and metallic chlorides, including aluminum chloride. Chlorinated hydrocarbon from chlorinating methane may be used in cleaning textiles, and this chlorinating process is being studied.

Anti-oxidants, for rubber manufacture and for the stabilization of motor fuels, may be added to dyes as products in the processing of benzol and tar. Acetic acid, which has an immense chemical future, may be made from carbon monoxide. To this end, Mr. Keyes declared, his division has made studies of the reaction between carbon dioxide and methyl alcohol at high pressure in the presence of catalysts. This acid could be used for the manufacture of non-flammable film, plastics, etc. Benzaldehyde has been made in his high-pressure laboratory by the action of carbon monoxide on benzol. Reacting on carbon monoxide, hydrogen from the coking process forms the higher alcohols for use in making lacquers and as solvents.

Carbon dioxide has been studied for production with benzol to form benzoic acid, from which sodium benzoate—a food preservative—is made. The same gas and beta-naphthol makes beta-hydroxynaphthoic acid for use in making many red dyes. Urea, a fertilizer, is cheaply produced by interaction of carbon dioxide and ammonia. The division has spent $60,000 in six years to produce sulphur dioxide from flue gas and has separated it at a price far below its present value, and hopes from it to obtain free sulphur at low cost. Sulphuric acid—the barometer of chemical activity—may be made for industry and agriculture from this source.

Demonstrating, in the Materials Testing Laboratory, the briquetting of Illinois coal by preheating to 420 deg. C. and a single impact of 500 lb. falling 4 ft., R. J. Piersol, Illinois Geological Survey, said the preheating added to the thermal value of the coal treated because the removed volatile matter, a light hydrocarbon and moisture, was of little combustion value. Coal ¼-in. and smaller was used, but ⅜-in. and smaller will briquet and strong briquets can be made from 1/64-in. coal. All Illinois coals will briquet equally well and without the use of binder.

Coal has been heated to 250 deg. C. to drive off moisture without volatilization of other matter, but better results are obtained at the higher temperature, which removes 15 per cent of volatile. The coal after heating to 420 is cooled to 300 deg. C. and run into a mold—compacted a little if of 2-in. diameter—before receiving the impact. The mold being tapered, the briquet slides out freely. Sizes run from 1½- to 3-in. diameter and 1.2 in. long. The gases given off manage to escape in the 0.01-in. clearance around the die. With hydraulic pressure, instead of impact, the escaping gas gives some trouble. After 24 hours the briquet, already strong, becomes much stronger. The difference between briquets of untreated and pretreated coal is in the smoke content. Briquets will take up 1 to 3 per cent of water, but no more, because of the fineness of the pore space. The sulphur content is not affected by the heat treatment as far as known.

Nine-tenths of the production of Illinois comes from the large- and moderate-sized plants, said Col. W. R. Roberts, chairman of the board, Roberts & Schaefer Co., speaking for R. J. Lawry, contracting engineer of that company, at Saturday's meeting, with C. J. Sandoe, vice-president, Gillespie Coal Co., chairman. These companies are large enough to operate suitable cleaning plants. The other tenth is mined by mines as numerous as those mined by the other nine-tenths. Should they clean their coal or should they fold up and cease to give a necessary local service and leave their employees without work? This question of Dr. Leighton had been assigned for answer to the author of the paper.

Should Small Mine Prepare Coal

Included in these small companies are many operating small wagon mines, said Colonel Roberts, so small that they could not possibly afford preparation plants; other companies with plants mining 500 to 1,000 tons daily and still others with plants of 1,000 to 1,500 tons of daily capacity. To hold their market these companies should clean their coal mechanically, but the last group probably would not be justified in cleaning mechanically their 6-in. coal, as the larger concerns are preparing to do or are doing. The largest size mechanically cleaned probably would be 3 in.

Such concerns would be likely to have 60 tons of coal of 3 in. and under to clean per hour. With four units the capacity per unit would be 15 tons per hour; somewhat small but within reason. The coal might be cleaned in a single unit, but, if it were,

the company might wish to omit refinements. However, if it did, the coal would be poorly prepared, and much salable coal would be lost—a costly procedure. Such a small company could not afford to dry with heat but could clean its fine coal with air. Nor could it employ a chemist or operate a testing laboratory. Sending its analyses to a consulting chemist, the coal might be in the market or the furnace before the report was rendered.

For the middle group (500 to 1,000 tons daily) the central plant invited consideration. The theory for such a plant was good, but in practice, said Colonel Roberts, central plants usually failed. He had opposed their establishment, though his advice had not always been followed. Degradation and transfer costs, uncertain running time and changing markets had usually caused abandonment; operating schedules could not be arranged, so no central plants were now in operation. He had never built a plant with several separate mine owners as clients. Alabama had many washing plants of the size named, but that is a Southern State. No housing was provided; all the operative needed was a little sun protection, and the machinery could be placed in the open. Of all the coal produced in Alabama, 74 per cent was washed; of 75 plants one produced 60 tons per hour, 7 only 200 tons per day and 66 only 300 tons daily. However, granted that there must be a central plant, he would advise a combination under a holding company for finance and operation, with funds provided locally so that the outsider would not make all the profit, and with arrangements for enlarged markets. An engineering company should select the companies, evaluate the properties, recommend improvements and assess the cost.

Why Sell Coal as Mixed Aggregate?

Much consideration has been given to combustion but little to the coal itself, which is not a simple compound but an aggregate with diverse characteristics, said Dr. Cady. True, the coal of Illinois rarely showed durain; clarain, vitrain and fusain were the usual constituents, but in No. 6 bed near Herrin was a 2-in. layer of durain. Vitrain percentage increases toward the southeast; clarain in the reverse direction. Illinois fusain is high in fixed carbon and B.t.u., and clarain in volatile matter. The latter has less heat units than fusain, and vitrain less than either. Moisture is low in fusain and high in vitrain, thus lowering the B.t.u. of the latter. Vitrain usually is found to be cracked by shrinkage, with the cracks filled with kaolinite. Most people say the mineral is calcite, and indeed at times it is. Kaolinite usually follows the bedding, which calcite crosses, but sometimes the former also crosses the bedding. The calcite probably is a later "enrichment."

In sizing, clarain is the lump coal, vitrain the medium, and fusain the small and highly friable coal. Vitrain swells on heating; clarain does not. Coke from bright coal will have 80 per cent of abrasion; coke from dull coal, 18 per cent; and raw coal, 60 per cent. The bright coal is mostly vitrain; the dull, mostly clarain. Vitrain is derived from wood, and clarain is the spindrift of the peat bog—leaves, bark, spores, and waxes. Little indeed of the ash is really organic. Ninety-eight per cent of it comprises detrital clay, kaolinite, calcite and pyrite.

Started with the purpose of obtaining sulphuric acid from coal-mine waste, said C. M. Smith, research assistant professor of mining engineering, the study of these wastes was diverted to the more attractive problem of obtaining coal values. About 2,000,000 tons of table pickings promise a real revenue. Today they catch fire and are a nuisance. Actual tests show a large tonnage of clean coal available from this source. Figuring 30c. a ton for cleaning and $1 for realization, a good profit is indicated. As the cleaner coal is the more friable, the smaller the size received from the crusher, the cleaner the coal obtained. Most of the refuse is pyrite. If the float at specific gravity 3 were removed, most of the remaining sink should be pyrite. There is no adherent skin of coal, but it is difficult to keep the carbon content below 2 per cent, as desired.

Illinois coal is harder than its impurities. The incombustible in the coal breaks more readily than the combustible, thus contrasting with Eastern coals, which are soft, stated H. Kreisinger, research engineer, Combustion Engineering Co. The fines from Eastern coals are better than those from Illinois coal, which latter also are laminated coals giving rectangular or cubic pieces. High in sulphur and ash, Illinois coal fuses at a low temperature. Having a high volatile content, it makes black smoke if not properly burned. Traveling-grate stokers are best suited to Illinois coal. They should be equipped with a rear arch. With a front arch there is no air to burn the escaping gases. Provision for cooling of the gases prevents them being sticky and thus coating the tubes with scale.

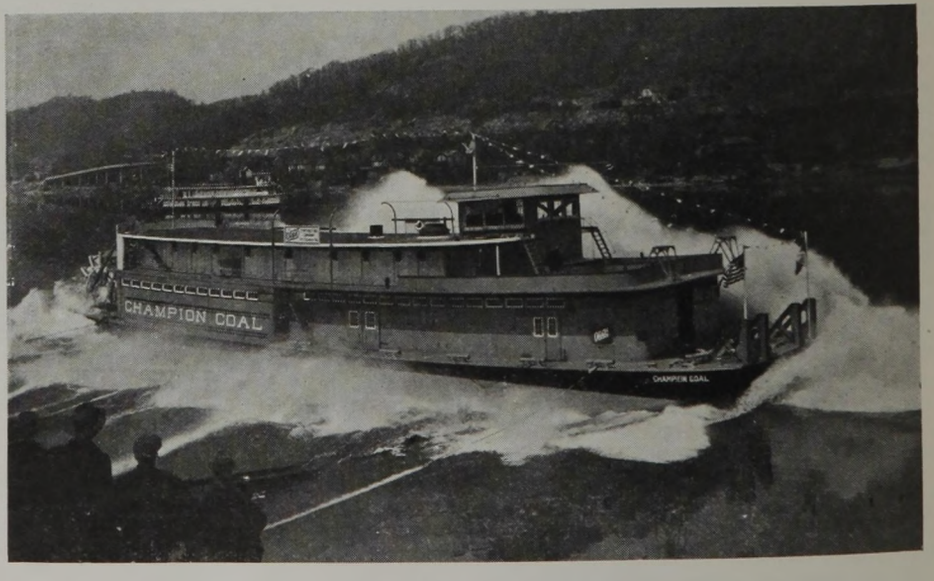
All early efforts to coke Illinois coal failed, even when mixed with low-volatile West Virginia coal, declared M. D. Curran, president, Radiant Fuel Corporation. If coal is completely carbonized to coke, the temperature of the fire will have to be kept high, and with a low ash-fusion coal, clinker is inevitable; but if a sufficient quantity of volatile is retained, the coal can be burned more slowly. Communities must learn that if they want smokeless coal they must be willing to buy the gas made in its manufacture. With the Knowles oven there is no need to blend Illinois coal with coal from other regions.

By carbonization of coal, said Gilbert Thiessen, associate chemist, Illinois Geological Survey, we shall never get enough light oils for the needs of industry. An improvement in England in the Knowles coal oven has been the recirculation of the heavy oil from the process back through the oven. This forms a coke material like that from petroleum, which, being low in ash, makes the final product higher in thermal value. The Bellingham-on-Tees hydrogenation plant of the Imperial Chemical Industries, Ltd., which is backed by the British government, will cost $11,000,000 and will make 37,000,000 gal. of oil annually. It will use 1,100 tons of coal daily, of which 440 will be hydrogenated. A promising form of chemical development is the combination of carbon monoxide with hydrogen to give water and some form of hydrocarbon.

Rates Cut to Fight Truckers

Twenty per cent reduction in freight rates on coal shipped on the Louisville & Nashville and Southern railroads from eastern Kentucky mines to points in central Kentucky was granted by the State Railroad Commission May 8 and became effective May 10. The reduced rates will be in effect for 90 days as an experiment in the effort to overcome competition of truck operators hauling coal from "wagon mines."

Coal producers agreed to reduce mine prices of coal 20 per cent and central Kentucky retailers will pass the reduction on to consumers. With this cooperation representatives of the railroads concurred in requesting the railroad commission to permit the experiment.



Addition to Pittsburgh Coal Co.'s River Fleet

The Steamer "Champion Coal," which will be added to the Pittsburgh Coal Co. fleet of river craft, was launched at Pittsburgh, Pa., late in April. The boat, a wrought-iron stern-wheeler, is 174 ft. long, has a maximum loaded displacement of 650 tons, will be powered with 800-hp. twin-tandem, compound condensing engines, and will be capable of towing more than 5,000 tons. The "Champion Coal" will be operated between Pittsburgh and lower river points. It will be ready for service early in June.

Obituary

JAMES CHAMBERS DICK, 63, well known as a mining engineer in Utah for more than 35 years, died early in May at his home in Salt Lake City after an illness of several months. Born in Pennsylvania and graduated from Lehigh University, his first business connection was with the Kansas & Texas Coal Co., Pittsburg, Kan. Moving to Salt Lake City in 1899, he made a geological survey of the Clear Creek coal field. At the time of his death he was a director of the Independent Coal & Coke Co. He also was widely known in the metal-mining field.

JAMES T. GALLOWAY, 39, mining engineer of the Simpson Creek Collieries Co., Galloway, W. Va., died May 15 in a hospital in Clarksburg, W. Va., after an operation. He had formerly been engineer for the Maryland Coal Co., Lonaconing, Md.

MARK PACKARD, a pioneer developer in the West Virginia bituminous fields, died in Buffalo May 1 from a heart attack. More than 40 years ago he purchased and developed a 10,000-acre tract of Pocahontas coal lands in McDowell County and became president of the Tug River Coal Land Co. and the Pocohontas Thin Vein Coal Land Co. He also owned and operated the Mahoning Colliery, in Armstrong County, Pennsylvania, and became the largest stockholder in the Hamilton Coal Mining Co., in Westmoreland County, Pennsylvania.

JOSEPH P. REND, 64, financier and former owner of extensive coal properties, died at his home in Chicago May 4, after a year's illness. After his graduation from college in 1890, he served in various capacities in the management and development of the coal properties owned by his father, Col. William P. Rend, in western Pennsylvania, Hocking Valley, Ohio, and the New River field, in West Virginia, becoming vice-president and general manager in 1896. He also acquired and developed other coal properties in Illinois and Indiana. At the death of his father, in 1915, he became president of the William P. Rend Coal Co. and subsidiaries. He disposed of the coal interests later, and engaged in finance.

BENJAMIN H. THROOP, 46, who owned a controlling interest in the Price, Pancoast Coal Co., anthracite producing company, Scranton, Pa., died May 10 in Harbor Hospital, New York, following an abdominal operation a week previous. Born at Scranton and orphaned before the age of five, Mr. Throop inherited the mining property and $10,000,000 when he was 21.

MORRIS WATTS, general manager of the Gilliam and Arlington coal and coke companies, McDowell County, West Virginia, and the Glen Alum Coal Co., Bluefield, died April 27 at his home in Bluefield. A native of Lynchburg, Va., Mr. Watts first became identified with the southern West Virginia coal industry 40 years ago as scrip clerk for the Shawnee Coal & Coke Co. At the time of his death he also was treasurer and member of the executive committee of the Pocahontas Operators' Association and of the executive committee of the Williamson Operators' Association.

ASHLEY H. FULLINGTON, 47, connected with the Hulburt Oil & Grease Co., Philadelphia, Pa., for six years, died May 3. He represented the company in western Pennsylvania.

The late Andrew J. Maloney

A. J. Maloney Passes Away

Andrew J. Maloney, president of the Philadelphia & Reading Coal & Iron Co., died of a heart attack at his home in Merion, Pa., at the age of 51. He had been ill for several months, but had conducted business affairs from his home.

He was born in Schuylkill County, Pennsylvania, where he was employed in the Hammond colliery of the Reading company at the age of eleven. At the age of sixteen he moved to Philadelphia, and obtained a job as usher in a theater and later as stenographer with a retail coal company. Enrolling at Temple University law school, he gave up his legal studies before their completion to become traffic manager for a cement company.

His career as a coal operator began as vice-president and sales manager of the Royal Colliery Co., Virden, Ill., which was soon merged with the Chicago, Wilmington & Franklin Coal Co. Mr. Maloney held the same position with the larger enterprise. In the autumn of 1927 he was elected president of the Philadelphia & Reading Coal & Iron Co. He also was chairman of the board of the Reading Iron Co.; vice-president and a director, Mt. Hope & Mineral R.R.; president, Thomas Iron Co., and held directorships in a number of other companies.

Research Studies Launched

RESEARCH studies under the sponsorship of Bituminous Coal Research, Inc., according to John C. Cosgrove, president, are to be undertaken at Battelle Memorial Institute, Columbus, Ohio; Carnegie Institute of Technology, Pittsburgh, Pa., and Penn State College, State College, Pa. The studies at Carnegie and Penn State are to be of a fundamental character, while those at Battelle are to be more of the character of commercial research.

The subjects for study at Carnegie are: "Main Constituents of Coal Ash," "Slagging Action in Western Pennsylvania Coals on Various Types of Refractories in Small Pulverized-Coal Installations" and "Studies of Physical Properties of Xylenols and Mixtures of Phenol, Cresols and Xylenols." At Penn State the hydrogenation of coal will be studied, the particular object being to develop fuel oil. All of these are continuations of studies that have been in progress under other sponsorship. Those at Carnegie are also being supported by twelve commercial corporations.

The studies at Battelle are: "Survey of Domestic and Small Heating Plants," "Further Development of Automatic Firing Equipment," and "Evaluation of Chemical Treatment for Coals." Other projects, not yet determined, are contemplated at Battelle.

Veteran Indiana Operator Dies

John A. Templeton, well-known Indiana operator, died April 26 at Union Hospital, Terre Haute, after an extended illness. The Templeton Coal Co., of which he was president, operates five mines in Sullivan and Greene counties, Indiana.

A native of Scotland, Mr. Templeton came to America in 1881 and settled in Carbon, Ind., where he obtained employment as a mine worker. Several years later he became an operator in a small way, gradually increasing his holdings until he became one of the largest mine owners in the Indiana field. He was president of the Indiana Coal Operators' Association and had been active in association work until six months ago. In October, 1933, he was a leading figure at the hearings which ended in the development of the bituminous coal code under NRA.

He took a deep interest in safety work in coal mining, having been a pioneer in that field in the mining industry of Indiana. One of his mines was the first in that State to receive the Holmes safety award. He was a regular attendant at first-aid meets and encouraged his employees in all types of safety activity.

Anthracite Rates Reduced

The Public Service Commission of Pennsylvania granted the railroads carrying anthracite to Philadelphia and intermediate points the right to reduce rates, it was announced May 7. The reductions, which will amount to 43c. per gross ton on prepared sizes and 18c. per ton on pea and smaller, went into effect May 15 and will continue until Oct. 31. The change was asked to stimulate summer buying and offset truck competition.

Montevallo to Open New Slope

Sinking of a new slope will be started soon at the Aldrich operations of the Montevallo Coal Mining Co., in Shelby County, Alabama. The opening will be about 2,000 ft. in length and penetrate a large area of virgin coal and extend into the old workings, from which coal is now being hoisted approximately 17,000 ft. The project, which will involve an outlay of about $35,000, will result in more efficient and economical operation.

American Chemical Society Focuses Attention On Possible Extension of Coal Markets

NOTHING could be more convincing as to the range of fundamental research into the chemistry of coal and the interest in it than the session of the Division of Gas and Fuel Chemistry of the American Chemical Society in its two coal meetings, April 25 and 26, at the Hotel Pennsylvania, New York, where 38 papers, the work of 61 chemists, were presented.

Illustrative of the problems were the remarks of H. C. Porter, consulting chemist, Philadelphia, Pa., on the behavior of coal when heated. In this regard it may be said that on heating bituminous coal, certain mysterious molecular changes occur, and it softens; afterward, as the heat increases, other molecular changes occur and the mass hardens. It also enables the processor to make briquets out of coal that will coke and even out of bituminous coal that will not coke, and to make low-temperature and high-temperature coke. It is therefore necessary to inquire into this characteristic. What makes the time long or short is important to the low-temperature coke manufacturer, for on the duration depends the size of the product and its docility in the caking process.

Rate of Heating Important

On the speed with which the temperature is raised and on the temperature at which that rate of heating is maintained depend the quantity of solids (coke) and the quantity of liquids (tar and oils) produced. By varying these rates the coke manufacturer can determine, within only narrow limits, however, how much liquid fuel he will make and how much solid fuel. If it is coke he wants he arranges the temperature and rate of heating so that he will get more of it, and if liquids are in demand, he arranges his heating methods accordingly. The gas output seems not to be affected by these factors, but solids and liquids are.

So studies of plasticity engross the time and attention of some of the best minds in the chemical world. What this plastic substance is perhaps is important. Is it the coal itself or is it a pitchy substance within the coal? Dr. Porter declared that pitch it certainly was not, because by putting pressure on the heated material he had been able to drive 95 per cent of the entire mass through a small hole in the end of the cylinder in which the heating took place. Coal placed in a capsule with thin walls of steel would ooze out of 1-mm. holes through these walls, just as if a pitchy substance was being driven out by the heat and by the pressure due to expansion. But, when this "pitch" was examined, it had two-thirds of the ash content of the normal coal, which was indeed strange if it really was pitch.

But the action in coking is affected not merely by heating and rate of heating but by the oxidation of the coal and Dr. Porter well said we need to know more of the behavior of coal toward oxygen. Proper temperature control will make non-coking coals coke. Oxidation may destroy the coking quality, but by proper arrangements it may not be rapid enough to do so. Low-rank coals are most fluid when slowly heated. When coal was coked in a capsule above a layer of coke, the coaly matter softened and penetrated the coke mass and would pass through 1½-mm. openings in the exterior walls of the capsule. Apparently plastic coal had a solvent action on the coal adjacent to it. This coal, already altered by the molecular changes resultant on heat, was dissolved by the oily material in the plastic mass adjacent.

The resistance of coal to the movement of a needle in the plastic mass, said Dr. Porter, has been used as a means of determining its plasticity at various temperatures and rates of heating. It had been proved, remarked Prof. F. H. Fish, Virginia Polytechnic Institute, that non-coking coal will soften, and Dr. Porter declared that the University of Illinois had found that at 200 deg. C., briquets could be produced without binder. (Other corroborative facts from foreign lands can be found in Notes From Across the Sea in *Coal Age*, May issue, p. 216.) Swelling characteristics, Dr. Porter added, are important; also the rate of decomposition and gas formation. The emission of gas had much to do with the working of the coal into a plastic mass. Some of the coal which would coke showed only a softening tendency without swelling.

Effects of different rates of heating in the preliminary, intermediate and final stages of coking were demonstrated by William B. Warren, Carnegie Institute of Technology. In what he termed the "preplastic range" of coking, said Joseph D. Davis, U. S. Bureau of Mines, only molecular changes occur.

Less obviously practical are the experiments being made to determine the electrical resistance of coke. H. S. Auvil, U. S. Bureau of Mines, showed that the resistance of dry coke at 800 deg. C. plotted on a graph followed closely the graph of the volatile matter and that the resistance of the devolatilized 800-deg. C. coke rose as the Layng-Hathorn plastic range decreased. The electrical resistance of coke as measured is the sum of two resistances, that of the coke itself and that of the contact between the coke and the metal by which that contact was made. All this, declared W. J. Huff, the chairman, might seem quite impractical were it not that it has been seriously suggested that the off-peak power of utilities be used for carbonization of coal.

Reactivity Speeds Ignition

Reactivity, Dr. Davis declared, was related in a general way to the ignition temperature and the electrical resistivity of coal. Reactivity is high for cokes of high resistance. So resistivity may throw some light on reactivity, which is important in combustion, gas making, blast-furnace operation and in other combustion operations but also in the making of activation agents which absorb oxygen and so hasten chemical reactions. Y. Oshima and Y. Fukuda, Tokyo Imperial University, in a paper read by C. C. Furnas, Yale University, declared that reactivity is modified by pore size. Apparently the more active a fuel is in adsorption of gases, the more active it is in combustion. That mysterious substance, "amorphous carbon," said the authors, is merely finely divided graphite with a certain quantity of hydrocarbon binder.

Coal products have been used extensively for paints, and the University of North Dakota has been studying resins of reactive, heat-hardening type made from the low-temperature tars of the Lurgi process by the aid of formaldehyde and has been testing their dielectric strengths as a means of determining their value as electric insulating materials, particularly in the form of varnish. Formaldehyde is itself a coal product, and as the phenolic resins are of a family out of which is made, or can be made insulation, furniture, wainscoting and other trim, trays, light machine parts and gadgets large and small, the coal industry may well be interested in studies of this character. The fractions were distilled from the Lurgi tar at temperatures ranging from 170-365 deg., from 180-280 deg. and from 180-300 deg. C. No catalyst was used.

Hydrogenation has been hailed as an artificial means of simulating the production of coal from vegetal material; in fact Dr. Bergius, the inventor of the process, originally had this as his main, if not sole, objective. E. Berl, Carnegie Institute of Technology, discussed these changes, showing how vegetal matter of all kinds, lignin and cellulose can be converted by hydrogen, pressure and temperature into chemical substances identical with the byproducts of coal. Gilbert Thiessen, Illinois Geological Survey, speaking for himself and his father, Reinhardt Thiessen, attacked the viewpoint that the cellulose of vegetal matter was converted into coal. Long before that, the bacteria of the peat bog has destroyed all the cellulose, he declared.

Compounds Derivable From Coal

Bituminous coal, said Dr. Berl, may be separated by extraction, for instance with tetralin and pressure, into solid "residue coal" and semi-liquid bitumen. On hydrogenation of the constituents of coal thus separated about 20 per cent more liquid fuels are obtained than by hydrogenating the original coal whereas charcoal, on hydrogenation, yields methane almost exclusively. Residue coal, therefore, has a chemical composition fundamentally different from charcoal. Asphalt and jet, the bitumen isolated from bituminous coal and the artificial bitumen formed on "coalification" of cellulose yield hydrocarbon mixtures which consist of aliphatic, semi-aromatic hydrocarbons, which resemble natural crude oil. Asphalt, therefore, is an intermediate stage in the formation of oil and is not formed by subsequent oxidation of crude-oil hydrocarbons.

The formation of bituminous coal, asphalt and crude oil in nature, Dr. Berl added, can be imitated by laboratory experiments. The conception that bituminous coal is formed from lignin, and that oil is derived from fish, is incorrect. Lignin and its derivatives, according to Dr. Berl, can never form coking coal under geochemical conditions. The fats which are found in dead fish and the fatty acids that are formed therefrom by saponification yield aromatic hydrocarbons only at such high temperatures as were never reached in the formation of natural crude oil, but carbohydrates can form furanoids and phenolic substances with aliphatic side chains at comparatively low temperatures. These, in turn, are transformed into aromatic and aliphatic hydrocarbons by geochemical reduction and decomposition processes.

A coal product which some think has possibilities is synthetic rubber which will be like natural rubber but devoid of its disadvantages—its hardening quality and its solubility in gasoline among others. The great advantage of natural rubber is its low price. Synthetic rubber can be and is being made from coal products and being successfully sold, but only where its advantage over natural rubber offsets its greater cost. If rubber could be made to pave our streets and roads, what a boost that would give the gas-making and coking industry of which it is a byproduct? If the price were not too high, the demand would be in excess of supply. Today, rubber pavements are feasible only where a light covering is needed, as on bridges, on steep gradients or where traffic is dense. Nitrogen is not a constituent of the basal substance of rubber—caoutchouc—which is a simple hydrocarbon; a substance of that character either already exists in coal as part of its make-up or readily can be made out of it by distillation.

Rubber From Coal

In the manufacture of gas, butadiene is made, which assists in converting the nitrous oxide in the gas into nitric oxide by catalytic action. The butadiene then combines with the nitric oxide to form a gum which ultimately hardens. Now, out of methylbutadiene, or out of isoprene, a derivative hydrocarbon, the first synthetic rubber was formed, and the gum doubtless is a form of rubber—not a useful member of the family, it is true, and one giving immense trouble to the gas fraternity, but one that should have possibilities deserving perhaps of investigation. And investigation it is getting aplenty from W. H. Fulweiler and his associates of the United Gas Improvement Co.; not with the idea of getting a commercially valuable product but with the purpose of keeping the obnoxious material out of gas pipes. Other hydrocarbons besides butadiene have the same quality of converting nitrous oxide into nitric acid; some of these analogues to butadiene are methylbutadiene, dimethylbutadiene, pentadiene, hexadiene, cyclopentadiene, dihydrobenzene and dihydrotoluene.

To prevent the formation of this vaprous gum in systems distributing manufactured gas, the concentration of nitric oxide must be kept below 0.0000005 per cent. Iron sulphide can be made to reduce the nitric oxide percentage, and this material is used for the purification of gas, but, as the purpose and manner of its use is diametrically opposed to the ridding of the gas of nitric oxide, the purified manufactured gas sometimes has fifty times as much nitric oxide as the crude gas. Iron sulphide under controlled conditions will maintain the percentage of nitric oxide at the desirable limit of concentration at a cost of about 15c. per 1,000 cu.ft. of gas. The point is whether a cheaper means is one that would make the vaprous gum, modify it and thus make a commercial product of it.

In the analysis of the constituents of coal the percentage of oxygen, strange to say, is the most difficult to determine. Hitherto it usually has been ascertained by difference, and anything thus determined is likely to be extremely erratic, combining the errors made in all other determinations. W. R. Kirner, Carnegie Institute of Technology, at the meeting, described his direct simultaneous microdetermination of carbon, hydrogen and oxygen. First of all, experiments were made with pure carbohydrates and then with other elements such as chlorine, bromine, nitrogen and sulphur in combination. The determinations of oxygen invariably ran higher than those where it was determined by difference, except in the case of coke.

Hydrogen can be collected by a solution of colloidal platinum and an organic acceptor, declared D. T. Bonney, Johns Hopkins University. This combination is more active than any reagent previously suggested, is easily revivified by contact with air and oxygen, and does not need frequent revivification, gives perfect absorption, is accurate in presence of nitrogen and saturated hydrocarbons, removes hydrogen and oxygen simultaneously; but carbon dioxide, unsaturates, oxygen and carbon monoxide should be removed prior to oxygen determination, is temporarily poisoned by carbon monoxide and carbon disulphide but readily regains its activity, operates at room temperature and is unaffected by standing or by exposure to light even for several months.

Arsenic in Coal

Brewers in the United States are indifferent to the presence of arsenic in coal, said A. H. Emery, U. S. Bureau of Mines, because the products of combustion do not come in contact with the malt. British brewers, pursuing other methods, are keenly apprehensive of this impurity and it is said that Canadian brewers also inquire frequently as to this matter, regarding which nothing was available until E. S. Hertzog, U. S. Bureau of Mines, made his researches on arsenic in coal and presented them at this meeting.

From the figures in Table II the percentage of arsenic increases with the increase in iron and sulphur, suggesting the presence of arsenopyrite, but, if so, this substance must be well diffused throughout the mass. Apparently, arsenic increases with ash content but does not increase in direct proportion to iron, sulphur and ash.

Catalysts of many kinds were described by R. F. Robey, Ohio State University. It was shown that, with acetylene black, the temperature of ignition was lowered most by silver oxide, manganese oxide and copper oxide and raised by magnesium oxide, boron oxide, aluminum oxide and titanium oxide. Hopcalite (copper oxide and manganese dioxide) was not as effective for lowering the temperature as was manganese dioxide and cobaltic oxide.

Dr. Furnas declared that the rate of activity of carbon was decreased by the presence of ash. Of nineteen salts tested by Messrs. Oshima and Fukuda, sodium and lithium salts were the most effective and lead acetate the least efficacious. The results, it may be added, were almost startling, but the quantities used, 5 per cent, were not such as would be applied to improve the action of coal.

Softening temperatures of coal do not accurately mirror clinkering tendencies, said D. J. Demorest, Ohio State University, and R. L. Schaefer, Thomas & Hockwalt Laboratories. By plotting softening temperature against $\frac{Al_2O_3}{SiO_2} \times \frac{SiO_2 + Al_2O_3 + TiO_2}{FeO + 0.6(CaO + MgO + K_2O + Na_2O)}$ a smooth curve is obtained. Iron acts as a flux up to 24 per cent of the total alumina and silica present, but beyond that point it apparently does not lower the softening temperature of the ash.

F. H. Reed, on behalf of H. O. Cowles, S. F. Ravitz and W. V. Peck, University of Utah, declared that Western stoker slacks were corrosive to grates because their ashes fused at a low temperature and had great fluidity when melted, causing them to run, thus opposing passage of air and inclosing unburned carbon. The authors showed that the addition of lime cured these defects, raising the melting points several hundred degrees, decreasing corrosion and producing a satisfactory porous clinker. The effect of iron, in the opinion of W. T. Reid, U. S. Bureau of Mines, depends on the degree of oxidation. FeO and Fe_2O_3 has entirely different characteristics.

Ash Mainly of Four Impurities

Examination of analyses of coal ash, said Gilbert Thiessen, C. G. Ball and Paul Grotts, Illinois Geological Survey, shows that 95 per cent of ash from coal consists of four oxides, alumina, silica, lime and ferric oxide (on an SO_3 free basis). Petrographic examination of the separable mineral matter from Illinois and western Pennsylvania coals shows over 95 per cent of it is composed of detrital clay, kaolinite,

Table I—Arsenic in Coal

Bed	State	Fixed As_2O_3 Per Cent	Total As_2O_3
Wadge	Colorado	Trace	0.0001
Black Creek	Alabama	0.0004	0.0004
Corona	Alabama	0.0007	0.0007
Alma	West Virginia	0.0006	0.0008
Bear Creek	Montana	0.0004	0.0009
Pittsburgh	West Virginia	0.0007	0.0010
Pittsburgh	Pennsylvania	0.0009	0.0013
No. 6	Illinois	0.0007	0.0013
Weir-Pittsburg	Kansas	0.0007	0.0014
Mary Lee	Alabama	0.0015	0.0015
No. 9	Kentucky (western)	0.0008	0.0015
Lexington	Missouri	0.0010	0.0017
No. 3	Iowa	0.0010	0.0021
Jefferson	Alabama	0.0130	0.0140

Table II—Average Analysis of Groups in Table I

Number of Samples Averaged	Total As_2O_3 Average Per Cent	Fe, Average Per Cent	S, Average Per Cent	Ash, Average Per Cent
2	0.0003	0.22	0.55	4.43
4	0.0009	1.01	1.92	8.31
4	0.0014	1.70	2.67	9.81
4	0.0048	3.29	4.93	14.97

calcite and pyrite with other minerals in unimportant quantities. On these major constituents, the fusion temperatures in the main depend.

Beside the common elements (calcium, aluminum, silicon, iron, manganese, phosphorus and sulphur), concentrations of beryllium, strontium, barium, boron, scandium, yttrium, lanthanam and lanthanides, zirconium, vanadium, cobalt, nickel, molybdenum, uranium, copper, zinc, gallium, germanium, arsenic, cadmium, tin, iodine, lead, bismuth, silver, gold, rhodium, palladium and platinum are found in coal, said H. H. Lowry, Carnegie Institute of Technology, presenting the paper of V. M. Goldschmidt, University of Göttingen, Germany. These were often in concentration above those in the lithosphere—that is, the explored crust of the earth. Apparently the vegetation gathered these rare minerals, by absorbing them during the life of the plants, and concentrated them by decay and also during mineralization. Perhaps some of the fertility of the carboniferous periods resulted from the presence of some of these rare minerals in the soil.

Walter Fuchs, New Jersey Agricultural Experiment Station, in contributing a corroboratory paper, declared that rare elements were often found in platinum electrodes and the investigators thought they were finding elements in the coal when really the elements were derived from the electrodes. The same difficulty occurs with carbon rods. In comment it may be said that to the presence of these many rarer elements has been ascribed the much debated advantages of the use of coal as a fertilizer and the more abundant life of the Carboniferous Era.

Permissible Plate Issued

One addition to the list of permissible equipment was made by the U. S. Bureau of mines in April. The approval (No. 289) was issued to the Goodman Manufacturing Co. on April 12 and covers the Type 260-C loading machine with three motors, 50-, 7½ and 3-hp., 220 volts, a.c.

Industrial Notes

Sullivan Machinery Co., has changed the location of its general offices in Chicago from the Wrigley Building to the Bell Building, 307 North Michigan Ave.

General Refractories Co., Philadelphia, Pa., announces the appointment of the Broadway Mfg. Co. as dealer agent in the Knoxville (Tenn.) district.

Bucybus-Erie Co., South Milwaukee, Wis., has appointed F. C. Crane Co., Dallas, Texas, as distributor of its excavating equipment in central and eastern Texas.

Republic Steel Corporation and subsidiaries, Berger Mfg. Co. and Union Drawn Steel Co., moved their Philadelphia (Pa.) offices May 18 to the Broad Street Station Building, 1617 Pennsylvania Boulevard. Lee Wright has been appointed Republic sales representative at Salt Lake City, Utah, with offices at 401 Atlas Building.

Morse Chain Co. has elected the following officers: D. B. Perry, president; C. J. Kenerson, vice-president, general manager and treasurer; N. L. Van Osdol, secretary and assistant general manager; S. B. Waring, assistant secretary and assistant treasurer.

H. F. Boe has been appointed assistant eastern district manager of Westinghouse Electric & Mfg. Co., with headquarters at Rockefeller Center, New York. He had been manager of the company's Buffalo industrial division since 1926.

Herbert F. Sauer has been appointed manager of the Chicago branch of the Electric Storage Battery Co. after fifteen years' service as manager of the Cleveland branch. His successor as Cleveland manager is William P. Roche.

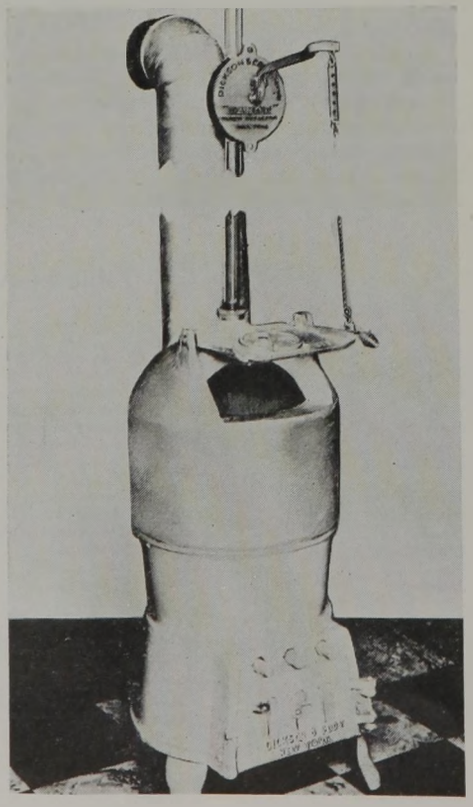
Louis Allis Co., Milwaukee, Wis., manufacturer of electric motors, has appointed the Harris-Green Co., Pittsburgh, Pa., as engineering-sales representative for western Pennsylvania.

Economical Water Heater

Emphasizing the convenience, dependability and economy of anthracite for hot-water heating, Dickson & Eddy, New York, are introducing two types of popular-priced hot-water tank heaters. The dome type is shown in the accompanying illustration, and there also is a flat-top type for combination water heating and laundry uses. Every "DandE" dome type tank heater is equipped with an automatic damper regulator as standard equipment. This automatic feature also is available separately for installation on existing small water-heating units.

Agents for Dickson & Eddy are marketing these heaters on convenient sales plans and the company also aids its dealers in effecting cooperative arrangements with reliable local plumbers and heating contractors for efficient installation.

Dome Type Tank Water Heater With 100 Gal. Capacity



Coal-Use Course at Illinois

A short course in coal utilization lasting three days will be held June 11-13 by the Department of Mining and Metallurgical Engineering and the Department of Mechanical Engineering of the University of Illinois, Urbana. The purpose of the course is to present an educational program of technical and practical information on the efficient utilization of coal for the benefit of those engaged in mining, preparing, marketing and using coal, as well as for those manufacturing and distributing equipment for its preparation and utilization. The program is as follows:

June 11—"Coal Analyses and Their Interpretation," A. C. Callen, head of the Department of Mining and Metallurgical Engineering, University of Illinois; "Combustion Equipment — Residence and Apartment Types," W. J. Woodruff, Urbana, Ill.; "Boiler Test Calculations," W. H. Severns, professor of mechanical engineering, University of Illinois: "Developments in Coal Cleaning," H. F. Hebley, preparation engineer, Allen & Garcia Co.; "Economics of Coal Preparation," D. R. Mitchell, assistant professor of mining and metallurgical engineering, University of Illinois; "Dustless Treatment With Calcium Chloride" (speaker to be selected); "Oil for Dustless Treatment," Berry N. Beaman, Viking Mfg. Co.; "Fuel Engineering Problems," T. A. Marsh, Iron Fireman Mfg. Co.; "Fuel Engineering Technique," J. G. Bently, fuel engineer, Sahara Coal Co.; "Stokers and Stoker Coal," A. O. Dady, Butler Mfg. Co.

June 12—"Heating Values Made Easy," A. C. Callen; "Heat Loss Calculations for Space Heating," A. P. Kratz, research professor of mechanical engineering, University of Illinois; "Control Equipment—Performance at the Research Residence," S. Konzo, special research associate in mechanical engineering, University of Illinois; "Results of the 'Glover Plan'," H. A. Glover, assistant to the president, Island Creek Coal Sales Co.; "Trouble Shooting in the Domestic Field," Carl J. Klermund, Chicago; "The Answer to the Coal Man's Problems," C. V. Beck, executive director, Coal Exchange, St. Louis, Mo.; "Packaged Fuels," R. F. Mitten, C. M. Eberling Coal Cubing Machines.

June 13—"Ash and Its Fusibility," W. D. Langtry, president, Commercial Testing & Engineering Co.; "Essentials of Air Conditioning," M. K. Fahnestock, research assistant professor of mechanical engineering, University of Illinois; "A New Purpose in Boiler Testing," Joseph Harrington, Commercial Testing & Engineering Co.; "Market Potentialities of Fuels and Equipment—an Analysis of the CWA Real Property Inventory," C. M. Smith, research assistant professor of mining engineering, University of Illinois; "Advertising," F. A. Russell, professor of business organization and operation, University of Illinois: "Fuel Advertising and Sales Promotion," C. Franklin Brown, Chicago.

Mine Death Rate Rises

Coal-mine accidents caused the deaths of 49 bituminous and 18 anthracite miners in April, according to reports furnished the U. S. Bureau of Mines by State mine inspectors. This compares with 82 bituminous and 19 anthracite fatalities in the preceding month and 66 bituminous and 23 anthracite deaths in April, 1934. With a production of 21,920,000 tons, the bituminous death rate in April was 2.24 per million tons, compared with 2.11 in the preceding month, when 38,848,000 tons was mined, and 2.68 in April, 1934, in mining 24,599,000 tons. The anthracite fatality rate was 3.76 per million tons in April, based on an output of 4,792,000 tons. In the preceding month the rate was 6.16 on an output of 3,082,000 tons, and in April, 1934, it was 4.76 in producing 4,837,000 tons. For the two industries combined, the death rate in April was 2.51, against 2.41 in March and 3.02 in April, 1934.