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, 1936

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Fruits of Victory

"PEACE" on the labor front in the anthracite region now seems assured for another two years. That a new agreement was reached without the threatened suspension was fortunate alike for both management and men; all those responsible for the prevention of a shutdown are to be congratulated, for any interruption to production carried the seeds of disaster. While, on its face, the tentative contract signed May 7 is a complete victory for the union, let there be no mistake as to its real meaning. Unless maintenance of present wages and granting of future increases can be translated into lower production costs, so that the market for hard coal can be extended, anthracite workers will find the fruits of victory rotting in their hands.

Post Mortem

ALTHOUGH the majority opinion of the Supreme Court in the Guffey-act cases poses seven separate questions for decision, one answer outshadows all the rest. That is the reiteration of the declaration that regulation of wages and conditions of employment is beyond the powers vested in Congress by the commerce clause of the Constitution. Upon that point the opinion is crystal clear. No comfort can be wrung from the refusal of the three dissenting justices to pass upon the labor provisions of the statute at this time when it is remembered that the opinion of the court in the *Schechter* case last year was unanimous.

The situation with respect to regulation of prices on interstate transactions is less forthright. Four of the justices definitely declare such regulation constitutional. In differentiating between the legal concepts of production and commerce, the majority opinion reaffirms the doctrine that sales, shipments and contracts to sell or ship a commodity to customers in another State are interstate commerce and as such subject only to federal control. But the majority opinion avoids a direct ruling on the price-fixing provisions of the Guffey act by holding those provisions so inseparable from the labor sections that the invalidation of the latter destroys the former.

This avoidance of the issue, however, is coupled with the statement that nothing said in the present decision "is to be taken as indicating that the court is of the opinion" that the price-fixing provisions, "if separately enacted, could be sustained." Thus the certainty with which the court states its views on the unconstitutionality of attempts to control wages and working conditions by federal statute yields to uncertainty as to the validity of price control. An industry seeking constitutional means of federal assistance in solving its problems is left to stumble in an ominous twilight zone that only another court decision can lighten.

First-Line Defense

THE DECISION of the Supreme Court in the Guffey-act cases is breathing new vitality into moribund district sales agencies and putting the spark of life into projects that up to now have never progressed beyond the preliminary organization stages. Such activity is encouraging because the district sales agency offers so many opportunities for cooperative effort in building a strong foundation for modern merchandising. Immediate preoccupation with price-fixing programs, however, should not blind the industry to the still greater field open to the district sales agency in the pursuit of basic studies of coal utilization under varying

and varied conditions. Such studies furnish the data for the establishment of a truer relationship between price and use value and, in the long run, will intrench the industry more strongly than simple price fixing.

Pre-Natal

BITUMINOUS OPERATORS committed to the belief in the necessity of government support to effect a sane stabilization of the industry have lost no time in laying the groundwork for a specific determination of how far the Supreme Court will go in upholding price fixing on interstate movement of coal. Their zeal in this direction is wholly commendable, but their haste to salvage the wreckage of the Guffey-act decision may prove their own undoing and imperil the attainment of the objectives they seek to reach. As the new Guffey-Vinson bill now stands, it incorporates all the weaknesses as well as the good points of the price-fixing provisions of the Bituminous Coal Conservation Act of 1935.

Except for the excision of the outlawed labor clauses and a revamping of the preamble to the bill, no essential change has been made in the redrafting process. The declaration for collective bargaining may be dismissed as pleasant surplusage appealing to labor and binding on nobody. The cardinal weakness of the new proposal is the continued attempt to make the bill appear to set up a system of voluntary regulation. If regulation is desirable in the public interest, there should be nothing optional in its application and enforcement. No subterfuge such as the tax scheme denounced as coercive by the Supreme Court decision last month should be invoked to force acceptance of the regulatory code. Neither should any producer be given permission to defeat the intent of the law by paying a penalty tax for that vicious privilege.

Before any new statute is passed, there also should be a calm and painstaking reexamination of the coordination question. No doubt, as in NRA days, sheer exhaustion or bureaucratic fiat can force competing districts to accept some form of correlation even when the basis itself is unacceptable. How long general adherence to such a compromise can be maintained is always problematical. But the greater danger is that coordination on the grandiose scale contemplated in Minimum-Price Area No. 1 may lead to the erection of artificial barriers to the free flow of coal and drive more consumers to other fuels. This and related issues should be faced squarely and with due deliberation. From the standpoint of the future of the industry, time for ample consideration of new legislation just now is far more important than speed in enactment.

Multiplier or Warning?

SPEED OF AIR current as determined by the anemometer is not merely a figure to be multiplied by cross-section of airway. If large, it is as much a warning that a reasonable velocity is being exceeded and that power is being wasted in driving the air at such high speed, the resistance being as the square of the velocity. So, in all reports, the velocity of the air current should be entered by the foreman and duly noted by the management both in main headings and in returns. It must be remembered that as splits move rapidly from the fan, the length of high-speed ventilation increases and resistance inevitably increases; so it is well to keep velocity low from the start, as it will be a limiting factor in ventilation as the mine develops.

Cutting Off the Hills

NOT MUCH is accomplished by cutting gradients below the ruling gradients of the road traversed. A short length of track may be even a little steeper than the limiting gradient, if trips are not likely to be flagged on it. In all cases, due consideration must be shown as to the conditions under which each heavy gradient has to be approached and negotiated, and the ruling gradient must not be too near the hauling capacity of the locomotive. Where, underground, a choice is permissible between a cut and a fill, the latter is preferable, for the rock merely has to be shot and most of it can be left where it falls, whereas all the cut has to be hauled out and dumped; but the final condition of the roof should be considered, whether more may come down or have to be brought down than desired and whether roof when cut can be maintained. Fills also may be made with less interference to operation than cuts.

COST OF UPRAISING SHAFT

+ At East Bear Ridge Colliery

Sets New Construction Standards

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NOTABLE cost reductions were obtained in driving the East Bear Ridge colliery shaft upward instead of downward, for mucking and pumping costs thereby were eliminated. Because of unfavorable surface conditions, the hoist room of this shaft is placed underground.* As completed the shaft raises the cars 239 ft., but its ultimate hoisting depth will be 459 ft. and eventually 850 ft. In drilling and blasting shot rounds, full advantage was taken of slips in the varying strata. A complete cut required 50 to 60 holes which were drilled to a depth of 6 ft. Details of these shaft rounds as drilled and fired are shown in Figs. 1 and 2. The first round (Fig. 1) was used in dense, hard, unstratified rock, such as conglomerate. When the rock was stratified, the method shown in Fig. 2 was employed. Holes numbered "1" were fired with straight exploders; all others were fired with delays. After the opening-cut holes had been shot, the result was ascertained and, if found satisfactory, the rest of the holes were fired in the order indicated by numbers.

Sixty per cent gelatin was used as explosive throughout the operation. Delays were gasless delay exploders with No. 6 blasting caps. All shots were fired from a multiple-shot battery located at the bottom drift of the shaft through a single No. 4 wire carried up the manway on insulators to a point 15 ft. from the face. All holes were well tamped with four to six 1½x12-in. clay-filled tamping bags. Before blasting rounds were ignited, the top of the manway compartment was covered with a heavy plank and timber barricade to prevent rock from falling down the shaft. Above the exposed shaft set, around the rock compartment old timber and plank were placed to protect it from flying rock.

After each round was fired, the shaft men entered the face through the barricade over the manway and made the face safe by pulling down loose rock. Then they cleared the barricade by throwing and shoveling the rock that had fallen on it into the rock compartment. At the same time, the bottom man drew out of the chute into mine cars enough spoil to maintain the top of the rock at all times level with the last shaft set. Drill operators stood on the rock pile in the rock compartment and on a temporary platform in the hoist compartment when drilling their rounds. After a cut had been fired and cleared away, a complete shaft set was installed, plumbed and wedged into place. As shaft raising proceeded, the load in the rock compartment increased so that the lower shaft sets had to be strengthened temporarily by placing relief props between them in horizontal and vertical directions.

When the shaft holed through on the Water Level drift and the necessary rock cutting for the installation of the caging equipment was completed, the rock compartment was emptied. The boards that had formed the temporary lining of the rock compartment were removed as the rock was withdrawn. Finally, the temporary loading battery and the rock ledge at the foot of the shaft were removed, and thus space was cleared for the construction of the sump, which was next undertaken.

During a period when the colliery was idle and raising in the main portion of the shaft in consequence had been suspended, the section above the Water Level drift was raised. This was done without shaft sets, however, as only 28 ft. of rock had to be cut in order to hole through to the point to which the inclined rope chute had been driven from the hoist room.

After a final plumbing and squaring of the shaft and replacing of two shaft sets that were found to have been damaged during the raising, the top and bottom shaft stations were constructed. Oak timber 10 in. x 14 in. x 16 ft. was used, leaving an unobstructed shaft opening 16 ft. high on each side so that rails and long timbers could be lowered on the cages. Next, the shaft guides were installed, starting from the Water Level drift station. As installation progressed down the shaft, temporary platforms that had been installed during raising were being removed.

Cost and Performance Data — The shaft-raising crew employed by the contractor was divided in three 8-hour shifts each day and totaled eighteen men, comprising one foreman, three chargemen, nine shaftmen, three helpers or bottom men and two drill sharpeners in the shop at the surface. The equipment with which the contractor executed the entire contract consisted of: three Ingersoll-Rand No. 79 stopers; 3,000 lb. of 1-in. S.K.F. hexagon drill steel, and one small air hoist for handling shaft timber and supplies. In the repair shop at the surface the contractor installed an Ingersoll-Rand No. 50 drill sharpener, an Ingersoll-Rand shank grinder and a forge. To drill a single shaft round, 150 to 225 pieces of steel were used.

At the completion of the shaft-raising contract, including extra work such as cutting additional rock at the shaft stations, the account of supplies and other charges, but exclusive of amortization or replacement of the equipment listed in the preceding paragraph, was:

307 boxes of 60 per cent gelatin explosives at $3.07	$942.49
2,500 delay exploders at $0.12	300.00
1,000 No. 6 caps at $0.06	60.00
Lead wire	10.00
100 spools of wire at $0.70	70.00
2 bbl. of lubricating oil at $33.50	67.00
4 rolls of tamping paper at $0.15	0.60
Axes, saws, pickhandles and incidentals	100.00
3,000 lb. of drill steel (used up)	375.00
Total	$1,925.09

Using a divisor of 288 lin.ft. of actual rock cut, the unit cost is $6.68 per linear foot. The area of the shaft cut in rock

*Conditions surrounding the construction of the shaft, its purposes, excavation specifications and timbering were described in the first article in the series, published last month, p. 182.

is 18x15 ft., or 270 sq.ft., hence every linear foot of shaft raised was equivalent to the cutting of 10 yd. of rock. So the cost per cubic yard was $0.668.

From bottom of sump to roof over head sheaves, the completed shaft measures 312 ft. It consists of the following main major sections:

Shaft above Water Level drift (elevation +1,141.5)	55 ft.
Shaft from Slope Level to Water Level (elevation +891.5)	250 ft.
Sump	7 ft.
Total	312 ft.

The actual shaft raised between the two landings measured 240 ft., as top and bottom stations were driven before raising was started. The average performance in this work was 2.98 ft. per 3-shift day worked, 6.1 man-hours per linear foot and 0.61 man-hour per cubic yard of shaft raised. Performances just stated included all work to be done by the contractor with the exception of installing guides and the removal of the temporary timbering such as the lining of the rock compartment and the platforms in the other compartment. When the shaft was completed the shaft had to be lined in a few places with 3-in. plank.

To collect drop water from the shaft and to permit in future the raising of the next shaft section without disturbing the present bottom station, a sump had to be excavated at the foot of the shaft. For this purpose a bearer set was installed in the bottom of the sump for the support of the station set. Shaft raising started Sept. 1, 1934, and was completed Jan. 26, 1935, but the work was shut down for three weeks in November and December when work at the colliery was suspended. Installation of guides is not included in this period, as the work was postponed until after the head sheaves and the caging equipment had been installed. A progress chart covering the raising operation in the main part of the shaft is reproduced in Fig. 3. The completed shaft with sump, guides and shaft stations cost $30,626.45, allocated as follows:

Items	Total Cost	Cost per Linear Foot
8-in. ventilation borehole	$1,423.12	$4.66
Shaft-raising contract (with extras)	19,738.66	64.71
Cost of shaft timber (permanent and temporary)	5,608.44	18.38
Cost of guides and bolts	730.02	2.46
Framing and delivering shaft timber	910.55	3.00
Timbering of shaft stations	2,195.66	7.20
Total	$30,626.45	$100.41

The shaft was put into operation by Aug. 1, 1935, though completed June 15. During the interval incidental work such as installing signals, laying ropes on drums of hoist and hanging cages in shaft was performed.

Comparison Between Raising and Sinking—Success in raising the shaft at East Bear Ridge colliery invites a comparison between the cost, speed, convenience and safety of the two methods of shaft construction. In this comparison, the items covering equipment and material should be and have been omitted, as they were unaffected by the method of construction. Bids received on the sinking method figured a unit cost of about $10 per cubic foot of shaft, whereas on the same basis a cost of $6.50 per cubic yard under the raising method was obtained.

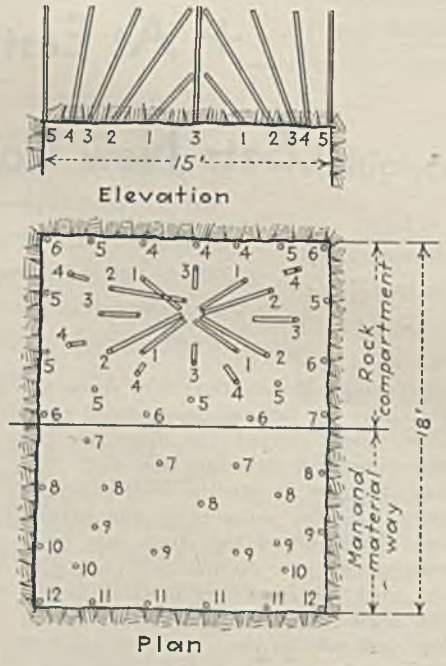


Fig. 1—Shaft round for dense unstratified rock

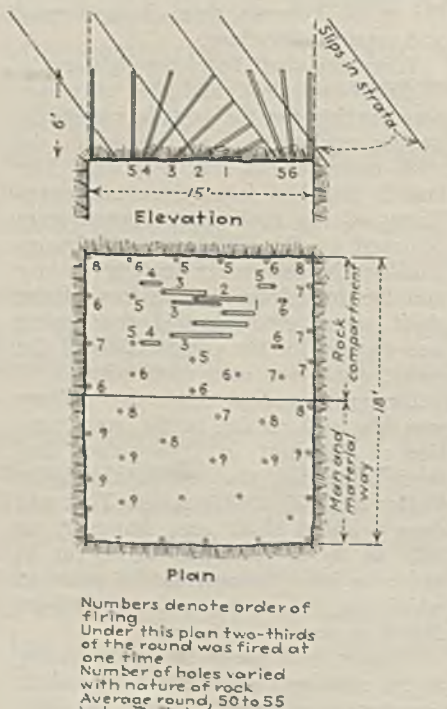


Fig. 2—Shaft round for stratified rock

This difference in cost of 35 per cent in favor of raising can be attributed chiefly to the fact that in raising, little or no mucking has to be done, whereas, in sinking, all rock has to be mucked by hand and hoisted in the shaft. In raising a shaft, all water seeping from the rock strata or used in drilling runs away, whereas in sinking it accumulates at the shaft bottom and requires pumping, and, though it may occur in small quantities, it nevertheless makes hand mucking difficult and slow. The absence of any expensive shaft-sinking equipment such as hoist, buckets and sinking headframe accounts also for the lower cost of the raising method.

As hand mucking is not needed when a shaft is raised, shaft raising is faster than shaft sinking. Here again the installation of a sinking hoist and the head arrangement incidental to the sinking method would require much more time than the building of a loading chute for shaft raising. A comparison in safety features of the two methods would most likely end in a draw. At East Bear Ridge, however, by good fortune not a single serious accident occurred during the execution of the program.

Shaft Equipment—The head sheaves, which are mounted on structural steel beams, hitched and cemented into the shaft walls in the highest point of the shaft, are of unit cast-steel construction and have a diameter of 9 ft., the same as that of the drums of the shaft hoist. Hoisting ropes have a diameter of 1¼ in. and run from the head sheaves to the shaft hoist through an inclined rope chute.

Cages are of single-deck all-steel design and are equipped with cam-type manganese-alloy-steel safety dogs with quick-grip springs. Dimensions of the cage platform are 6 ft. 1½ in. x 11 ft. 9 in. The substantially built cages have replaceable cast-steel guide slides and non-skid steel floor plates. Mine cars are held on the cage by Nolan automatic car-locking devices operating at the landing points by cagers of the same make. Complete with safety chains, cages weigh 12,025 lb. They were built for use with leg-type landers which engage the ends of the cage.

Shaft Stations were built as far as possible on a standard plan incorporating automatic caging equipment of the Nolan type. Sixty-pound rails were used throughout the stations. A complete caging device consists of a chain-type trip feeder, an automatic alternating switch and two Nolan spring-cushioned double-horn car cagers. The equipment on the Water Level drift station receives the empty mine cars in trips backed into the empty branch by a trolley locomotive. When the first

car is engaged by the dogs of the trip feeder, the locomotive is uncoupled and the trip is handled automatically by the caging equipment. As the trip feeder pulls the car trip forward, cars are uncoupled while passing over a knuckle point of the track and then run by gravity into the alternating switch. This switch distributes the cars evenly between the two cagers.

By means of a tripper, the car cagers are operated automatically by the shaft cages. It opens the front horns and closes the back horns, thus releasing the car, which, standing on a gradient, immediately travels on to the cage. At will each caging unit may be thrown out of operation by a hand lever. This throw-out device is interlocked with the landers' lever so that the cagers are inoperative and clear of the path of the cages when the landers are withdrawn. This is necessary as a safety provision when the shaft is used for hoisting men.

Approximate caging time at each shaft station is 4 seconds. As heavy loaded cars push the empties from the cage on the bottom station while lighter empties must push loads from the cage on the top station, different track gradients have had to be provided to suit the respective caging units. The hoisting requirements of the shaft are 99 cars per hour.

Loaded mine cars pushed off the cage at the Water Level drift run by gravity toward the main tunnel, where they are assembled into trips and hauled to the breaker. On the Slope Level the empty

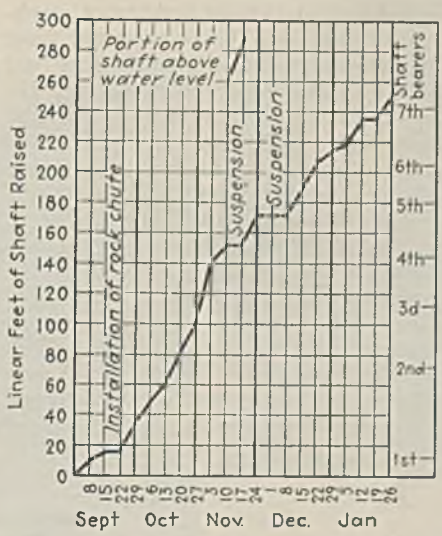


Fig. 3—Progress chart for shaft raising

cars run into a kick-back which sends the cars into a branch provided for empty cars. Here is installed another trip feeder which permits the long branch to be stored with cars without requiring them to run by gravity for a long distance.

All trip feeders are of the chain type with single dogs that operate against the car axle. They are actuated by 5-hp. gear motors that give a chain speed of 25 ft. per minute. The pushbutton controls for the trip feeders are placed in convenient reach of the shaft-station operator. One station operator and one car coupler suffice at each landing.

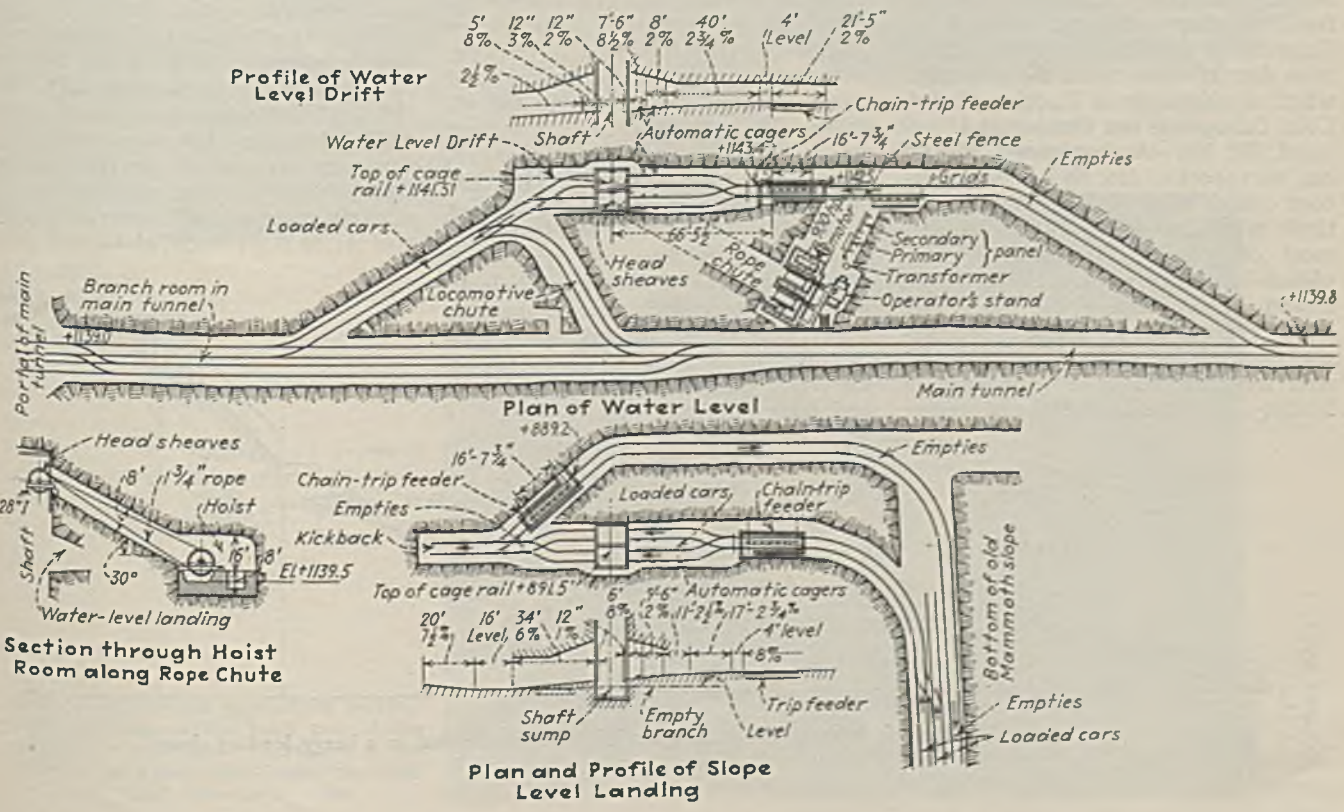
Both shaft stations are cut in rock so massive as to require no timbering. Near the shaft the stations are cut from a height of 8 ft. at the approaches to 15 ft. in the clear at the shaft timber. At each landing a manway 3 ft. wide has been provided around one side of the shaft. Both shaft stations are well lighted electrically and have ample room between the cars and the rib of the drift for the convenient passage of men.

Shaft Hoist—Because of the unfavorable topographical conditions of Bear Ridge Mountian, the shaft hoist was located underground. An estimate comparing the cost of an inside and outside location showed a large saving in favor of the underground location. The hoist room is located between the old "Girard tunnel" and the newly constructed shaft landing on the Water Level. It is connected with both openings for convenient access in case of major repairs and for efficient ventilation and is cut in solid conglomerate which does not require timbering. The dimensions are: length, 32 ft.; width, 23 ft.; height above engine bedplate, 15 ft.

To provide the concrete foundation for the shaft hoist, 8 ft. of rock had to be excavated below the present floor level. The floor level of the hoist room is at +1143.0 elevation, which is 4 ft. above the track in the main tunnel. This provides assurance that the hoist room will be free of water even should the tunnel be flooded.

The shaft hoist is an Ottumwa

Fig. 4—Shaft landings, East Bear Ridge colliery



double cylindrical drum unit with a clutch on one drum. Its drums are cast in one piece, have a diameter of 9 ft. and a width of 4 ft. 2 in. The drum shaft is driven by single-reduction herringbone gears inclosed in an oiltight case. The motor is placed at the right side of the hoist as seen from the operator's stand. A 990-hp., 2,200-volt, 450-r.p.m. induction motor is coupled to the pinion shaft of the reduction gears by a semi-flexible coupling of the cantilever type. Switchboard and control equipment were placed as close to the motor as possible by locating them in the shaft-side approach of the hoist room.

By inclosing entirely the operator's stand by a glass-front building of corrugated sheet iron he is protected from the noise of the running of the hoist and of the flashes at the control panels. He is connected with the shaft stations by telephone and electric-bell signals. The normal speed of hoist is 900 ft. per minute and the drums will hold rope for an ultimate shaft depth of 850 ft.

The 2,200-volt electric current is brought into the hoist room from the substation on the slope of Bear Ridge Mountain by means of a lead-covered three-conductor cable located in a 6-in. vertical and cased borehole. Ample electric lighting with reflectors turned away from the operator's stand toward the hoist and the rope chute makes a well-lighted hoist room.

Future Shaft Development—Present shaft arrangements permit of hoisting only from the Slope Level. The new level that is to be established at a +680 elevation is being opened by a slope driven in rock from the Slope Level down. Under this plan the shaft landing on the new level would be driven first and fully equipped before shaft raising would be started. In this way, the rock from the shaft raising could be handled at minimum expense, and the new lift could be holed through into the present shaft sump without interrupting the operation of the shaft.

NEW HAREWOOD MINE

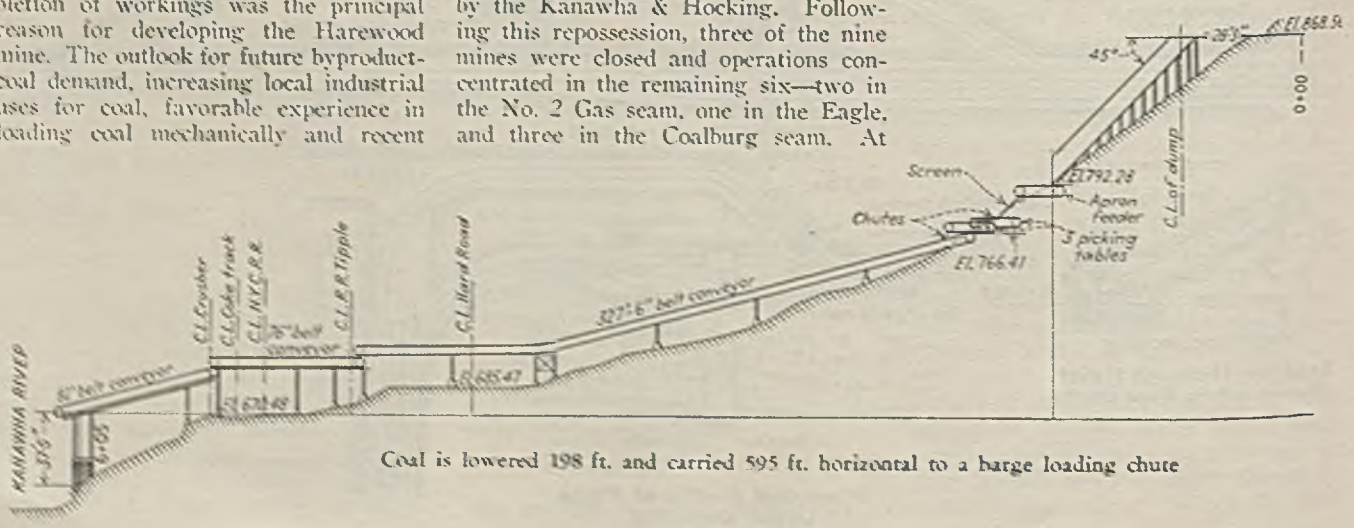
+ Planned to Capitalize on Changing Trends

In Marketing, Operating and Transportation

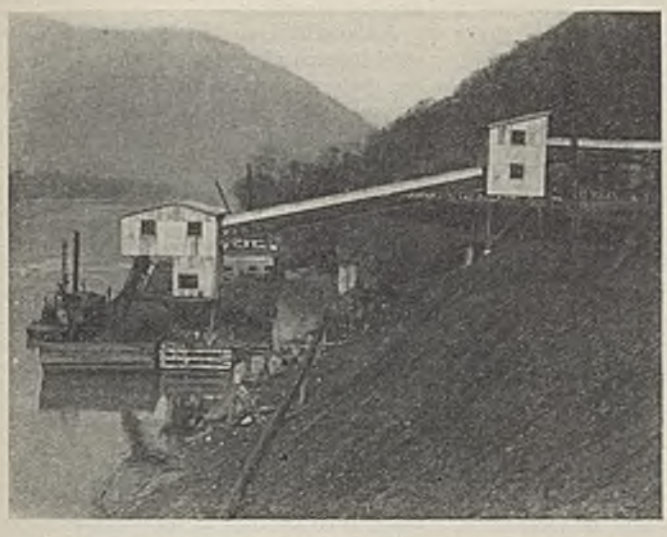
RIVER transportation, use of a loading machine for development and rock work, plans for full-mechanical mining, and a large acreage of Eagle seam byproduct coal less than two miles from the river and in the heart of the Kanawha Valley mining and beehive-oven district characterize the new mine which the Kanawha & Hocking Coal & Coke Co. opened last October at Harewood, W. Va. Approximately $60,000 has been spent to date on a 600-ton-per-hour outside plant built on the site of a tipple which burned in 1925. Replacement of tonnage diminished by depletion of workings was the principal reason for developing the Harewood mine. The outlook for future byproduct-coal demand, increasing local industrial uses for coal, favorable experience in loading coal mechanically and recent improvements in navigation on the Kanawha River all had a bearing on the decision that the expenditure be made at this time.

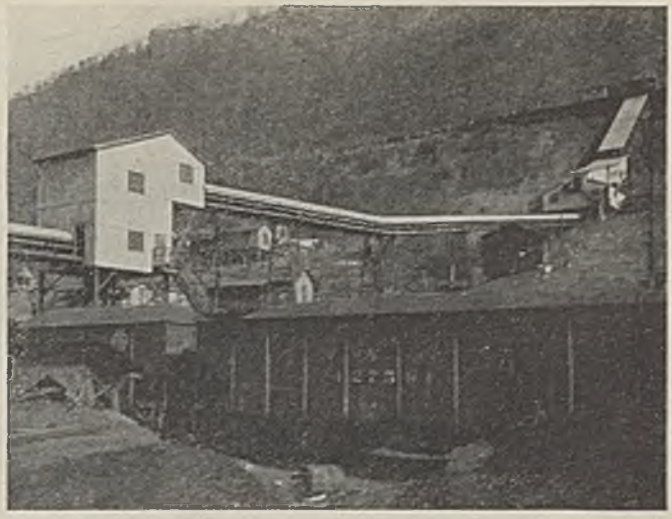
Mining at Harewood first was started in the No. 2 Gas seam in 1890—eleven years before the Kanawha & Hocking company acquired the operation and opened several other mines in the vicinity. The original mine was worked out in 1922, and the tipple then remained idle until it burned. In 1903 the mines were leased to the Sunday Creek Coal Co., which operated them until 1916, when they were repossessed by the Kanawha & Hocking. Following this repossession, three of the nine mines were closed and operations concentrated in the remaining six—two in the No. 2 Gas seam, one in the Eagle, and three in the Coalburg seam. At present the company is operating three mines—Harewood; Longacre, in the No. 2 Gas seam, which has three years of remaining life at low tonnage; and the Mammoth mine, in the No. 5 Block seam. All three operations have river terminals and Longacre and Mammoth also have railroad tipples.

The Eagle seam at Harewood was originally opened in 1912, but, because of a thick divider in the seam, only 300,000 to 400,000 tons was mined up to 1922, when the plant was shut down. The area over which the splitting extends is 3,000 ft. wide, and back of it is a virgin tract of 1,700 acres of proved coal 4½ to 6 ft. thick which will yield



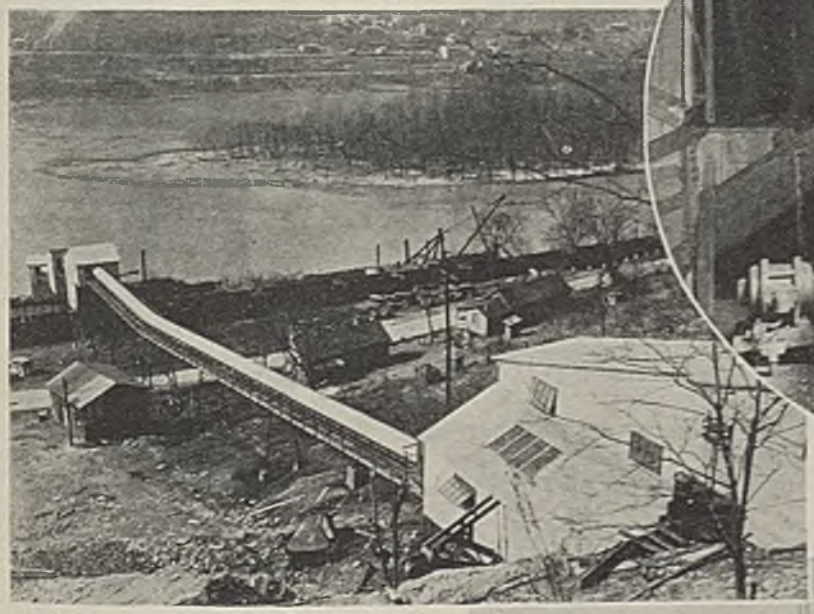
Coal is lowered 198 ft. and carried 595 ft. horizontal to a barge loading chute

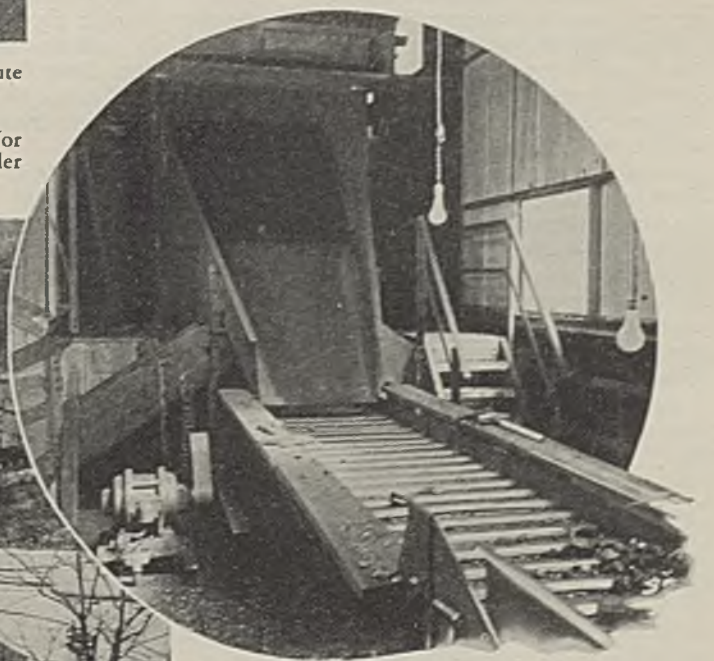




Above—Transfer building, to right, provides for diversion chute and crusher for supply of company's beehive ovens

Upper right—In building to left, provision has been made for use as a railroad loading tipple. No track has been laid under this building





Coal over 3 in. is cleaned on the picking table in the foreground and the 3x¾-in. on two picking tables, one on each side, but on a lower floor

Above—View of the new plant from the headhouse

Right—Construction view of the picking-table building at the head end of the 327-ft. belt conveyor. Excavation is under way for a larry track under discharge of refuse conveyor to right

approximately 10,000,000 tons. In addition, possibly 6,000,000 tons of 26- to 36-in. coal is available to the plant. According to drillhole samples, this Eagle coal will contain approximately 0.8 per cent sulphur, 6 per cent ash, and 34 per cent volatile.

The new equipment of the plant handles the coal from a crossover dump located on the mountainside, 198 ft. vertical and 595 ft. horizontal from the conveyor discharge at the barge loading terminal. Conveyors cross overhead both the vehicular highway (U. S. 60) and the tracks of the New York Central R.R. Provision was made in the design to facilitate installation of a diversion chute and crusher if and when it becomes necessary to supply coal from the new mine to the 166 beehive ovens now operating at Harewood but receiving coal from Longacre mine.

Steel construction begins at the bottom of a 200-ton wooden bin extending from the dump 100 ft. down the mountainside. All this equipment from the wooden bin to and including the river terminal was furnished by the Kanawha Manufacturing Co. In a building at the foot of the wooden bin is housed the hand-picking plant. Here an apron feeder delivers to a 3-in. sloping bar screen, the oversize going to a picking table situated on an upper floor and the minus-3-in., after being divested of the ½-in. slack by a second bar screen, dividing and going to two similar apron-type picking tables located on each side and at lower levels. Reassembled, the coal travels 330 ft. on a belt conveyor to a transfer building which at some later date will be provided with loading chutes to act as a railroad tipple. At the terminus of another belt conveyor, 76 ft. long, is situated a second transfer building which later may house a crusher to serve the coke ovens. A third belt conveyor in the series delivers to a 30-in. round telescoping chute by which the barges are loaded. All belt conveyors are 42 in. wide and are equipped with Timken-bearing idlers.

Recent completion of a lock and dam on the Kanawha River at London, five miles downstream from Harewood and about 25 miles from Charleston, raised the water level 12 ft. and provided a normal pool 15 ft. deep, with slight fluctuations, at the loading terminal. The power company which operates a hydro-electric generating plant at the dam has a right to lower the water 3 ft. if necessary and a flood will not raise the pool above normal unless a quantity of water is passing so great as would have raised the river 12 ft. above the former 6-ft. pool. A 9-ft. stage is provided at the upper end of the pool by the new dam.

In the early workings of the Eagle seam the haulage headings had been advanced 2,200 ft. along the bottom split of the troubled area. In September of last year, a Goodman Type 206A loader was purchased and put into service cleaning the headings and some of the old workings and in October it was put into three-shift service to load rock and coal while the remaining 1,800 ft. was being driven through the troubled area.

For all but 200 ft. of the distance "jumbled strata" of hard sandstone were encountered, the large lumps from which had to be broken by reshooting. This unexpected difficulty slowed progress and raised the cost above the estimate, yet the work was accomplished at a cost somewhat lower than the lowest contractor's bid of $30 per running yard. A two-heading entry was driven at an average rate of 25 ft. per day. Blowers were used, and crosscuts made every 200 ft. Headings are 7x14 ft. and are spaced on 30-ft. centers. The split which was followed is 26 to 30 in. thick, and approximately 30 per cent of the coal was recovered, the rest being wasted with the rock.

Working the loading machine shifts 26 to 27 days per month, total maintenance cost (including lubrication, cable and supplies) was 3.75c. per ton based on a material weight of 165 lb. per cubic foot. One cable-reel locomotive served the loader, and the cars employed therewith were of such size that an average of only three tons of coal could be loaded in them by hand when thus employed prior to their use in driving the entry.

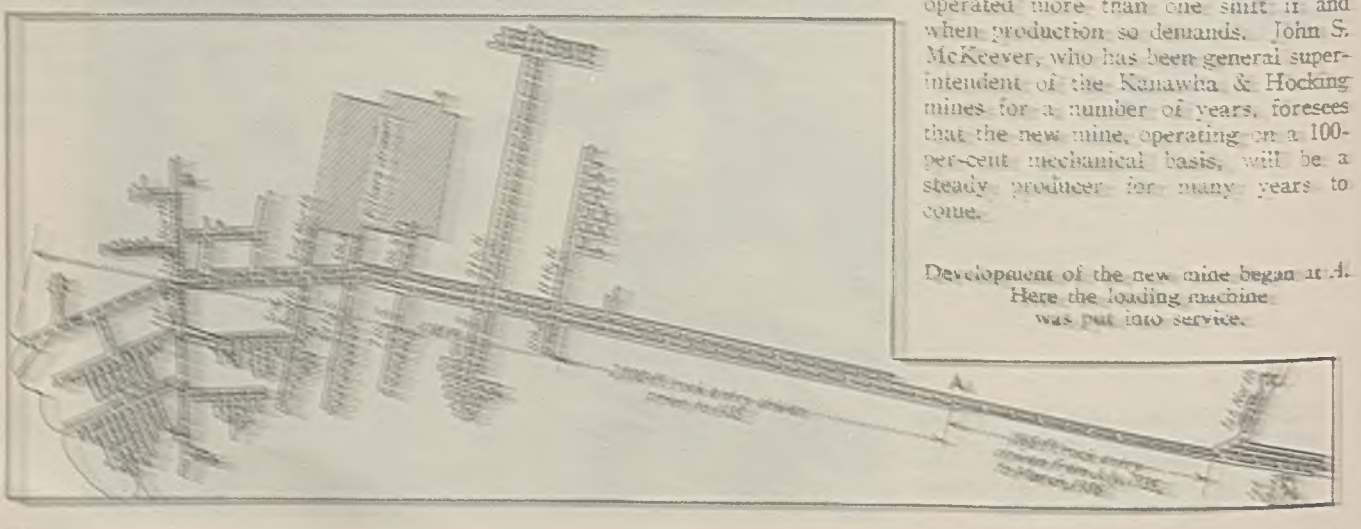
Although two jackhammers were used in each place to drill the sandstone, the material was so hard that often the loading was delayed on this account. Over 25 minutes was required to drill many of the holes.

The loader is now being employed to continue the development on into the 6-ft. coal, and a second cable-reel locomotive has been added to service the unit. Car loadings average 2½ tons. Above the coal is a 1-in. rash which will be continuous over the area to be mined, but drillings over the tract indicate that a ½-in. parting 18 in. from the bottom now being encountered is not a persistent condition.

With the present equipment of 2½-ton cars, the goal for the loading machine is to average at least 250 tons per shift in development work. The intention is to equip the mine at a later date with 5-ton cars, and it is expected that the loader will then produce an average of 400 tons per shift driving rooms and drawing pillars. The plan is to drive rooms 20 ft. wide and 300 ft. deep on 100-ft. centers and work the 80-ft. pillars open-ended.

Recognized practices for promoting safety and efficiency are standard in the mine. These include permissible explosives, electric cap lamps, a no-smoking regulation, and safety clothing. A condition when hiring the men is that they agree to wear protective caps and hard-toed shoes. Inside equipment, other than the loading machine, was transferred from other mines of the company. The list includes five Goodman Type 12AA shortwall machines; one 10-ton Goodman, one 10-ton General Electric, one 6-ton General Electric cable-reel and four 6-ton Goodman cable-reel locomotives.

To increase efficiency in hand-picking, the handling equipment has been slowed from the designed maximum capacity of 600 tons to 300 tons per hour, and it will continue to be run at this slower speed. The tipple will be operated more than one shift if and when production so demands. John S. McKeever, who has been general superintendent of the Kanawha & Hocking mines for a number of years, foresees that the new mine, operating on a 100-per-cent mechanical basis, will be a steady producer for many years to come.



Development of the new mine began at A. Here the loading machine was put into service.

DUSTPROOFING COAL

+ Brings Wide Consumer Acceptance

In Highly Competitive Domestic Markets*

By CHARLES E. WEST
Sales Manager, Utah Fuel Co.
Salt Lake City, Utah

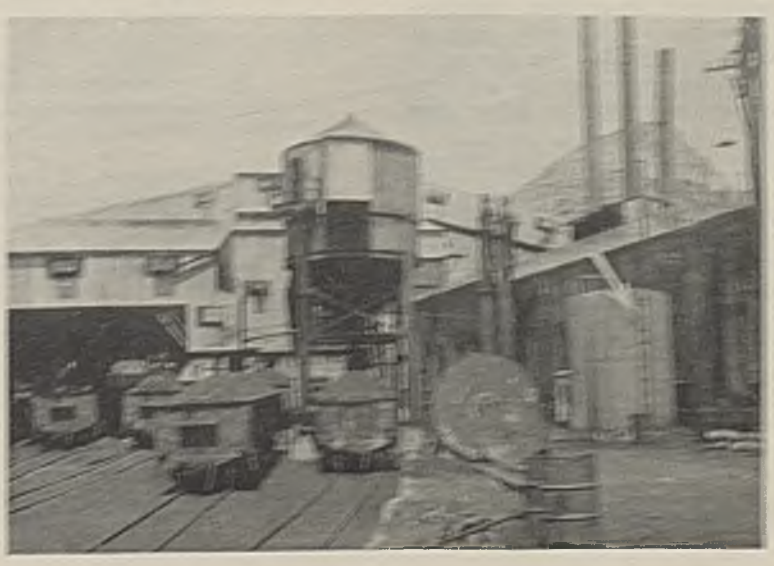
WITH the reduction in the price of automatic coal-burning equipment, the stoker salesman immediately found a field for solicitation which he had not previously enjoyed. Many of his prospective customers had been canvassed for gas- or oil-burning equipment, and in these solicitations much emphasis had been placed on the relationship of cleanliness of other fuels as compared with coal. The average heat user was, therefore, supremely conscious of the alleged superiority of other fuels in the matter of cleanliness. To combat this argument, which was most appealing to the housewife, it was necessary that the coal industry devise some means of preparing its product in such a manner as to make it more acceptable from the standpoint of cleanliness. In other words, the demand for a dustless preparation came from without rather than from within.

Aqueous solutions for controlling dust were first used, and, while they produced an improvement over untreated coal, objection was found to the use of water and chemicals. About this time the oil treatment of slack was being discussed in trade journals, and, after a preliminary investigation, a small plant was purchased for use in one of our Salt Lake City retail outlets. This treatment proved to be an immediate success and the company installed a plant at its mine so as to be prepared to furnish all its customers with oil-treated coal. The oil-treating process installed was furnished by the Wilking Co. The original installation contemplated the treating of screenings only. The equipment included the following: oil storage tank, high-pressure pumping unit, heating unit, and sprays.

Provision was made for transferring the oil direct from tank cars to storage tank by the installation of a 2-in. centrifugal pump with flexible hosing attachment to the tank car. An auxiliary tank also was installed for use when the oil was received in barrels. This tank was located conveniently for truck and rail unloading. The barrels can be emptied into the auxiliary tank and from there the oil is pumped to the storage tank. The high-pressure pumping unit is installed in a concrete housing adjoining the storage tank. The integral parts of this unit include: screen, pump, pressure tank, bypass and pressure valve. Oil is drawn through a screen for removal of impurities before entering the auxiliary pressure tank. A constant pressure (set at 120 lb., adjustable to 150 lb.) is maintained in this tank so that the oil flow to heating units can be closely regulated.

Oil is pumped through a 1¼-in. line to the heating unit, which is located at the base of the screenings hopper. Here it is raised to a temperature of 88 deg. C. (190 deg. F.) before going to the sprays. This heating unit consists of an electrical coil inclosed within a cast housing. The flow of oil to the sprays can thus be closely controlled by valves, as both temperature and pressure are maintained at practical constants. From the heating unit ¾-in. oil lines run to each set of sprays. Sprays for 1-in. screenings are spaced evenly around a telescoped throat or discharge pipe through which the screenings pass from a large hopper, the coal dropping through a fine mist of oil directly into

Tipple and dustless treatment plant. Slack storage hopper appears in center; oil storage tank, indicated by arrow, is at the right, with corner of pump house showing in rear.



*Abstract of an address entitled "Dustless Coal" before the Rocky Mountain Coal Mining Institute, at Salt Lake City, Utah, April 24, 1936.

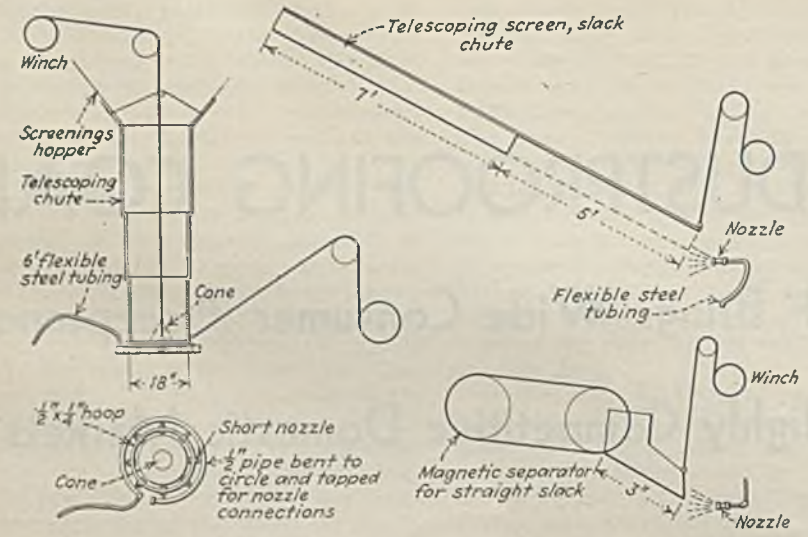


Fig. 1—Three types of nozzle installations employed by the Utah Fuel Co.

gondola cars. To insure better penetration of the oil a cone is placed in the throat of the discharge pipe, the screenings passing over this cone in a thin stream. Sizes other than 1-in. screenings are treated by nozzles located in the loading chute.

To obtain satisfactory results, it has been our experience that the following points should be watched closely:

1. A good grade of clean, well filtered oil should be used. Such oil should be entirely odorless. The heating, while partly offsetting differences in gravity in oils, should not eliminate the proper choice of the correct grade. We have found that an oil with the following specifications gives best results: gravity, 28 deg.; viscosity, 100 at 100 deg. F.; flash point, about 275 deg. F.; cold test, zero deg. F.

2. The optimum amounts of oil for our plant and product are:

1-in. screenings	3.0 quarts per ton
1½-in. screenings	2.5 quarts per ton
1x1½-in. screened slack	2.0 quarts per ton
1½x3-in. nut	1.5 quarts per ton

Our experience shows that quantities of oil in excess of the above cause an oily sludge to form in the bottom of cars. Smaller quantities do not provide enough coverage to allay dust properly.

3. One man alone should be charged with the operation of the unit. We have found that one man can handle it very well, and this man will develop his own technique as to proper coverage and operation. Variations in the rate of oil flow have to be made by this operator to conform to different rates of coal discharge from booms and hoppers.

4. The temperature around the high-pressure pumping unit should be maintained above the freezing point of water so that the oil will pass freely through the screen to the pressure tank. Lower temperatures cause the formation of sludge on the screen and the oil will not pump freely. To accomplish this result we have installed an ordinary radiant electric heater in the pump house.

We find that the oil-treated coal offers the following advantages:

1. Coal is made "dustproof." This characteristic is practically permanent for ordinary use. Oil-treated screenings will retain the oil for several months even though exposed to the weather. It is common for the dealer to hold storage piles throughout the summer with only slight loss of "dustproof" characteristic.

2. Oil-treated coal produces a better clinker for domestic furnaces and less fly ash. A common observance is that fly ash is materially reduced. The clinker appears to be more solid, and therefore removal of ash is simplified.

3. Oil-treated coal acts as a preservative to metal surfaces such as railroad cars, retail yard equipment and stoker hoppers. The elimination of corrosive tendencies of the treating medium removes one of the greatest objections to coal-spraying processes.

4. Less segregation. Fines tend to adhere to larger pieces; therefore, handling in yards is simplified. Stoker feed also is more uniform. This in turn results in reduced packing tendency in stoker hoppers.

5. Somewhat lessened tendency to spontaneous combustion. Decreased segregation probably is the cause of this change, and coating the coal with a thin film of oil may result in less opportunity for oxygen to combine with the coal gases.

Our experience shows that the domestic trade demands the oil-treated coal to the exclusion of any substitutes. It is safe to say that practically 100 per cent of the domestic users prefer this product. In addition, small commercial plants and warehouses are now beginning to insist on the treated coal, solely as a means of eliminating dust which is destructive to merchandise. Industrial plants have not found the treated coal essential, probably because they have not been troubled with dust in their more isolated locations.

The wide acceptance by the trade of oil-treated slack coal has led to the use of the process for treating screened slack (1x1⅝-in.) and of nut coal (1⅝x3-in.). These sizes require less oil, due to their smaller surface areas and to their relatively small quantity of extremely fine fly dust associated with them. While an increasing proportion of these sizes is being treated, the necessity of allaying dust here does not approach that with the slack coal. However, where their preparation does not accomplish the desired cleanliness, the dustproofing treatment is most valuable.

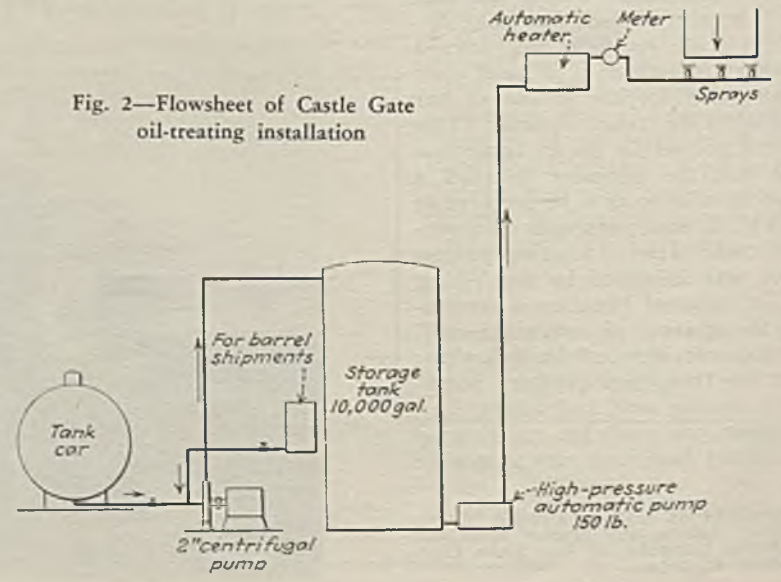


Fig. 2—Flowsheet of Castle Gate oil-treating installation

CINCINNATI CONVENTION

+ Highlights Importance of Coordination

In Developing Efficient Production Methods

COAL MINING is no longer a simple extractive process: increasing mechanization to lower production costs daily is introducing new problems of management; on the preparation side, as anthracite operators long ago recognized, bituminous mines are discovering that cleaning and sizing coal for a discriminating market is becoming more and more a manufacturing job. These changes—as speakers at the technical sessions of the 13th Annual Convention and Exposition of the Coal Division of the American Mining Congress at Cincinnati, Ohio, May 11-15, pointed out—put a premium on a coordinated viewpoint which will embrace every phase of the operating cycle and integrate them into a harmonious whole.

Not so many years back, declared Paul Weir, vice-president, Bell & Zoller Coal & Mining Co., in highlighting this trend, when coal men met, they usually discussed mining methods—room-and-pillar and longwall. Their interests were few. Today a host of new problems confront them—management, electrification, transportation, preparation and all their ramifications. The problems of operation and management have broadened and multiplied, and successful management must have both the vision and the grasp to meet them. A narrow viewpoint will not serve.

Teamwork Beats Prima Donnas

A team of stars, said Charles F. Hamilton, vice-president, Binkley Coal Co., often is beaten by less capable men who work together. An industry acting as a unit will be more successful than one in which each man plays his own game without regard to the combined efforts of his fellow industrialists. It takes real courage to be a good loser and accept the losses which go with team play, but, if the good of the entire industry animates, all those in the industry ultimately will be benefited. Better, for example, to tell a brother operator about a prospective order for which your coal is not suitable than let the business be captured by oil or gas.

The past quarter of a century, stated Eugene McAuliffe, president, Union Pacific Coal Co., has witnessed a number of outstanding changes in production methods and policies. Among them are: (1) Increased use of cutting machines, (2) rapid extension of machine loading to replace hand loading, (3) substitution of electric cap lamps for oil and acetylene, (4) increased use of permissible explosives, (5) marked improvement in labor relations with the elimination of unduly depressed rates and undesirable competitive conditions between producing districts, and (6) a more healthy relation of annual output to capital invested in the mines. Two major opportunities for further improvement which invite exploration are greater promotion of safety work and cooperation between management and labor in legislative matters.

Complete government fact-finding for the industry, with the results made public promptly, was advocated by Mr. McAuliffe "as the most promising aid to cooperative effort" in the broader field of coal economics. He expressed the opinion that neither the NRA code nor the Guffey act had proved a satisfactory mechanism for the control of labor relations and coal prices. Labor organizations, he added, should be urged to "compose their differences" and "to discontinue their caustic, irritating type of publicity."

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Cincinnati Pace Setters

Raymond E. Salvati, general manager, Island Creek Coal Co., as national chairman of the program committee, headed the group responsible for the technical sessions of the 13th Annual Convention and Exposition at Cincinnati. E. J. Newbaker, vice-president, Berwind-White Coal Mining Co., and national chairman of the Coal Division, which sponsored the meeting, was another member of the directing group, while the exposition end headed up under Charles B. Officer, vice-president, Sullivan Machinery Co., and chairman of the Manufacturers' Section.

The eight technical sessions of the convention were presided over by the following chairmen:

I. N. Bayless, assistant general manager, Union Pacific Coal Co., Monday morning.

J. D. Rogers, vice-president, Stonega Coke & Coal Co., Monday afternoon.

Harry M. Moses, general superintendent, United States Coal & Coke Co., Tuesday morning.

H. C. Faust, general manager, United Pocahontas Coal Co., Tuesday afternoon.

H. L. Griffin, division engineer, Koppers Coal Co., Wednesday morning.

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

Peter F. Loftus, consulting engineer, Thursday morning.

K. A. Spencer, vice-president, Pittsburg & Midway Coal Mining Co., Thursday afternoon.

Slump Helped Coal Industry

Perhaps, suggested I. N. Bayless, assistant general manager, Union Pacific Coal Co., the slump in the coal industry has not been without its redeeming features since it has made the industry realize the need for mechanical development. Progress in mechanization and preparation, declared R. E. Salvati, general manager, Island Creek Coal Co., is more rapid today than ever before. West Virginia, predicted H. B. Husband, general manager, fuel mines, Chesapeake & Ohio Ry., will move to the top of the list of mechanized States. What modern mechanical mining and preparation involve was further stressed in a talking motion picture of the Zeigler (Ill.) operations of the Bell & Zoller Coal & Mining Co., where emphasis again was laid on the manu-

facturing aspects of modern coal production and preparation.

Faced with losses to competitive sources of energy and with the further fact that coal consumption has not kept pace with rising industrial activity because of increasing efficiency in fuel utilization, said P. C. Thomas, vice-president, Koppers Coal Co., coal companies cast about for a way of turning fine coal into a household fuel, and the domestic stoker was born. The railroads, he continued, have overlooked the importance of coal in their financial set-up. With coal losing ground to rivals which, in the case of gas and water power, enter the market without using railroad transportation and, in the case of oil, with only a partial employment of that transportation service, the railroads are losing important sources of essential revenue. Despite this situation, the railroads have elected to encourage further displacement of coal traffic by the imposition of emergency surcharges which increase the competitive disadvantages under which coal labors.

Nothing is more important to the mining industry, asserted L. E. Young, vice-president, Pittsburgh Coal Co., than research conducted by each company in its own mines and within its own organization. Such research makes the results of actual tests in practical operation of the various pieces of equipment available for its use. Each company should keep cost data covering a long period of time under the varying conditions of actual operation. Company officials should get ideas from everyone from the veteran of the face to the foreman in charge because much skill and talent resides in these men.

Every company, continued Dr. Young, should have its "suggestion department." One large British manufacturing concern has made much use of ideas thus obtained and has found that not only does it derive assistance in design and operation from such suggestions but that it also creates no small measure of goodwill. The men delight to see their ideas fructify into new designs and improved methods and to sense the feeling that they also "belong." The working force and the face bosses should be trained for their several duties. With such provision the industry should make even greater progress than in the past.

Attendance Climbs

Attendance at the Cincinnati convention this year showed an increase of more than 25 per cent over 1935 figures—and enthusiasm of the delegates also reached new heights. Total registration for the five days, according to the final check-up, was 3,889; the attendance tally for coal executives and operating men totaled 2,186.

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Modernizing Mining Methods

BIT TREATMENT is one of the livest topics of discussion wherever operating men meet—and Cincinnati last month was no exception. Closely allied is the broader question of cutting-machine efficiencies. Another subject destined to attract increasing attention is air-conditioning to halt roof disintegration. These and other aspects of mining methods—including hitch-drill practice, use of portable rotary compressors in low coal, width of standard headings, tunnel driving in Wyoming and in the Pennsylvania anthracite region, and diamond-drill prospecting—are summarized in this section of the convention report.

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SINCE 1929 approximately 20 miles of entry top in mines of the Binkley Mining Co. has been protected by crossbars or pegs installed by the use of a hitch drill designed by the coal company (*Coal Age,* Vol. 40, p. 237), said Frank Schull, general superintendent. This drill also has been employed to advantage in cutting 24-in. ventilation holes through 20-ft. pillars. Use of the drill cut the entry timbering costs to one-third the costs by the old method of using posts or hitching by hand picks.

Envisaging a portable rotary mine compressor for use in 4-ft. coal finally persuaded a manufacturer to build such equipment; now, as was brought out in his talk on the subject, three of these portable compressors are delivering excellent service. Rated 69 cu.ft. per minute at 100 lb. pressure and direct-driven by a 25-hp. 1,750-hp. motor, this compressor will operate two jackhammers and maintain the pressure above 40 lb. Known as the Ro-Twin, it has two cylinders, the rotors of which are keyed to the one shaft. Cylinder jacket and intercooler water are cooled by a tractor-type radiator with fan. As mounted on a truck for mine use the height above the rail is 28 in.

That increasing the standard heading width from 8 ft. to 18 or 20 ft. greatly reduced roof falls in the 4½- to 5-ft. Pittsburgh No. 8 seam mines near Wheeling, W. Va., was brought out in a paper read by O. B. Pryor, general superintendent, Elm Grove Mining Co. When safety clearance standards compelled increasing heading widths it was discovered that 90 per cent of the roof falls previous to the change occurred in headings and only a few falls took place in rooms of 24-ft. width. The wider entry appears to allow a sagging which relieves pressure and reduces the tendency for shear at the rib. A better quality of coal is produced from wide headings than was produced from the narrow. As much as 4 ft. of drawslate is gobbed on one or both sides of the wide headings. Discussing the same subject, Alexander Jack, Pennsylvania Coal & Coke Corporation, described the success attained by mining caving chambers adjacent to entries in the 40-in. "B" seam, where the cover varies from a few hundred to 1,300 ft.

An 825-ft. tunnel was driven in three months through a fault into the Winton mine in Wyoming by the aid of a duckbill and conveyors, said M. A. Sharp, foreman, Union Pacific Coal Co., in a paper read by I. N. Bayless, assistant general manager of the same company. This tunnel was driven on a gradient of 1.5 per cent 400 ft. through soft sandstone and through 425 ft. of hard shale with laminations of sandstone 12 to 18 in. thick. As a rule the rock in a tunnel is shot without regard to its disposition after the blast, as the muckers can load the rock wherever it may fall, but, when the duckbill is used, the rock should fall as a body where the duckbill can reach it. While this reduces drilling efficiency, use of the duckbill more than compensates for this loss in efficiency by economy in mucking. A 40 per cent gelatin dynamite was found to give the best results. Six men and a unit foreman drove the tunnel. The drive when moved up was set 30 ft. from the face, and a barricade was built to protect it from the blast. A heavier drive had to be provided than sufficed for the handling of coal. Mucking for each shot took three hours. Total cost was $10,049, about $7,000 being expended in labor and $3,000 in material, of which the explosives cost was $1,400.

About 90 per cent of the rock tunnel driven for the Philadelphia & Reading Coal & Iron Co. is excavated by company crews, though in earlier years contractors did much of this work. In some tunnels a 7½-ft. cut is standard and only one shift is worked in each period of 24 hours. In others the cut is shortened to 6½ ft., and two cuts of that length, one in each of two shifts, are made in the same period, said B. L. Lubelsky, explosives engineer and tunnel superintendent. The rock penetrated has a hardness of 7 on a scale in which the hardness of the diamond is rated as 10. Aluminum columns are used for the drills to reduce weight. A hydraulic aluminum column has been introduced to save time. Automatic feed for drills has not been found satisfactory, and the drill feed is now regulated by the operative. Forged bits were formerly used, but today detachable bits are standard. About 180,000 are used annually which have an average duty of 7.06 ft. Drill cost in small tunnels is 23c. per yard advance, drill maintenance cost is 39c. and scraper costs are figured at 10c., though a scraper will last 3½ years.

The mining-machine-bit question is still unsolved, in the opinion of N. A. Elmslie, division superintendent, Industrial Collieries Corporation, West Virginia. Based on tonnage cut, the cost of special bits today is comparable to that with conventional bits. Using tipped bits the mines had cut several million tons "at a lower cost than with standard bits." A bent bit, although troublesome, he termed a safety valve which relieves the mining machine of shock and which may prevent the machine kicking out of the cut.

Four to five times as much coal cut per point, one set of bits lasting a full

shift in cutting dirt bands instead of for only one or a few places, and one set cutting as many as forty places in coal, were cited by E. H. Jenks, mining engineer, Rochester & Pittsburgh Coal Co., as the results from that company's change to a central bit-making and bit-tipping plant where steel of 0.70 to 0.90 carbon and 0.45 manganese is used and the finished bits are tipped with an alloy. This practice was adopted after a year's experiments with various methods including application of tungsten-carbide crystals to standard bit steel. Rounded-corner stock is used to eliminate binding of the bits in the holder from expansion due to setscrew pressure. After 1/9-in. length of alloy plating has been welded to the tip, the bit is heated to cherry red at the tip and then cooled. The company sharpens between 1,000,000 and 1,500,000 bits per year. At least three companies in the central Pennsylvania field have standardized on tipping or plating.

Untreated bits preheated, then tipped for $\frac{3}{8}$ in. with boron at a central shop is the practice at Valley Camp Coal Co. mines in the West Virginia Panhandle, said H. E. Schweinsberg, production engineer. One man now accomplishes what was formerly done by six blacksmiths and he could handle double the number of bits now used. A circular table and a preheating furnace are used to improve and speed the tipping operation. Cost per bit approximates 1 mill for tipping compound, 2 mills for other supplies and 5 mills for wages. A test showed 20 per cent less power consumed on the third cut with tipped bits than on the first cut with untipped bits, and the latter were unfit for a second cut.

Plating of bits with hard surfacing materials and then reconditioning by three or four grindings between platings has assumed the proportions of general practice in Illinois mines, according to D. D. Wilcox, general superintendent, Superior Coal Co. "Hard-surfaced bits are a complete failure in hard cutting," asserted James Hyslop, chief engineer, Walter Bledsoe & Co. The "truly hard cutting" in Indiana, he insisted, is entirely different from the easier cutting in Eastern mines. He has found that the tipped bits are good only for abrasion. Coal cutting, he maintained, is not true cutting but a breaking process. The common bit properly heat-treated is his choice for cutting Indiana coals. The bits are quenched from a forging heat and then tempered in a fusible salt (*Coal Age*, Vol. 40, p. 32).

According to W. D. Northover, production engineer, cutting out impurity bands in mines of the Rochester & Pittsburgh Coal Co. and associated companies working the Freeport seams in central Pennsylvania is still in the experimental stage, but very definite benefits have been observed. Better and more uniform preparation is secured, work is less burdensome on the miner and his earning power has been increased. There is no loading-wage differential compensating the company for the extra cutting cost. The cuttings contain only a small quantity of combustible, a factor favorable to the practice of gobbing the material along the ribs in room mining.

Most of the work has been done with cutter bars of 5½-in. kerf, single bars being used for partings up to 4 in. thick and double-deck bars for partings of 7 to 10 in. and thicker. Thin-kerf cutter bars (2½ to 3½ in.) have been used in the more recent experiments and these cutter bars are spaced in the mounting so as to leave a core of impurity which is easily gobbed or to leave a core of clean coal which is loaded. For the most part the impurity bands consist of hard slate.

Diamond drillholes costing $3.50 to $5 per foot and driven from the surface have proved cheaper than prospect headings in the southern Wyoming field, where conditions of pitching seams, with changes of pitch in short distances, and lenticular deposits are the rule, declared C. E. Swann, chief engineer, Union Pacific Coal Co. In some locations it is not advisable to space the holes more than 1,000 ft., while in others the greater continuity of the coal deposits allows spacings of 3,000 to 4,000 ft. Cores as small as 1⅝ in. have proved satisfactory for depths up to 500 or 600 ft., but the degree of care exercised by the drill crew is more important than diameter of core. Working the drill 24 hours per day is advantageous in broken or unbroken cover. Difficulties in transporting coal and water favor gasoline-driven rigs, but electricity is the choice where line connections are available.

Coal should be cut at night so as not to interfere with day loading and to equalize the electric load, declared David Ingle, Jr., superintendent, Buckskin Coal Corporation. Unfortunately, union restrictions and opposition largely offset these advantages and night cutting at Buckskin has been abandoned. Rooms should be made as wide as posible under existing roof conditions so as to give the loading crews a maximum tonnage of coal to load without flitting. This width, however, should not be so great as to necessitate double-tracking the room. More coal can be obtained also by making a deep undercut; however, this is limited by the difficulty of arranging for successful shooting. Loading crews should inspect the roof on entering a room and, if it is not safe, they should move along to another room without waste of time. Bits should be changed in the room to be cut, because delays are likely in passing from room to room, and, when the opportunity favors such travel, machines must not be prevented from availing themselves of this opportunity by the changing of bits. Dull bits never should be used. Mr. Ingle had found that with certain cutter chains he could save 40 per cent in the use of power and increase his cutting speed 19 per cent.

With Sullivan cutters the Chicago, Wilmington & Franklin Coal Co. had been able to increase the quantity of large sizes by shearing as well as horizontally cutting the coal. The officials would like to shear the coal at both ribs but are not prepared to change the bits for the second shear, so they make a vertical kerf only against the left rib. The machine gives a 4-in. kerf, thus greatly reducing the quantity of bug dust, stated T. L. Garwood, engineer, New Orient mine.

Although only partially completed for use late last summer, an air-conditioning system at the No. 2 mine of the Knox Consolidated Coal Corporation, Bicknell, Ind., appeared to have had a materially beneficial effect in preventing disintegration of roof and, therefore, will be further perfected, said H. G. Conrad, general superintendent. Sprays connected to mine-water discharge pipes are installed in a bricked section of the intake airway near the shaft bottom. Mine water when scarce is recooled by being allowed to drain back into a sump and left to stand. The first installation of air conditioning, made nine years ago and still in use, is at the Saxton Coal Mining Co. in Indiana. In an extension of the air drift on the surface, water at 56 deg. F. is sprayed through the intake air current. At a third Indiana mine an installation is now under way where the used water is to be recooled by being sprayed through the return air current from the mine.

Mechanization Marches On

WEST AND EAST again joined in the mechanization parade at Cincinnati. Washington and West Virginia vied with Illinois and Pennsylvania while the anthracite region matched the new Kentucky "trackless" mining with a conveyor story of its own. There is one mine car at the Harry Taylor mine, confessed T. F. Steele, general manager, Penn Anthracite Collieries Co.—and that is used to take in heavy material. His company had installed its all-conveyor mine to mine coal that otherwise would be economically valueless and was mining it now with a profit. Some of the coal is clean and some badly laminated, and the roof varies from a good sandstone to a poor slate (see Fig. 1). A large part of the rubbish is brought out with the coal, because there is no space in the mine to stow all the refuse.

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MOBILE LOADERS and conveyors shared the spotlight in mechanization talks at Cincinnati. The anthracite region and Kentucky had "trackless" mining stories to tell; Illinois, Ohio, Washington and West Virginia were heard on mobile machines and several States recounted their experiences with conveyor installations.

Each room has a face and a room conveyor, and there is a mother conveyor which receives the coal from four rooms on the right and four on the left and brings it to the road on the entry heading. Rooms used to be driven up the pitch where they could be driven at all, but with conveyor mining they are

driven across the 15-deg. pitch. In this way the coal flows down to the room conveyor readily. Pillars are removed with the aid of the conveyors. A duckbill is used in the loading of the rock in the roadway which is on the motherbelt side of the wide place known as the entry. This entry has two passageways, one against each rib, and the space between them is supported by gob.

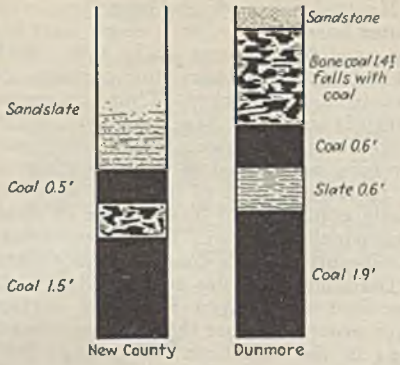
With conveyors, stated Mr. Steele, a large recovery can be obtained from a small area and, because of the speed with which the coal is extracted, the roof is kept under better control. In three years there has been only one delay, whereas, with car haulage, delays are a constant source of annoyance and cost. Supervision is bettered as a smaller area is kept in operation. Safety is increased. No accident from the movement of coal from face to breaker has occurred since the belts were installed three years ago. As less powder is used, explosives accidents have been reduced (*Coal Age*, Vol. 39, p. 419).

Conveyor mining in the Jerome mine, Hillman Coal & Coke Co., was described by E. A. Siemon, division general superintendent. The coal varies in thickness from 30 to 60 in. and has a cover ranging from 100 to 600 ft.; the seam mined is the "C Prime," or Upper Kittanning. Double-chain flight conveyors are used in rooms and single-chain flight conveyors in driving headings. At first, belt conveyors with skirt boards were used at the face, but it was found that the maintenance costs were too high. The face conveyors have 3-hp. motors. Rooms are driven up and pillars drawn back in 12 to 15 days.

No mother conveyors have been used because the men are expected to clean the coal, and the mixing of coal on the mother conveyor would make it difficult to ascertain who was loading out substandard material. The pick-mining rate is 89c. and the conveyor mining rate 57.63c. per ton. Some difficulty is experienced in finding men who like to work together and shifts have to be made. With conveyor mining all the shots in a face are fired at one time, increasing degradation, and some fine coal is made by the action of the flight conveyor.

Although new conveying units have been installed in central Pennsylvania, no radical changes were made in mining methods during 1935. Use of conveyor equipment has increased, partly because with it more development can be made in a given time and a larger tonnage produced and partly because production costs can be lowered, asserted T. F. McCarthy, general superintendent, Clearfield Bituminous Coal Corporation. Room-and-pillar systems still continue to be general practice. Two new types of conveyor mining have been tentatively tested and by the end of 1936 may have established themselves. Conveyor mining to H. E. Wilson, chief engineer, Laurel Creek Coal Co., after experience in three places in the Oak Hill mine of West Virginia, seemed best suited to thin coal beds without horsebacks or other trouble and to wide places. Where the coal was troubled, hand loading had sometimes an advantage in cost per ton.

In Ohio, declared A. A. Mills, purchasing agent, Hanna Coal Co., speaking for J. H. Richards, mining engineer, mechanical loading had been adopted because it speeded up production and reduced cost. Notably, it reduced the expense of heading maintenance, because the speed with which room entries were worked out was so great that they could be abandoned before the roof became unduly weakened by exposure to the air. With the seven-hour day, anything that will enable the manager to maintain production is most welcome.



Seams Mined by Conveyor System of Penn Anthracite Mining Co.

Mechanical loaders and conveyors have been installed in a 54-in. seam in the Cascade Mountains in Washington and are making notable economies, declared Thomas Murphy, superintendent of mines, Northwestern Improvement Co. Cutting machines are not flitted from room to room but held ready for immediate service. Conveyor chutes are made of ⅛x30-in. steel. In earlier years absentee management was quite general and not unsuccessful, but today supervision must be continuous, for a mechanized mine will not run itself.

West Virginia must mechanize and industrialize if it would compete with oil and gas, declared H. B. Husband, general manager, fuel division, Chesapeake & Ohio Railway Co. Already she has a mine with no locomotives with main conveyors driven with 25-hp. motors, room conveyors with 10-hp. motors and face conveyors with 5-hp. motors. When the coal reaches the surface it meets one man who inspects it, and if it is not clean he switches it to the slate dump. The surface force is reduced as notably as the underground force.

Applying effective supervision, "which is just common sense," takes first place in raising mechanical efficiency, stated T. J. Thomas, president, Valier Coal Co. (Illinois), in a paper read by D. W. Jones, electrical engineer. That the workmen are surrounded by safer conditions in mechanical mining is substantiated by the lower accident frequency rates at full-mechanical mines.

A caterpillar-mounted cutting machine was suggested by O. S. Batten, mining engineer, Elkhorn Utilities Coal Co., as a possible help in solving the problem of speeding face preparation in low coal to keep ahead of loading in the conveyor-loading-machine-mining system exemplified at the new Goose Creek Mining Co. operation in Floyd County, Kentucky (*Coal Age*, May, 1936, p. 177).

Speeding Up Transportation

TRANSPORTATION plays an important part in modern production. Trucks are taking the place of standard railroad equipment at many stripping operations while underground progressive management is devoting more study to car design, ties and roadbed, and dispatching. These developments to break bottle necks and insure smooth and steady running, as related by practical operating men at Cincinnati, are highlighted in this section of the convention report.

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MOTOR-TRUCK transportation is revolutionizing strip-pit operations, asserted C. F. Hamilton, vice-president, Binkley Coal Co., in the opening discussion of haulage problems at the Cincinnati technical sessions. The larger the loads trucked, the cheaper the transportation; due regard, however, must be given to proper coordination: i.e., a 20-ton truck needs a 3½-cu.yd. shovel. At present the limit of haul seems to be three miles, making, with return haul, six miles. Trucks can climb such steep gradients that the distance from strip pit to tipple can often be greatly reduced from that necessary if railroad cars are used. A 6-per-cent gradient should be the limit, though a 15-per-cent gradient can be negotiated. With the 6-per-cent limit, it is always possible to "make the grade," so operation is never delayed. Contrary to the usual axiom, if one link in a chain of motor trucks fails and has to be withdrawn, the others can be accelerated, and loading, transportation and dumping will continue unhampered.

A truck has a normal life expectancy of about ten years. Although trucks can be loaded beyond the limit for which designed, the owner then pays heavily in life, maintenance, uncertainty and worry. First cost of trucks is not as important as operating cost. Wheels must be of large diameter and must have big tires for satisfactory operation.

Rules for trip-dispatching were laid down by R. G. Lazzell, operating superintendent, Island Creek Coal Co., who also described the dispatching system in detail in one of the mines of his company (see *Coal Age*, Vol. 28, p. 555). In the opinion of W. J. Wolf, division manager, Consolidation Coal Co., whose paper was read by L. B. Abbott, division engineer, trip dispatching is vitally necessary in all mines producing 1,500 tons or more daily. (The Consolidation dispatching system was described in *Coal Age*, Vol. 35, p. 585.)

With better roadbeds and more ade-

quately maintained equipment more regular schedules of operation can be attained, asserted J. Anstead, electrical engineer, Templeton Coal Co. It does not pay to save time by excessive speed and lose it all by splitting a switch and wasting much more time in rerailing the locomotive. Regular and consistent operation under conditions made favorable is the surest way to obtain large tonnages. When the locomotive runs without operating difficulties, the motorman can give the road ahead of him his undivided attention.

Introduction of mechanical loading, added Lee Haskins, superintendent, Bell & Zoller Coal & Mining Co., has intensified the haulage problem. With hand loading a delay in one section could be compensated by drawing from another part of the mine; with mechanical loading, to lay off any section means the loss of the labor of a large number of employees and the temporary idleness of expensive equipment. Moreover, the mechanized mine is not planned for any tonnage beyond that desired, and to lose coal in any section means a failure to reach the expected tonnage. The number of cars per trip should be limited to avoid delay in operations and overheating armatures. Excessive speed, he agreed, should be avoided. A dispatcher at the mine bottom should direct the trip movements. An extra locomotive of every class should be provided, ready for emergency service. In car changing, two locomotives will give the most profitable results. Cars can be changed at the Bell & Zoller mines in from 10 to 15 seconds.

Large-capacity cars reduce haulage costs, and the stub axle aids in giving the large capacity, said F. S. Follansbee, chief engineer, Koppers Coal Co. With hand loading, declared C. J. Sandoe, vice-president, Perry Coal Co., large cars cut costs because fewer cars have to be placed and the loading height can be made less. Low cars not only lighten the physical labor but break up the coal less, because a heavy lump of coal can be lifted to the top of the car without undue exertion. With machines, the few car changes enable the loading machine and its crew to work more steadily. As many cars can still be hoisted and as many cars dumped. The modern car is far sturdier than the older car and has a lower upkeep. In one of the old wood cars were 275 bolts which were likely to get loose, whereas in a modern car Mr. Sandoe had counted only 87 rivets and four bolts. At the mines of the Lehigh Navigation Coal Co. the chute material, which may be rock or coal, falls 5 ft. into the car and may be as heavy as one ton in a single lump. Sturdy cars are needed for such service, said R. E. Hobart, mechanical engineer (see *Coal Age*, Vol. 40, p. 403).

Cars should have large capacity, flexibility to negotiate uneven track and to pass around curves, durability and strength, according to A. R. Long, superintendent, New River Co. Possibilities of derailment should be considered in the design of cars so as to protect employees who have to put them back on the track, but above all, cars should be so constructed that they should not go off the track for any fault in their construction (see *Coal Age*, January, 1936, p. 20).

Use of rail heavier than necessary on temporary and semi-permanent tracks is an unwarranted expense, in the opinion of George E. Bayless, chief engineer, Ohio & Pennsylvania Coal Co. What may be good track in one type of service may be poor track in other service. For short-life track such as in butt entries and rooms he advocates making the track as light as possible consistent with safety and service. Generally, he said, 25- to 30-lb. rail is used for butt entries and rooms, 30- to 35-lb. for intermediate haulways and 50- to 85-lb. for main hauls, which usually have a life of 20 years or more.

Adoption of treated ties for principal hauls is the one change which effected the greatest improvement in transportation cost and efficiency at the four shaft mines of the Sahara Coal Co., of Illinois, said Paul Helbersleben, general superintendent. Creosote treatment of the ties, mainly sawed from Southern hardwoods, including gum, has displaced the earlier zinc-chloride process because mine flooding demonstrated that the zinc chloride is rapidly leeched out by water. The company engineering force lays out all curves and deflections on both secondary and main-line track. In addition to allowing greater traveling speeds this careful alignment and engineering reduces maintenance of both track and rolling equipment.

Bruce G. Shotton

Bruce G. Shotton, Hendrick Manufacturing Co., was elected second of the Manufacturers' Section. Coal Divison, American Mining Congress, at a meeting of the board of governors of the section at Cincinnati May 12. He succeeds Charles B. Officer, Sullivan Machinery Co.

William E. Goodman, Goodman Manufacturing Co., was advanced to the post of first vice-chairman of the board; R. L. Cox, Jeffrey Manufacturing Co., was elected second vice-chairman, and Frank E. Mueller, Roberts & Schaefer Co., was made third vice-chairman. G. E. Stringfellow, Edison Storage Battery Co., was elected to the board to fill the vacancy caused by the resignation of E. A. Williford, National Carbon Co., who had been elected third vice-chairman of the board at the 1935 convention.

Haulage projections for many years of future work have proved a valuable aid in maintaining development balance at the Pocahontas district mines of the American Coal Co. of Allegany County, according to H. W. Saunders, chief engineer. Close checking with the development chart discloses what entries, if any, are falling behind schedule and should be double-shifted. Based on periods (of working days), charts have been made covering as many as ten years and, in certain instances, for the life of a mine. Drillholes not too far spaced were advocated as necessary for proper projection of a new mine or territory; their cost, remarked the speaker, will be returned usually by more efficient haulage and drainage. Daily haulage reports, which later are summarized into monthly reports, prove effective in maintaining haulage on an efficient basis in each section of the mine.

At the Pinnacle and Crane Creek mines, continued Mr. Saunders, purchase of 500 mine cars to store the Pinnacle production and to haul it several miles to the Crane Creek air-cleaning plant has proved a great advantage. When the Crane Creek preparation plant handled the output of the one mine there were times during the day when coal was not available—a feature which disturbed the air-table performance—and overtime operation was necessary to complete the preparation of the daily output. Now, if the Crane Creek coal flow lags, some of the stored cars of the Pinnacle coal are drawn upon to fill the impending gap. The plant is operated a second shift to prepare the Pinnacle coal. At another mine of the company a preparation plant is operated on a 4 p.m. to 11 p.m. shift so that in the morning all mine cars will be empty and ready for a prompt start of the loading shift.

"An ample supply of mine cars is a flywheel in production effort," said Walter Buss, mining engineer, Knox Consolidated Coal Corporation. At Knox and generally at other Illinois and Indiana mechanized operations, the switch to which the unit locomotive must haul in changing cars for the loading machine is kept within 100 ft. of the face and a relay locomotive serving two loading units hauls approximately 1,000 ft. to the main-line pick-up parting. Few changes were made in mining layout to shift from hand to mechanical loading, the principal one being to increase the room length from 250 ft. to 400 ft. A six-ton cable-reel locomotive is used to serve each loader; for this duty only the speedier design of locomotive is favored.

Relative costs of $68.24 and $100.41 per hundred rail joints for electric welded rails and bonded joints, respectively, were given by G. Stuart Jenkins, general superintendent, Consolidated Coal Co. (Illinois). All main-line rails except at frogs and switches are now electrically welded. The start was made in 1933 and the only failures (four) which have occurred have happened on

the first jobs, which were of an experimental nature. Rails are assembled with ⅛-in. gaps and clamped in alignment with angle bars. Next they are V'ed at the ball with an acetylene torch, then welded by the metallic arc process. To impart the desired hardness at the top of the weld, manganese rod is used in finishing the weld. Taking up this type of track presents no difficulties; angle bars are removed with heavy chisels and wedges, and the rail joint weld is then broken by raising and lowering the end of the rail.

Irvin C. Spotti, mine foreman of the Hanna Coal Co. of Ohio, outlined thermit track welding experience of the company (see *Coal Age*, April, 1936, p. 137). Success with a 3,000-ft. trial installation in Willow Grove has brought the decision to thermit-weld all main-line track in that mine, which is to produce 4,000 tons per day from three mechanical loading shifts.

Cutting the Accident Toll

ACCIDENT-FREQUENCY rates are declining, but, as the roll-call at Cincinnati showed, there is no slackening in the drive for still greater safety. Broadcasting safety messages as men go on a shift, special signs and signals, bonuses for good records, and open vs. closed meetings on safety work were among the developments discussed and summarized in this section of the Cincinnati story. This section also reviews the collateral topics of ventilation theory and practice, and protection from coal bumps.

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ACCIDENT PREVENTION and safety-promotion work claimed the attention of a number of speakers at three of the technical sessions of the Mining Congress convention. Aeromechanics as applied to ventilation and the phenomenon of bumps also came into the picture. How signals, signs and warnings made by inserting 0.58-in.-diameter glass-reflector units into holes drilled in treated wood blocks 4 to 6 in. in diameter have been applied to many uses and types of equipment at mines of the Industrial Collieries Corporation was described by J. V. Berry, safety director of this Bethlehem Steel Co. subsidiary. Different colored reflectors are used to designate certain functions or conditions. Tests indicate the signs can be seen 200 to 400 ft. by light reflected by cap lamps and 500 ft. to 1,000 ft. by locomotive headlights.

Beginning June 5, 1935, public address systems, costing $300 to $500 each less cables, have been installed in three mines of the Bell & Zoller interests in Illinois, according to John Lyons, safety engineer. Broadcasting safety talks each morning to the employees assembled principally in parked man-trips has passed the experimental stage and is now a permanent feature. Vacuum tubes are used in the 35-watt amplifiers, but the layout is not a wireless system. In the mine having the most extensive installation, loud speakers spaced along the headings at the shaft bottom provide a sound coverage of 800 ft. of track.

Broadcasting stations are situated on the surface close to the shaft. Four conductors are required between the station and the loud speakers. Two-conductor Parkway cable (with two-conductor cable two cables in parallel are required) costs 9.7c. per foot and the optional four-conductor Parkway (but one required) costs 17.8c. per foot. Speakers have 125-volt fields and two are connected in series. Entertainment beginning at 6 a.m. precedes the ten-minute safety talks, and station announcements include the call letters and station name, as examples, S-A-F-E-T-Y and T-H-I-N-K.

To promote safety as well as to increase production and reduce cost, the Union Pacific Coal Co., said President Eugene McAuliffe, in 1930 adopted a tonnage-rate general bonus. Although this system was discontinued in September, 1934, the experience gained led to the adoption of a plan under which monthly cash prizes totaling $100 or more are awarded at mines making superior labor, material and power cost records by drawings held at safety meetings. He believes that the total of bonus payments, 0.87c. per ton on approximately 15,000,000 tons mined and 1.4c. per ton on the 12,000,000-ton mechanically loaded portion, has paid through increased output, lower cost and safer operation. I. N. Bayless, assistant general manager of the company, attributed the outstanding safety record that the mines have made to date this year to this bonus system. He observed that the men are more enthusiastic in attending safety meetings and also in their suggestions for better mining methods.

Bank days are declared and eight $5 bills are distributed by lot to eligible workmen at Bell & Zoller mines at which records of 2,500 man-shifts without a lost-time accident are made. Distribution to the men, said Ernest Todd, chief clerk, was found to be an improvement on a system (adopted Jan. 1, 1935) of paying foremen bonuses for effecting savings in compensation costs based on man-hours of exposure and compared to a bogey. To be eligible for the drawing the employee must have worked all of the available time during the period. Just how much of the improvement in safety can be attributed to the bonus system cannot be determined, however, because other changes, such as the introduction of hard hats, also were made last year.

Bumps in Harlan County, asserted N. M. Wilder, geologist, Kentucky Department of Mines and Minerals, are caused by roof action and not gas. In that area where the cover ranges from 500 ft. to 2,000 ft. the pillars are liable to shatter instead of transmitting the shock of subsidence of the strong upper measures. Rapid extraction, mining methods which do not leave pillar stumps and do provide long pillar lines parallel to the systems of joint planes were among the preventives prescribed.

That few, if any, advances were made in mine ventilation for many years was attributed by A. Lee Barrett, Pittsburgh Coal Co., to a lack of understanding of the fundamentals of aeromechanics. In an illustrated talk on that subject he explained that power-consuming turbulence occurs almost wholly back of the airway obstruction. He described the design features of the Troller axial-flow fan of which the Pittsburgh Coal Co. has built and operates several (see *Coal Age*, November, 1935, p. 447; January, 1936, p. 15).

Charts exhibited by W. W. Adams, supervising statistician, U. S. Bureau of Mines, showed national accident frequencies per million man hours were less in all the important catagories in anthracite and bituminous mining in 1931 to 1934. Safety in mechanized mining progressed faster than in hand loading. The mechanized mines of eight States have better accident-frequency rates than are normal for all classes of mines in the United States. Wyoming, where mechanized mining is ascendent, had accident frequencies in 1930 and 1931 much greater than the national average; since that time the rate has dropped about 50 per cent, and now is much less than that of the country as a whole.

As the number of hours worked by employees in the various occupations cannot be correctly estimated, said N. P. Rhinehart, chief, West Virginia Department of Mines, in a paper read by D. C. Weidler, safety engineer, accident frequencies are based on tonnage and not man-hours. Frequency from falls of roof is 18.89; for transportation, 16.13; and for handling coal, 8.74. Illinois producers, declared J. W. McSherry, chief inspector of Illinois, in an article read by M. K. Harrington, are distinctly safety-minded, employ good safety men and have introduced first-aid training at many of their mines. Companies with a large proportion of their men trained in first-aid show the best results in safety work.

Fatal-accident statistics, urged W. J. Grogan, Lynch Coal Operators' Association, speaking for Indiana, do not give an adequate or correct appraisal of safety. Some of the best years in accident prevention were the worst from the point of view of fatalities. The cost of compensation also may not agree with the accident frequency. The latter figures varied within 0.3 per cent as between hand-loading and mechanical-loading operations.

Mechanical loading started in the Madeira-Hill anthracite operations in 1922, but the work was really only experimental until 1931, said William Richards, safety engineer, Madeira, Hill & Co. Comparative frequency rates for that year and 1935 were:

Accidents from	Frequency Rate 1931	1935
Falls of roof	12.18	2.82
Falls of rib or face	4.21	2.52
Haulage	7.03	2.82
Handling coal and rock	7.39	2.11
Handling other material	3.74	8.45
Electricity	0.46	0.00
Use of tools	2.81	0.00
Explosives	0.46	1.41

Accidents in haulage have been reduced by use of conveying methods. No gas has been ignited for four years. Three electrical accidents have occurred in the last five years, all these being finger burns.

If accident rates rise at a plant, it is time to make a radical change in the system of accident prevention, declared W. J. Stiteler, Jr., Coal Operators' Casualty Co. Strange to say, remarked T. P. Kearns, Industrial Commission of Ohio, not roof falls but haulage gives the greatest accident frequency in the mines of Ohio, though 58 per cent of the accidents in that State are from roof falls. The roof has a dangerous drawslate. Nevertheless, one company has mined 2,000,000 tons of coal since its last injury. Kentucky is proud, announced J. F. Bryson, safety director, Harlan County Coal Operators' Association, that it has an accident frequency so far below that of the country as a whole. Some classes of machines are more dangerous than others, and this accounts for the slight upturn in Kentucky's accident frequency and not the intrinsic insecurity of mechanical operation, which is not by any means demonstrable. The addition of a number of wagon mines to the list of those coming under mine inspection explains also in part the increase in accident frequency.

Dust of all kinds is undesirable in the mine air, said P. H. Burnell, superintendent, Owl Creek Coal Co., Gebo, Wyo. Insoluble dust injures and clogs the lung passages and some soluble dust possibly may be poisonous. Rock-dusting was necessary, not only to protect mines against explosion but also for hygienic reasons. To prevent explosions, water should be used on the cutter bar and should be sprinkled on the tops of loaded cars and the bottoms of empty cars to prevent coal dust from being blown into the air of haulageways. It is a mistake, remarked G. S. Rice, chief mining engineer, U. S. Bureau of Mines, to affirm that all dust is equally harmful.

None of the various forms of safety promotion—bulletin boards, slips in the pay envelope and the like—are substitutes for the safety meeting, declared C. W. Connor, superintendent of mines, Nellis Coal Corporation, for it introduces the personal word. Both open and closed meetings are desirable. In the first, every member of the employees' families and those not employees but living in the mining town are welcomed. Such meetings must have entertainment and should not strictly relate to safety. Public officials and business and professional men have been invited to speak on safety from their various angles and in relation to their own lines of work. Sometimes also the president of the company gives his message. At Nellis, open meetings led to closed meetings for mine employees only, in which the employees take part and the superintendent presides. As it is their meeting, the employees are intensely interested, and when putting a new item in the code of safety the matter is fully discussed at one or more of these closed meetings.

Safety meetings are held at some mines of the Koppers Coal Co., stated J. B. Benson, but it is left to the superintendent whether he will inaugurate this type of safety effort. The open meeting gives the best results. The superintendent presides and suggestions are welcomed. Each suggestion is numbered and discussed. The superintendent often tells the suggester that he would like to talk the proposal over with him personally after the meeting. About 75 to 85 per cent of the day shift comes to these sessions.

Safety meetings at Philadelphia & Reading mines, said G. A. Ross, are planned (1) to be democratic and cooperative and (2) cover everybody from top to bottom. At each meeting the minutes of the preceding session are read, and every matter designated in the previous meeting is checked up, then safety activities, accidents at the mine and at other mines are discussed.

Hard Problems in Cleaning

AS MORE attention is given preparation more problems approach a solution. This was the major point in the discussions at Cincinnati covering operation of mechanical-cleaning equipment and plants, water and steam sprays for dust collection, oil flotation for recovering fines, improvement of strip-coal extraction, the salvaging of coal from refuse by mechanical cleaning, abstracted in this section of the convention report.

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KNOTTY PROBLEMS in preparation and new methods for solving them were given free play at the May 11-12 sessions of the Cincinnati convention. The preparation plant of the Northwestern Improvement Co. in the Roslyn-Cle Elum district of Washington, explained E. R. McMillan, mining engineer of the company and the first speaker on cleaning problems, uses Vissac jigs for its 3½x1¼-in. and 1¼x¾-in. coal and American concentrator tables for treating the ¾x0-in. fraction. The product of several mines with coals varying in character is handled. While the Vissac jig has much in common with other jigs, it differs in the means of obtaining the pulsations. Water enters the jig through a semicircular hutch and is admitted by a pipe which is opened and closed by a butterfly valve rotated by a motor. When the valve is closed, water rises in a chamber located in a side passage to the pipe and compresses the air; when the valve opens, water is driven into the hutch.

Raw coal enters at the upper end of an inclined screen and stratifies upon it. Clean coal passes off at an upper level and the refuse by a lower level, the quantity being regulated by a star refuse extractor. The hutch also discharges its fine, heavy refuse, and both refuses pass to the bottom of an inclined flight conveyor which discharges this waste material. A float connected to the conveyor chamber provides further regulation and adjusts the action of the jig in response to inequalities in character of the feed. Jig performance closely duplicated the results obtained from float-and-sink tests; the tables reduced the ash content from 16 to 12.9 per cent. The entire plant has a capacity exceeding 150 tons per hour and the dry concentrator a capacity of 50 tons hourly.

Though authorities on dust collection have been skeptical on some of the changes introduced during extended experiments on cleaning extremely friable and dry coal at Revloc, Pa., said A. E. Roberts, chief engineer, Heisley Coal Co., the problem seems to be approaching solution. The dust is derived from the air-flow boxes for cleaning 1¼x0-in. coal in RandS equipment. Rotoclones were first installed, but, as some dust still escaped, cyclones were added. Nevertheless, dust escaped into the air. Oil at 400-lb. pressure then was sprayed on the coal before cleaning, but, since this clogged air boxes, an effort to bring down the dust after cleaning seemed the better approach to a solution. Hence, steam and water sprays are turned on the voided air in a large chamber. Thus far, the results have not been entirely satisfactory. About 2 tons of dust are brought down in this manner daily. The 300-mesh dust held by the steam and water sprays is found to contain 65 per cent more ash and 120 per cent more sulphur than the other coal. It was expected that the finest of the particles would be clean coal, but apparently the fines are slaty and, therefore, laminar and float in the air like pieces of paper.

At a certain West Virginia plant, declared W. J. Skewes, mechanical engineer, Pocahontas Fuel Co., Inc., much dirt and rash occur above the coal. Wet cleaning methods are used and the selling of the fine product at one time was difficult. In consequence, it was decided to improve face preparation by overcutting the coal and thus removing the muck and rash. The floor is now covered with iron plates, and the kerf and cuttings are swept clean before the coal is shot. This makes a better product. The ¾x⅜-in. fraction, which is dirtier than the minus ¾ in., is washed. In general it is advisable to put all minus 3-in. coal over the vibrating screens because the larger coal prevents the blanketing of the screen.

An English system—the Elmore flotation process—is about to be introduced into this country by a Pittsburgh company for the removal of fines, said R. H. Sherwood, president, Central Indiana Coal Co. Raw fines are mixed with oil and water by paddles; the oil adheres to the coal and refuses to adhere to the non-carbonaceous material. The mixture, after leaving the mixing boxes, falls to a small chamber, from which it is elevated by suction to a separator. Impurities sink in this vessel and coal coated with a fine layer of oil and supported by bubbles of air rises to the top and is carried off. The coal is dry because when the bubbles burst on the application of air pressure the water falls off. The impurities are removed at the bottom by a trap. This method of cleaning is said to cost about 2c. per ton.

Jigs are used to clean No. 1 buckwheat and larger sizes and the Hydrotator han-

dles the smaller coal at the Oneida mine of the Wolf Collieries Co., near Hazleton, Pa., stated P. C. Saricks, vice-president, in a paper read by E. B. Agee, superintendent, Youngstown Mines Corporation. Mr. Saricks stressed that the new form of Hydrotator installed made it possible to clean the fine sizes which otherwise would be unmarketable. This plant was described in *Coal Age*, April, 1936, p. 135.

A new development in Rheolaveur practice at the Champion plant with three elevators on the launder was described by J. B. Morrow, preparation manager, Pittsburgh Coal Co. By screening the coal in one direction, laundering it in the opposite direction and reversing the direction on its rescreening, the whole process takes place in a minimum area.

Seven Vissac jigs, 8½ ft. high, 4½ ft. wide and 6½ ft. long, were installed at the Snow Hill Coal Corporation's new mine in 1935, reported E. J. Weimer, general manager. Air pressure on the water in the jig is 3.46 lb. per square inch. About 15,000 gal. of water is supplied per minute. Eighteen horsepower is required to raise the water and the motor operating the butterfly valve and refuse gate takes 2 hp. The capacity of the jigs is 100 tons per hour, though they were designed for the cleaning of only 70 tons hourly.

Coal is being profitably cleaned at the Northern Illinois Coal Corporation, where the No. 2 seam is being mined, asserted R. S. Weimer, general superintendent. The stripping has 30 to 60 ft. of cover; before a washing plant was installed, some coal had to be left; today despite loss of weight by reason of removal of impurities, more coal is prepared for market per ton of coal exploited than before. Moreover, the change has decreased production cost, for the coal can now be loaded faster because there is no desire to load it meticulously clean, since the dirt is removed in the preparation plant. One of the pits produced 0.4 per cent more of the available coal during three months after cleaning started than it did in the three months prior to washing, though the ash was reduced to 5.5 per cent. Another pit produced 1.5 per cent more of the available coal five months after cleaning started than it did in the previous five months and the ash was reduced to 4.5 per cent.

Like telephones and air brakes, observed W. E. Wolfe, supervisor, Clinchfield Coal Corporation, preparation methods were devised before a need had been developed for such methods, so progress was slow. However, as the best seams were worked out, as the market became more critical and as many mines had ceased to maintain discriminatory face-preparation methods, an urgent need for mechanical preparation had arisen. Cleaning has sometimes gone too far—so far as to lower the fusion point of the ash. Sometimes the coal had been washed to a degree that it changed the character of the fuel bed and made the coal less desirable to some consumers.

Recovery of coal and pyrite from breaker refuse is the principal duty of a central cleaning plant built by the Peabody Coal Co. near Taylorville, Ill., stated J. R. Verhoeff, construction engineer. This plant also cleans screenings when and if shipped from four Peabody mines within a radius of a few miles. Approximate daily average recoveries from tipple refuse formerly wasted are: 750 tons of 13.5-per-cent-ash coal and 10 tons of pyrite which is shipped to sulphuric-acid manufacturers. Equipment consists of a 9x17-ft. Bradford breaker, picking table, Link-Belt Simon-Carves washer box and a settling cone. The pyrite is recovered by hand-picking from plus-2½-in. material that rides over the breaker plates. Because of the high percentage of pyrite and its abrasive character the breaker plates and conveyor wearing surfaces are of high-carbon steel. Pyrite picking is done under ultra-violet light because that quality of light reacts on the pyrite crystals in a way which facilitates distinguishing them from the other material.

More for the Electric Dollar

HOW a refuse product is utilized in a plant built to handle the power load of several mines and a mining town . . . how steam and electric power costs compare . . . rectifiers as d.c. substation units . . . and the importance of periodic power-cost surveys featured the electrification and power-distribution phases of the Cincinnati convention. The essential juices of these discussions are distilled for the busy reader in this section of the report.

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POSSIBILITIES of utilizing a mine-refuse product of the Sherwood-Templeton and Central Indiana Coal companies, said R. H. Sherwood, president of the latter company and of the Antioch Power Co., suggested the construction of a plant to burn this waste material, containing 40 per cent non-combustible and 18 per cent water, to furnish power to the two mines and the town of Linton, Ind. The Antioch Power Co. was organized and a plant generating 6,800 hp. was built. Although it was realized in advance that the load would be extremely freakish, it proved even more erratic than had been anticipated. A large stripping shovel sent back 600 kw. into the line once every minute whenever it lowered its bucket and swung back into the pit; a coal-loading shovel contributed other unfortunate load characteristics. Linton, nevertheless, received a steady current and no complaints had been registered. Since erection, a third mine has been added to the power-plant load.

Discussing power efficiencies C. H. Matthews, electrical engineer, Susquehanna Collieries Co., pointed to a steam cost of 6c. per thousand pounds and an electricity cost of 2.5 mills per kilowatt-hour at a power plant where breaker slush, formerly considered as refuse, is pulverized and burned in suspension. Costs at a stoker plant burning slush-bank refuse are 9.5c. for steam and less than 3 mills for electricity. Use of high-pressure turbines bleeding lower pressure steam to operate hoists and air compressors is an economically attractive method. Geared steam-turbine mine pumps operate at a comparatively high efficiency and have a place where steam is available. Rotating condensers, Mr. Matthews said, may cost more in energy consumption than they save by power-factor increase. Where synchronous motors cannot be applied economically, he suggested the capacitor, which has a loss not exceeding 0.5 per cent.

Rectifiers as d.c. substation units were placed in a favorable light by W. A. Buchanan, district manager, Appalachian Power Co., Welch, W. Va., in a paper dealing with the general economic comparisons with rotating equipment, and summarizing the company's nine-year experience with a rectifier in use at Rolfe colliery in the Pocahontas field. For semi-automatic units the first cost (buildings not included) of motor generators and converters (transformers included) are about equal. The rectifier with its transformer equipment is about 10 per cent higher. With full-automatic controls the costs of the three types are approximately the same through the range of sizes commonly applicable to mining.

Comparative efficiencies of 275-volt 200-kw. units show the converter and rectifier about equal over the normal load range and the motor-generator approximately 12 per cent lower. Of eleven mine-supply substations owned and operated by the Appalachian Power Co. three are motor generators, nine are converters and one is the nine-year-old rectifier. Maintenance costs per year for recent years have averaged as follows: rectifier, $79; converter, $225; and motor generator, $190. The calculated saving in losses (300-kw. substation), at the prevailing power rate, by use of a rectifier instead of a motor generator is $628 per year.

Rectifiers have not been used more frequently at mines, said W. E. Gutzwiller, Allis-Chalmers Mfg. Co., because the early developments were for 600 to 3,000 volts. Only recently has the cost of the 275-volt equipment become comparable to the rotating type of units, and also only recently was grid control developed which allows d.c. voltage adjustment and compounding.

Metering and testing should be practiced and regular surveys made to determine the power cost of each part of the system, declared C. C. Klipmeyer, consulting engineer and electrical department head of Rose Polytechnic Institute. In pointing to the principal power wasters in each phase of mining he advanced the suggestion that the ventilation survey report be gotten up to show the exact cost in dollars per month of each badly designed overcast, short turn and other air disturbers which are found in the circulation path.

NEW WEAPONS FOR COAL

+ In Fight for More Business

Offered at Cincinnati Exposition

PLENTIFUL EVIDENCE of the part being played by manufacturers of equipment and supplies in fostering the upward trend in coal appeared on the exhibit floors at the Thirteenth Annual Convention of Coal-Operating Men and National Exposition of Coal-Mining Equipment, held at Cincinnati, Ohio, May 11-15, under the auspices of the Manufacturers' Section, Coal Division, American Mining Congress. Greater extraction of thinner seams, higher outputs from concentrated areas in thick seams, increased machine life and safer operation were the major points stressed for the various items of equipment offered for all phases of mining, preparation and safety.

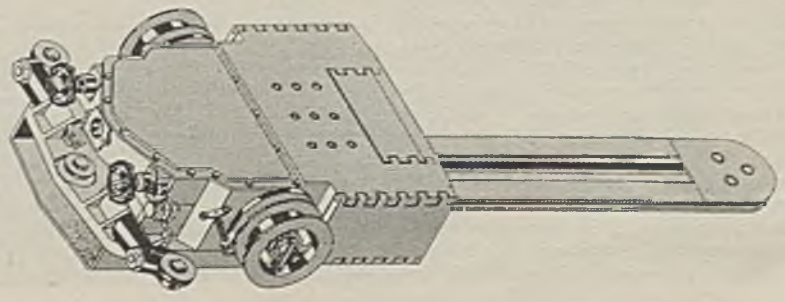
LOADING, cutting, drilling and stripping equipment for higher capacity or greater efficiency was featured by eighteen manufacturers at the Cincinnati exposition. "Stoodite" hard-surfacing material for cutter bits was shown by the Air Reduction Sales Co., New York. Bowdil Co., Canton, Ohio, showed Bowdil cutter chains, bars and double-ended bits. The bits, the company pointed out, produce more lump with a minimum of bug dust, reduce sharpening time, cut three to six times more coal per point and reduce power consumption at least one-third. A pictorial display of stripping and loading shovels, draglines, including walking types, and welded alloy-steel dippers was offered by Bucyrus-Erie Co., Milwaukee, Wis.

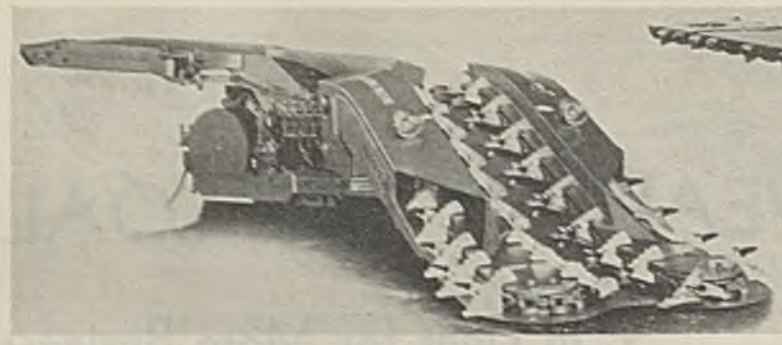
The Duplex bit-making machine for the manufacture of "Duplex" bits from bar stock, offered on a lease or sale basis, was featured by the Cincinnati Mine Machinery Co., Cincinnati, Ohio. Cutting is done with a 3/32-in. abrasive wheel and the machine, it was stated, will produce an average of 300 bits per hour at approximately 2c. each. Other Cincinnati equipment included thin-kerf cutter bars machined from solid heat-treated alloy-steel plate, Duplex cutter chain, regular cutter bars fabricated of heat-treated alloy-steel plate and chains to match.

Portable hand-held and mounted electric coal drills in both open and approved types, "Power-Vane" rotary hand-held air-driven coal drills weighing 27½ lb. and drilling holes up to 3 in. in diameter, and portable electric and pneumatic drills, nut runners, hammers and grinders for mine-shop and car-repair work were displayed by the Chicago Pneumatic Tool Co., New York City. In addition, the company featured a new boxing assembly without projecting parts and fitted with a liner which can be engaged and disengaged while the thread bar is rotating without danger. Just 30 seconds is required to change the liner, the company stated, and the thread bar can be removed from the housing by giving the boxing a half turn, which also releases the liners from the thread bar. Another new product was the one-piece "twisted-steel" auger, designed so that the cuttings are carried to the center, thus eliminating wedging. Special alloy steel is used in its manufacture for longer life, faster drilling and economy. A double-flight feature was said to remove cuttings faster, reduce friction and cut motor load. The cutter head used on these augers, another new product, featured a double cutting edge, straight teeth, special alloy-steel construction and heat-treated alloy-steel reversible bits held in place by a round tapered wedge. To remove the bits, the wedge is slipped out. Also, bits may be locked firmly in any position. A new post head which allows the drill to come to within 3 in. of the roof or bottom, or 5 in. closer than with the old type, also was offered by the company. The new head fits the old-type post. Safety sockets with a smooth sleeve in which the socket revolves, making it safe for the operator to hold the socket while the thread bar is revolving, was another new product. Available in flat-taper and ¾- and 1-in. square types, the socket is made with a concave surface to eliminate any tendency of the hand to slip off.

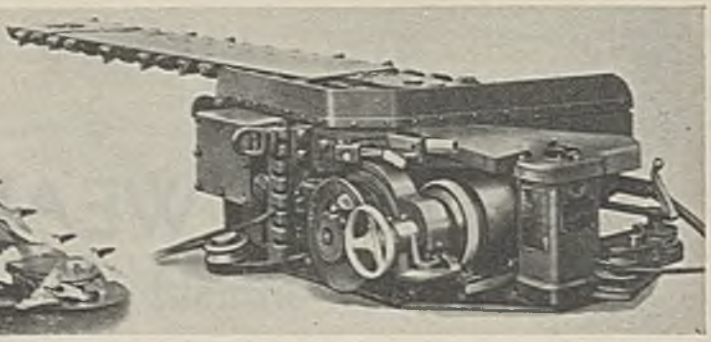
The new Type 512 shortwall cutter particularly for conveyor mining was shown by the Goodman Mfg. Co., Chicago. Height is 23¾ in. with standard cutter bar or 21¾ in. with thin-kerf bar; length over the body is 64 in. Features cited by the company included: discharge of cuttings at the rear; 50-hp. motor; universal control; full reversibility; anti-friction bearings; oil bath for all working parts; contactor control with automatic acceleration; power on both drums for operation together or separately, two operating speeds, controls on back end of machine; sheave arrangement providing practically universal motion; built-in tilting device; and two-unit construction, with separate

Goodman Type 512 shortwall cutter





Jeffrey L-400 track-mounted loader



Jeffrey 41-A shortwall top-cutter

electrical and mechanical units attached to each other by through bolts. Goodman also exhibited the 260-A track-mounted loading machine with Goodman motors, new transmission case and new gathering head, as well as items from its shaker-conveyor line, including the Type H reversible drive operating the new LOB duckbill with either fast or slow motion to facilitate advance or withdrawal, respectively, and improved shoe arrangement for feeder trough to keep loader on bottom and permit working on moderate side pitches or grades; a 90-deg. trough; and F drive shaking coal up conveyor line on 15-per cent grade; and a face-loading pan.

The L-400 frontal-attack track-mounted loading machine was exhibited by the Jeffrey Mfg. Co., Columbus, Ohio. Features noted for the machine included: capacity, 6 to 8 tons per minute; finger-touch hydraulic control with four short-range levers controlling all operations and fewer wearing parts; instant maneuverability; simplified design; sturdy construction; single-motor power; automatic cable reel; and modified three-point suspension. Maximum height, loading boom horizontal, is 65½ in.; minimum, 39½ in. Loading boom swing is 40 deg. to each side; corresponding swing of the loading head is 38 deg. Weight of the unit is 13 tons. Over-all length varies from 31 ft. 1 in. to 39 ft. 1 in., depending upon boom length.

Jeffrey also displayed A-6 and A-7 coal drills, 61-EA conveyors, 61-HG face conveyors, 61-AM room conveyors, 51-B belt-conveyor sections, and the new 41-A shortwall top cutter for conveyor mining featuring remote contactor control on a separate skid, thin-kerf cutter bar, star bits and cutter chain and 35-hp. motor in both open and approved types. The machine, it was stated, is designed without truck to be kept in the working place. In the top-cutting type—a bottom-cutting type also is available—the cutter bar is adustable vertically.

Joy Mfg. Co., Franklin, Pa., offered three loading machines and two conveyors, as follows: 11-BU loader for high output in thick seams, 54-in. over-all height and a guaranteed loading rate of 4 tons per minute; 8-BU loader for use with pit cars or concentrated conveyor-transportation systems in medium-height seams, 38-in. over-all height and a guaranteed loading rate of 1½ tons per minute; Joy, Jr., loader for use with pit cars or concentrated conveyor-transportation systems, 26-in. over-all height and a guaranteed loading rate of ¾ ton per minute; Joy chain-conveyor unit for continuous transportation of coal from the face in concentrated systems employing Joy loaders; and a Joy-M. & C. trough belt conveyor drive, pan and take-up section designed to collect and transport coal from multiple shaker or chain-conveyor units; available for extensions up to 1,800 ft. and in widths and drive speeds for 75 to 325 tons per hour.

La-Del Conveyor & Mfg. Co., New Philadelphia, Ohio, offered examples of its sealed-bearing positive-aligning belt conveyors for gathering and transportation of coal underground, a Model SLS-14 shaker-conveyor drive and troughing and the La-Del single-strand chain-and-flight face conveyor. All idlers on the belt conveyor are fitted with detachable ball bearings sealed for life and said never to require lubrication after installation.

Stripping and loading shovels, draglines and aluminum-alloy dippers were presented pictorially by the Marion Steam Shovel Co., Marion, Ohio. "Stellite" for tipping cutter bits was featured at the booth of the National Carbon Co., Cleveland, Ohio.

A Whaley "Automat" No. 3 size loading machine was shown by the Myers-Whaley Co., Knoxville, Tenn. Reach of the unit, now available with narrow-gage frame, has been increased to enable it to operate in places 24 ft. wide, according to the company, which also cited the following additional features: automatic time-starter control; two-speed tramming through field control; new larger-diameter ventilated clutch giving two to three times service without replacement of facings; double-thickness troughing and side plates; use of manganese-steel castings for bellcrank, shovel arms and other front-end parts to increase strength 25 per cent; one-third increase in speed of boom swing; power-driven protected cable reel; and rubber-hose inclosures for all wiring.

The Nordberg underground shovel was featured pictorially by the Nordberg Mfg. Co., Milwaukee, Wis. "Invincible" cutter chains, cutter heads, cutter bars and drive sprockets for all late-type mining machines were displayed by the Frank Prox Co., Terre Haute, Ind. Underground belt-conveyor equipment was exhibited by the Robins Conveying Belt Co., New York.

Cutting machines and other underground equipment were exhibited by the Sullivan Machinery Co., Chicago, Ill., which also showed the 7-AU track-mounted cutting and shearing machine, room hoists, car pullers, etc. Four new cutters were displayed: "Dual-Duty" shortwall-longwall, a combination machine working either as a shortwall machine in narrow places or as a longwall machine on long faces; "Master" shortwall cutter, designed for increased capacity and more continuous operation in thin seams; "Super" shortwall cutter for thick seams, stated to be a machine providing the same capacity as the modern loading machine; and the "Miners' Buddy," a light-duty, relatively low-priced cutter to be kept continuously in a single working place.

Electrical equipments of the Master, Super and Dual-Duty machines, the company pointed out, are identical and most of the mechanical parts are interchangeable, resulting in manufacturing economies. Other features include: more powerful motor; higher cutting speed; more power in the cutter chain; duplicate drum drives; high and low speed, both drums; separate drum-retarding friction; lever-controlled drum clutches; "free-wheeling" in drums; more direct lead of feed ropes; "drop-out" chain clutch; complete rear-end control; rear-end cable entrance; simplified, dependable electrical control; ball bearings throughout; splash lubrication; unusual accessibility; "a real two-direction cutter"; and a new-type ball-bearing reversible tramming truck. General specifications of the three machines and the "Miners' Buddy," are given below.

Sullivan also offered a bit-handling and hard-facing plant. Hard-faced bits.

	Master Type 6-B	Super Type 7-B	Dual-Duty Type 8-B	Miners' Buddy Type 5-B
Approximate weight, less truck, lb.	6,500	6,500	6,500	1,000
Approximate weight, power truck, lb.	3,500	3,500	3,500	.....
Over-all length, without cutter bar, in.	90	66	95	36
Over-all width, in.	40	49	31	23
Over-all height, without truck, in.	16	24	16	16½
On truck with 10-in. wheels, in.	24½	33½	24½	.....
Kerf thickness, in.	4, 5, 6	4, 5, 6	4, 5, 6	2½
Cutter-bar length, ft.	3 to 8	5 to 9	3 to 8	3 to 5
Cutting feeds, in. per min.	18, 24, 30, 36, 42	20, 26, 33, 38, 44	18, 24, 30, 36, 42	15
Handling speed, ft. per min.	32	24	32	17
Motor (a.c. or d.c.), hp.	50	50	50	10

the company pointed out, will cut more coal and may be ground one to four times with three to ten times increase in life of bit steel. One pound of Sullivan hard-facing material will face 2,000 to 2,400 bits, it was asserted, and the hard-facing equipment included in the bit-treatment plant permits one man to tip 500 to 1,000 bits per hour, using a turntable holding 400 bits at one time. Using the Sullivan sharpener and automatic preheating furnace, one man can sharpen 1,400 to 2,000 bits in seven hours, was stated. Also, one tank of oxygen lasts about six 7-hour shifts; one tank acetylene, ten shifts.

New drilling equipment exhibited by Sullivan included the B-2 pick designed particularly for mining thin seams of coal, scaling roof, cleaning bottom, cutting hitchings, etc. Features cited included easy handling, durability, strength, drop forgings in major parts and heat-treated alloy-steel in other parts. Three new drifters were offered: T-9, 4 in.; T-10, 3½ in.; T-11, 3 in. Features claimed were: superior drilling speed; low upkeep; exceptional air economy; easy, convenient operation; practical balanced design; adaptability to all kinds of rock conditions; and invariable reliability. Sullivan also offered a new detachable bit featuring a departure from the conventional cross bit design giving broad cutting and reaming edges; 40 to 60 per cent more hole; smaller gage changes; less transmission of twisting effect to operator; elimination of rifled holes; and improved performance in broken, seamy ground. The H-2 45-lb. auger drill designed for greater efficiency in drilling soft materials was another new Sullivan product. Tremendous stalling torque, minimizing this tendency, was stated to give superior drilling speed under auger conditions, as well as greater ease of operation and a low upkeep cost. By a simple change, is was stated, the unit can be made into a good hard-rock machine.

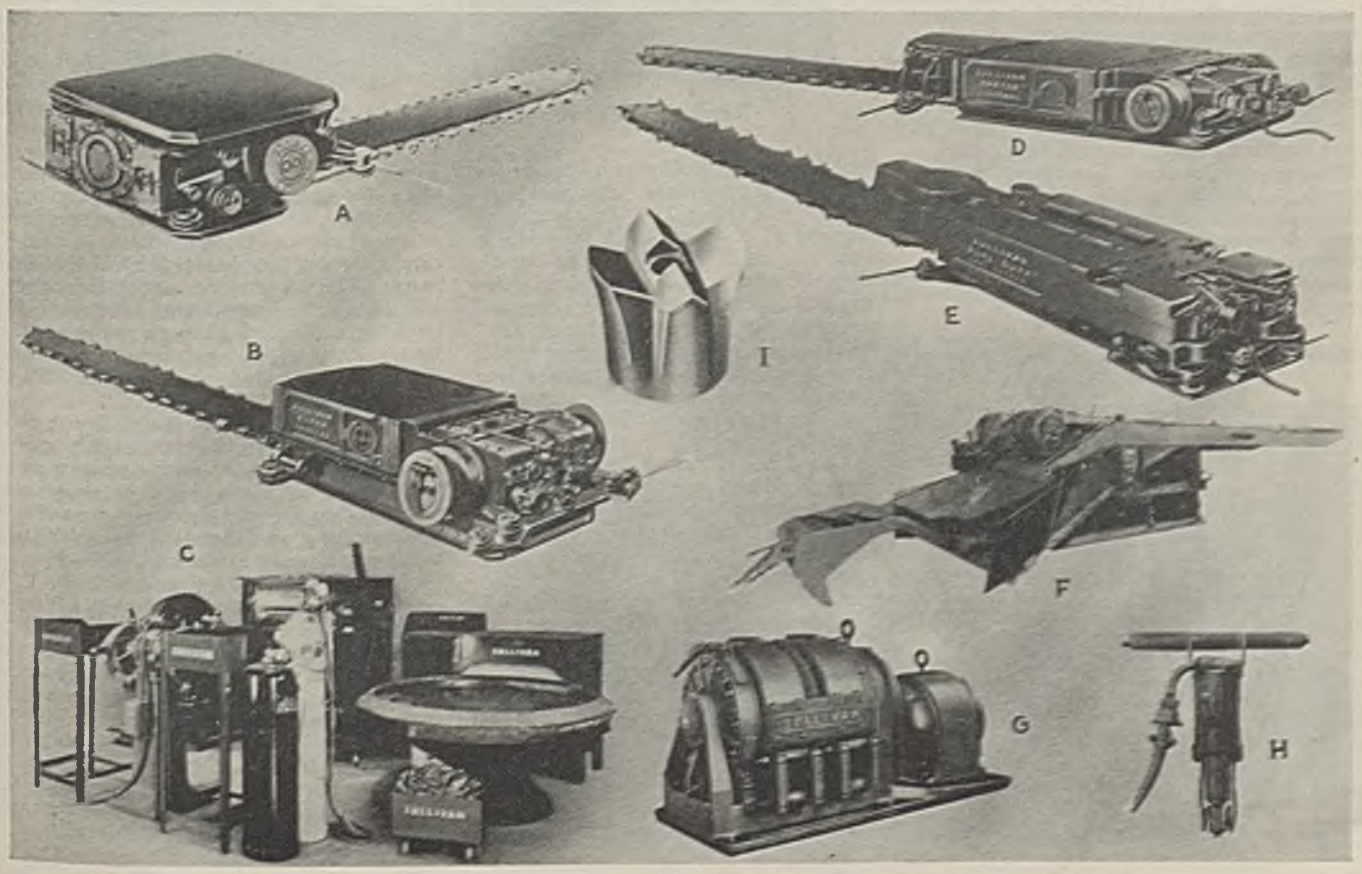
The ABC series of Universal scraper mucking hoists was another new feature of the Sullivan exhibit, available in the following sizes: Types A-211 and A-212, 7½-, 10- or 15-hp. motors, interchangeably; B-211 and B-212, 15-, 20- or 25-hp. motors, interchangeably; C-211, 30-, 40- or 50-hp. motors. Features cited included: low-cost operation, ease of movement, greater safety through improved guards and closures, maximum accessibility of parts, ease of operation, lubrication direct to all bearings and moving parts, simple external contracting band clutch, band-type no-spin brakes, vertically split gear housing, double-life gears, exclusive grease-retaining feature, shielded ball bearings, removable rope guards, eyebolt for lifting hoist, heavily ribbed cast-steel frame, standard toggle-type clutch levers, clutch-band stop, clutch-lever adjusting screw, largest possible drum diameter, rope-hole cover plate, band-type brakes with foot lever, four position rope guides, heavy hardened-steel guide rollers, square horizontal dowel, deep cups for timber sprags and skid-type base.

Sullivan also presented pictorially the new "Lo-hite" rock loader consisting essentially of a hoe-type scraper operating over a track-mounted slide discharging into pit cars. The scraper is powered by a Type J-211 "Lo-hite" scraper hoist with 15-hp. motor. Low initial cost, low upkeep, low operating cost, loading speed equal to speed of car service and simple operation are points noted by the company.

Tracy cutter chain featured the display of the Bertrand P. Tracy Co., Pittsburgh, Pa., which pointed to the following features: roller-type drive sprocket with full complement of teeth; manganese and molybdenum alloys; freedom from troublesome elongation; carbonized connector pins instead of the old-type rivets, reducing rate of wear and facilitating repairs; slotted-type "barrel" setscrew to prevent looseness and freezing in the block; substantial power saving in service.

On display by the Utility Mine Equipment Co., St. Louis, Mo., was the "Umeco" track-mounted loading machine. In this machine, the company pointed out, the gathering arm extends 11 in. ahead of the machine and sweeps parallel with the floor. The head can be adjusted from 36 in. above to 18 in. below the rail, can be swung 45 deg. off center and can load out a 26-ft. room. The rear trough can be elevated 24 in. and swung 30 deg. off center; spring cushions permit it to drop down when it encounters the roof. Track need not be laid closer than 7 ft. from the face. Loading capacity is 5 tons per hour and tramming speed is 4 m.p.h., according to the company.

Sullivan mechanical-mining equipment: A, "Miners' Buddy"; B, "Super" shortwall cutter; C, bit-sharpening and hard-facing plant; D, "Master" shortwall cutter; E, "Dual-Duty" shortwall-longwall cutter; F, "Lo-Hite" rock loader; G, Sullivan scraper hoist, ABC series; H, H-2 auger drill; I, Sullivan detachable bit



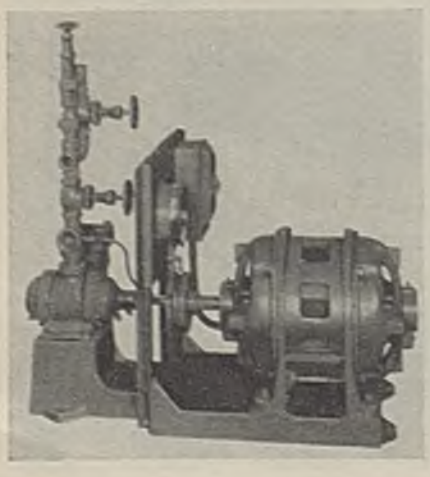
Preparation Facilities Raise Quality

PREPARATION equipment featured at the Cincinnati exposition ranged all the way from full-scale mechanical-cleaning units and plants to dustless-treating materials, with supplementary exhibits covering refuse-disposal equipment. Abbe Engineering Co., New York, displayed Rima wedge wire and other screen specialties. Hydroseal sand pumps with Maximix rubber impellers, shell and side-plate liners, etc., for handling water containing fine coal and other abrasive materials were exhibited by the Allen-Sherman-Hoff Co., Philadelphia, Pa., which called attention to a substantial reduction in power consumption. The "Low-Head" horizontal vibrating screen (*Coal Age*, April, 1936, p. 167) was featured by the Allis-Chalmers Mfg. Co., Milwaukee, Wis. A model of a single reversible aerial tramway was shown by the American Steel & Wire Co., Chicago, for coal.

Brown-Fayro Co., Johnstown, Pa., displayed the "Brownie" oil-spray system for dustproofing coal by the atomization of oil at pressures of 300 to 600 lb. per square inch in impact-type Pigott spray nozzles without heating. Operating at 400 lb. per square inch on oil with a viscosity of 100 sec. Saybolt at 100 deg. F., various pump motors on 60-cycle current give the following outputs: 3 hp., 290 g.p.h.; 5 hp., 480 g.p.h.; 7½ hp., 825 g.p.h. Two types of Pigott nozzles in eight sizes are available in capacities ranging from 5 to 80 g.p.h.

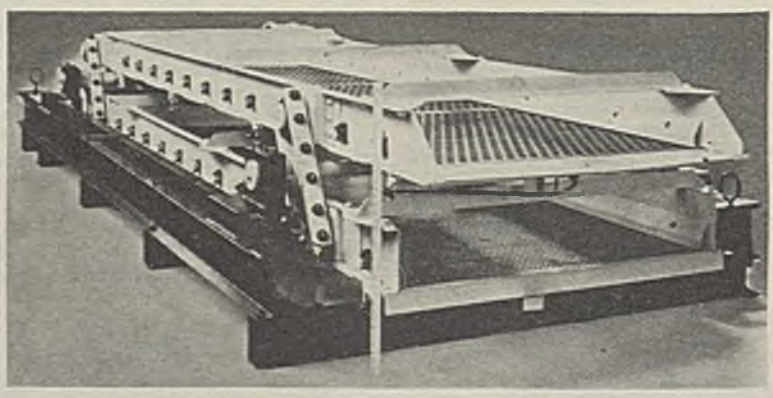
Columbia Alkali Corporation, Barberton, Ohio, offered "Col-Rec" for improving the combustion qualities of coal. Deister Concentrator Co., Fort Wayne, Ind., used actual equipment units, photographs and diagrams to present the Deister-Overstrom "Diagonal - Deck" coal-washing table, Leahy heavy-duty vibrating screen and Concenco spray nozzles. Models of the Dorr torque thickener with pivoted arm for climbing over an excessive load in any part of the tank, and bowl and rake-type classifiers were exhibited by the Dorr Co., Inc., New York.

"Brownie" pumping unit for dustproofing coal with oil



"Dustlix" dustproofing fluid for coal and equipment for applying it were shown by Dustlix Systems, Inc., Milwaukee, Wis. Dustlix, the company stated, is a refined petroleum oil processed especially for complete and permanent dustproofing of coal. Consumption ranges from ½ to ¾ gal. per ton.

Shaking and whipping at the same time on a level plane were the major features stressed for the new screen of the Hendrick Mfg. Co., Carbondale, Pa., along with low headroom. Large capacity is one result of the design, it was stated, together with ample strength for the most strenuous service growing out of balanced construction and freedom from destructive vibration. At medium speed, with a short stroke, the screen operates between 350 and 400 r.p.m. Other features include: adaptability to either installation on any flat foundation or overhead suspension; time- and labor-saving Hendrick "hold-down" hooks for facilitating screen-plate changes; and availability in either two- or three-deck construction, 3, 3½, 4 or 5 ft. wide in lengths up to 20 ft. Rounding out its exhibit, Hendrick also showed samples of various types of perforated plate and other preparation specialties.



Hendrick screen combining shaking and whipping effects

Jeffrey Mfg. Co., Columbus, Ohio, offered a display showing construction and operation of the Jeffrey automatic Baum-type coal-washer, "fish" float control, refuse draw and air valve; Traylor vibrators and vibrating conveyors; a Jeffrey single-roll crusher redesigned for making sizes smaller than formerly obtainable; and a redesigned Jeffrey double-roll crusher featuring saw-blade teeth for breaking down slabby coal. Other major features cited for the double-roll unit were: all-welded steel frame and belt drive, the latter eliminating gear noise, hazards and maintenance, and also permitting change of product in about 2 minutes compared to two to three hours with the gear-type machine.

The preparation service and refuse-disposal equipment of the Kanawha Mfg. Co., Charleston, W. Va., were presented pictorially. Rheolaveur and Menzies cone washers, Birtley and Wareing dedusting equipment, Carpenter centrifugal dryers and wedge-wire screens were presented by photographs and diagrams at the booth of the Koppers-Rheolaveur Co., Pittsburgh, Pa.

A feature of the exhibit of the Link-Belt Co., Chicago, was a "scene-in-action" pictorialization of the Link-Belt rotary louver dryer, showing material being discharged into the drum and hot air being blown in under the coal, passing through the bed of material and then being drawn out into a Cyclone dust arrester. Another feature was an operating model showing action of the "electric-eye" refuse-discharge control of the Link-Belt-Simon-Carves washer. Other preparation and utilization units in the Link-Belt display were a model of a Link-Belt-Simon-Carves coal-washing plant, a 1936 Link-Belt automatic coal burner, chains in sizes commonly used for conveying and power transmission, and conveyor idlers and stands.

In addition to a diagrammatic presentation of the McNally-Norton automatic washer and conveyor rolls with "N-D-Seal" bearings, McNally-Pittsburg Mfg. Corporation, Chicago, offered a laboratory model of a grinder for reducing sample size prior to analysis. The grinder also will be made in larger sizes for general refractory grinding, coal, ores, etc. High capacity with maximum reduction in size were the principal features emphasized by the company. The laboratory model displayed will reduce, it was stated, 1,000 lb. per hour from 1¼-in. to 10-mesh in one pass. In three passes, 50 per cent will pass a 60-mesh screen and all will pass a 20-mesh screen.

A model of a self-contained five-track shaker-screen unit was featured by the Morrow Mfg. Co., Wellston, Ohio, for installation in either new or existing plants. Morris circulating pumps for coal washing and handling water containing coal were exhibited by the Morris Machine Works, Baldwinsville, N. Y. Nordberg Mfg. Co., Milwaukee, Wis., showed a Nordberg-Symons screen with both screening and conveying action. Slate larries, perforated plates, screen bars, screens, chutes and weigh hoppers were included in the exhibit of the Phillips Mine & Mill Supply Co., Pittsburgh, Pa. Pure Oil Co., Pittsburgh, Pa., featured spray oils for dustproofing coal.

The Stump air-flow coal cleaner was the major item in the exhibit of the Roberts & Schaefer Co., Chicago. Rob-

ins Conveying Belt Co., New York, offered a Gyrex vibrating screen with Robins "Quick-Change" cloth grip, stated to reduce cloth-changing time 90 per cent; also belt-conveyor idlers, stands and training idlers in both ball- and roller-bearing types and Robins "Super-Gyraloy" screen cloths. John A. Roebling's Sons Co., Trenton, N. J., displayed screen cloths of various types. Solvay Sales Co., Pittsburgh, Pa., stressed the calcium-chloride method of dustproofing coal. Spray oils for dustproofing were offered by the Standard Oil Co. of Indiana, Chicago.

Models and diagrams were employed by the Stephens-Adamson Mfg. Co., Aurora, Ill., to tell the story of the air-sand coal-cleaning process and Redler conveying and elevating equipment. In addition to "Coalkotes" "A," "B," "C," and "CB," the Sun Oil Co., Philadelphia, Pa., featured the new "Coalkote CBO," for which it cited unusual value and permanency and low cost. Stated to be made from a specially selected crude, "Coalkote CBO" was said to possess the following advantages: all-season application—creeps and spreads at low temperatures; pours at 35 deg. below zero; absolutely non-corrosive; permanent; practically odorless; and lowest in cost.

W. S. Tyler Co., Cleveland, Ohio, displayed a Type 400 vibrator with Thermionic control, a Tyler-Niagara mechanically vibrated screen, test equipment for making a screen analysis of large samples, the "16-to-1" automatic sample splitter and Tyrod, Ton-Cap and square-mesh screen cloths.

Jeffrey double-roll welded crusher with belt drive

A full-sized mine-type Viking dustproofing unit comprising automatic pumping unit, oil heater and spray nozzles, in operation, was exhibited by the Viking Mfg. Co., Jackson, Mich., in addition to a small retail-yard unit used also in spraying mine cars both inside and outside to check rust and prevent freezing of the coal in severe weather.

High-intensity mercury-vapor lamps for picking tables were offered by the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

Bigger Units Speed Coal Movement

LARGER mine cars for both low and high seams featured displays of transportation equipment at the Cincinnati exposition, which also included locomotives, track work and other haulage auxiliaries. Austin-Western trail cars for strip mines were presented pictorially by the Austin-Western Road Machinery Co., Aurora, Ill. Bronze and steel-welded joints for mine tracks were shown by the Air Reduction Sales Co., New York.

The Red Jacket, Jr., Coal Co. car, wheels and links and pins and hitchings, in both heat-treated and non-heat-treated types, were displayed by the American Car & Foundry Co., New York. Built for large capacity with minimum height, the car measures 20 in. over the rail, weighs 3,875 lb. and has a level-full capacity of 105 cu.ft. Inside length is 11½ ft.; width, 7½ ft. Of the four-axle type, construction features cited include: spring bumper for absorbing shocks in both draft and buff; high-tensile-steel side plates; inside reinforcements for additional strength; and chilled-tread wheels made under the improved A.C.F. heat-treating process giving a hardness of 500 to 600 deg. Brinell on the tread and flange. The company's wheel display included double-plate, double-spoke, plain spoke, plate-rib, angle-plate and combination plate and spoke types in both plain and anti-friction-bearing models. In the double-plate, double-spoke and similar types, the maker stressed elimination of soft spots on the tread.

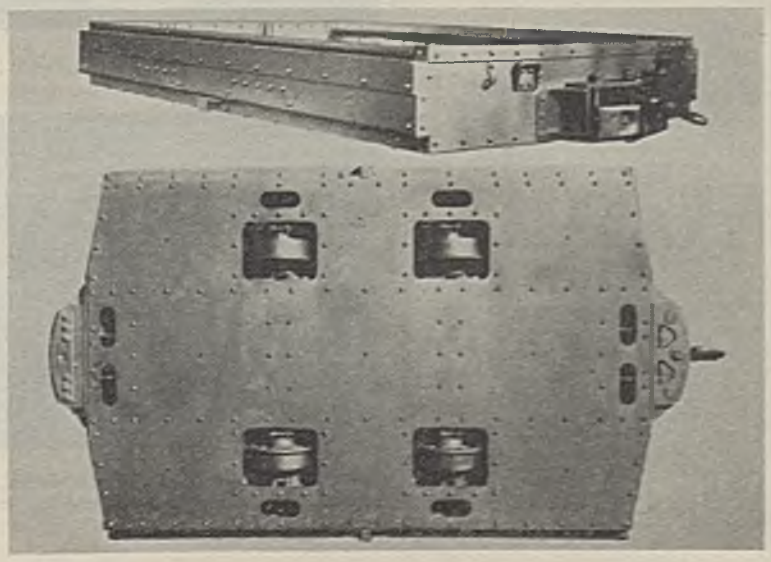
An all-welded light-weight mine car of molybdenum and Mayari R steel was exhibited by the Bethlehem Steel Co., Bethlehem, Pa., which also offered forged-steel wheels—one five years old to show relatively slow wear in service—and a steel tie display, which included two types of steel switch ties and was arranged to show the trend of steel mine-tie development. Weight of the car—capacity, 80 cu.ft.—with drop axles to lower the body for adequate clearance, even with the lowest rail, is 3,000 lb., against 3,940 lb. for the former car of 78 cu.ft. capacity. The drop-axles, it was stated, hold the wheels—of forged steel with sealed anti-friction bearings—true to gage and perpendicular to the track. Wheels can drop as much as 1 in. in compensating for track irregularities.

In addition to a slow-speed car-spotting hoist, wheels, rerailers, sheaves, rollers and other haulage accessories, Brown-Fayro Co., Johnstown, Pa., offered the HKH car-spotting hoist primarily for use with conveyors and scraper loaders where slow-speed haulage and rapid handling of empty rope are the rule. The hoist has two rope drums, separately controlled. The haulage drum, holding 525 ft. of ¾-in. rope, is driven through a triple-reduction gear at a speed suitable for spotting. An automatic friction brake holds the trip on the grade. The tail-rope drum, 550 ft. ⅞-in. rope, is geared for high-speed rope return. Weight of the standard unit, with 20-hp. motor, is 6,200 lb. Over-all dimensions on skids are: length, 96 in.; width, 44 in.; height to top of guards, 35 in.

Differential mine cars, air-dump refuse and coal cars, larries and mine locomotives were featured pictorially by the Differential Steel Car Co., Findlay, Ohio.

The Duncan cast-steel mine-car bottom with integrally cast boxes to eliminate bolts was displayed by the Duncan Foundry & Machine Works, Alton, Ill., which also showed cast-steel wheels, stated to be lighter in weight, safer because of elimination of breakage in service and more durable—about three times the life. Features cited for the mine-car bottom, identical with a number furnished the Perry Coal Co., were: substantial increase in capacity as compared with the composite car of same dimensions; material reduction in bolts and rivets, cutting maintenance attention; considerably greater resistance to damage in service. Thickness of the metal in the bottom is approximately ⅝ in., and weight of the complete car with ¾-in. side and end sheets and chilled gray-iron wheels is approximately 3,800 lb. Water-level capacity is 4 tons; capacity mechanically loaded is 3.75 tons.

Red Jacket, Jr., Coal Co. car, by American Car & Foundry Co.



Draft-gear riggings are individual castings to facilitate replacement in case of breakage.

Enterprise Wheel & Car Corporation, Bristol, Va., offered, in addition to a low-type end-gate car of the conventional type and a solid-roller-bearing mine-car truck in service 22 years at the mine of the Clover Fork Coal Co., a 4-axle car increased in size for mechanical loading. Water-level capacity of the car is 200 cu.ft. Inside length is 12 ft.; width, 7½ ft.; height, 36 in. Other features are high-strength corrosion-resisting body plates, 16-in. special heavy-duty semi-steel wheels, rubber bumper and spring drawbar.

Flood City Brass & Electric Co., Johnstown, Pa., displayed the Flood City friction-clutch-type room hoist with 5-hp. motor.

The Inland Steel Co. 6-ton low-height sealed-equipped gathering locomotive was shown by the General Electric Co., Schenectady, N. Y. Height is 26 in.; rated speed, 4 m.p.h. It is equipped with gearless reel, anti-climbing guides and a cab for the triprider.

Hockensmith Wheel & Mine Car Co., Penn, Pa., featured a 4-axle car with wooden bottom, stated to be the first car of this type designed. Other features cited included: New Departure ball-bearing trucks; a minimum of pockets for maximum clearance in dumping; junction of rounded plate between bottom and side to facilitate passage of coal and reduce breakage; inside length of 135 in.; width, 82 in.; height, 28 in.; body depth, 20 in.; capacity, 125 cu.ft., level full; 16-in. wheels. Other equipment shown included rubber-covered rope and track rollers, chilled and pipe rollers and various types of mine-car wheels, including a new anti-friction-bearing four-pocket-oiling type holding 8 lb. of grease and fitted with the Hockensmith disk closure.

The Windsor Power House Coal Co. car was offered by the Irwin Foundry & Mine Car Co., Irwin, Pa., which described it as a composite car with demountable trucks attached to the body by 18 bolts. The car is made of welded Toncan iron with the following dimensions: inside length, 104 in.; width, 62 in.; height, 37 in.; gage, 42 in.

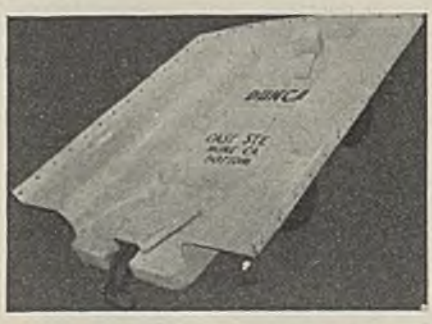
Jeffrey Mfg. Co., Columbus, Ohio, displayed a 6-ton outside-wheel gathering locomotive.

The 4-axle low-type Ridgeview Coal Co. car and Meehanite-metal mine-car wheels were displayed by the Kanawha Mfg. Co., Charleston, W. Va. Water-level capacity of the car, 20 in. high, 12 ft. long and 6 ft. wide inside, is 2 tons. Designed for rotary-dump operation, the car is equipped with Timken roller bearings and band brakes.

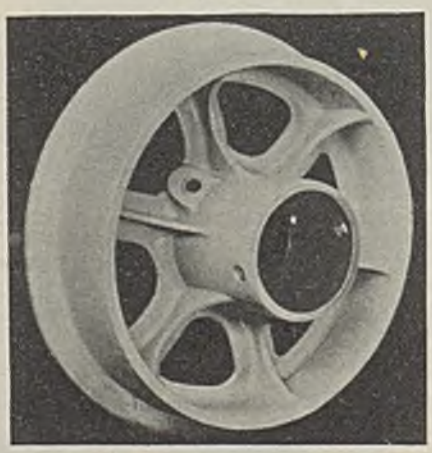
Koppel Industrial Car & Equipment Co., Koppel Pa., offered a low-height rotary-dump car designed for machine loading. Of the stub-axle type, the car is fitted with either or both, spring draft or buffing gear and is 11 ft. 6⅜ in. long and 7 ft. 6 in. wide inside and 24 in. high. Capacity of the car is 135 cu.ft. level full. Weight is 4,300 lb.

Thermit welding of rail joints (*Coal Age*, April, 1936, p. 137) was featured by the Metal & Thermit Corporation, New York.

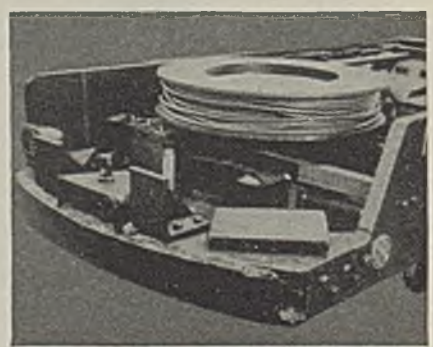
A newly developed spring bumper (Type PL) said to afford spring action in both draft and buff was shown by W. H. Miner, Inc., Chicago. Maximum safety, minimum weight, highest capacity and lowest cost—comparing favorably with that of rigid construction—were among the advantages cited for the bumper, which is designed so that the coupling link is held in a horiontal position at all times, thus increasing safety and facilitating coupling. The horizontal coupling also eliminates repairs to drawbars and buffer caps resulting from fouling of the links. The bumper includes only three moving parts, it was stated, one of which is a heat-treated pin actuating the spring in draft. Capacities run as high as 36,000 lb. with a 1-in. travel in buff and 27,000 lb. with a 1⅜-in. travel in draft. Other Miner units shown were: Class D4 double-bumper gear, Class SL4 center-bumper gear and the T-3, T-6 and T-7 friction gears.



Duncan cast-steel mine-car bottom



Duncan cast-steel mine-car wheel



View of Inland Steel Co. locomotive, by the General Electric Co., showing triprider's cab

Naco steel mine-car wheels, hitchings and the Willison automatic mine-car coupler were offered by the National Malleable & Steel Castings Co., Cleveland, Ohio. Nordberg hoists and track shifters were featured pictorially by the Nordberg Mfg. Co., Milwaukee, Wis. Phillips Mine & Mill Supply Co., Pittsburgh, Pa., used models, photographs and actual units to present its steel and composite mine cars, wood-car parts, heat-treated coupling pins and links; cast-iron, cast-steel, rolled-steel, roller- and ball-bearing, machine-truck, Phillips open-cap and plain-bore wheels; Phillips automatic crossover, pushback and gravity-operated rotary dumps; car stops, retarders and caging apparatus. Princeton Foundry & Supply Co., Princeton, W. Va., offered the "Perfection" cone-stove sand dryer.

The Creech Coal Co. ball-bearing car, in service since the fall of 1927 without lubrication or change of bearings, was featured by the Sanford-Day Iron Works, Inc., Knoxville, Tenn., which also offered models of bottom-dumping trailers for strip mines, a full-sized S.-D. Griffiths automatic bottom-dumping mine car, models of end- and rotary-dump cars and S.-D. "Floater" ball-bearing and Timken roller-bearing wheels. Car pullers and room hoists comprised part of the exhibit of the Sullivan Machinery Co., Chicago.

Subsidiaries of the United States Steel Corporation offered the following: Lorain division, Carnegie-Illinois Steel Corporation, Pittsburgh, Pa.—welded light-weight mine car of high-tensile (Cor-Ten) steel with rolled-steel wheels, also rails and frogs; Carnegie-Illinois Steel Co.—rails, steel ties; Columbus Steel Co., San Francisco, Calif., and the Tennessee Coal, Iron & R.R. Co., Birmingham, Ala.—rails, ties, and other United States Steel products.

One of the Crescent Coal Co. maximum-capacity flat-bottomed mine cars featuring creosoted yellow-pine bumpers for long life and freedom from repairs was shown by the Watt Car & Wheel Co., Barnesville, Ohio. Of the through-axle type for rotary-dump service, the car is equipped with a channel drawbar, which also serves as the connection between the bottom plates, made in two halves, and with both longitudinal and transverse angles for greater rigidity. Brake riggings are installed on both ends of the car, which averages 3 tons hand loaded. Other items included a model of the Watt-Dalton spring bumper for mine cars. Weir-Kilby Corporation, Cincinnati, Ohio, offered Weir "Titan" frogs, switch stands, switches, guard-rail clamps and a number of other track materials.

A new development featured by the West Virginia Rail Co., Huntington, W. Va., was the application of opalescent paint to switch stands to increase safety by assuring high visibility. The company also offered a light-type alloy-steel positive-pull rail bender with a fixed stroke, in which the degree of bend is governed by the distance the bender is moved each time along the rail. Other company products included manganese-steel frogs, one-piece-point safety frogs, heavy-duty manganese-steel frogs, Universal switch ties and West Virginia steel mine ties.

Extending Power Use at Coal Mines

ELECTRICAL equipment and controls were shown by 26 manufacturers at the Cincinnati exposition. A mercury-arc rectifier for mine-haulage systems rated at 150 kw. at 275 volts and 300 kw. at 550 volts was shown in operation by the Allis-Chalmers Mfg. Co., Milwaukee, Wis., along with gear-head motors. "Amerclad" all-rubber cables, electrical wires and cables and "Tiger-Weld" rail bonds were featured by the American Steel & Wire Co., Chicago.

In addition to "Duracord" and rubber mining and shovel cables, building wire, special cables, trolley and feeder wire, magnet wire, power cables and signal and control cables, Anaconda Wire & Cable Co., New York, offered a borehole suspension unit designed to terminate, seal and support vertical riser cables for 110 volts and over in conductor sizes from No. 6 Awg. to 2,000,000 circ.mil without placing strain on the insulation. Major features outlined include: complete assembly of cable and suspension unit; reduced installation cost; neatness and compactness; less supporting framework; reduction of 50 per cent in cable weight.

Improved KSA mechanically operated automatic-reclosing circuit breakers with magnetically operated switches and KSC inclosed automatic-reclosing circuit breakers for sectionalizing were displayed by the Automatic Reclosing Circuit Breaker Co., Columbus, Ohio. Bowdil Co., Canton, Ohio, demonstrated the new Bryant-Bowdil choke-arc transfer switch, stated to give a more positive transfer, greater safety and lower cost on gathering locomotives and mechanical cutting and loading machines.

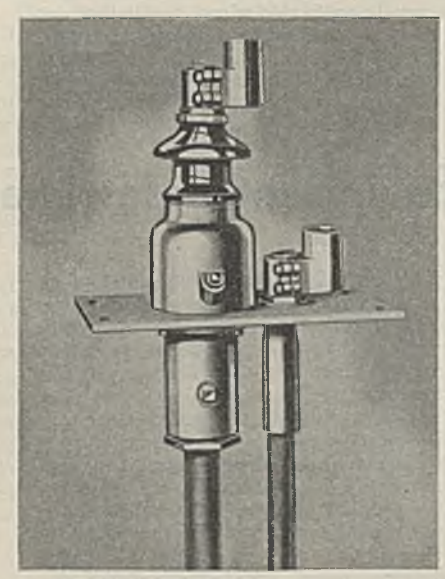
Edison storage-battery division, Thomas A. Edison Industries, Inc., East Orange, N. J., presented Edison nickel-iron-alkaline cells for mine-locomotive haulage. Electric Railway Equipment Co., Cincinnati, Ohio, displayed "Elreco" trolley and line materials, switches, section insulators, sectionalizing switches, etc. "Erico" rail bonds and welders were featured by the Electric Railway Improvement Co., Cleveland, Ohio.

Types MVM, TLM and FLM "Exide-Ironclad" and "Exide-Hycap" cells for locomotive batteries were shown by the Electric Storage Battery Co., Philadelphia, Pa., which featured the TLM cell with an increased height of 5 in. and 43 per cent more capacity for increasing locomotive performance where height is available. Fairbanks, Morse & Co., Chicago, displayed a.c. and d.c. motors for all purposes, including inclosed and ventilated units.

Flood City Brass & Electric Co., Johnstown, Pa., offered the new "No-Fuse" permissible starter for gaseous mines with De-Ion grid contacts for high interrupting capacity. An inverse time-limit element, it was further stated, permits maximum motor performance with positive protection. When tripped by an overload it is only necessary to move the handle to the "reset" position. Additional Flood City equipment included two types of controllers, trolley wheels, gliders, wire splicers, etc.; a field-coil testing machine for shunt or series testing; and automatic and manual transfer switches.

Products displayed by the General Electric Co., Schenectady, N. Y., included tellurium-compounded and other mining cables, motors and gear-motors, floodlights, EW resistors and Pyranol transformers, for which the following features were noted: non-inflammable, non-explosive, reduced over-all installation costs and elimination of vaults and long runs of secondary cables.

Gould Storage Battery Corporation, Depew, N. Y., showed Types KMD and KHD rubber-jar mine-locomotive battery



Anaconda d.c. cable suspension unit

cells; Types OSX, HSX, NHSX, NHSC and OPE cells for trolley-voltage control and maintenance; Durapor separators; and an improved battery tray. Voltage-control batteries featured the Gould Plante positive plate, while major points offered for the KHD cell were high capacity through the use of a decreased sediment space, thus increasing plate length.

In addition to trolley wheels, sectional switches, frogs and splicers, poles, pole heads, harps, clamps, expansion bolts and hangers, Mosebach Electric & Supply Co., Pittsburgh, Pa., offered two new "Mescoweld" bonds: AWM8F separate-joint type and AWM8X-F combination joint and cross-bond type. Designed for installation under the rail, both are made by the electric flashweld process with soft-steel terminals with welding pockets on the top. The combination bond, the company stated, makes it unnecessary to use individual joint and cross bonds.

Pyramid carbon brushes, including the "SA" series designed especially for heavy-duty d.c. equipment, with high contact drop and low coefficient of friction, were shown by the National Carbon Co., Cleveland, Ohio. Electric coils and insulation were displayed by the National Electric Coil Co., Columbus, Ohio.

Ohio Brass Co., Mansfield, Ohio, displayed wheel- and shoe-type current collectors for mine locomotives; section insulators in automatic and non-automatic types, including a new unit with a shunt to prevent arcing; hangers, frogs, wire splicers and other line material; fused trolley taps; ground clamps; quick-break switches with clamps adjustable to all sizes of cable, eliminating solderings; insulators; bonds of all types; trolley-wire lubricators; safety feeder switches; gasproof fused junction boxes; and the Types KD, AD (both adapted to remote control), DRT, KSD and KS6A motor starters for underground service.

In addition to trolley-line materials and harps, Penn Machine Co., Johnstown, Pa., featured "Super-Weld" rail bonds made by the flash welding process to unite every wire of the bond to the terminal. Also, it was stated, terminal design prevents oxidation of the strand in welding. These and other features were said to give longer life, higher tensile strength and greater conductivity. "Micanite" insulating materials, products of the National Vulcanized Fibre Co., "Mycalex" parts, and insulation and electrical coils were exhibited by the Pennsylvania Electrical Repair Co., Pittsburgh, Pa.

The company's new steel-grid resistor was shown by the Post-Glover Electric Co., Cincinnati, Ohio. Features stressed included: adaptability to internal mounting, non-breakable construction, elimination of warping or drooping, high carrying capacity, increased air space to give equal heat distribution, unusually cool grid ends, low thermal coefficient of resistance, elimination of porcelain, easily adjustable terminals, minimum number of supporting bolts, no corrosion and easy assembly and disassembly. Other Post-Glover equipment included transfer switches, self-starters for d.c. motors and K. & H. solderless terminal plugs. Pure Carbon Co., St. Marys, Pa., presented brushes and other carbon products.

Insulated wires and cable were shown by the John A. Roebling's Sons Co., Trenton, N. J. Simplex Wire & Cable Co., Chicago, in addition to Tirex cables, called attention to its borehole types, the new "Anhydrex" rubber compounds, rubber-jacketed cables for mine telephone circuits, signal systems and similar applications, and special cables with "Latox" insulation.

The new "Frigid-Arc" line of alternating-current controllers was exhibited by the Sullivan Machinery Co., Chicago, along with Crompton "Tong-Test" ammeters. Available in three styles (A, interchangeable with old-style controllers on all CLE-5 or CLE-6, 50-hp. a.c. longwall cutters; B, interchangeable on CE-7 or CR-3 short-wall cutters; and C, non-reversing fused or safety switch of the contactor type for pumps, fans, compressors, tipple motors, etc.), the following features were cited for the units: ability to rupture 3,000 amp., a.c., at 600 volts in 0.05 second; manual operation, unaffected by voltage drop; quick make and break, minimizing burning of contacts; new arc-quenching method; no coils, magnets, relays or dashpots; mechanical interlock, insuring safe reversing and low maintenance cost. "Dual-Duty" rail bonds were featured by

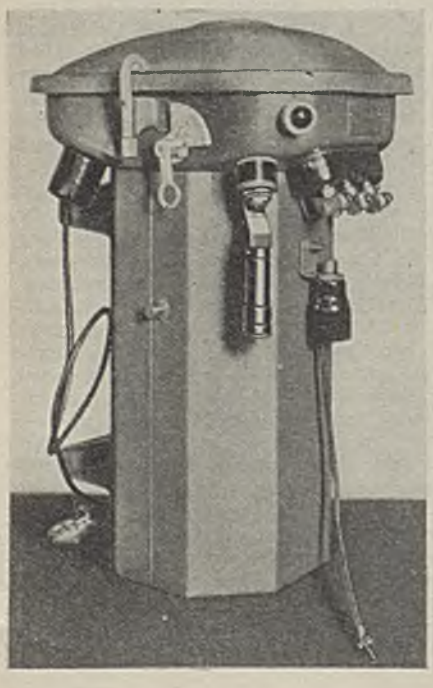
the Bertrand P. Tracy Co., Pittsburgh, Pa.

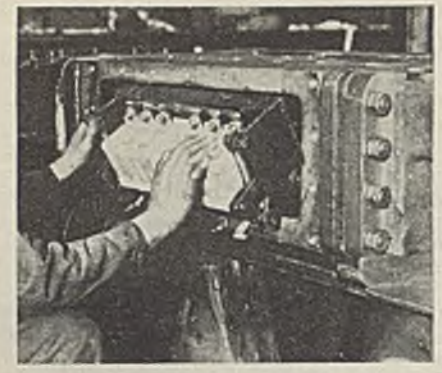
Presenting a number of new items, the exhibit of the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., featured a 300-kw. 6-phase "Ignitron" mercury-arc rectifier, with water-cooled steel "Ignitron" tubes. In this rectifier, the company pointed out, anodes are in separate tubes, eliminating backfiring and assuring a low arc drop, with resultant high efficiency. Advantages in mining service, it was stated, include: high short-time overload capacity with complete freedom from commutation difficulties on short circuits; elimination of bearings; elimination of cloth, paper or other fibrous insulation or gum impregnation subject to damage by relatively low temperatures: light weight and no vibration, making heavy foundations unnecessary and moving relatively easy; simple automatic control; elimination of high starting currents; and high efficiency over the complete load range.

Type CSP surge-protected distribution transformers were another Westinghouse product. Complete self-protection without auxiliary devices was cited by the company. Improved De-ion gaps provide lightning protection, and an internally mounted circuit breaker and high-voltage protective links take the place of primary fuses and give protection against burnouts from cumulative overloads and short circuits. In addition, the breaker, without opening the circuit, gives advance warning of excessive copper temperatures by lighting an indicating lamp.

Another new Westinghouse item was a fan-cooled totally inclosed d.c. motor, Type SK, in ratings from 5 to 75 hp., 115, 230 and 550 volts. Exclusion of all foreign matter, protection against splashing water, examination of commutator and brushes by removing one cover, adaptability to mounting pulley or pinion close to supporting bearing, continuous ratings impossible with totally inclosed motors depending upon radiation and smaller and more compact frames for given ratings were features.

Westinghouse CSP distribution transformer





Sullivan "Frigid-Arc" controller on cutter

Westinghouse also showed a complete new line of linestarters employing the De-ion principle of arc interruption, designed for across-the-line starting of single- and polyphase squirrel-cage induction motors and as primary switches for wound-rotor induction motors. They were stated to be especially applicable where pushbutton control is desired with complete protection.

Types TX (d.c.) and TA (a.c.) industrial analyzers were additional new products shown by Westinghouse. The TX unit consists of an ammeter (7.5, 75 and 750 amp.) and volt-ohmeter (0 to 750 volts and 0 to 200 or 0 to 20,000 ohms), with suitable shunts, multipliers and range-changing switches all mounted in a 7½x10¾x13-in. case weighing 18 lb. The TA unit, according to the company, measures amperes, volts, watts and power-factor, polyphase; and amperes, volts and watts, single phase. Ratings are: 5, 25, 125 amp.; 150, 300, 600 volts; 25 to 133 cycles. Case dimensions are: 9¼x13¼x18⅝ in. Weight is 35½ lb.

Type F metal-clad switchgear, available in 25,000 kva. interrupting capacity 600-amp. 5,000-volt and 800-amp. 2,500-volt units, was another new Westinghouse product. It consists essentially of two parts-stationary cell, or housing, containing buses and connections, instrument transformers and disconnecting devices; and removable oil-circuit-breaker unit with disconnecting contacts and operating mechanism.

Other Westinghouse products included: FD double-reduction gear-motors; carbon brushes, line materials, splashproof a.c. motors, "Rhinobestos" coils; insulating materials, trolley poles and current collectors, wires and cables, etc.

Equipment Eases Drainage Problems

EQUIPMENT and supplies for dewatering mines were offered by ten manufacturers at the Cincinnati exposition. Centrifugal pumps were displayed by the Allis-Chalmers Mfg. Co., Milwaukee, Wis. Atlas Lumnite Cement Co., New York, a subsidiary of the United States Steel Corporation, stressed Lumnite cement pipe and Lumnite cement-lined pipe for acid-water service. Foot-valves, strainers and other pumping auxiliaries were shown by the Brown-Fayro Co., Johnstown, Pa.

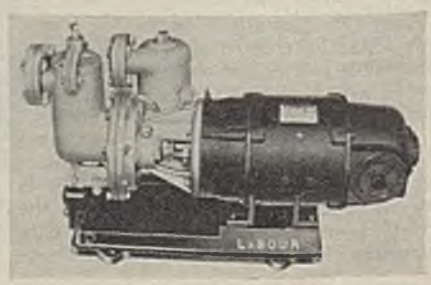
Centrifugal pumps and a new mine gathering pump with standardized construction were exhibited by Fairbanks, Morse & Co., Chicago. Available in a 5x5-in. model with a capacity of 50 g.p.m. at 100 lb. per square inch, the new gathering unit is equipped with a piston with leather cups which do not cut out; removable liner held by three bolts; valves mounted in individual pots with individual covers held by two yokes and designed with large clearances and high lift to handle sizeable pieces of coal; and is adaptable to any drive. In the standard model, motor and pump are mounted on a cast-iron base notched for car axles. A sealed, fully inclosed power end, available with Fairbanks-Morse motor, is a feature of the pump, with the rod working through a stuffing box to prevent escape of oil or entrance of water and dirt.

A new reversible water end of high-grade acid-resisting bronze, stated to be adaptable to various types and makes of plunger pumps, was displayed by the Flood City Brass & Electric Co., Johnstown, Pa. Features noted by the company were: extra-heavy walls and smooth curves for free flow of water; wide valve covers with machined joints for easy access; ample-sized studs to hold valve; standard-design valves with pressed tapered seats to eliminate leakage; special stem and spring to prevent breakage and clogging; standard flange connections; chrome-steel piston rods and valve stems; bronze liners, valve seats, etc. (chrome steel furnished if desired).

In addition to an acid- and corrosion-resisting mine gathering pump in operation to show air-handling and priming performance, the LaBour Co., Elkhart, Ind., offered a new permissible gathering pump combining a Westinghouse explosion-tested motor with direct-mounted self-priming centrifugal pump. Compactness was stressed by the company, which cited as an example the No. 10 unit (100 g.p.m., 30-ft. head, or 25 g.p.m., 60-ft. head, including suction lift), 22 in. high and requiring floor space of 21x38 in.

The Morris double-suction pump with floating sealing ring kept tight by the pressure in the pump was shown by the Morris Machine Works, Baldwinsville, N. Y. Universal cast-iron pipe was displayed by the Post-Glover Electric Co., Cincinnati, Ohio. National pipe in various styles was shown by the National Tube Co., Pittsburgh, Pa., a subsidiary of the United States Steel Co. "Toncan" corrosion-resisting pipe was exhibited by the Republic Steel Corporation, Cleveland, Ohio, with plain steel and copper-bearing types.

LaBour permissible gathering pump



Coal-Mining Aids Smooth Operation

SIXTY companies offered a variety of staple and special products at the Cincinnati exposition, including power-transmission equipment, bearings, explosives, lubricants, wood preservatives, jacks, repair parts, wire rope, steel and steel products, etc. Ahlberg Bearing Co., Chicago, displayed its new line of CJB pillow blocks in the following types: Ec, light duty; unit type, medium duty; and ball-and-socket type, heavy duty. Great strength, dependability and reduction in power were stressed by the company, which featured Ahlberg ground bearings and new industrial types of single- and double-row CJB bearings.

Texrope V-belts, the Texrope "Vari-Pitch" drive and "Ro-Twin" stationary and mine-car compressors (*Coal Age*, April, 1936, p. 167), were shown by the Allis-Chalmers Mfg. Co., Milwaukee, Wis. Welding gases, nozzles, tips, welding rods, the Wilson 75-amp. arc-welding machine, other welding supplies and National Carbide Co. carbide were offered by Air Reduction Sales Co., New York. American Cable Co., Wilkes-Barre, Pa., exhibited "Tru-Lay" preformed wire rope for mine use.

General and Burton explosives divisions, American Cyanamid & Chemical Corporation, Pittsburgh, Pa., featured high explosives, the new American A, B and C pellet powders wrapped four pellets per cartridge in paraffined paper and blasting supplies. American A is offered for seams over 60 in.; B, 48 to 60 in.; and C, under 48 in.

"Blakstix" with improved moisture-resisting properties, "Coalite" permissible, "Accordion-Fold" electric blasting caps, all-metal closed-shell electric squibs and the new "Apcol" ammonia-base powder with a detonating speed of 5,000 f.p.s. were displayed by the Atlas Powder Co., Wilmington, Del. The new powder, it was stated, runs 130 to 138 1¼x8-in. sticks per 50-lb. box.

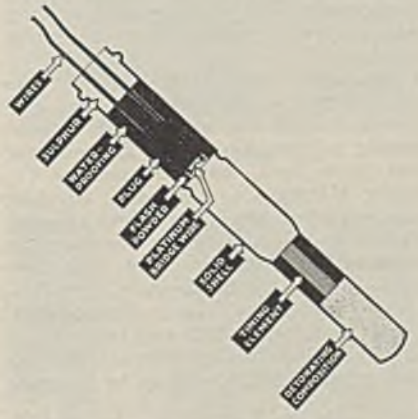
"Yellow-Strand" wire rope, including mining-machine, shaft, incline and shovel types, was shown by the Broderick & Bascom Rope Co., St. Louis, Mo. Coal Mine Equipment Sales Co., Terre Haute, Ind., stressed its used-equipment service. In addition to screw jacks, timber jacks, lifting jacks, etc., Duff-Norton Mfg. Co., Pittsburgh, Pa., offered "Genuine Barrett" automatic lowering and trip jacks in capacities from 15 to 20 tons. For use with locomotives, cars, mining machines and in track repairs, the new line was stated to be stronger and to have a new simplified mechanism reducing maintenance and insuring positive operation.

The reclassified line of Duobel (high-velocity), Monobel (low-velocity) and Gelobel (permissible-gelatin) explosives was featured by E. I. duPont de Nemours & Co., Inc., Wilmington, Del., in addition to blasting powders, electric squibs, Nitramon and Nitramon primers and other blasting materials and supplies.

Weighing mine cars in motion was demonstrated by Fairbanks, Morse & Co., Chicago. The automatic weigher is made up of a Type "S" suspension; an automatic tripping device consisting of two track switches, both of which must be tripped by the front wheel of the car to operate the recorder, thus permitting maximum backing up of trips without interfering with recording; and a cabinet dial with "Printomatic" weigher and locked glass-inclosed tare bar. The Printomatic weigher is fitted, as desired, with designating letters, numbers and dating stamps to show all or any of the following: check number, weight, car number, section of mine originating car; month, day, hour and minute, a.m. or p.m., etc. The printer can be located away from the scale, if desired, and is fitted with a double roll of paper, one half of which is fed out and the other retained in the machine.

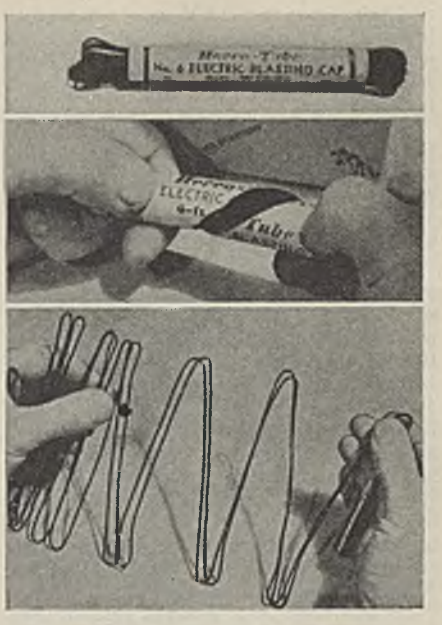
Standard, sealed- self-aligning and "Precision" ball bearings were displayed by the Fafnir Bearing Co., New Britain, Conn., which featured mine-car bearings, pillow blocks and journal roller bearings. Repair parts for mining machines were offered by the Flood City Brass & Electric Co., Johnstown, Pa. Chromated zinc chloride for timber treatment was featured by the Grasselli Chemical Co., Cleveland, Ohio.

Lubricants of all types, with examples of applications to mine-car wheels, gathering pumps and other equipment, were exhibited by the Gulf Refining Co., Pittsburgh, Pa. Calling attention to the part played by Erskine Hazard in the first successful use of anthracite in the Hazard & White wire mill in 1814, Hazard Wire Rope Co., Wilkes-Barre, Pa., offered samples of its line of "Lay-Set" wire rope.



Hercules "No-Vent" delay detonator

Jeffrey locomotive headlight



"Hercotube" protected blasting cap

Hercules Powder Co., Wilmington, Del., showed high explosives, black and pellet powders, blasting supplies, permissible powders and the new "Hercotube" individual blasting caps and "No-Vent" all-metal delay caps. Features cited for the Hercotube cap included: stout tube around shell and folded wires, with the latter projecting for ready identification; convenient distribution; and wrapper easily broken by twisting, after which the wires unfold without kinks. The No-Vent cap, it was stated, was made possible by the use of a non-gas-releasing timing element, thus obviating vents that might let water in and cause misfires. As the explosive charge cannot be burned by the cap, it is possible to fire even black powder charges in rotation.

Hulburt Oil & Grease Co., Philadelphia, Pa., showed a complete line of "Quality" greases for mining.

Parts and equipment for locomotives, mining machines, etc., and a new headlight for mine locomotives and machines were displayed by the Jeffrey Mfg. Co., Columbus, Ohio. In addition to a full range of Joyce jacks for mining and heavy-duty industrial service, Joyce Cridland Co., Dayton, Ohio, featured the following: automatic-lowering mining-machine jack, capacity 5 tons; mine timber jack; standard- and high-speed ball-bearing jacks up to 50 tons capacity; and a complete line of hydraulic jacks in capacities from 1½ to 30 tons.

Keystone Lubricating Co., St. Louis, Mo., offered Keystone mining and industrial lubricants and demonstrated the application of the Keystone safety lubricator to general tipple and screen lubrication.

Hercules "Red-Strand" wire rope and cables, including hoisting, conveying, stripping, tramway-track and mining-machine types in both non-preformed and preformed construction, as required, were exhibited by A. Leschen & Sons Rope Co., St. Louis, Mo.

Link-Belt Co., Chicago, showed samples of a new line of anti-friction pillow blocks, streamlined plain pillow blocks

and take-ups; the P.I.V. gear adapted to a variable-remote control; a motorized speed reducer; and chains in sizes commonly used for conveying and power transmission.

Macwhyte internally lubricated hoisting, stripping, mining-machine, loader and scraper, and haulage ropes were displayed by the Macwhyte Co., Kenosha, Wis., together with Atlas and Drew safety wire-rope slings.

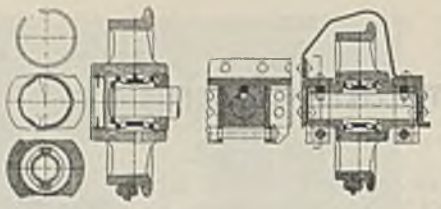
M-R-C ball bearings, with special emphasis on double-shielded bearings for use in motors, mine-car wheels and other places where dirt is encountered and lubrication is infrequent, were displayed by the Marlin-Rockwell Corporation, Jamestown, N. Y. "Carbic" floodlights, Linde oxygen, "Prest-O-Lite" acetylene, "Oxweld" generators and welding and cutting torches, Haynes "Stellite" hard-surfacing material, welding rods, composite rods, "Haystellite" inserts, and other welding materials and supplies were shown at the booth of the National Carbon Co., Cleveland, Ohio.

In addition to a general line of ball bearings, New Departure Mfg. Co., Bristol, Conn., featured the "N-D-Seal" conveyor bearing, wheel mountings for standard full- and straight-stub-axle mine cars with bearing lock rings and non-threaded shafts eliminating drilling, tapping and threading; and double-row sheave bearings allowing sheave centers to be brought close together, it was stated, with greater resistance to cocking loads.

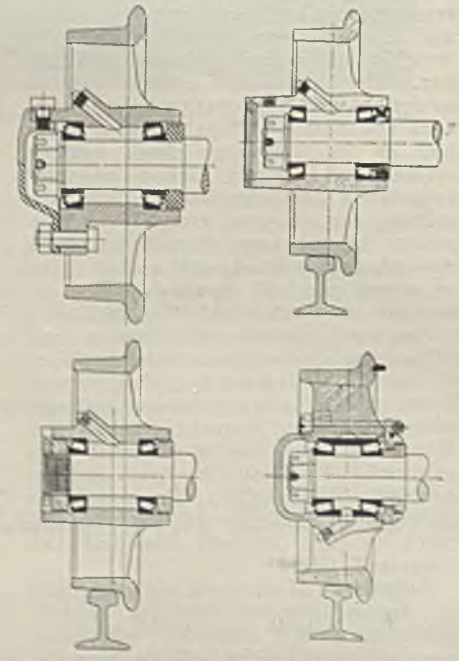
Norma-Hoffmann Bearings Corporation, Stamford, Conn., showed ball and roller bearings and a mine-locomotive motor with deep-grooved ball bearings with solid-bronze retainers at the commutator end for thrust in either direction and a standard bronze-retainer straight-roller bearing at the pinion end for heavy radial loads.

Repair parts for mining machines were offered by the Penn Machine Co., Johnstown, Pa. Phillips Mine & Mill Supply Co., Pittsburgh, Pa., called attention to its fabricated-plate and structural-steel service. A complete line of mining lubricants, including low-pour-point greases for plain and anti-friction mine-car bearings, was featured by the Pure Oil Co., Pittsburgh, Pa. Republic Steel Corporation, Cleveland, Ohio, showed stainless steels and products, and "Electrunite" boiler and other tubes.

Roebling "Blue-Center" steel ropes, wire-rope fittings and flat cold-rolled strips were displayed by the John A. Roebling's Sons Co., Trenton, N. J. Joseph T. Ryerson & Sons, Inc., Chicago, offered bars and structural shapes,



New Departure full- and stub-axle mountings without threaded shafts



Upper left, standard Timken two-bearing mounting with annular-groove closure; upper right, latest labyrinth closure; lower left, new combination nut and closure; lower right, shrunk-on dust collar modified to provide labyrinth seal

alloy, stainless and cold-finished steels, all classes of sheets and plates, welding rods, tool steels and heavy-plate-burning services.

The new low-pressure Cardox cartridge, stated to cost no more yet containing double the volume of carbon-dioxide and breaking down 25 to 50 per cent more coal, was stressed by the Safety Mining Co., Chicago. Blockier structure and freedom from shatter cracks, with consequent decrease in degradation in transit, were other advantages noted by the company.

SKF Industries, Inc., Philadelphia, Pa., in addition to ball and roller bearings and pillow blocks, demonstrated the application of SKF bearings to the shaft of a mine-locomotive motor and wheel journal. Socony-Vacuum Oil Co., Inc., featured Gargoyle lubricants and lubrication service. Standard Oil Co. of Indiana, Chicago, displayed a full line of lubricants, including loading-machine types, and called attention to its engineering bulletin service. Sun Oil Co., Philadelphia, Pa., presented items from its line of industrial lubricants.

The new Model 120 low-height 4-cylinder "Mine-Air" compressor with a capacity of 120 c.f.m. at 100 lb. per square inch gage, sufficient for three pick hammers or two 30-lb. air drills, was exhibited by the Sullivan Machinery Co., Chicago. Over-all length of the unit is 9 ft. 11¼ in.; width, 42-in.; track gage, 46 in.; height above the rail, 26¼ in.

"Simplex" jacks and maintenance units were shown by Templeton Kenly & Co., Chicago, which featured the following new items: gear puller; wire and trolley stretcher weighing 14 lb. with a capacity of 14 tons with a 14-in. travel, for heavy cables; a high-capacity collapsible roof jack for use with pipe column in open-end mining; double-acting automatic-reversing post-pulling jack with a capacity of 5 tons and a travel of 47 in.

Texas Co., Chicago, offered a full line of mining and industrial lubricants. "Tycol" oils and "Green-Cast" mining greases were presented by the Tide Water Oil Co., New York, N. Y.

Timken Roller Bearing Co., Canton, Ohio, featured cutaway wheels showing how different Timken bearings are mounted on mine-car axles; closures, including (1) standard two-bearing mounting with annular-groove closure, (2) latest labyrinth closure, and (3) conventional mounting demonstrating how the new combinaiton nut and closure is applied, giving the protection of annular-groove closures to the outer end of the journal in addition to functioning as an adjusting nut for the two bearings constituting the mounting; and several types of recent quick-demountable wheels held in place by U-bolts and fitted with double-cup bearings, including a design with a new shrunk-on dust collar modified to provide a labyrinth seal. With the double-cup mounting, the company stated, the bearing remains in place on the axle as a complete unit when the wheel is removed, and bearing adjustment therefore is undisturbed.

Tool-steel, hardened, heat-treated gears, pinions, sprockets and other mining-equipment parts, including new items for some of the newer cutting and loading machines, and gears and pinions for pumps and tipple drives were displayed by the Tool Steel Gear & Pinion Co., Cincinnati, Ohio. Bertrand P. Tracy Co., Pittsburgh, Pa., offered repair parts for locomotives and mining machines. Application of Tyson tapered cageless roller bearings to mine-car wheels was featured by the Tyson Roller Bearing Corporation, Massillon, Ohio.

United States Steel Corporation subsidiaries offered the following equipment and services: American Bridge Co., Pittsburgh, Pa., erection; American Sheet & Tin Plate Co., Pittsburgh, USS high-tensile steel sheets, plates and shapes; American Steel & Wire Co., Chicago, "Tiger Brand" wire rope and fittings; Carnegie-Illinois Steel Co.,

Sullivan Model 120 "Mine-Air" compressor

Pittsburgh, beams and shapes for mine construction; Cyclone Fence Co., Waukegan, Ill., industrial fencing; Columbia Steel Co., San Francisco, Calif., Scully Steel Products Co., Pittsburgh, Pa., and the Tennessee Coal, Iron & R.R. Co., Birmingham, Ala., general line of Steel Corporation products.

Universal Lubricating Co., Cleveland, Ohio, displayed "Tulc" lubricants for mining service. Light-weight aluminum-alloy tools (jacks, rail benders, rail punches, etc.) were offered by the Utility Mine Equipment Co., St. Louis, Mo. Western electric and delay caps, "Protect-O-Spool" blasting caps and other blasting materials and supplies were shown by the Western Cartridge Co., East Alton, Ill.

Renewal parts and services and the new "FlexArc" welder were offered by the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. Features cited for the welder were: lower-cost welds—absolutely constant arc, meaning more metal deposit per unit of current; faster and easier welding because of steadier arc—preset single-dial control saves time; and stronger and denser welds—arc sputtering and electrode sticking eliminated.

Williamsport Wire Rope Co., Williamsport, Pa., showed "Purple-Strand" wire rope, mining cables, wire lines and fittings and slings. Cost-saving possibilities, wood preservatives and methods of treatment were featured by the Wood Preserving Corporation, Pittsburgh, Pa.

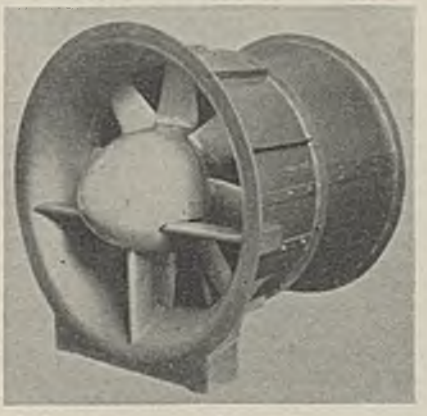
Modern Aids Promote Safe Operation

SAFETY was again the major theme of a number of exhibits at the Cincinnati exposition. American Brattice Cloth Co., Warsaw, Ind., stressed "Mine-Vent" tubing and couplings and American brattice cloth, including waterproof and fireproof grades. "Brownie" auxiliary tubing blowers were shown by the Brown-Fayro Co., Johnstown, Pa.

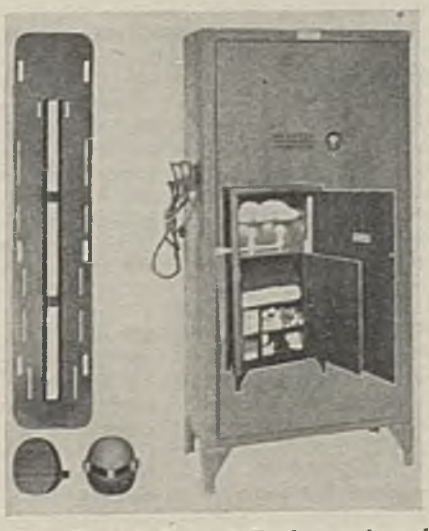
For mine ventilation, the Jeffrey Mfg. Co., Columbus, Ohio, offered tubing blowers, "Aerovane" fans and the new "Aerodyne" fan, said to possess the following advantages: high ventilating efficiency, high volume and pressure capacity, low installation cost and characteristics fitted to mine requirements. High fan efficiency, it was stated, results from refinements in design and reduction of losses to a minimum; high ventilating efficiency from keeping air velocities through the fan low in comparison to the pressure produced. The steeply rising pressure curve and flat efficiency curve, it was pointed out, assure stable operation with changing mine resistance. The non-overloading power curve removes the danger of burning out motors and also the necessity for initial overmotoring. Emergency air reversal is accomplished by reversing direction of rotation.

In addition to a full line of leather and rubber safety footgear, Lehigh Safety Shoe Co., Allentown, Pa., offered the new X910 police model with light-calf upper, "Viscol" sole, cork welt and improved steel-box toe held intact between upper stock and inner sole by a small flange. The steel box rests on a composition "Vinolite" box extending about ¼ in. beyond the steel box to the stitching of the leather tip, thus preventing the steel box from resting on the foot. This shoe is available from A to EEE in width, sizes 6 to 12. Use of the same toe-box in other Lehigh leather shoes was stressed by the company.

Among the new products of the Mine Safety Appliances Co., Pittsburgh, Pa., was a direct-reading air-velocity indicator said to possess extreme accuracy in the determination of velocities from 20 to 1,500 f.p.m. The indicator operates on the electrical principle, drawing power from an Edison cap-lamp battery. It was offered as an improved means of making more accurate ventilation surveys. A second new item was a continuous methane recorder giving a graphic record of the methane content of main returns or splits and featured by an accuracy of 0.02 to 0.03 per cent. Increased portability, making it suitable for low-seam work, was the major feature claimed for a third new product: a portable methane indicator substantially reduced in size. The company also offered Edison electric cap lamps and a model of the new M-S-A self-service charging rack, McCaa permissible oxygen breathing apparatus, gas masks of all kinds, Comfo respirators, ComfoCaps, Skullgards, safety shoes, goggles and other protective clothing and devices; first-aid equipment and materials, Wolf safety lamps, H-H inhalators, M-S-A car stops, and other safety products.



Jeffrey "Aerodyne" Fan



Right, Portable Lamp & Equipment heated first-aid cabinet; upper left, stretcher board; lower left, knee pad

The U.C.C. methane detector was included in the exhibit of the National Carbon Co., Cleveland, Ohio.

Supplementing a display of Wheat electric cap lamps, "cafeteria" charging rack, "Cool-Caps," rubber and leather safety footgear, including a new ankle-fit high-top rubber shoe made of flexible, stretchable rubber for neatness and comfort, and other safety materials, Portable Lamp & Equipment Co., Pittsburgh, Pa., offered a new first-aid cabinet 54¼ in. high, 27 in. wide and 12 in. deep, weighing 75 lb. A top compartment, heated by two 75-watt lamps, holds eight sandbags for shock treatment, and a dustproof inner door to the supplies compartment keeps materials sterile until required. A combination splint and stretcher board was another company product. Made of clear poplar and 7 ft. long, 17 in. wide and 1½ in. thick, the board is cross-braced and provided with insulated feet. In addition to three hand holes on each side, said the maker, there are six additional slots placed so that when triangular bandages are put in the slots and the patient is firmly bound to the board he automatically receives the best attention for first-aid treatment of fractured spine, pelvis, thigh, leg, ankle and knee.

Portable Lamp & Equipment Co. also offered an improvement in the locked car stop (*Coal Age*, March, 1936, p. 126) consisting of a flanged casting to permit bolting the stop to the rail base when required, obviating the customary wooden wedge. New knee cushions were another product. Made of soft sponge rubber, these cushions, the company stated, offer much more comfort to the wearer when walking. Design to fit the knee, sharp curved lip at the top of the pad to keep out dust, water and dirt, and double buckles attached to a canvas strip embedded in the rubber pad were features cited.

In addition to a pictorial display of turbine and propeller fans, Robinson Ventilating Co., Zelienople, Pa., exhibited mancooling fans, motor-cooling blowers, center-tubing blowers and a model of a new vacuum sweeper for dust collection in shops, coal tipples, etc. Design to fit particular conditions and a variety of sizes were points stressed for the sweeper.

New items offered by the Safety First Supply Co., Pittsburgh, Pa., included the "Black Beauty" miner's cap, a shotfiring reel, several new head and eye protectors and a new filament-type methane indicator affording automatic readings. Additional equipment comprised a complete line of safety equipment, shoes, first-aid kits, gas masks, welding masks, etc.

Charts and tables showing graphically the trend of various classes of coal-mine injuries and safe equipment and testing devices for gaseous mines were the themes of the display of the U. S. Bureau of Mines, Washington, D. C.

NOTES
From Across the Sea

GERMANY has a reserve of 62,547,000,000 short tons of lignite, which, though much less than that of the United States, with an original resource of 986,855,100,000 tons of lignite and 860,331,100,000 tons of sub-bituminous coal, is much larger than that estimated for Germany in "The Coal Resources of the World," 1923, which gave the Reich at that time only 14,747,000,000 tons. The revised figures are those of A. Hoffmann, in "Braunkohle," who declares that the estimate of tonnage available has been increased as a result of more and deeper holes being drilled to the deposits.

In 1930, declares Herr Hoffmann, a ratio of coal thickness to cover depth of 1 to 3 was thought to be barely profitable; now 1 to 3, or even 1 to 7, is being attained. Of course, in this country, where the coal is thin and the cover light in actual feet of depth, ratios up to 1 to 20 have been attained, but where, as in the German lignite mines, the pay bed is thick and the cover, to afford a high ratio, is still thicker, it is necessary to transport the overburden in trains of cars and dump it, much as in our anthracite region; thus the economic ratio falls nearer to 1 to 5 than 1 to 20.

In 1920, losses in strip mining were on the average 30 per cent in Germany, but in 1934 they had fallen below 20 per cent. That seems a big percentage of loss for stripping, more by far than in the American strippings. As against these losses may be placed those in the deep mines of Germany, which were 50 per cent in 1920 and between 35 and 40 per cent in 1934.

IN BRITISH MINES coal still is being broken down by hydraulic means, and the equipment for doing this has been much improved. It still consists, however, of a steel barrel bored at definite intervals to receive pistons or plungers, says the *Iron and Coal Trades Review*, of London, England. It is connected by a tube to a hydraulic pump which forces water, made greasy by a little oil, behind the pistons. When the pressure is released, the pistons return to their original position. The equipment is made of stainless steel. A pressure of 3 short tons per square inch can be generated by the pump, but 1½ to 2 short tons usually suffices. A specially armored rubber pipe tested to 4 short tons per square inch connects the pump with the barrel.

One of these equipments is used on the longwall faces at Peckfield colliery of the Micklefield Coal & Lime Co., Ltd. Some have thought, it may be commented, that a hydraulic machine might find the coal too ready under pressure to sag without breaking, but here is a longwall face which would be more likely to sag than a seam worked on the room-and-pillar method. But the coal, nevertheless, is readily brought down. To quote the record, the longwall faces were one 255 ft. long worked quartering between butt and face and one 270 ft. long worked "on bord" (meaning probably "on end"), the last, of course, says the author, being a more difficult proposition. In both cases the coal is readily brought down. The coal is undercut 5 ft., and the Coal Burster used is 5 ft. long, but the actual barrel with its pistons is only 27 in. long by 3½ in. diameter. It has nine plungers having a full stroke of 3¾ in.

About as many holes are used as with explosives, 54 on the bord face and 43 to 45 on the half-and-half face, the holes being 3¾ in. in diameter. One man drills the hole, and a man and a youth operate the Burster. A 5-ft. hole can be drilled in an average of 2½ minutes, and the coal is brought down about 2 minutes from the time the Burster is set. About ten holes can be burst per hour. Because the coal is large it can be loaded more rapidly, it is said, than coal mined by explosives. The percentage of "round coal" obtained by the use of hydraulic means has been increased 9.1 per cent.

FILTERING is only one of the ways of cleaning dust out of air and many particles that are removed by a filter cloth are really not filtered at all, according to H. W. Adler and J. P. Rees, in a paper read before the Chemical, Metallurgical and Mining Society of South Africa. The openings through the cloth were large enough to let the dust through but the dust was caught on the fibers of the flannel. It was not filtration, therefore, but deposition. The hairs of the nose are far apart, yet how readily they gather dust! Why, then, put the air through the filter? Why not carry it along the filtering material, circulating it between close walls of the fabric? A "filter" based on this principle, where the air passes through the filter material but travels for a much longer distance along the fabric, has been devised. It is asserted that the dedusting equipment is compact, is readily handled, and can be regulated, as the fabric clogs with dust, by a suitable increase of the space between the cloth surfaces. With it the fabric will have a long life, and uniformity in quality will not be so important as with a true filter, in which small flaws lead to channeling.

THICKNESS of coal, declared H. G. A. Hickling, professor of geology, Armstrong College, Newcastle-on-Tyne, England, is of the order of one-twentieth that of the peat from which it was derived—that is, a 60-ft. bed of peat would form a 3-ft. bed of coal—but this does not mean that the bed was ever 60 ft. thick, for as it developed it became compressed and changed. Thickness is to be interpreted as the depth the peat would have accumulated had it not thus been compressed and metamorphosed. The growth of the peat bed was perhaps one inch a year. Thus a 3-ft. bed would be some 700 or 1,000 years in formation.

STEEL supports for the roof and steel frames for haulage pulleys are recommended in the interim report of the Joint Committee (British) on the Cause, Prevention and Methods of Dealing with Underground Fires. Brattice cloth, as at present in general use, the committee says, is a flammable material, and thus far a satisfactory fireproofed cloth has not been produced on a commercial scale. Electrical cables covered with a braiding treated with non-flammable compound are now manufactured, and some are in use. Trailing cables with a non-flammable chlorinated-naphthalene-impregnated rubber are being made, one of which is receiving a practical test. Coal dust, waste oil, paper and other flammable materials should not be allowed to accumulate.

Superficial fires of flaming material can be suppressed by hand extinguishers, but sand or rock dust usually is preferable. Water cannot be used on electrical fires, but these dusts will extinguish such fires where superficial. If hand extinguishers are to be used, those which release carbon dioxide and thus project a spray of powder (mainly sodium bicarbonate) are to be preferred. Carbon tetrachloride and methyl bromide are effective, but in a confined space are too toxic for use. Oil fires can be fought with powder spray and foam extinguishers, whereas water may spread the flame. Here also, sand or rock dust should be effective. If only one type of hand fire extinguisher is to be provided, the committee favors the powder-spray type, recognizing, however, that further practical tests are needed. "Soda-acid" or "foam" extinguishers, the committee declares, are liable to deterioration even if the containers are of copper. Care must be given to their storage and maintenance.

RECENT progress in the Yorkshire mines of England was outlined by H. J. Humphrys, (government) inspector of mines in the Yorkshire division, addressing the Royal Commission on Safety in Coal Mines. Since 1911 the output has not materially changed, but the number of mines has been reduced about one-half. The number of sections in each mine, and consequently the length of working face, has been drastically reduced, until in many mines it is only about half what it was some three or four years ago. Mines at work have been reduced from 460 to 239; total output has risen from 43,792,000 to 44,576,000 tons annually, yet the total number of employees has fallen from 148,003 to 144,035 and the number employed underground from 117,047 to 112,967. The output has been maintained by a more rapid advance of the working face with introduction and extended use of machinery, a substantial increase in quantity of explosives used and reduction of horse haulage. Chain machines almost have displaced all other types. Tons produced per machine increased 66 per cent between 1929 and 1934.

Compressed-air machinery predom-

inates because of the gassy nature of the seams. One company operating a 4-ft.-3-in. seam has stated that the cost of undercutting by electricity is ½c. per ton and by compressed air, 2½c., making a difference of 2c. per ton. With a seam only half as thick, Mr. Humphrys supposed the difference would be 4c. In 1929, 9 per cent of the total output was carried on conveyors and in 1934, 33 per cent.

Sheathed explosives now are being largely used both for shooting coal and ripping. The number of shots has been more than trebled, but the average weight of explosive per shot has been reduced and the quantity of explosives used has only doubled. In 1912, 9,375 horses were used, and in 1935, only 4,899. Opinion varies as to the relative safety of machine and hand work, but, says Mr. Humphrys, there may be an ultimate gain in safety by the introduction of face machinery. In the Barnsley bed (where mechanization has been introduced recently) 162 accidents have occurred per 100,000 man-shifts, whereas only 133 accidents have been recorded on the same basis in hand face workings, but in the other beds which have long been mechanized, the machine-face accident rate per 100,000 man-shifts is 65 and in hand-face workings 79.

In 1926 steel props were used only in two mines, and no steel arches were set in unsettled ground. Cambered girders were not introduced until 1930. However, in 1934 the division had 110,302 steel props, 38,025 steel bars at working faces, 266 miles of steel-arched roads and 46 miles of cambered-girder roads.

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.

The Deterioration of Colliery Winding Ropes in Service (Including a Revision of Paper No. 50), by S. M. Dixon, M. A. Hogan and S. L. Robertson. Safety in Mines Research Board (British), Paper No. 94. British Library of Information, New York City. 108 pp., 6x9¾ in. Price, 61c.

This careful study of the technique of hoisting ropes covers preparation and properties of cold-drawn wire, rope construction and the working conditions, deterioration and examination of hoisting ropes. In the so-called "patenting process"—the standard heat-treatment of the rod preparatory to wire drawing—the rod is brought to a temperature between 950 and 1,050 deg. C. and then cooled with fair rapidity in air, molten lead or some other medium. Thus are formed fairly large homogeneous grains of austenite—a solid solution of carbon or iron carbide in iron. With rapid cooling the grains are more uniformly distributed.

Unfortunately, in the drawing of the wire the surface of the steel may be decarburized by oxidation and leave ferrite, which is only a third to a quarter as strong as carbon steel should be; a few violent reductions prove to be better than many easier passes. If the steel is overdrawn, it becomes less ductile and may have a cuppy fracture. It should be relatively free of inclusions of non-metallic material, such as iron oxide, manganese sulphide, aluminum oxide and silicates.

Without wear or acid corrosion, good zinc-coated wire has long life. Corrosion occurs when the zinc coating becomes cracked by bending stresses or wear, and moisture is admitted. Electrical galvanization is said to make the wire more ductile, but the authors have not examined any rope with wire thus coated. In the galvanizing bath, special fluxes are used in some proprietary processes, and the coated wire sometimes is drawn through additional dies which polish and consolidate the zinc.

A rope with 0.034 gram of zinc per square centimeter on each wire was still in good condition after 42 months of service; this coating approximates the thickness of that on galvanized sheet. On the other hand, in a static test, a galvanized wire with 0.0029 gram of zinc per square centimeter was measurably corroded after a year's exposure to the weather. Apparently the coating should contain at least 0.01 gram of zinc per square centimeter, or 0.0005 in. "Our observations on winding ropes in service," say the authors, "are in agreement with those of other workers in showing that the use of galvanized wire is the best method of combating corrosive conditions," for no longer is it necessary, as in the past, in galvanizing wire to destroy its torsion properties.

The unusually high tensile strength required in wire for colliery hoisting ropes has so far rendered it impossible to use either of the common types of rustless steel. Copper steel (0.48 per cent copper and 0.15 per cent molybdenum) showed 10 per cent less atmospheric corrosion than plain carbon steels drawn under the same conditions. The difference would not justify a change to copper-bearing steels, declare the authors.

Much of the rest of the book is duplication and amplification of the earlier publication, and the most important consideration—when to take a rope out of service—is, the authors will admit, most unsatisfying, but little else could be expected. The answer has yet, if ever, to be found. The empirical answer still remains time and condition of service, loss of diameter and broken wires, but all these are misleading indications, though the best available. Loss of metal may some day be determinable magnetically. That method yet may reveal fractures hidden within the rope.

Recent investigations of the fine-grained structure of iron and steel suggest that the approach of fatigue may soon be determined, say the authors, by the width of the X-ray interference band of the steel, which is a measure of the distortion of the crystal lattice, because fracture occurs when the band width exceeds a definite value, irrespective of the manner of distortion.

Falls of Coal and Rock on Man-Trips in Bituminous Coal Mines, by C. W. Owings, U. S. Bureau of Mines. Information Circular 6863; 7 pp.

Roads should be inspected thoroughly at least once a day before the major shift starts and by the vibration method as well as by sounding, declares the author. When roof coal sounds drummy, it is often left in the belief that it will not fall. Roof coal and overhanging rock on ribs at sidetracks, turnouts, or other places where man-trips stop frequently should be examined and tested before the beginning and end of each shift on which man-trips are run. Whereever entry roof is taken down or a fall occurs, the roof at the entrance to rooms should be supported by two or more crossbars placed 6 to 12 in. apart. On roadways, roof coal usually should be taken down.

Man cars should not be overloaded because, in case of a short fall, more men will then be placed in jeopardy. Men should be required to sit on the opposite side of the car from the trolley wire or other power wires. This would not only reduce the danger of electrocution but afford the men an opportunity to dodge rock that might fall, using the sides of the car as a shield. In one case at least, this provision might have saved several lives, for the falling rock formed a bridge from one side of the car to the other. Ribs and roof at regular stopping places should be made safe by posts set 3 ft. apart with substantial cap pieces and with blocks between posts and rib to prevent rib material from rolling over on man-trips. Men should wear their safety hats while riding to their work.

Methane-Indicating Detectors Prove Dependable in Sampling Air in Anthracite Mines, by R. D. Currie, U. S. Bureau of Mines. I.C. 6874, 24 pp.

Two permissible methane detectors were used by the author and found to give results so dependable that he says every coal mine known to emit explosive gas should have at least one of these detectors to aid officials in planning for control of ventilation and in checking firebosses' and mine foremen's reports of gas. Their indications, he adds, are immediate and can be made at the location of sampling.

OPERATING IDEAS

From Production, Electrical and Mechanical Men

Hard Surfacing Reduces Bit-Tipping Cost To One-Fourth Former Figure

DISCONTINUING the hardening of bit points and substituting the practice of tipping with hard material reduced the number of bits sharpened per day to one-fourth the former figure at Nelms mine of the Ohio & Pennsylvania Coal Co., Cadiz, Ohio. For the entire year of 1935 the total cost of new bits, sharpening and tipping averaged less than one-fifth of a cent per ton. The usual gains by power reduction due to sharper bits and the time savings by fewer bit changes attended this improved practice.

Dull bits, after being repointed in a Diamond forging machine and cooled in a pile on the floor, are ready for the two operations involved in applying the hard material, which in this case is Stellite. First the top of the bit is touched to a grinding wheel to clean off the scale for a distance of at least ¾ in. back from the tip. Next the Stellite is applied with an acetylene torch and, as far as possible, the quantity is limited to a thickness of approximately ⅛ in. on an area extending only ¾ in. back from the tip. Limiting the hard-surfacing material to this small quantity results in a lower material cost; also, little or none of the material remains on the dull bit to interfere with repointing in the forging machine. Bits tipped per pound of hard-surfacing material average 7,045.

Actual application of the Stellite is accomplished by the torch operator at an average rate of 700 bits per hour, this including the time he uses in filling and emptying the trough or jig in which the bits are arranged with their tips in alignment. Skillful handling of the acetylene torch so as to preheat the bit points ahead of the welding and a like degree of skill in manipulating the Stellite rod makes for rapid progress along the line. The operator has tipped as many as 1,000 bits in one hour.

Four man-hours per day is the total time required for bit sharpening for the eighteen shortwall and four shearing machines which cut the 3,600 tons of coal produced per day. Formerly 3,400 bits were sharpened each

Three typical bits

No. 1 is worn so that only a trace of the hard-surfacing material remains. No. 2 has been repointed and the top cleaned for ¾ in. back. No. 3 is a finished bit with hard-surfacing material about ⅛ in. thick extending not over ¾ in. back from the point.

Success lies in applying a thin and short coating. Bits are lined up in a jig to facilitate tipping.

After bits are repointed in a hammer-type machine they are allowed to air-cool in a pile on the floor.

Mining-Machine Bit Cost in 1935

10,000 new bits	$275.00
1,400 gal. kerosene	120.50
26 lb. Stellite	104.00
1,927 cu.ft. acetylene	57.81
6,160 cu.ft. oxygen	86.24
935 man-hours labor	654.00
Total cost	$1,306.55
Total bit points made	183,176
Cost per bit point, mills	7.13
Tons coal cut	600,000
Bit pointing cost per ton, mills	2.17
Tons cut per bit point	3.278

day. Now, with hard surfacing, the number is less than 1,000.

Mining is in 6 ft. of Middle Kittanning seam and for each cut, producing 30 tons of coal, an undercut of 132 sq.ft. and a shear cut of 36 sq.ft. are made in the coal. Thus 168 sq.ft. of cutting is done for each 30 tons mined. The number of square feet of cutting per bit sharpened is 183 and the bit cost per 100 sq.ft. of cutting is 3.89c.

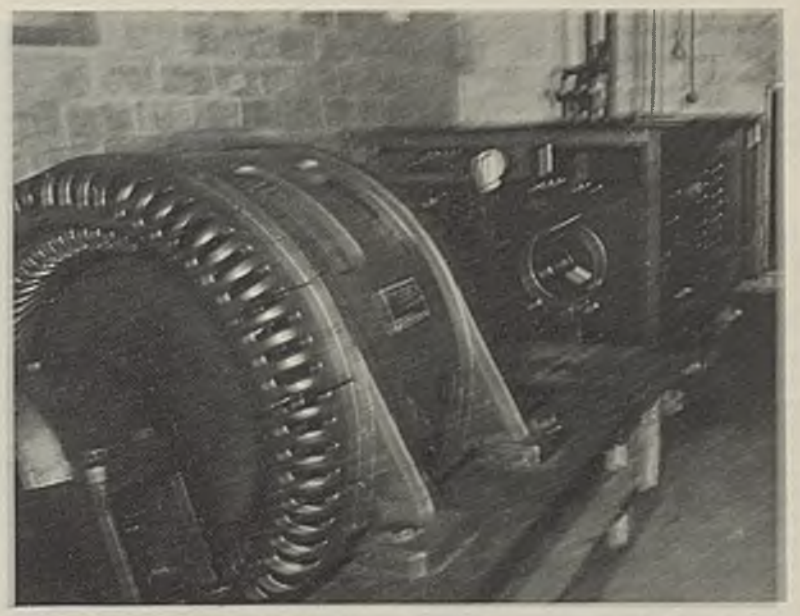
Portable 400-Kw. Substation Embodies Compact Design

Over-all dimensions smaller than any heretofore achieved for a 400-kw. full-automatic motor-generator control truck mark the design of a new portable substation which was put into service within the last few months at the full-mechanical mine of the Wheeling Township Coal Mining Co., Adena, Ohio. Although for nine years the mine has been worked on a concentrated system using mechanical loaders, this new substation is the first departure from the stationary type of power equipment.

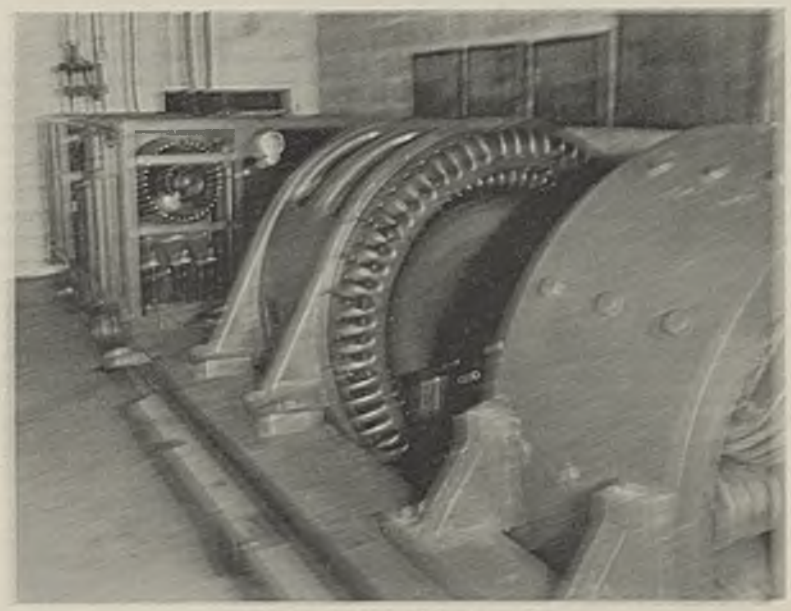
The track gage is 42 in., and both trucks are built with 48-in. wheelbase and have roller-bearing wheels. Over-all dimensions of the control truck with its equipment are: height above rail, 50½ in.; width over wheel hubs, 55 in.; width over truck frame, 49½ in.; and length over bumpers, 120 in. The wheel diameter is 12 in. This truck complete with the control apparatus, switchboard, protective relays and indicating instruments was built by Westinghouse.

The 400-kw. motor-generator stands 51 in. above the rail; the width is 60 in. across the base channels; lengths are 10 ft. 9½ in. over the motor generator proper and 11 ft. 11½ in. over the truck bumpers. The minimum bottom clearance is 31 in. above the rail and the wheels are 14½ in. in diameter. This motor generator complete with truck was furnished by the General Electric Co.

Specifications and ratings of the Type TS Form A synchronous motor are: 4,000 volts, 60 cycles, three-phase, 1,200 r.p.m.; field amp., 14.9; power factor, 80 per cent leading, 575 hp., nominal; 690 hp., 2 hours, 55 deg. C. rise. The type MPC generator is rated 250 volts, 1,200 amp., 400 kw., nominal; 600 kw., 2 hours, 55 deg. C. rise.



Right-hand view including the synchronous motor and control truck



Left-hand view of both trucks

In its present location the portable substation is 14,000 ft. from the main portal of the mine and 7,600 ft. from the bottom of a borehole through which its power and that to a stationary mine substation are fed. The 7,000-ft. cable conducting the 4,000-volt power along the aircourse to the portable substation is three-conductor size No. 2 with rubber insulation and jute protection.

Nine mechanical loading units operate in the mine and each unit includes one 25-hp. Joy type 5BU loading machine, one 40-hp. 4-ton cable-reel locomotive, one 35- or 50-in. cutter, and one 5-hp. coal

★ ★ *Fortune*

• Fortune generally is depicted as either smiling or frowning. Good fortune or bad fortune, however, is not always the result of whim or luck, as man, by application, can bend fortune to his will. This truism applies in mining coal as well as in other activities, and the operating, electrical, mechanical or safety man who, by his own efforts or prior knowledge, can get the drop on the problems he encounters is that much farther along in the race for fortune's favors. Look through these pages. Perhaps they contain something that may help you crack a hard nut. And then send in your own shortcuts to smoother operation and lower costs. Acceptable ideas are paid for at the rate of $5 or more each.

★

drill. Other substation equipment furnishing direct current to the main haulage and loading units includes one 300-kw. motor generator on the outside near the main portal and two 200-kw. units on the inside at the bottom of the borehole.

Portable Reclosing Breakers Aid Mechanical Loading

By fitting automatic breakers into special skid-type boxes and providing connection cables of standard lengths, the time of moving these breakers to new locations, necessary every two to three months in the full-mechanical mine of the Wheeling Township Coal Mining Co., Adena, Ohio, is but 4½ man-hours per breaker. These automatic reclosing sectionalizing breakers are considered a necessary part of the mechanical loading equipment.

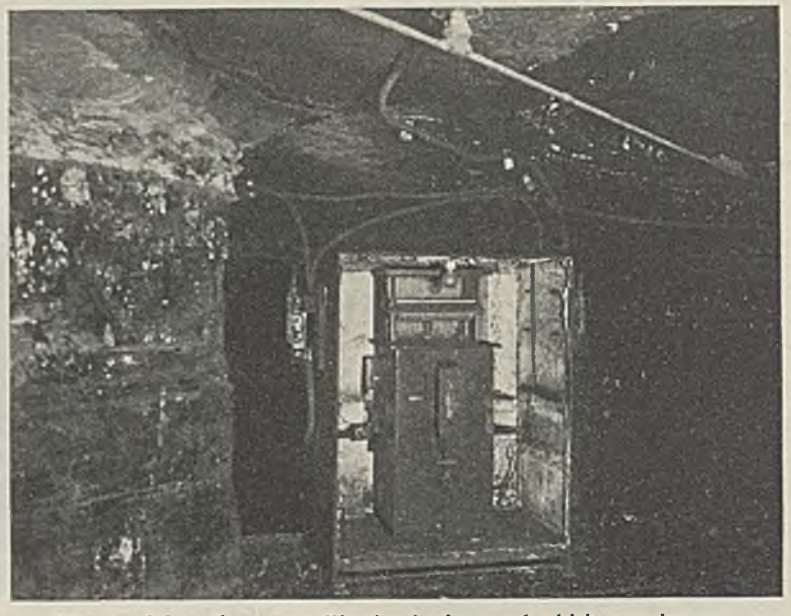
One 1,200-amp. 250-volt breaker set at 800 amp. serves two mechanical loading units, one operating in the right-hand rooms of a panel and the other in the left-hand rooms. The breaker is installed in the first breakthrough between loaded-track headings of the room or butt entry. Although the breakers—Columbus Type KSC, made by the Automatic Reclosing Circuit Breaker Co.—are themselves in protective cases, it was considered advisable to fasten them into boxes which would provide greater protection against roof falls, facilitate rapid and safe handling when being moved and, furthermore, allow permanent mounting of the knife switches used in conjunction with the breaker leads.

The box, 37 in. wide, 46 in. high and 26 in. deep, is built of No. 16 gage steel fastened to a ½x2-in. frame. On the outside of the back sheet are two 2x¼-in. angles having tapered ends. Bolts supporting the breaker pass through these angles. Besides acting as stiffeners and supports, these angles serve as skids when the breaker is tipped over backward and loaded onto a truck. The 2-in. space then existing between the back sheet and the truck bed facilitates moving the breaker by hand or by pinch bar and practically eliminates chance of injury to the fingers.

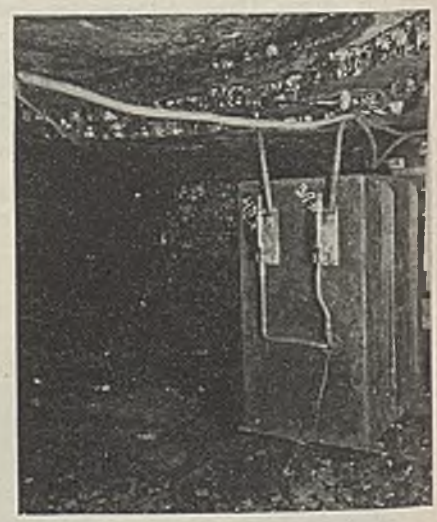
An asbestos lining protects against accidental flash or contact to the box steel which is grounded to the negative wire that is necessary for reclosing operation and to supply the light which is installed in the top of the box. A front door is not considered necessary and, moreover, its application would have complicated the ventilation which is desirable around the breaker resistance.

In order to minimize delay to the mechanical-loading units of a panel in case of real or imagined difficulty with the breaker, incoming and outgoing quick-break knife switches are provided. By opening these knife switches and closing the two-section insulator switches of the trolley line of the adjacent headings, the panel continues to receive power and the breaker is isolated from the line ready for inspection and repair. During a year or more of service, no troubles chargeable to faulty breaker construction have occurred.

The incoming switch, rated 800 amp., is equipped with a double lug to accommodate two 500,000-circ.-mil cables. Two 400-amp. outgoing switches each fitted with single lugs for the same size (500,000-circ. mil) cable, serve to feed separately the right-hand and left-hand loading units. Insulating bushings for the holes where the cables enter the circuit breaker box are made from 3-in. hard-rubber pipe threaded

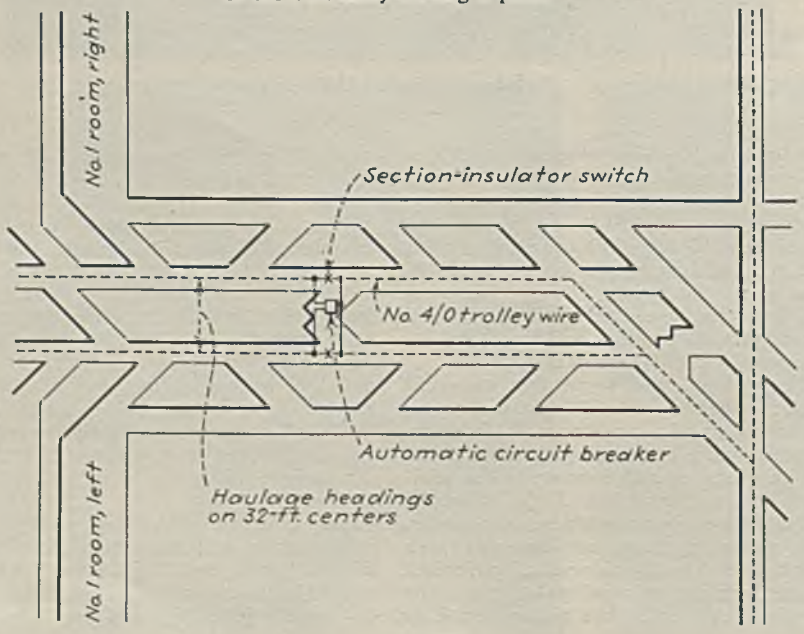


The watchdog of power utilization in the panel which contains two loading units



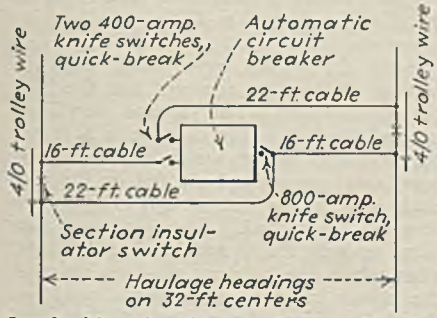
Two 400-amp. switches on one side serve the outgoing feeders. Angles on the back serve as stiffeners and as skids for moving

The breaker is installed in the first breakthrough between loaded headings of the butt entry serving a panel

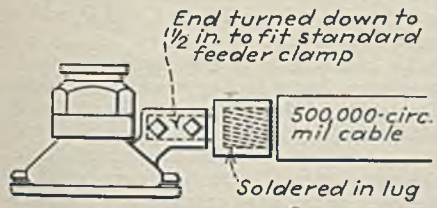


on the outside and held in place by locknuts made from hard-rubber sleeves intended for the same size pipe.

Incoming and outgoing connections of 500,000-circ.mil rubber-covered stranded cable consist of two 16-ft. lengths and two 22-ft. lengths. This arrangement of cable lengths permits of installing the breaker either close to the right-hand or the left-hand heading. Cable ends connected to the trolley wires are fitted with soldered terminals with round ends ½ in. in diameter to fit into lugs of trolley-wire feeder clamps.



Standard-length cables made up with terminals serve as incoming and outgoing lines for the breaker



Terminals with ½-in. round ends facilitate connections to the trolley feeder clamps

To prepare a breaker for moving, the four cables are disconnected from the trolley wires and the cables folded or wound into the front of the breaker box without being disconnected from it. In one shift two men disconnected, moved to new locations, and reconnected three breakers.

Nine loading-machine units are employed in the mine, and normally six of these are on production in rooms and three on development. Six circuit breakers take care of the nine units. The connected load per unit consists of one 25-hp. Joy 5BU loading machine, one 40-hp. 4-ton cable-reel locomotive, one 35- or 50-hp. shortwall mining machine and one 5-hp. drill.

The primary object in using sectionalizing breakers is to eliminate unnecessary opening of the substation breaker. This confining of the power interruption to the one section responsible for the trouble is but one of the many requisites of efficient mechanical operation. Protection against fire, a safer operating condition and a tendency for low voltage in any section to make itself known by prolonged high current are other advantages.

That the safety consideration is by no means unimportant was demonstrated recently when a broken trolley wire wound itself about a man in a locomotive cab. A study of the peculiar circumstances during the time that the man struggled to free himself from the wire indicates that the automatic breaker saved him from serious injury. As it was, he suffered some shock but lost no time.

This mine of the Wheeling Township company is the pioneer full-mechanical operation of Ohio and during nine years of loader operation there has been no let-up in studies to improve efficiency. The semi-portable sectionalizing circuit-breaker installation is one of the recent refinements. In connection with this mechanization of the mine, all of the original loading machines are still operating efficiently, which is noteworthy, considering the state of loader development when they were built. E. J. Christy is chief engineer in charge of mining equipment.

Working Hints From a Shopman's Notebook; Boring Gathering-Arm Disks

By WALTER BAUM
Master Mechanic, Perry Coal Co., O'Fallon, Ill.

TO FACILITATE boring the gathering-arm disk of a Joy 11BU loader for the installation of a new pin, the jig hereinafter described has been of value to the writer. As the pin is welded in the disk, it is impossibe to remove the broken part and put in a new pin in the same location that would be true with the disk shaft.

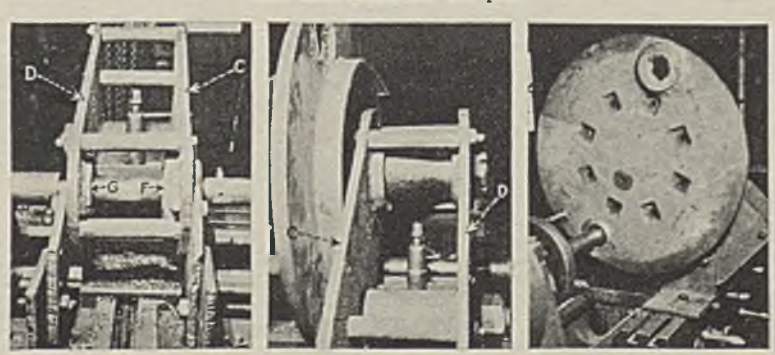
The jig was devised as a substitute for a non-available boring machine, and the first step in its construction was cutting a hole with a torch in a 1x5½x6½-in. steel plate, *A*, to fit the tool post on the lathe. Next a piece of 3½-in. shafting, *B*, 7 in. long, was cut and welded to the plate so that the center of the shaft was in line with the lathe centers (Fig. 4). The cross feed was then run in so that the center of the shaft was in line with the lathe centers, whereupon a 2-in. hole was bored in the shafting and it was faced off 6¾ in. long. Next the bolt shown in Fig. 5 was made on another lathe.

Plates *C* and *D* (Figs. 6 and 7) were then cut out of ⅝x10x24-in. plates to make the jig. Both plates were identical in shape, and holes were cut out with a torch for welding in Collars *F* and *G*, Fig. 8. These collars were faced on both ends and were bored with 2-in. holes prior to installation. The method of assembling the plates and collars, by electric welding, is shown in Figs. 6 and 7. The 4½-in. collar in Plate *D* projects on only one side, while the 6-in. collar in Plate *D* projects 1 in. on one side to permit it to rest against the disk.

Distances *E-E* and *H-H* were obtained by screwing the cross feed back toward the front of the lathe with *A* and *B* in place as in Fig. 4 and then measuring from the center of *B* to the center of the tailstock plates. Plates *C* and *D* were then cut 12 in. longer than the distance between the lathe center and the center of Shaft *B* to permit boring out Collars *F* and *G* to their final sizes. This method permits the jig to be made for any swing of lathe by lifting Plates *C* and *D* up higher on the collar end.

Holes were next drilled in the two plates for the spacers, and the plates were then bolted to Shaft *B* through the Collars *F* and *G*, using the 2-in. bolt already made. The spacers were then placed and the bolts were then drawn up tight with their heads on Plate *C*. The cross feed was then run back as far a it would go and the plates were blocked up so that their centers were in line with the lathe centers. A 2-in. hole was then bored through both plates, care being used to get it exactly the same size as the 2-in. bolt. The 2-in. bolt was then removed and Plates *C* and *D* were turned end for end with

Fig. 1 (Left)—Showing method of holding jig rigid while Collars *F* and *G* in Plates *C* and *D* are bored to final measurements (looking at jig from back of lathe). Fig. 2 (Center)—Jig from front of lathe with the disk in place and hole for a new pin bored out. Fig. 3 (Right)—Boring completed and disk faced off for pin.



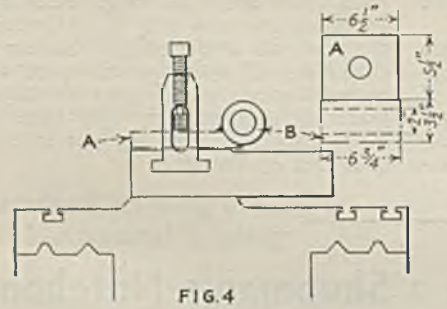


FIG. 4

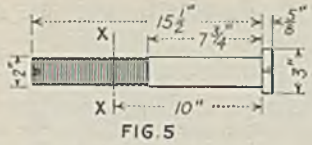


FIG. 5

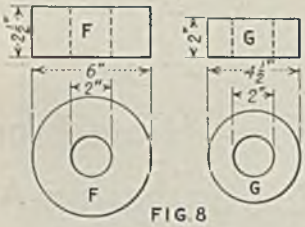


FIG. 8

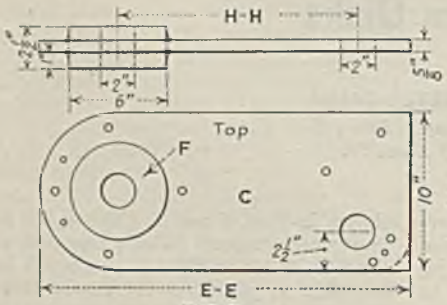


FIG. 6

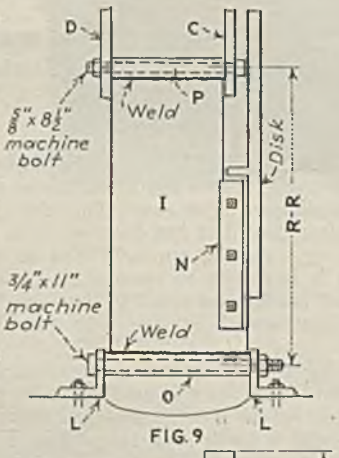


FIG. 9

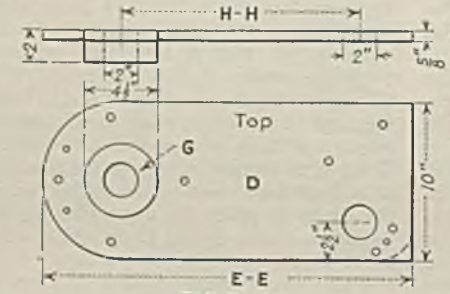


FIG. 7

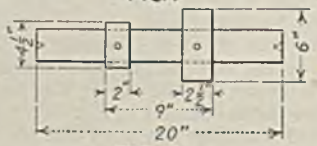


FIG. 10

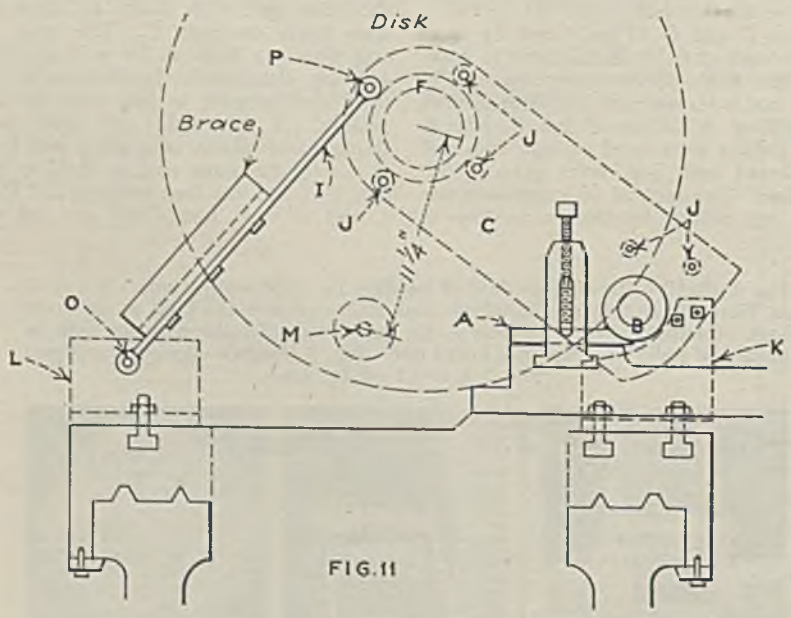


FIG. 11

Fig. 11—*I*, brace of ⅜-in. steel plate; *J*, spacers of 1-in. pipe 6¼ in. long; *K*, ⅝x6x6x7-in. angles (two required); *L*, ⅝x5x4x5-in. angles (two required); *M*, lathe center in tailstock; *N*, length of ⅜x2x3-in. angle to permit use of clamp for disk; *O*, seamless steel tube, ¾ in. I.D., 1⅛ in. O.D.; *P*, length of seamless steel tubing, ⅝ in. I.D., 1⅛ O.D.

Plate *C* on the side of the lathe head. Next the 2-in. bolt was cut off at the line *X-X* (Fig. 5), and the plates were placed one on each side of Shaft *B*. Through the 2-in. holes drilled in the plates, the 2-in. bolt was placed with the head on Plate *C*. The collars were then centered and the jig was then bolted down as in Fig. 1, being held by the two No. 3 angles and two connecting plates. Connecting plates were attached to Plates *C* and *D* by two bolts each, and to the No. 3 angles by one bolt each, using the ¾-in. holes in the angles. Collar *F* was then bored out to 4½ in. and Collar *G* to 2½ in., inside measurements.

After the collars were bored, the connecting plates were removed and the 2-in. nut was released. The jig was then lifted up and blocked. The disk, with a center punch mark where the hole was to be bored, was placed and the nut on the disk shaft was run up just enough to allow the disk to be turned. The jig was then lifted up with chains and blocked and held, after which the tailstock was run up until the center hit the center-punch mark on the disk. Next, the nut on the 2-in. bolt was drawn up very tight, also the tool-post screw. The angles (*K*, Fig. 11; lower right, Fig. 3) were bolted to the lathe carriage and marked and drilled to correspond to the holes in Plates *C* and *D*, which were bolted in place.

To hold the assembly rigidly in place, the brace shown in Fig. 9 was next made. It consists of the Plate *I*, the length being obtained after the disk has been placed and the 11¼-in. measurement determined. Then the two angles (*L*, Fig. 11) were bolted to the back of the lathe carriage and the piece of seamless steel tubing (*O*, Fig. 11) was fastened in place with a through bolt. Another piece of seamless steel tubing (*P*, Fig. 11) was placed between Plates *C* and *D*, and then Plate *I* was welded in place —one end to Tube *O* and the other to Tube *P*. Distance *R-R* will vary according to the lathe size. Angle *N* is bolted to Plate *I* after the disk is in place, to permit use of a clamp to keep the disk from turning while the pinhole is being bored out.

With the jig completed, the hole was bored 0.004 in. less than the diameter of the pin and the disk was faced off around the hole (Fig. 3) to allow the shoulder on the pin to fit closely the surface of the disk. The disk was then warmed around the hole to expand it and the pin put in place. Boring and facing of the disk required approximately 30 minutes.

Fig. 10 shows the mandrel developed to line up the jig for reuse after it has been removed from the lathe. The two collars were made to fit the collars in Plates *C* and *D*. Then the nut on the 2-in. bolt is released, also the bolt holding Tube *P* (Fig. 11). This permits swinging the brace, *I*, back and allows Plates *C* and *D* to drop down. Then the centers in the mandrel can be placed on the lathe centers, bringing the collars in Plates *C* and *D* into position when Plate *A* and Shaft *B* are tightened down with the tool-post screw. The jig can then be lifted up and the Brace *I* put in place and fastened with the bolts and the 2-in. bolt can be tightened, after which another disk can be bored.

WORD FROM THE FIELD

Study Tours to Feature Power Conference

Representatives of nine leading American technical and engineering societies, including L. E. Young, vice-president, Pittsburgh Coal Co., representing the National Coal Association, approved plans in New York City on May 13 for an international "convention on wheels" to start from New York in connection with the Third World Power Conference, to be held Sept. 7-12 in Washington, D. C. Foreign engineers attending the convention, about 700 in number, will be taken on a series of "study tours" to examine the latest practice in representative power plants, research laboratories, industrial plants devoted to the manufacture of electrical equipment, and points of interest in the production and utilization of coal, oil and gas in the Eastern United States.

A series of round-table conferences between American and foreign electric-power specialists will be held in each city as the tours proceed. The series of technical discussions and study tours will begin in New York late in August and will be carried on until Sept. 7, when the entire conference will gather in Washington for a week's session. Following the conference, the study tours will be resumed, ending in New York ten days later. Tour 1, devoted to mineral sources of energy, will cover coal, oil, gas and internal combustion engines. The tour will last six days, starting Aug. 31, and New York, Detroit, Mich.; Cleveland, Ohio; and Pittsburgh, Pa., will be visited. There also will be three other study tours.

New Mine for Illinois

Pschirrer & Sons Coal Co., Canton, Ill., is now engaged in sinking a 160-ft. shaft to open a new mine near that city. Capacity of the new operation, to be equipped with a shaker-screen preparation plant, Jeffrey loading machines and other modern equipment, is expected to be 1,000 tons per day.

Stoker Makers to Convene

A joint dinner meeting with a group of Eastern coal operators and railroad traffic officials will climax the annual meeting of the Stoker Manufacturers' Association, to be held June 11-13 at the Greenbrier Inn, White Sulphur Springs, W. Va., according to plans announced by J. R. Whitehead, president of the association. During the sessions consideration will be given to plans tentatively formulated concerning a stoker research program in cooperation with the bituminous coal industry through Bituminous Coal Research, Inc., and a

thorough study will be made of recommendations which will be presented by the association's engineering committee regarding its investigations during the year on standardization of stoker ratings, boiler-setting heights, furnace dimensions and related items.

Keeping Step With Coal Demand

Bituminous Production

Week Ended:	1936 (1,000 Tons)	1935* (1,000 Tons)
March 14	7,500	8,829
March 21	5,635	9,394
March 28	6,300	9,630
April 4	6,415	3,782
April 11	7,335	5,532
April 18	6,783	5,933
April 25	7,115	4,877
May 2	6,845	4,993
May 9	6,855	5,640
May 16	6,758	5,848
Total to May 16	157,441	145,273
Month of March	31,233	38,701
Month of April	30,350	21,970

Anthracite Production

March 14	740	704
March 21	456	741
March 28	531	596
April 4	394	703
April 11	479	1,283
April 18	1,055	1,320
April 25	1,463	1,089
May 2	1,433	909
May 9	1,155	935
May 16	1,007	1,123
Total to May 16	21,227	20,494
Month of March	2,730	3,082
Month of April	4,360	4,806

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

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

Bituminous Coal Stocks

(Thousands of Net Tons)

	April 1 1936	March 1 1936	April 1 1935
Electric utilities	5,509	5,637	6,031
Byproduct ovens	3,431	3,845	5,680
Steel and rolling mills	817	858	1,414
Railroads (Class I)	4,840	4,774	8,663
Other industrial*	7,536	8,228	9,655
Total industrial	22,133	23,342	31,443
Retail dealers	5,950	6,200	7,100
Grand total	28,083	29,542	38,543

*Including coal-gas retorts and cement mills.

Bituminous Coal Consumption

(Thousands of Net Tons)

	March 1936	Feb. 1936	March 1935
Electric power utilities	2,906	3,195	2,501
Byproduct ovens	4,688	4,522	4,218
Steel and rolling mills	1,091	1,181	1,053
Railroads (Class I)	7,392	8,118	6,920
Other industrial*	9,754	10,654	8,733
Total industrial	25,831	27,670	23,425

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

NRA Report Reviews Operations Under Bituminous Code

How the bituminous industry fared under its NRA code is summarized in a report released last month by the Division of Review of NRA. The report, entitled "Economic Survey of the Bituminous Coal Industry Under Free Competition and Code Regulations," is one of the series of industry studies made under the direction of the Division of Review (*Coal Age*, August, 1935, p. 347) after NRA had ceased to function as a control organization. The study, a two-volume work of over 700 mimeographed pages, was under the immediate supervision of F. E. Berquist. He was assisted in its preparation by E. B. Gordon, Charles E. Persons, George A. Lamb, Louis Levine, W. T. Crandall and Charlotte E. Warner, of the bituminous-coal unit.

Because of reduced personnel, the scope of the report was materially modified and reduced from that originally planned. Labor, costs and price fixing are the major aspects covered. Studies on code-authority organization and administration, functioning of labor boards, transportation, and compliance and enforcement—included in the preliminary drafts of the work—were abandoned. As far as data were available, however, an effort was made to carry base wage rates back to the days of the old Central Competitive Field agreements.

Employment indices and the average number of days worked by the bituminous mines indicate that the man-days of employment in 1934 were 21.2 per cent greater than in 1933. How much of this increase was attributable to code provisions which first established the 40-hour week and still later the 35-hour week as the maximum and how much was due to increased production, says the report, cannot be definitely ascertained. The increase which can be credited directly to the code was somewhere between 8 and 13 per cent, "probably nearer the lower than the upper limit." Available employment data indicate that approximately 41,000 men were added to the bituminous payroll in 1934.

Average hourly earnings for all classes of mine workers in the area east of the Mississippi River, states the report, dropped from 79.5c. in the last quarter of 1924 to 41.2c. in February, 1933. "Wage rates just prior to the code were at the lowest level since 1916." Under the original code, base rates in the Appalachian region were increased from 32.5 per cent in central Pennsylvania to 60.7 per cent in northern West Virginia, with an average increase of 50.4 per cent for the entire region exclusive of the Southern low-volatile fields. The increase in Alabama was 64.3 per cent. Increases in 1934, when hours were reduced and base rates raised, ranged from 17.8 per cent in Maryland to 28.5 per cent in northern West Virginia. Exclusive of

the Southern low-volatile districts, the wage cost per ton in the Appalachian region rose from 61.4c. (estimated) in May, 1933, to $1.153 in April, 1934.

"Applying this increase to the total production in Division I (exclusive of Southern subdivision No. 1, western Kentucky and Michigan) for the coal year ended March 31, 1935, the increase in the wage bill because of hours and wage-rate changes in the code amounted to $111,000,000. On the basis of the calculated gain in earnings, the average increase per worker for that period was $419, compared with what the earnings would have been if May, 1933, wage rates and hours had continued during this period."

Although the code passed into history without carrying out any of its provisions "respecting the study of differentials or adjusting the many claims and counterclaims as to the economic validity of the rates as established during the code," it would be wrong to assume, insists Mr. Berquist, that the schedule of minimum rates established was without merit. "On the contrary, the wage pattern was one of the outstanding achievements of the code in that it substituted a definite, solid foundation for costs instead of the shifting, uncoordinated and unpredictable basis that had previously existed. It set definite standards as among the various areas which, when tested by the experience of time, would reveal any inequities of the rates."

The data collected on costs and realization did suggest the necessity for modification. Had an adequate fact-finding program under NRA been accepted by the industry, asserts Mr. Berquist, "the basis for an equitable and economic wage structure with sound differentials would have been laid. Until an adequate basis in fact is established, the wage pattern for the industry rests upon the bargaining strength of the operators of the various areas and the representatives of the employees."

Turning to realizations and costs, the report finds that the average realizations for commercial mines in Division I (exclusive of Michigan and western Kentucky) increased from $1.10 per ton in 1932 to $1.90 for the ten months ended Jan. 31, 1935; Illinois and Indiana (Division II) averages rose from $1.53 to $1.69, and Division III realizations from $1.57 to $2.25. During the last period (April, 1934, to January, 1935) total costs, exclusive of capital charges, averaged $1.892 in Division I, $1.545 for the Illinois and Indiana subdivisions of Division II and $2.298 for Division III. Average realizations under the code were depressed to some extent by shipments on contracts entered into prior to the code at less than code prices.

Allocation also has a part in the review. "Any plan of minimum price fixing in the bituminous coal industry," concludes the report, "must recognize established movements of coal if certain sections are not to be destroyed or greatly reduced in their position in the industry. Therefore, price fixing becomes a round-about method of production control or allocation and tends to preserve the weaker economic sections of the industry and retards the adjustment of excessive capacity to the level of consumptive demands. Whether in the long run allocation of tonnage through the indirect method of price fixing could be maintained is highly problematical. The difficulties under the code appear to support the proponents of direct allocation of production."

STOKER SALES OUTDISTANCE THOSE OF YEAR AGO

SALES of mechanical stokers in March, 1936, totaled 2,678, of which 2,376 were small residential-size units, according to statistics furnished the U. S. Bureau of the Census by 108 manufacturers. This compares with sales of 2,706 units in the preceding month and 1,180 in March, 1935. Figures for the first three months of this year show that 7,881 units of all types and sizes were sold, compared with 4,141 in the corresponding period of 1935.

Sales by classes in the first quarter of this year were as follows: residential (under 100 lb. of coal per hour), 6,783; apartment-house and small commercial heating jobs (100 to 200 lb. per hour), 484; general heating and small high-pressure steam plants (200 to 300 lb. per hour), 195; large commercial and high-pressure steam plants (over 300 lb. per hour), 419. In the first three months of 1935 the figures were 3,310, 338. 146 and 347, respectively.

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Institute Lists Timely Topics

Seven papers covering topics of pressing interest will be included in the program of the summer meeting and boat trip of the Illinois Mining Institute. The meeting will be held aboard the Steamer "Golden Eagle," which will leave St. Louis, Mo., at 10:30 p.m., June 5, and return at 9 a.m., June 7.

Following an address of welcome by T. J. Thomas, president of the institute, the following papers will be presented: "Effect of Good Safety Practice on Operating Efficiency," Eugene W. Fultz, Franklin County Coal Corporation; "Improving the Car-Change Cycle Behind Loading Machines," Howard Lewis, Old Ben Coal Corporation; "Factors Affecting Sizes of Coal Produced—Methods of Control": (a) "Natural Hardness Inherent in the Coal," Prof. C. M. Smith, University of Illinois; (b) "Cutting and Shearing," L. A. Hill, Chicago, Wilmington & Franklin Coal Co.; (c) "Drilling and Shooting," Joseph Lenzini, Bell & Zoller Coal & Mining Co.; (d) "Loading," J. W. Starks, Peabody Coal Co.; (e) "Screening and Tipple Handling," Louis von Perbandt, Allen & Garcia Co.

Abandons Flooded Mine

After an unsuccessful five-month fight to stem the flow of subterranean waters from old adjacent workings (*Coal Age*, February, 1936, p. 85), the Old Ben Coal Corporation abandoned mine No. 18, at Johnson City, Ill., on May 23. The mine had employed 550 miners an average of 200 days a year. An appropriation of $100,000 for equipment to pump out the mine which had been passed by the State Legislature was declared unconstitutional by Attorney General Otto Kerner, but, according to Jesse Jackson, president of Old Ben Local, United Mine Workers, a new appropriation bill, drafted in accordance with Attorney General Kerner's opinion, will soon be presented to the Legislature in order to save the mine.

Alabama Mine Station Opens

The new Southern experiment station of the U. S. Bureau of Mines, at Tuscaloosa, Ala., was dedicated May 26 with a program arranged jointly by the Southeast Section, American Institute of Mining and Metallurgical Engineers, U. S. Bureau of Mines and the University of Alabama. Among those taking part in the dedication exercises were Dr. John W. Finch, director, U. S. Bureau of Mines; George H. Denny, president, University of Alabama; Karl Landgrebe, vice-president, Tennessee Coal, Iron & Railroad Co.; Milton Fies, vice-president, DeBardeleben Coal Corporation, and James L. Davidson, secretary, Alabama Mining Institute.

The new building is a three-story structure of spray-glazed tile walls, 50x159 ft., and was erected and equipped with an allotment of $200,000 from PWA on 2½ acres of ground donated by the University of Alabama. The station is in charge of B. W. Gandrud, supervising engineer.

New Southern Experimental Station at Tuscaloosa, Ala.

(*Bureau of Mines Photo*)

Guffey Act Thrown Out by Supreme Court; Rush New Bill Minus Labor Control

IN A DECISION split three ways the Supreme Court of the United States rejected the Guffey bituminous coal stabilization act on May 18, but two days later a similar bill stripped of the labor provisions and modified in several other particulars to meet the objections of the court was introduced in the Senate by Senator Guffey and referred to the Committee on Interstate Commerce. A majority of five members, Justice Sutherland delivering the decision, held that the interstate price-fixing provisions were so closely bound up with the regulation of wages and hours, which was declared to infringe on States' rights, that the entire statute was thrown out. Congress had taken pains to point out that the titles of the measure were separable, and this point was emphasized by government counsel defending the act in the suits brought by J. Walter Carter, the Tway Coal Co. and others (*Coal Age*, April, 1936, p. 163). Chief Justice Hughes concurred with the majority opinion in rejecting the wages-and-hours regulations, but maintained that the price-fixing section was valid and separable. A dissenting opinion by Justice Cardozo, in which he was joined by Justices Brandeis and Stone, held that the regulations on prices and trade practices should have been upheld, but that ruling on the other points at issue should have been withheld until an expression of opinion became necessary, since they might never take effect at all.

Tax Held a Penalty

The majority opinion, delivered by Justice Sutherland, was that the suits were properly brought, were maintainable in a court of equity and were not premature. The 15 per cent excise tax on the sale price or value of coal, depending on whether it is commercial or captive tonnage, with drawback of 13½ per cent, is construed as a penalty, however, being intended not as a true tax but to compel compliance. While conceding that the purposes of the act are worthy, the majority held that the Constitution did not confer on Congress the right to attain them by the means sought. The purposes set forth in Sec. 1, which is designated as a preamble, are held to be of the most general character, whereas "the powers which the general government may air are only those specifically enumerated in the Constitution, and such implied powers as are necessary and proper to carry into effect the enumerated powers." The notion that Congress, entirely apart from powers delegated by the Constitution, "may enact laws to promote the general welfare has never been accepted but always definitely rejected by this court."

In the matter of whether the labor provisions of the act are a true exercise of the power to regulate interstate commerce it was held that mining is not interstate commerce, but, like manufacturing, is a local business, subject only to regulation by the State; "production is not commerce, but a step in preparation for commerce." Disputes over wages, working conditions, the right of collective bargaining, etc., and the resulting strikes, curtailment and irregularity of production and effect on prices are likewise designated in the majority opinion as local evils over which the federal government has no legislative control. "Such effect as they may have upon commerce, however extensive it may be, is secondary and indirect."

The wage and hour provisions contained in subdivision (g) of Part 3 of the code, it was declared, conferred upon the majority, in effect, "the power to regulate the affairs of an unwilling minority. This is legislative delegation in its most obnoxious form; for it is not even delegation to an official or an official body, presumptively disinterested, but to private persons whose interests may be and often are adverse to the interests of others in the same business. . . . The delegation is so clearly arbitrary, and so clearly a denial of rights safeguarded by the due process clause of the Fifth Amendment, that it is unnecesasry to do more than refer to decisions of this court which foreclose the question,"

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OPINIONS OF THE JUSTICES ON POINTS AT ISSUE

The majority decision considered the questions involved in ruling on the Guffey act under seven heads. How the justices of the court ruled upon them follows:

1. Had the stockholders the right to bring suits of this character? The majority and Chief Justice Hughes said "yes." The three dissenters gave no answer.

2. Were the legal actions brought prematurely? The majority and the Chief Justice, "no." The dissenters, "yes."

3. Is the 15 per cent tax on coal sales a tax or a penalty? The majority and the Chief Justice, "a penalty." The dissenters, "not necessary to answer that question until it arises."

4. Has Congress the power to assume the control attempted in the act? The majority, "no, as to wages and hours." The Chief Justice, "no, as to wages and hours; yes, as to interstate price fixing." The dissenters, "court's opinion begins at wrong end; complainants cried before they were hurt."

5. Can the labor provisions be upheld as proper exercise of power to regulate interstate commerce? The majority and the Chief Justice, "no." The minority, "not necessary to decide now."

6. Is power to establish wages and hours an unlawful delegation of power? The majority and the Chief Justice, "yes." The minority, "not necessary to decide now; may never take effect."

7. Is price fixing constitutional and are price-fixing and labor provisions separable? Majority, "no." The Chief Justice and three dissenters, "yes."

The price-fixing provisions of the code, the decision points out, are set forth in the same section as those regulating labor, from which it is deduced that they were "plainly meant to operate together and not separately," constituting the means "designed to bring about the stabilization of bituminous-coal production, and thereby to regulate or affect interstate commerce in such coal. . . . Wages, hours of labor, and working conditions are to be so adjusted as to effectuate the purposes of the act; and prices are to be so regulated as to *stabilize* wages, working conditions, and hours of labor which have been or are to be fixed under the labor provisions. The two are so woven together as to render the probability plain enough that uniform prices, in the opinion of Congress, could not be fairly fixed or effectively regulated without also regulating these elements of labor which enter so largely into the cost of production."

Having thus disposed of the price-fixing provisions without ruling on their constitutionality, the opinion warned that "neither this disposition of the matter, nor anything we have said, is to be taken as indicating that the court is of opinion that these provisions, if separately enacted, could be sustained."

Chief Justice Hughes' partially concurring opinion was in agreement with the majority in construing the 15 per cent tax as a penalty and in holding that Congress was without power to regulate wages and hours. This provision, said the Chief Justice, "goes beyond any proper measure of protection of interstate commerce and attempts a broad regulation of industry within the State. . . . If the people desire to give Congress the power to regulate industries within the States, and the regulation of employers and employees in those industries, they are at liberty to declare their will in the appropriate manner, but it is not for the court to amend the Constitution by decision."

Upholds Federal Regulation

In the matter of regulation of prices and prohibition of unfair methods of competition, however, he said that "undoubtedly, transactions in carrying on interstate commerce are subject to the federal power to regulate that commerce, and the control of charges and the protection of fair competition in that commerce are familiar illustrations of the exercise of the power.

"Congress evidently desired stabilization through both the provisions relating to marketing and those relating to labor, but the setting up of the two sorts of requirements do not make the one dependent upon the validity of the other. It is apparent that they are not so interwoven that they cannot have separate operation and effect. . . . In this view, the act, and the code for which it provides, may be sustained in relation to the provisions for marketing in interstate commerce, and the decisions of the courts below, so far as they accomplish that result, should be affirmed."

Justice Cardozo, for the three dissenters, said: "I am satisfied that the act is within the power of the central government in so far as it provides for minimum and maximum prices upon sales of coal in the transactions of interstate commerce and in those of intrastate commerce where interstate commerce is directly or intimately affected. . . . Within rulings the most ortho-

dox, the prices for intrastate sales of coal have so inescapable a relation to those for interstate sales that a system of regulation for transactions of the one class is necessary to give adequate protection to the system of regulation adopted for the other.

"The standards established by this act are quite as definite as others that have had the approval of this court. Certainly a bench of judges, not experts in the coal business, cannot say with assurance that members of a commission will be unable, when advised and informed by others experienced in the industry, to make the standards workable, or to overcome through the development of an administrative technique many obstacles and difficulties that might be baffling to inexperience or ignorance. For the most part the prohibitions are ancillary to the fixing of a minimum price. The power to fix a price carries with it the subsidiary power to forbid and prevent evasion."

The statute itself plainly creates a "presumption of divisibility," according to the dissenting opinion. The probabilities of intention, too, are far from overcoming the force of the presumption; in fact, they fortify and confirm it. "Plainly, then, there was no intention on the part of the framers of the statute that prices should not be fixed if the provisions for wages or hours of labor were found to be invalid. . . . The failure to agree upon a wage scale or upon maximum hours of daily or weekly labor may make the statutory scheme abortive in the very phases and aspects that the court has chosen to condemn. What the code will provide as to wages and hours of labor, or whether it will provide anything, is still in the domain of prophecy. The opinion of the court begins at the wrong end. To adopt a homely form of words, the complainants have been crying before they are really hurt."

New Bill Rushed to Congress

With the labor provisions cut out bodily, the Guffey act was reintroduced in the upper house on May 20 as the Bituminous Coal Act of 1936 by the Pennsylvania Senator, Representative Vinson, of Kentucky, being its sponsor in the lower chamber. The new bill contains no assertion that the mining and distribution of bituminous coal are affected with a national public interest. Instead the preamble now reads:

"That there exist practices and methods of distribution and marketing of such coal that waste the coal resources of the nation and disorganize, burden and obstruct interstate commerce in bituminous coal, with the result that regulation of the prices thereof, and of unfair methods of competition therein, is necessary to promote interstate commerce in bituminous coal and to remove burdens and obstructions therefrom."

The 15 per cent tax on production with drawback allowance for compliance is retained, however, as also are the price-fixing, marketing and fair-practice provisions. The wording in some instances also is toned down; for example, district boards are now empowered to "propose" minimum prices instead of "establish" them, as provided in the original statute (*Coal Age*, September, 1935, pp. 389-395). A new section is added to the portion governing unfair methods of competition, as follows:

"Sec. 4-A. Without in any way limiting the scope or application of Sec. 4, whenever prices in intrastate commerce in any locality cause any undue or unreasonable advantage, preference, or prejudice as between persons and localities in such commerce on the one hand and interstate commerce on the other hand, or any undue, unreasonable, or unjust discrimination against interstate commerce, such prices in such locality shall be subject to the provisions of Sec. 4 hereof."

Regulation of labor is limited in the new measure to the following:

"Sec. 9. It is hereby declared to be the public policy of the United States that employees shall have the right to organize and bargain collectively through representatives of their own choosing, and shall be free from interference, restraint, or coercion of employers, or their agents, in the designation of such representatives or in self-organization or in other concerted activities for the purpose of collective bargaining or other mutual aid or protection; and that no employee and no one seeking employment shall be required as a condition of employment to join any company union. Nothing contained in this act shall be construed to repeal or modify the Act of March 23, 1932, c. 90, 47 Stat. 70, or any other act regarding labor relations."

The Bituminous Coal Commission is enlarged in the new measure from five to seven members, two representing employees, two for the producers and three having no connection with coal or power production or a related industry. The rejected law made no reference as to how the committee members should be chosen.

John L. Lewis, president, United Mine Workers, declared that the union would join in urging Congress to enact the new bill as soon as possible as the best step to take at the present time. He said it would tend to maintain equilibrium in the coal industry pending further study of stabilization.

A plea to coal producers to support the measure was made by Charles O'Neill, chairman of the legislative committee of the National Conference of Bituminous Coal Producers. In a telegram sent on May 22 to Senators Wheeler and Guffey and Representatives Doughton and Vinson, Mr. O'Neill said:

"The Guffey coal act should be passed at this session of Congress. The new act is the old act with the provisions of the old act condemned by the Supreme Court stricken therefrom. All of the provisions have been subject to lengthy public hearings by your committee during the consideration of the original act. Request for public hearing on the measure now pending could only be for the purpose of delay and to estop its passage at this session. Congress has already acted on the provisions of the new bill, and in the light of the opinions expressed by the Supreme Court should enact the new bill. I am telegraphing you on behalf of 800 owners of coal mines in twenty-two States producing more than 125 millions of tons annually."

Opponents Wire Protest

Strong opposition to enactment of the new bill was voiced by a group of operators in a telegram on May 21 to Senator Wheeler and Representative Doughton. These producers assert that the bill would merely increase the price of coal without helping the industry. The telegram read:

"Undersigned oppose the reenactment of the price-fixing provision of the Guffey Coal Act recently declared invalid by the Supreme Court. The majority of the industry opposed the original act. We are confident that the same formidable opposition exists to the proposed reenactment of its price-fixing provision.

"We believe that a scheme of governmental price fixing to increase the price of coal to American homes, railroads and industries will hurt and not help the industry. The theoretical price-fixing plan proposed cannot be honestly applied in practical operation.

"Enactment of this bill will force coal operators in self-preservation to immediately institute suits to test its validity, and they will be kept in uncertainty for another year as to their legal position in the conduct of their own businesses.

"The repeated enactment of unconstitutional acts has prevented coal operators from carrying out their plans of cooperative marketing permitted under the Appalachian Coals Supreme Court decision. If this legislation is to be seriously considered we urgently request that public hearings be had, and we request an opportunity to appear at such hearing."

The protest bore the names of O. L. Alexander, president, Pocahontas Fuel Co.; J. G. Bradley, president, Elk River Coal & Lumber Co.; James Walter Carter, president, Carter Coal Co.; W. J. Cunningham, president, Crummies Creek Coal Co.; Ira Clemens, president, Commercial

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HARD SLEDDING PREDICTED

Washington, D. C., May 26—Chances for enactment of the new Guffey-Vinson bituminous-coal price-control bill at the present session of Congress are not bright, in the opinion of Washington observers, unless the President throws the full weight of his influence behind the movement to drive the bill through. Even the friends of the measure admit that. Senator Wheeler, chairman of the Senate committee on commerce, to which the Guffey bill has been referred, has expressed no great interest in pushing the measure. The House ways and means committee, to which the duplicate measure sponsored by Representative Vinson was referred, ordered a favorable report on the measure today by a vote of 18 to 6.

Opponents of the legislation, led largely by the same group of operators that fought the original act, are demanding that Congress give no consideration to the new measure unless they are given an opportunity to present their protests before the committees in charge of the bills. Proponents, arguing that the Guffey-Vinson measure proposes merely to reenact the price-fixing provisions and to clarify certain faulty language in the original bill, take the position that the subject matter was amply debated in the hearings last year and that no further public hearings are necessary.

Fuel Co.; J. D. Francis, president, Island Creek Coal Co.; Eugene McAuliffe, president, Union Pacific Coal Co.; R. D. Patterson, president, Weyanoke Coal & Coke Co.; J. Noble Snider, vice-president, Consolidation Coal Co., and Grant Stauffer, president, Sinclair Coal Co.

This protest was indorsed in a supplementary telegram to Chairmen Wheeler and Doughton May 22 by W. D. Boyer, Fentress Coal & Coke Co.; William Collins, Hanna Coal Co.; D. B. Cornett, Cornett-Lewis Coal C.; R. W. Creech, Creech Coal Co.; S. J. Dickenson, Virginia Jellico Coal Co.; W. M. Gravatt, Mary Helen Coal Corporation; E. Guthrie, Harlan Fuel Co.; Elmer D. Hall, Three Point Coal Co.; G. H. Jackson, Jackson-Laxton Coal Co.; J. D. A. Morrow, Pittsburgh Coal Co.; H. H. Patterson, Davidson Mining Co.; J. E. Patton, Sewanee Fuel Co.; Caroline Penn, Reinecke Coal Mining Co.; George St. Clair, Jewell Ridge Coal Corporation; J. C. Stras, Kentucky Cardinal Coal Corporation; R. C. Tway, R. C. Tway Coal Co.; A. F. Whitfield, Harlan Collieries Co.; George F. Williams, Williams Coal Co.

Industry Divided on Effects of Decision, But Sees Boost for Modernization

INDUSTRY REACTIONS to the decision of the Supreme Court in the Guffey-act cases are still badly mixed. Lower prices are predicted by many coal men, but a substantial minority insists no general decline in price levels is in sight. One large Southern group followed the decision with the announcement of an increase in spot quotations. Because the industry as a whole is now working under union agreements which do not expire until next April, majority opinion among the producers is that the decision will result in no immediate change in the labor situation; some operators, however, are frankly apprehensive of disturbances next spring. Generally speaking, operators believe that the sales-agency movement will be sharply stimulated.

With only few exceptions, coal-mine executives forecast increased capital investments for equipment to reduce production costs. As the majority see it, such increases are inevitable where management desires to maintain or improve its competitive position in the industry. Expenditures for underground mechanization and new preparation plants are included in the contemplated capital outlays. Mines that cannot or will not modernize will be forced out of the picture. These views on the effects of the decision on the future course of the bituminous industry are revealed in a telegraphic survey of the situation made by *Coal Age* May 25-26.

In this survey, covering key operations in all of the important bituminous-coal producing States, executives were asked to tell what effect, in their opinion, the Supreme Court decision will have on: (1) prices, (2) capital expenditures for new mining machinery to reduce production costs, (3) labor relations, and (4) organization and activities of district selling agencies. The final question was: "Do you favor the new Guffey-Vinson price-control bill?"

As was the case with the original Guffey bill last summer, opinion on the proposal to reenact the price-fixing provisions of the outlawed act was widely divided. Generally speaking, central Pennsylvania mines covered by the survey favored the new bill; western Pennsylvania operators were split on the question. Ohio also was divided. For the most part, sentiment in Illinois and Indiana was still favorable. Although much of the opposition to further attempts at control legislation centers in the southern Appalachian area, the new bill is not without its supporters in that region. Most operators in the Southwest and Rocky Mountain States appear either in the opposition ranks or are indifferent.

The most outspoken condemnation of the new bill comes from Alabama. "I am opposed to anything with Guffey's name attached to it," bluntly declared one prominent producer there; "we want a return to personal liberty." The new bill, asserted a statement voicing the views of over 90 per cent of the commercial production of the State, "robs district boards of all authority granted them by the former Guffey act over prices and would centralize all coal prices exclusively in the hands of a politically appointed commission in Washington. It contemplates rigid regulation of the entire coal industry, but leaves competing laborless fuels, such as natural gas, hydroelectric power and fuel oil, unhampered."

Charging that the bill is being sponsored by "an organized minority of coal producers and allied labor leaders for their own selfish purposes and would be controlled in its administration by them at the expense of smaller competitive fields," the Alabama group demands that no Congressional action be taken without public hearings. Such hearings, it contends, "are imperative because of radical changes from the former bill, because the already outlawed labor provisions are retained in the new bill, because Congress and the public should be informed of the costly experience of nine months' administration of the National Bituminous Coal Commission without one single stabilizing effect for employers or employees. Alabama coal-mine owners are unanimously and unconditionally opposed to the new Guffey bill."

Must Modernize to Survive

Mining companies which wish to survive, says one prominent Illinois operator, will be compelled either to dip into their surpluses or borrow for new investments in cost-reducing machinery. His own organization, he adds, plans to expend approximately $300,000 for capital improvements this year. Moreover, in his opinion, companies installing modern equipment to reduce costs will favor the maintenance of higher wage rates even though prior to such investments they may have advocated lower wage structures. Purchases of such equipment, remarks the president of one of the large West Virginia producers, will increase production for the modernized mine and in turn stimulate other equipment purchases.

While the opinion that the decision opens the door to increased activity by district selling agencies is widespread, there are some who doubt whether this type of organization will be able to control the price situation. Some who hold this adverse viewpoint were in the vanguard of the 1932-33 movement to establish such agencies. Fear that large producers will make contracts for the disposition of the major part of their output and offer only a small tonnage for sale at the prices fixed by the regional selling agency is voiced. On the other hand, some operators who were lukewarm to the movement in its earlier days now take the position that there is a real place for such agencies.

If the decision should lead to an undermining of the existing wage structure, undermining, it is declared, will be initiated by the marginal operations and by companies so situated financially that they cannot make the necessary capital investments for equipment to lower their production costs. Displacement of men by machines also may complicate the picture, according to some operators.

District Sales Organizations Take on New Life

Renewed activity of district sales agencies already organized and revived interest in the proposals for the creation of additional district and regional groups, have followed the decision of the Supreme Court of the United States in the Guffey-act cases. Appalachian Coals, Inc., which made tentative plans to expand its work some weeks ago, swung into action promptly as soon as the decision was announced. At a meeting in Cincinnati, Ohio, May 22, stockholders present voted unanimously to carry on sales work through the Appalachian agency. Sufficient tonnage from the high-volatile fields of Kentucky, Tennessee and the Virginias was either signed up or pledged to permit immediate resumption of marketing activities. The meeting, which was attended by more than 100 operators, appointed a management committee of three to cooperate with the paid personnel of the agency in conducting the business of the corporation. Members of this managment committee are: W. J. Cunningham, president, Crummies Creek Coal Co. (Kentucky); John A. Howe, vice-president, Truax-Traer Coal Co. (West Virginia); and L. E. Woods, president, Crystal Block Coal & Coke Co. (West Virginia). Many of the producers not present at the May 22 meeting are expected again to put their tonnage under the control of the agency at a meeting called for May 27.

Directors of Alabama Coals, Inc., met in Birmingham, Ala., the day following the Supreme Court decision for the purpose of taking immediate action to steady the economic situation and forestall any threat to the wage structure of the coal industry in that State. The schedules, classifications and rules which had been proposed under the Guffey act were adopted as interim standards for the sale and distribution of coal pending a careful study of conditions in the various consuming markets. This

study, it is announced, will be pursued for some time before a definite program of action is established. Action of the board of directors was ratified at a special meeting of the stockholders of the Alabama agency on May 20.

No definite action had been taken by Hocking Coals, Inc., up to May 25 as a result of the Guffey decision, but an early meeting of the board of directors of this southern Ohio agency to determine future actions and policies was forecast. Western Pennsylvania operators are taking fresh interest in the organization of a district agency to supervise sales in that area. Northern West Virginia producers announced that a meeting would be held at Morgantown, W. Va., during the week of May 28 to canvass the district-agency question.

New Preparation Facilities

DEBARDELEBEN COAL CORPORATION, Empire, Ala.: contract closed with the Deister Concentrator Co. for Deister-Overstrom "Diagonal-Deck" coal-washing equipment for 3x0-in. coal; feed capacity, 7 tons per hour.

ELKHORN COLLIERIES CORPORATION, Winters No. 2 mine, Farraday, Ky.: contract closed with the Morrow Mfg. Co. for rescreening plant, including conveyors, vibrating screen and car-loading equipment, for handling minus 11-in. coal, making a ¾-in. separation.

ISLAND CREEK COAL CO., Mine No. 22, Pine Creek, W. Va.: contract closed with the Roberts & Schaefer Co. for complete pneumatic cleaning plant for minus 3-in. coal; capacity, 160 tons per hour; to be completed Aug. 1.

LEHIGH NAVIGATION COAL CO., Lansford colliery, Lansford, Pa.: contract closed with the Deister Concentrator Co. for Deister-Overstrom "Diagonal-Deck" coal-washing equipment for No. 4 buckwheat; feed capacity, approximately 8 tons per hour.

MONROE COAL MINING CO., Revloc, Pa.: contract closed with the Roberts & Schaefer Co. for complete Stump "Air-Flow" coal-cleaning plant, capacity 90 tons per hour, and tipple screening plant for handling minus 12-in. coal, capacity 275 tons per hour; to be completed Sept. 1.

OAKWOOD SMOKELESS COAL CORPORATION, Hanger, Buchanan County, Va.: contract closed with the Kanawha Mfg. Co. for preparation and coal-handling facilities consisting of headhouse with trip feeder, scales and rotary dump; pipe-and-button conveyor for lowering coal; and a six-track tipple equipped with shaker screens, five loading booms, mixing conveyor, etc.; capacity, 300 tons per hour.

SUSQUEHANNA COLLIERIES CO., Glen Lyon, Pa.: contract closed with Koppers-Rheolaweur Co. for three 12-ft. Menzies cone separators for use in reconstruction of No. 9 breaker. Mine-run feed will be crushed to stove and smaller, and two cone separators in parallel will clean stove, nut and pea; the third cone separator will clean buckwheat, rice and No. 4. Screens and other auxiliaries will be installed by the coal company. Shipping capacity of the breaker, after completion of reconstruction, about Aug. 1, will be 2,500 tons per day.

Operating, Safety and Economic Problems To Fore at Rocky Mountain Meeting

OPERATING, safety, preparation and economic problems featured the technical sessions at the 34th regular meeting of the Rocky Mountain Coal Mining Institute, held April 23-25 at the Hotel Utah, Salt Lake City, Utah. Reflecting the trend of progress in the Far West, papers and discussion dealt with mechanical loading, high-speed transportation, principles and practice of safety, regulation of the bituminous-coal-mining industry and the problems of merchandising soft coal. Consumers, said Charles E. West, sales manager, Utah Fuel Co., in discussing the hot-vapor process used by his company (see p. 229), readily pay a premium of 25c. per ton for dustless-treated coal.

Origin of the "rock wants" in the Hiawatha seam in the Wasatch Plateau field of Utah was discussed by H. B. Lindeman, engineer, United States Fuel Co., Hiawatha, Utah. These wants, Mr. Lindeman explained, are the result of replacement of the coal over small areas by sandstone identical in character with that of the roof. Thickness of the cover, inaccessibility and other conditions make prospecting from the surface impracticable and consequently, where the wants extend for some distance, tunneling is necessary to reach the coal on the other side. With an adequate theory of the formation of the wants and a careful study of conditions in each case, it should be possible to determine the places where the least amount of such tunneling would be necessary.

Where a want is encountered it generally is found that the layers of coal and whatever streaks or partings are present begin to dip toward the want at a point about 10 to 50 ft. away. Floor and roof also start to dip, the latter at a greater rate than the former, until they both meet. Unless dipping of the coal, roof or floor, or any combination, is observed, it is impossible to forecast with certainty the proximity of a want. "Even then there is no positive assurance that coal will be entirely lacking." Under the second general set of conditions governing occurrence, wants are encountered without any previous indications, in which case they are vertical or nearly so. In other cases, only a slight dipping of the floor and roof is noticeable, and that only a few feet from the point of contact.

Wants Reflect Vegetal Growth

Developing his theory of the origin of the wants, Mr. Lindeman expressed the opinion that the coal was derived from small vegetation, as there seems to be little evidence of larger plants in quantities. This vegetation grew and was deposited on a relatively level plain with, however, local depressions containing water, on the sides of which vegetation did not grow so well, as indicated by the pitching of the floor and the still greater pitching of the coal layers and roof toward the area of the wants. When the plain was flooded, with consequent formation of the sandstone roof, these depressions likewise were filled with sandstone-forming material. In some cases also, the flooding was accompanied by erosion of the vegetal matter, resulting in washed-out areas with vertical or nearly vertical sides characteristic of the second class of wants. "No evidence whatever exists to indicate that any rock wants were formed after the deposition of the main roof," and, as no faulting has been observed in the field, the wants cannot be ascribed to this cause.

Coal-mine design as related to safety and conservation was the subject of a joint paper by B. W. Dyer, district mining supervisor; James McKim and George C. Bywater, U. S. Geological Survey, read by Mr. McKim. Before opening a mine, said the authors, the outcrop of the seam should be located and faced up at frequent intervals to determine the persistence, nature and

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ROCKY MOUNTAIN LEADERS

GLEN A. KNOX, superintendent, Gunn-Quealy Coal Co., Quealy, Wyo., was elected president of the Rocky Mountain Coal Mining Institute at its 34th regular meeting in Salt Lake City, succeeding Gilbert C. Davis, manager, Stag Canon Branch, Phelps Dodge Corporation, Dawson, N. M. H. C. Marchant, Denver, Colo., was reelected secretary-treasurer and the following were chosen vice-presidents:

Colorado—Robert Williams, Jr., superintendent, Utah Fuel Co., Somerset, Colo.

New Mexico—Thomas Husband, superintendent, Gallup American Coal Co., Gamerco, N. M.

Utah—David G. Brown, general superintendent, Spring Canyon Coal Co., Spring Canyon, Utah.

Wyoming—V. O. Murray, safety director, Union Pacific Coal Co., Rock Springs, Wyo.

Members of the executive board are as follows:

Colorado—Roy Williams, general superintendent, National Fuel Co., Lafayette, and S. M. Thompson, president, Caliente Coal Co., Ravenwood.

New Mexico—Frank A. Young, mining engineer, St. Louis, Rocky Mountain & Pacific Co., Raton; and Oscar Huber, general superintendent, Albuquerque & Cerrillos Coal Co., Madrid.

Utah—H. R. Ellis, Utah Fuel Co., Castlegate, and Burt B. Brewster, publisher, *Mining & Contracting Review*, Salt Lake City.

Wyoming—Ray M. Bottomley, superintendent, Hotchkiss Coal Co., Monarch, and P. H. Burnell, general superintendent, Owl Creek Coal Co., Gebo.

thickness of the coal and the nature of the roof and floor, including the nature and direction of the cleats in the coal and the joint and bedding planes in the overlying rocks. This investigation should be supplemented by diamond drilling, followed by a study of the surface topography of the property. The latter is important because of the bearing location of ridges and gulches will have on the nature and thickness of the strata overlying the coal, as well as on the coal itself, and consequently on the position of haulageways, future air shafts and escapeways.

Prospecting also should include an investigation of all structural features of the country rock to determine the location, strike, dip and displacement of faults, thickness and character of rock strata above and below the seam, presence or absence of major folds and the general strike and dip of the seam. Study of the roof is an important element in determining the direction of the entries. In general, the roof stays up better when the openings are driven across the joint planes or slips in the rock, although in driving rooms it probably is best to adjust their direction so that when pillars are drawn the pillar line will have some definite relationship to the roof slips or joint planes, so that the break line can be maintained. Depth of cover, within certain limits, determines size of openings and pillars, possible percentage of extraction and the system of mining. Topography and the strength of the overlying strata are determining factors in the percentage of coal that can be safely and economically extracted on first mining, as an uneven surface or a resistant rock stratum over the seam may result, respectively, in uneven distribution of pressure or in the transmission of weight over onto the unmined coal, resulting in bumps and heaves. Mine design should be adjusted to prevent such occurrences as far as possible. Cantilever action, in particular, probably can be best minimized by large pillars and the early establishment and subsequent maintenance of break lines.

Sectionalizing Promotes Safety

Control of ventilation, explosion and fire hazards can be made more certain by sectionalizing the mine with barrier pillars and concentrating operations in comparatively small areas worked continuously to completion and then sealed off. Columnization is essential in working two or more seams simultaneously: where the dip is less than 30 deg., work in the upper seams should be kept at least two years in advance; where the dip is greater than 30 deg., depending upon the intervals between the seams, it may be necessary to keep all workings abreast, operating all the seams as one.

In general, with a cover of 1,000 ft. or more, extraction on the advance will vary from 20 to 35 per cent, the authors stated. The tendency in the past has been to extract an unduly high percentage on the advance and leave the pillars standing until the distant future. Pillar size, in many instances, was insufficient to prevent crushing and the development plan generally prevented robbing of the pillar as soon as the room was driven. Now, it is felt that mines should be laid out to allow almost

Glen A. Knox

President, Rocky Mountain Coal Mining Institute

immediate pillar extraction through some form of retreat mining. Under certain conditions, this may involve extra development, but with mechanical loading the hardship is reduced to a minimum. The full-retreat system minimizes the likelihood of bumps or bounces in pillar mining where the roof and floor are strong, extraction being carried on until a break is imminent, whereupon work is stopped until the ground can settle. Extra development would be necessary so that the tonnage would be constant even with intermittent operation on each entry. "Using a retreat system of mining, the depth under which mining can be done is increased 40 per cent without increasing the cost."

Reviewing the characteristics of the three major types of mechanical loading equipment and the conditions which must be present underground for most successful operation, the authors gave the following estimates of productivity and cost: scrapers, 400 tons per machine-shift; 18 to 21 tons per man-shift, including moving; and 65c. per ton slope partings; shaker conveyors, 10 to 25 tons per man-shift, with an average of 15 tons; cost, 3-ft. coal as high as 95c. per ton; 5- to 6-ft. coal as low as 55c.; average, 65 to 70c.; mobile loaders, 20 to 30 tons per man-shift, 50 to 60c. per ton on the parting.

Tonnage per man-shift, rather than per machine-shift, is the most important gage of mechanical-loading results, declared Walter M. Dake, Joy Mfg. Co., in a discussion abstracted by Charles M. Schloss, Shubart & Schloss, Denver, Colo. Driving entries in thin coal with the smallest Joy loader in a Southern mine, with an output of 100 tons (30 cars at 3.3 tons per car) and an eight-man crew, the total labor cost is $45.64 per shift, making the cost per ton on the parting (including explosives, 2.5c. per ton; power, 1.0c.; maintenance, 2.5c.; and depreciation and interest, 3.0c.), 54.6c. per ton. The contract rate for cutting and loading on the other hand, is 58.2c. per ton. Adding the additional cost of 16.4c. per ton under hand loading for gathering, timbering, trackwork and supervision to the parting brings the total up to 74.6c. per ton. At another operation using the 8BU loader for entry development, average output by an eight-man crew is 100 1.7-ton pit cars per shift. Total cost is 41.5c. per ton to the parting, compared with a cost of 71.5c. under hand loading.

A suitable permissible explosive, properly loaded, "will produce lump coal equal in quality and quantity to that obtained from any other form of explosive or blasting device, and will produce it more economically," declared William F. Koch, Hercules Powder Co., Salt Lake City. Difficulties in blasting coal satisfactorily, he said, are inherent in the nature of the material to be broken down. Consequently, the details which must be considered in choosing the proper explosive for any particular operation include: type of coal, thickness of seam, presence and position of rock and sulphur bands, gas, type of mining, whether holes are wet or dry, whether the coal is shot off the solid or after various types of cutting and shearing machines, size of coal desired and the method of loading, whether hand or machine.

A seam of hard-shooting coal with a hard band may require a dense explosive that can be confined in the back of the hole. An explosive of intermediate velocity may be preferable to one of low velocity. Cushioned blasting may offer no advantage. In some instances, though not common, a strong, dense, fairly high velocity explosive, confined to the back of the hole, produces best results. To balance the explosive charge properly in a thin seam which has been undercut, it is necessary to spread the effective action over a large portion of the hole. The total energy required is relatively small. "Here, cushioned blasting is definitely indicated, and is necessary to produce a high percentage of lump coal. In such an instance, probably the bulkiest permissible explosive available—in relatively small sized cartridges, compared to the size of the hole—should be used and, if necessary, spacers also should be used to provide the necessary cushioning and spreading effect."

Speed Not Permissible Determinant

In an Illinois mine in a 7½-ft. seam, with places undercut 6½ ft. deep and snubbed, tests of permissible and black powders gave the following costs per ton, including fuse and caps: Permissible A, 5,870 f.p.s., 2.15c.; B, 7,450 f.p.s., 1.67c.; C, 8,290 f.p.s., 1.80c.; Pellet B, 106 2x8-in. sticks per 50-lb. box, 1.57c.; D, 125 sticks per box, 1.57c.; FF powder, 1.87c. Results of this test, Mr. Koch declared, support the contention that speed alone is not the determining factor in the selection of a permissible powder, and also showed that when properly loaded in well-prepared places, permissible produced results "equal to the best results obtained with black powder, either in pellet or grain form."

Scraper mining is employed at the Elkol (Wyo.) mine of the Kemmerer Coal Co. in the extraction of 7 ft. of coal, said Gomer Reese, general superintendent. The seam operated is the Mammoth, which varies from 40 to 84

ft. in thickness and pitches 15 deg. to the west. Small clay partings 14 ft. down from the roof and the same distance up from the floor serve as guides in entry work in the seam.

Development is based on the use of two headings 9 ft. high and 15 ft. wide. Crosscuts between the headings are driven on 200-ft. centers and are turned on an angle of 40 deg. (Fig. 1) to make a slant to the back heading. Heading coal is shot off the solid and is loaded by a semicircular scraper powered by a 25-hp. 220-volt a.c. hoist over a slide into the pit cars. Rooms are necked as the main heading is advanced. Main and back headings are driven in 200-ft. cycles, the hoist being moved from one to the other as required. Two men drill, shoot and load out a round, averaging 40 tons, in each 7-hour shift. While the back entry is being extended, track and switches are laid in the main heading and later connected up with the back-heading track, which serves as a parting.

Benches First Started by Hand

Rooms are turned at right angles to the main heading on 100-ft. centers and are driven 25 ft. wide to a depth of 360 ft. A pair of rooms is operated as a unit and a solid pillar is left between each pair to eliminate air loss. In starting a room, a chute is first built on the heading so that the coal will run into the cars when the gate is opened. From this chute a raise is driven up in the coal to the height to which it is to be removed, as determined by the clay parting. The first bench is started from this raise and is driven approximately 20 ft. just under the parting. The second 9-ft. bench is then started, and when it is advanced 20 ft. the third 9-ft. bench is started.

The coal is drilled with electric drills. Five or six holes are placed in the face of the upper bench and two to three holes in the lower benches. Toothed scrapers with curved and partly solid backs are employed in rooms and are operated by double-drum hoists similar to those used in the headings. The sheave at the face is hung in a hole driven in the top coal above the top bench. The scrapers are constructed so that they will operate when turned either top or bottom, as they frequently are upset by chunks in traveling up the room. The path traveled by the scrapers lies in the center of the rooms, and consequently a deep trough is worn in the coal. Thus, when the shots are fired, the coal, due to the dip of the seam, readily finds its way into the trough. One round usually yields 150 to 200 tons. Recovery from each pair of rooms, including crosscuts, totals 20,000 tons. Two men drill and shoot and move the sheave up once in each seven-hour shift. Another man operates the hoist and loads and trims the cars on the heading. Cars for both the rooms and the entry are handled by a 5-ton locomotive.

A record of 807½ tons in seven hours has been made by one of two 260-A track-mounted loaders at the Bulah (N. D.) mine of the Knife River Coal Mining Co., stated A. C. Green, Goodman Mfg. Co., in a paper read by P. H. Fitzgerald, of the same company. Operations at this mine are carried on in a lignite seam 18 to 22 ft. thick, of which about 14 ft. is marketable. A weak roof is protected by leaving up top coal. Development (Fig. 2) is based on the use of main and cross, or room, entries, each consisting of two headings 12 to 14 ft. wide. Rooms are driven 24 to 25 ft. wide on 40-ft. centers to a depth of 250 ft. and rooms and room headings constitute a panel surrounded by an unbroken pillar of coal except for the openings made by the two headings. Because the coal fires easily, the mining system is designed to eliminate fire hazard as far as possible and at the same time, if a fire should start, permit it to be sealed off with a minimum of labor and loss of territory.

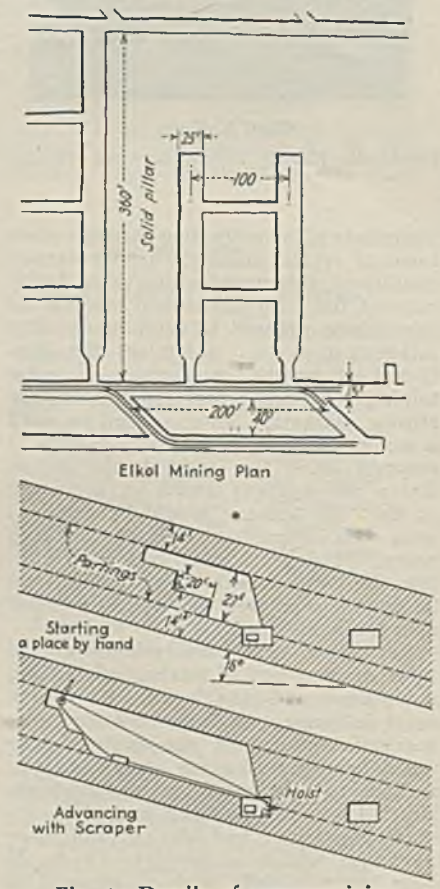

Fig. 1—Details of scraper-mining system at Elkol mine

Coal is center-cut by a track-mounted machine which first makes one 7½-ft. cut, after which the bar is pulled out, raised the thickness of the kerf and another cut made to half the preceding depth (Fig. 2). This snubbing cut allows the coal to roll out from the face. In rooms cut in this manner, four holes are drilled in the top bench and the same number in the bottom bench. The coal is blasted with pellet powder and is very blocky, containing lumps weighing as much as 600 to 1,000 lb. Headings are cut the same way as the rooms, but only three holes are put in each bench.

Four mules are employed to service each loader, delivering the loaded cars, holding an average of 5,200 lb. each, to the room entry, where they are picked up by a 4-ton gathering locomotive operating between the room entry and the main-entry partings. One mule is used to pull the empty cars up under the loader, while another pulls the loads away. The two additional mules are employed to relay the empties and loads from and to the room entry, respectively.

In all advance work, the coal is taken to a height of 9 ft., and the remainder in the top, averaging 5 ft., is extracted on the retreat. When a room reaches the full depth of 250 ft., the end of the track is turned in and a 25-ft. section of the pillar is loaded out (Fig. 2). Then the top coal in the remaining 25x40-ft. section, about 200 tons, is shot down and loaded. The machine then drops back and takes out another 25-ft. length of pillar and another 25x40-ft. section of top coal. Final operations in a panel consist of taking out the chain pillars and top coal along the room entry down to within 90 ft. of the main entry. One machine at Bulah, said Mr. Green, loaded 14,874.6 tons in 27 days and parts of days (176 hours) in February, while the other, in 28 days and parts of days (183 hours), loaded 16,103.375 tons. In development work in narrow places, the first machine installed averaged 90 ft. of advance per shift in the first fourteen days of operation, loading out as many as 12 to 14 cuts in seven hours.

Diagrams and motion pictures were employed at the Friday morning session by E. B. Gellatly, manager, underground conveyor division, Jeffrey Mfg. Co., Columbus, Ohio, in describing typical conveyor operations in thin coal in the East, ranging from single- or multiple-room units with or without gathering conveyors to large installations employing long mother belts.

Most Accidents Are Preventable

Analysis shows that most mine accidents could have been prevented, declared F. J. Stortz, foreman, Union Pacific Coal Co., Superior, Wyo. The foreman, "as head of the supervisory and working force, is properly held responsible for the production, working methods and efficient operation of the mine. He exercises control primarily through his section foremen and machine bosses and, to a lesser extent, through instruction and personal example to individuals. The prevention of accidents, therefore, is one of his most important duties."

Systematic timbering, said Mr. Stortz, is one of the best means of preventing injuries from falls of roof and coal, and, if a plan is not prescribed by the company, it should be formulated by the foreman, who then should insist that it be strictly adhered to and that sufficient supervision be available. Frequent inspection of timbering by the foreman is a necessity; suitable sharp tools and sufficient timber must be available and good individual lights are essential.

Overhanging face coal is a hazard that can best be controlled by the proper spacing of shotholes, by placing extra holes when necessary and by careful supervision. Pillar work approaching old caved areas, especially if water slips are present, may collapse without warning. Foremen usually know when caved areas are close and can have a supervisor

Mechanization Promotes Safety

"IN THE PAST," declared Gomer Reese, general superintendent, Kemmerer Coal Co., in describing the results of scraper mining at Elkol to the Rocky Mountain Coal Mining Institute, "mechanical loading has been considered more hazardous than hand mining, but this mine, since mechanization, has been just the opposite. The Elkol mine last year received the Joseph A. Holmes certificate of honor for operating without a fatality from Nov. 21, 1924, to Jan. 1, 1935, or 1,485 days, with an average force of 22 employees working 34,235 man-shifts and producing 616,625 tons of coal. Eight nonfatal accidents have occurred at this mine in ten years, resultant loss of time being 72.9 days."

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there to direct placing of timbers. In mines where the roof caves readily after extraction, a small pillar of coal left next to the caved area often will be better than timber in preventing a collapse. In heavily timbered areas, clean, straight manways should be provided and the men required to use them.

Thorough supervision and, where possible, standardization of drilling, tamping and blasting methods is essential. In the operation of machinery—specifically mining machines, drills and loading equipment—no amount of printed rules will cover all the hazards. Machines, first of all, should be maintained in good operating condition and the men running them should be educated in their capabilities and the dangers connected with their operation. When an accident or near accident occurs, a personal investigation on the spot should be made by the foreman. Inexperienced men should not be allowed to work alone or all in a single group, as the more the foreman can get his experienced men to teach his new employees the more smoothly will his organization function.

Revising Haulage Speeds Operation

Early methods of transportation in coal mines were reviewed briefly by George Jackson, foreman, Independent Coal & Coke Co., Kenilworth, Utah, in introducing a description of the main-line haulage and dispatching practices at the Aberdeen mine of the company. At this mine, the coal outcrops 800 ft. above tipple level, dipping away from the outcrop approximately 10 per cent to the north. For seventeen years it was the practice to haul the coal up the pitch and drop it down a shelf incline with a grade of 13 per cent to a gravity plane on a 35-per-cent grade leading to the tipple. To replace this costly installation, a tunnel was driven from a point at tipple level to intersect all the seams and thus cut the number of transfer points from six to three. Length of the tunnel, driven through sandstone and therefore requiring a minimum of timbering, is 8,500 ft.; height, 8 ft.; width, 16 ft.; grade, 1¾ per cent in favor of the loads (*Coal Age*, Vol. 38, p. 305, September, 1933). The tunnel is illuminated throughout its length by 50-watt lamps on 100-ft. centers, and men on foot are not allowed in it.

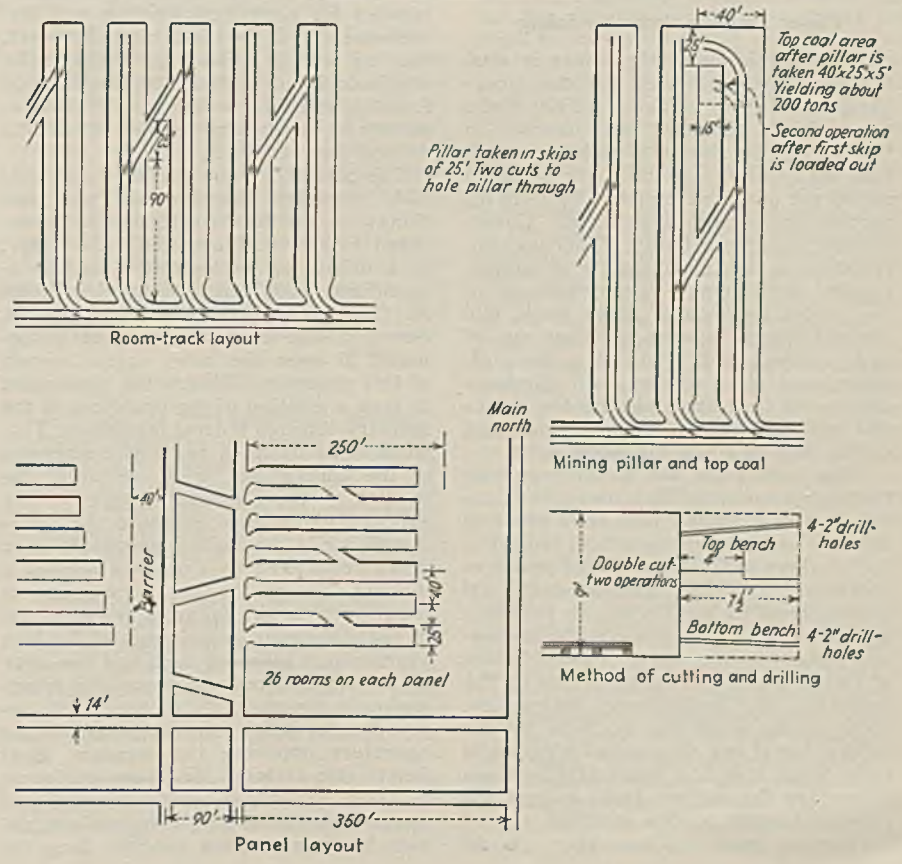
Later, a preparation plant with a daily capacity of over 3,000 tons was built at the property, and to keep it in operation a steady stream of coal became necessary, bringing up the problem of delivery of coal on a regulated schedule. The problem finally resolved itself into the regulation of main-line haulage through a tunnel serving four operating mines. Three 15-ton locomotives handle cars from four partings 325 ft. long and graded so that the loads will run to the outer switch and there stand without blocking, also so graded that the empties will travel to the opposite end and to the hoisting rope. A double track, laid with 60- and 75-lb. steel, extends 8,400 ft. from the tipple to the first intersection with the coal; other seams are served by a single track laid with 50- and 60-lb. steel. At the intersection with the first seam, a dispatcher's office, built of concrete with glass on three sides to permit full view of the tracks, switch lights and trips, was located.

Equipment in the dispatcher's office includes two telephones and a switchboard serving thirteen other phones in various parts of the mine, as well as the surface. "From this office, through the dispatcher, are controlled all movements of trips, operation of the electric switch throwers, operation of the block-signal system, operation of the telephone system and the ordering and delivering of all materials. All communications go through this office—in fact, it is the nerve center of the operation," and the dispatcher, in addition to his other duties, keeps track of the location of foremen and maintenance men and follows closely conditions in all parts of the mine. Improvement in trip movement and routing of cars to the point where they are needed has resulted in an increase in the number of cars to the loader of from 2.5 to 4 per day, "without fail." Indirect results include a reduction in number of men and pieces of equipment required.

Friction shoes are employed to brake the loaded trips in the tunnel, leaving to the locomotive brakes only the task of regulating speed. Supplementing the use of these shoes, a quick means of removing them has been developed at the mine. Maintenance of the tunnel track, which normally is low, is confined to the summer, as the large volume of air passing through it makes working uncomfortable in the winter. Also, the company has standardized on 45-lb. rail and cast-manganese frogs, instead of the weights of 25 and 30 lb. formerly employed. Results this past winter have proved the wisdom of the step.

To promote safe haulage, wire hooks are used by nippers and couplers; all locomotives are equipped with rerailers; safety dogs are furnished to all working places for holding the cars stationary; short rails in dip places must be fishplated to prevent the rails from tipping and dumping the car into the face; cars must not be switched and left unblocked on main lines; nippers must not

Fig. 2—Panel, track, pillar and cutting plans, Knife River Coal Co. mine



ride on the front end of moving trips; adequate clearance must be maintained between cars and ribs; cars purchased in the future must be provided with false bumpers of sufficient area for adequate foothold and prevention of locked bumpers when trips are pushed; all haulage men are required to look for defective cars, etc.

"Hope for coal," declared B. B. Brewster, publisher, *Mining & Contracting Review*, lies not in the experimental and vote-getting plans of the "socially, if not Communistically, inclined administration" but in the "unheard-of idea—in the coal business—that the survival of the fittest, in free, honest, decent competition, applies to the coal business. Few in the business and apparently none in the present administration seem to have thought of that. That hope lies in regulation by the government in the matter of price-cutting and throat-cutting tactics, but not in the kind of overlordship now being attempted. That hope lies in sensible-tonnage mines, in sensible treatment of product according to the market and improved efficiency in burning."

That hope lies, continued Mr. Brewster, in convincing the public and the coal miner that John L. Lewis is wrong when he paints the entire coal industry as a band of dishonest and oppressing cut-throats. "That hope lies in convincing the miners and the general public that the interest of the worker and the industry lies not in cheap politics but in a common, sensible understanding of their mutual problems, based upon cool consideration and shoulder-to-shoulder cooperation. And last, but not least, that hope lies in the hands of the honest, intelligent and decent producer of coal. There are many."

Miner Training Promotes Safety

Proper training of the miner is vital in promoting safety, said William Moorhead, consulting engineer, Salt Lake City. Little time has been devoted to this subject in the past, with the result that many of the practices in common use by the miner were picked up from his partner or through experience. Consequently, many are faulty. Thorough instruction in the fundamentals of mining, coupled with actual demonstrations of the proper methods of doing work, will prevent many injuries growing out of bad practices, will result in a more efficient and safer worker, will eliminate unpleasant controversies with the bosses and will add to the miner's pride and satisfaction in doing his work right.

"The bosses are the keymen and no training program is likely to succeed unless it is in harmony with their point of view. Therefore, job practices taught to the workers must be accepted practices approved by the management. Of course, hand in hand with job practices are good rules and disciplinary procedure whenever necessary." Consideration of such a training program brings up the problem of designating instructors. Most of the work can be done by the bosses, but if any substantial progress is to be made it is first necessary for them to analyze the various tasks around the mine and settle on the accepted way of performing each. Then they should teach each step of the job as approved.

"While making the analysis, the bosses will gain more than they give, as it makes them think through each step of the job they supervise." Management, Mr. Moorhead pointed out, also gains in five ways: (1) discovery of bad practices to be corrected; (2) location of good practices so that they may be used more generally; (3) simplification of supervision through a trend toward standardization of practices; (4) elimination of misunderstandings by defining responsibility; and (5) discovery of opportunities for organized training and improvement. It is important, however, that no step in giving instructions be overlooked, no matter how small, and foremen and their assistants should constantly be instructing the men in what to do and how to do it.

The troubles of the coal man and possible remedies therefor are not new things in the bituminous industry, declared Sydney A. Hale, editor, *Coal Age*, in a discussion of legislative and merchandising problems, presented by Ivan A. Given, associate editor. "There is, however, one trend that cannot be ignored in even the most casual survey of this situation. That is the movement to seek a solution of the problems of the industry through federal regulation. This trend finds its most concrete expression in the Guffey act, now awaiting the verdict of the Supreme Court." The support given this measure by producers while the Guffey proposals were being considered by Congress marked a distinct change in the viewpoint of many men in the industry growing out of the disastrous experiences of the lean years which followed 1925 and the taste of profits and orderly procedure which probably the majority of producers enjoyed under NRA. In fact, even among operators opposing the measure, it is fair to say, declared Mr. Hale, that most of the opposition was directed not against the principle of federal regulation but against the specific form of regulation embodied in the Guffey act.

Too great reliance on governmental agencies, continued the speaker, is really the greatest danger in government regulation. "When an industry comes under government control it is so easy to be lulled into a sense of false security—a belief that regulation of the internal processes of an industry is a protection against outside competition. Nothing is farther from the truth. Nobody, not even Uncle Sam, is going to dump orders on your doorstep or, allocation or no allocation, compel consumers to deal with you in preference to another mine or a rival fuel." That is a task for the industry, and here associated effort, much of it through selling agencies or other merchandising organizations, will yield maximum results.

Need More Merchandising Work

In considering selling agencies, remarked Mr. Hale, it seems that "many coal men do not value highly enough the non-spectacular work along fundamental merchandising lines that these groups are doing." Too often, price is the sole element considered, and, while price is important, knowledge of the characteristics of the coals handled by the organization and of the competitive situation also should prove valuable in setting prices that will fairly represent competitive values and which can be defended as fair representations of the value delivered. More work of this type is necessary, "and the results will justify the cost of such organizations even if they do no actual selling or price-fixing."

Increased load resulting from increasing mechanization and prospective new mining developments were the major reasons calling for the additions to the Rock Springs (Wyo.) power plant of the Union Pacific Coal Co., said A. T. Henkell, general master mechanic, and D. C. McKeehan, chief electrician, in a paper read by Mr. Henkell. Present equipment consists of three 2,500-kw. and one 1,000-kw. generators, operating condensing (jet type) and supplied with steam at 150 lb. gage and 100 deg. of superheat by six 304-hp. Babcock & Wilcox boilers equipped with chain-grate stokers and six similar 264-hp. boilers with Type "E" underfeed stokers. Boiler water containing approximately 26 grains of solids per gallon is supplied by air-lift wells and no treating equipment has been installed in the present plant, as the scale is easily removed.

"The trend in power-plant practice has, of late years, been toward higher pressures and temperatures and, after some discussion, it was decided to design our new additions for 450-lb. pressure with a total temperature of 750 deg. F." Consequently, the new equipment will consist of two B. & W. "Integral-Furnace" boilers, each with a capacity of 75,000 lb. of steam per hour and each equipped with two unit pulverizers, each pulverizer capable of supplying fuel for 40,000 lb. of steam per hour. The new generator will be rated at 5,000 kw., 80 per cent power factor. One of the new boilers will operate at rated pressure and temperature to supply steam for the new generating unit, while the other will be operated at 150

Coming Meetings

- Illinois Mining Institute: 18th annual boat trip and summer meeting, June 5-7, on Str. "Golden Eagle," leaving St. Louis, Mo., at 11 p.m., June 5, and returning to St. Louis at 10 a.m., June 7.
- American Wholesale Coal Association: annual convention, June 8-10, Netherlands-Plaza Hotel, Cincinnati, Ohio.
- Indiana Coal Producers' Association: annual meeting, June 9, Terre Haute, Ind.
- Mining Society of Nova Scotia: annual meeting, June 25 and 26, Pictou Lodge, Pictou, N. S., Canada.
- Mine Inspectors' Institute of America: 27th annual convention, June 29-30 and July 1, Shirley-Savoy Hotel, Denver, Colo.
- American Society for Testing Materials: 39th annual meeting, June 29-July 3, Atlantic City, N. J.
- Southern Wyoming Coal Operators' Association: annual meeting, July 14, Cheyenne, Wyo.
- International Railway Fuel Association: annual meeting, Sept. 16 and 17, Hotel Sherman, Chicago, Ill.

lb. with 100 deg. of superheat in connection with the operation of present generating equipment. At the pressure and temperature of the new boilers, more consideration must be given to the boiler feed water, "and, as a surface condenser is to be used with the new unit, all water used at the plant must be treated." This will be done in a hot-process softener with a capacity of 16,000 g.p.h., complete with two filters and back-wash pumps, using the lime-soda process.

"It is a well-recognized fact," declared D. J. Parker, district engineer, U. S. Bureau of Mines, "that, in order to prevent accidents, some form of organized effort is absolutely necessary. Judging, however, from results obtained at many mining operations, the type of safety organization or the methods employed in accident-prevention work are not of material significance provided the necessary effort, including intensive supervision, is expended." To achieve success in safety work, management must be convinced: (1) that accidents, or at least the most of them, can be prevented; (2) that it is more economical to prevent accidents than to pay for them—in other words, accident prevention is sound business; and (3) that safety must be considered by all concerned a major operating problem. "Assuming the manager is steeped in the thought that accidents shall be prevented and that the responsibility for their occurrence shall be placed squarely upon the shoulders of those to whom it belongs, he is then in the happy frame of mind necessary for laying the foundation for a well-organized safety program, the structure of which of necessity rests upon a three-point foundation, viz.: supervision, education and discipline."

Coal-mine accidents in Utah in the past 18 years, said O. F. McShane, Industrial Commission of Utah, have resulted in 582 deaths, 13 permanent total disabilities, 779 permanent partial disabilities and 27,122 temporary injuries. Direct cost of claims was $4,292,665. Possibly 75 per cent of this could have been saved "had the proper safety precautions been taken and all known hazards eliminated," thus permitting the distribution of an additional $3,000,000 in dividends to the various coal companies. Moreover, a reduction of 50 per cent in the compensation premium rate would have been possible, allowing an additional $3,000,000 to be set aside for the dividend fund. In addition, much of the $16,044,000 involved in the loss of 4,111,000 man-days would have been saved.

B. & B. Celebrates 60th

Broderick & Bascom Rope Co., original manufacturer of wire rope west of the Allegheny Mountains, celebrated in May the sixtieth anniversary of the establishment of its first rope-making plant at St. Louis, Mo., in 1876. In its second plant, built in 1883, original equipment included the only wire-rope-making machinery to be found between the Allegheny and the Sierra Nevada mountains. Operations at St. Louis are now concentrated in the fourth in a series of manufacturing plants, built in 1924.

New Two-Year Anthracite Wage Agreement Grants Shorter Work-week in 1937

AFTER negotiations that dragged along nearly three months, representatives of anthracite operators and union miners reached an agreement on a new wage contract in New York on May 8. The new pact, which is effective until April 30, 1938, contains the following principal provisions: As of May 1, 1937, the miners are granted a seven-hour day and five-day week, modified by a provision that the mines may be operated for six days a week in any twelve weeks of the year. In cases of emergency, a further extension of the six-day week may be granted by a board set up for the purpose. The complete check-off is granted. A clause providing for full responsibility on the part of district and international officers of the United Mine Workers to prevent strikes in violation of the agreement and to improve discipline for violations is included. Equalization of work in a modified form is granted.

The agreement is subject to ratification by Districts Nos. 1, 7 and 9, United Mine Workers. A convention for the purpose has been arranged to take place beginning June 2 or 3 in Hazleton, Pa., according to an announcement by Michael J. Kosik, president of District 1.

Prior to reaching an agreement on wages and working conditions, the conference agreed to establish a joint commission of operators and miners for stabilization of the anthracite industry. One of the first tasks of the commission, it was decided, will be to seek a cut in freight rates to reduce selling prices. A petition to this end, it was agreed, will be presented jointly by the operators and mine workers to the Interstate Commerce Commission.

On several occasions during the course of negotiations a strike of the more than 100,000 hard-coal miners was threatened when the conferees seemed hopelessly far apart on the issues involved. The intervention of Frances Perkins, Secretary of Labor, averted a break on April 30, when she prevailed upon the joint conference to extend the old agreement to permit continuance of negotiations. Edward F. McGrady, Assistant Secretary of Labor, came to New York by airplane the same day to cooperate with the conferees in trying to find an amicable solution of the points at issue.

Anthracite Agreement

Full text of the agreement follows:

THIS AGREEMENT, made this seventh day of May, 1936, between Districts 1, 7 and 9, United Mine Workers of America, parties of the first part, and the undersigned anthracite operators acting severally and not jointly, parties of the second part, witnesseth:

WHEREAS, the parties, hereto, under date of Aug. 8, 1930, entered into an agreement covering wages and conditions of employment in the anthracite coal fields of Pennsylvania, which agreement under its terms expired April 1, 1936, but was extended by mutual understanding to May 7, 1936; and

WHEREAS, the parties hereto deem it expedient to enter into a new agreement extending the provisions of said agreement of Aug. 8, 1930, for a further period, subject to certain modifications, as hereinafter more specifically provided.

NOW, THEREFORE, the parties hereto do covenant and agree, each with the other, as follows:

(1) The provisions of said agreement of Aug. 8, 1930, except as hereinafter modified and amended, shall be in full force and effect for the period beginning May 7, 1936, and ending April 30, 1938.

(2) Except as modified or more specifically provided herein, the terms and provisions of the award of the Anthracite Coal Strike Commission and subsequent agreements made in modification thereof or supplemental thereto, as well as the rulings and decisions of the Board of Conciliation, are hereby ratified, confirmed and continued for and during the full term of this contract, beginning May 7, 1936, and ending April 30, 1938.

HOURS AND WORKING TIME

(3) Beginning on May 1, 1937, and for the remaining term of this contract, the work-day of employees shall be changed from eight hours to seven hours, and the work-week from six days to five days, except that, at the option of the operator, the employees at any operation shall work six days per week in any twelve weeks in any contract year. The changes in hours per day and days per week shall apply to employees, subject to such modifications as hereinafter provided, and shall not be construed as limiting operation of the mine or breaker. The five days worked in a week may be any five days in such week, excepting only legal holidays.

Seven-hour day means seven hours of actual work for all classes of labor, at the usual working place, exclusive of noon-time for five days per week, or six days per week to the extent herein provided, if the operator desires to work his mines to that extent, excepting only legal holidays. The time required in going to and coming from the place of employment in or about the mine shall not include any part of the day's labor. Drivers shall take their mules from the stables to the usual working place before starting time and shall return them to the stables after quitting time, compensation for such service being included in the day rates established for this class of labor. If, because of breakdown, repairs, or the requirements of transportation, or other causes essential to efficient operation, it is found necessary to extend the normal work-day or work-week of any employee or any class of employees, the operator may do so, at his option, paying for overtime the rates per hour applicable to such employees under the seven-hour day.

The following classes of employees are exempt from the maximum hours of work as above provided:

Employees at each mine who are required to remain on duty while men are entering or leaving the mines; employees engaged in the transportation of men and coal who shall work the additional time necessary to handle man-trips and coal in transit; outside employees engaged in the repreparation of condemned coal; providing no regular shift is now engaged in such work; outside employees engaged in the handling, dumping and preparation of coal or dumping of breaker refuse, who shall work as much additional time as necessary (but not more than one-half hour

1935 included 8,000,000 tons of vitrain, greatly swelling coal with less than 2 per cent ash; 1,000,000 tons of fusain, largely dust with 65 to 70 per cent fixed carbon; 35,000,000 tons of clarain, less strongly swelling than vitrain and, as a result, freer burning, and with an average ash of 6 to 8 per cent. Durain, which very infrequently occurs in the No. 6 seam of some mines in the southern part of the State, may be dismissed from consideration because clarain, vitrain and fusain probably constitute over 99 per cent of the combustible parts of Illinois coals. Examination of broken blocks of carefully handled coal show that the surfaces parallel to the bedding planes are usually covered with fusain and that in some blocks vitrain covers one or more of the bedding surfaces. This indicates that fusain is the weakest and is responsible for most of the degradation, and that the vitrain is much weaker than the clarain.

Tests indicate clearly that the vitrain concentrates in the small sizes and continues this concentration in most instances until the 100- or 200-mesh size is reached. Below this the fusain is highly concentrated. As already is well known, fusain also concentrates in the fine sizes and the tests showed that it becomes highly concentrated at that point where the vitrain concentration no longer increases.

Experiments on 850-deg. C. coking coals showed the vitrain to be highly swelling, thus imparting a fluid condition to the bed and making a brilliant coke. Clarain made a dull, dense, heavy coke, and durain a weak and granular product. Thomas L. Garwood, supervisor of top preparation, Orient mines, Chicago, Wilmington & Franklin Coal Co., offered as discussion the observation that in the smaller sizes the ash increased less than had been expected and that apparently the concentration of vitrain as shown by the laboratory tests must be the factor responsible.

At this time, when many coal companies are establishing laboratories, there is urgent need for a standardization of laboratory methods, said O. W. Rees, associate chemist, Illinois State Geological Survey. First comes the necessity for proper housing of the laboratory with respect to shock, vibration and dust. Sampling should be standardized; grinding should be done so as to produce a minimum of heat, thus losing as little as possible of the moisture from the sample, and standard procedure should be "followed to the letter," although short-cut methods may be necessary for daily control analyses. "There is," he warned, "no such thing as a standard sample because samples change upon standing." As to grinding with minimum heat, it is known that in some cases samples have ignited during the grinding. There is urgent need for a method of differentiating between surface and inherent moisture.

Mr. Viall, supplementing his earlier discussion of analyses and unit coal, said that B.t.u. determinations of the leading laboratories in the United States do not check, and this was proved by an investigation whereby each laboratory was asked to submit fractional samples to each of the other laboratories selected for the investigation. Errors made by first-grade laboratories may cause a coal company to lose thousands of dollars yearly.

That smokeless briquets can be made from Illinois coal without artificial binder and by the same equipment and with the same magnitude of impact as is used to briquet raw coal without binding material if 15 per cent of the volatile matter is driven out of the fines, was the report of R. J. Piersol, physicist, Illinois State Geological Survey, in giving the results of laboratory experiments. A reduction of volatile matter in the coal was found to increase the strength of the briquet. Both Franklin and Will County coals begin to volatilize at 410 to 420 deg. C. In making smokeless briquets from these coals, the fines were heated to 450 deg. C. for ten minutes, then put into the impact press at 300 to 350 deg. C. This lower temperature of pressing was used because with it dies of special metal to withstand the heat and pressure were not needed.

Combustion tests of the smokeless briquets in an open fire indicated that these briquets do not soften as much as briquets with an artificial binder. It also was demonstrated that the briquets burn at low temperature, emit a high radiant heat and hold fire for long periods. The smokeless briquet, said Arthur C. Smith, Consolidated Coal Co., may be the answer to Mr. Taylor's question as to what shall be done with the small coal which is a byproduct of stoker-coal manufacture.

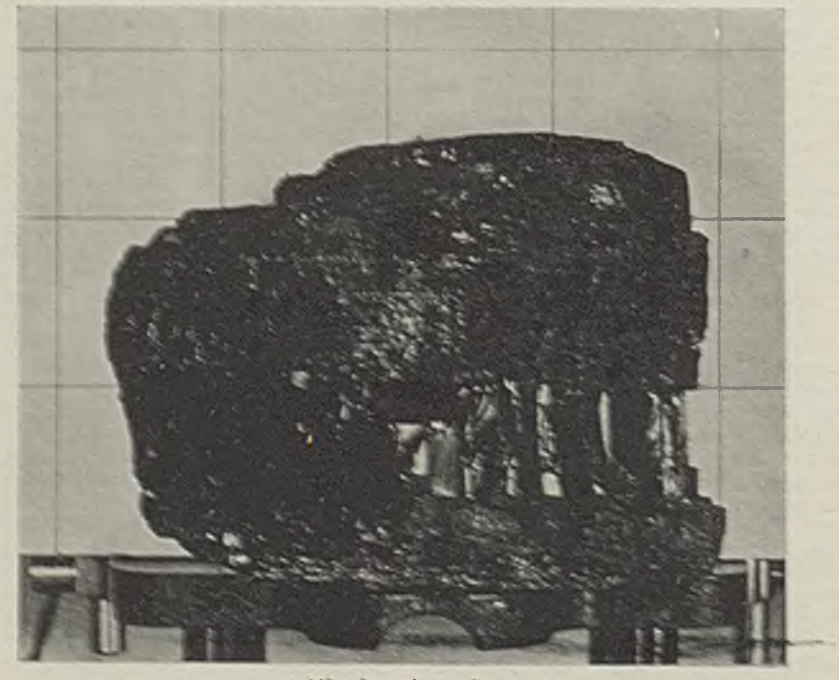
To facilitate this smokeless briquet investigation, explained Dr. Piersol, it was desirable to develop a quantitative measurement of smoke, and the result was the "smoke index method" whereby the total smoke from one gram of the material is measured by deflections of a galvanometer actuated by a photo-electric cell which in turn is activated by transmitted light from a constant source. Natural coals were tested with the same apparatus, and it was thereby determined that their smoke contents are almost proportional to the percentages of volatile matter.

Plastic Zone Slows Coking

The principal difficulty in low-temperature carbonization is the high-temperature gradient across a ¼-in. plastic zone. This fact, said Dr. G. Thiessen, associate chemist of the State Survey, has been demonstrated by tests on the Knowles-type oven which is operating at West Frankfort (*Coal Age*, Vol. 39, p. 421). Coals, he continued, weather rapidly and thus lose their ability to stick together to form coke; in some cases, this loss occurs within just a few hours. Thermocouples placed in the Knowles oven showed a bottom temperature of 1,100 deg. C., a top temperature of 500 to 600 deg. C. and a gradient of 200 to 300 deg. C. across the ¼-in. plastic zone as it moves upward through the bed. To round out the economic side of the picture, Dr. Thiessen said that the use of domestic coke increased constantly from 1913 to 1934 and that during the same period the value of the gas increased, that of the ammonia decreased and that of the benzol products remained constant.

M. D. Curran, president, Radiant Fuel Co., of St. Louis, expressed the opinion that Illinois coke will be excluded from the metallurgical market for many years to come. Experience with the Knowles-type oven at West Frankfort indicates that by a combination of washing and carbonizing it is "quite possible" to eliminate three-fourths of the sulphur in Illinois coals.

Although the best and most cheaply mined coals of Illinois have already suf-



Vitrain and clarain

In this illustration of one of the Illinois coal exhibits used by L. C. McCabe in his discussion of "Constitution of Coal in Relation to Its Use," the vitrain is the brilliant band with concholdal fracture in the center of the block, flanked by the tough, laminated clarain. Two-inch squares are shown in the background.

fered serious depletion, the coal thus far extracted represents only a small percentage of the total supply; these conclusions were announced by J. H. Weller, geologist of the survey, in a paper inventorying the coal resources of the State. Study of the coal geology, he continued, has led to the conclusion that an important part of the coal reserves lie beneath the coal beds now being mined in areas already active. The Pennsylvanian beds, which underlie three-fourths of the State and reach a maximum thickness of one-half mile, have been recognized to consist of a succession of ten different principal rocks of which the sandstone is the most variable, and in the field work, although always one or more of the beds are missing, the succession can be recognized even if half of the rocks are missing. Certain key beds such as No. 6, with its persistent blue-band parting, and the No. 2, of consistent 30-in. thickness, can be recognized, and the other beds, totaling about forty in number, have been correlated with respect to the key beds.

The lowest bed (No. 1 or Rock Island coal) is lenticular and not persistent, so may later be discovered in commercial quantities in areas where drillholes hitherto have not reached it. Coal No. 2, which is thin but the most persistent of any of the seams, will increase in importance as the thicker beds are depleted. As a result of this recognition of the succession of principal rocks the inventory of the present day, said Dr. Cady, in discussing the Weller paper, is incomparably more accurate than that made fifteen years ago. Other useful observations, such as the relation of sulphur to the character of the roof, also have been made.

Stokers Must Burn Low-Grade Fuel

Manufacturers of small stokers designed to burn Illinois coals, suggested C. V. Beck, president, St. Louis Coal Co., possibly have been working in the wrong direction. The fact that hold-fire controls have in many cases actually put out the fire would seem to indicate that highly intermittent operation may be more desirable than operation with shorter periods of quiescence. More attention, he believed, should be given to the very low grade Illinois coals—i.e., coals with an ash-fushion temperature as low as 1,900 deg. F. and ash content as high as 25 per cent. Although most stoker men would say that it is almost impossible to burn such coal in automatic equipment, Mr. Beck estimated that several million tons of that type of coal is now being burned successfully on small underfeed stokers, and he stated that "we may just as well make up our minds that it is going to comprise a substantial part of the diet of such stokers and prepare stokers to digest it."

With Illinois coals, according to Mr. Beck, it is more satisfactory to have a stoker which will feed for 20 to 30 minutes continuously once every six hours than to feed for two minutes every half hour. Although the underfeed stoker of the screw-feed type has many disadvantages, it now has 95 per cent of the total market: for very small installations it has so many advantages that it

T. J. Thomas

Chairman, Illinois Mineral Industries Committee

is now the only type "worthy of serious consideration." This screw-feed type of stoker is made up of four standard parts: a transmission, a worm feed, a retort with tuyeres and air supply, and electrical controls. Whether the stoker will perform seems to be entirely a question of proportion; therefore, he suggested research on the effect of varying the proportions for each type of coal. Perhaps the control should be one to maintain the fuel bed in good condition rather than one designed to "reestablish a good condition."

Discussing Mr. Beck's paper, J. B. Bentley, chief fuel engineer, Sahara Coal Co., proposed studies of the variables in coal against the variables that can be made in stoker design. Mr. Viall thought much could be learned from size investigation. Fines in the coal may be segregated by the screw feed, thus producing choked spots in the retort. By approaching the ideal of a uniform small marble size for stoker fuel it may be possible to overcome the need for high air pressure and low temperature in the retort. Peering into the distant future, Mr. Viall voiced the opinion that the price of stoker coal will not be above the price of mine-run and that the price of lump and egg will drop to approach that of mine-run. "If the stoker coal gets too high, the large users will buy mine-run and crush it."

Fifty sizes of stoker coal are made in Illinois and perhaps 200 over the country as a whole, said H. C. Woods, vice-president, Sahara Coal Co., who strongly advocated standardization of stoker sizes. One of the principal difficulties today, he felt, is that the manufacturers try to make a stoker that will operate on any coal, "a feat that cannot be done." Mr. Taylor thought that an agreement on stoker sizes today is impossible, but urged that tests be made so as to arrive at a minimum number of sizes. W. J. Jenkins, president, Consolidated Coal Co., opposed the suggestion that the mines dump the fine dust; such disposition might easily provoke complaints that this dust was being blown over the countryside. Mr. Beck stated that the minus-10-mesh fraction accounts for approximately 3 per cent of the total output of Illinois mines. The ultimate consumer, Mr. Bentley emphasized, is the one who will finally determine what size stoker coal shall be.

A product of absolutely uniform heat value can be maintained by regulation of ash and moisture at the strip-mine preparation plant of the Northern Illinois Coal Corporation, said T. E. Shaughnessy, combustion engineer, in a paper on moisture control as a factor in beneficiation. No line, he felt, can be drawn to distinguish between surface moisture and inherent moisture. The plant is a 6,000-ton operation handling coal from the No. 2 seam and equipped with wet washers for 3-in. and smaller, dehydrating screens, and a drying plant consisting of centrifugal dryers and two types of heat dryers. The seam moisture is 15 to 16 per cent. The dryers have been successful in reducing the moisture as much as 10 per cent below that of the feed, and the moisture in the coarser sizes has been reduced to a figure 2 to 3 per cent below that normal for the seam. This No. 2 strip coal, added John Griffen, Koppers-Rheolaveur Co., presented a new problem because of the unusually high moisture and the uncertainty of a dividing line. Moisture content has a bearing on segregation of fines by a screw stoker. "If moisture is not too far removed, there may be little size segregation in stoker use."

Experimental Time Is Limited

Because time is short to get the necessary information on Illinois coals ready for producing motor fuel when the petroleum shortage predicted to start in 1940 to 1945 arrives, F. H. Reed, chief chemist, Illinois Geological Survey, advocated that the Illinois agencies avail themselves of the opportunity to test coal in the experimental plant under way at the U. S. Bureau of Mines' Pittsburgh experimental station. Commercially successful plants producing motor fuel in Germany and England have production costs of 12 to 18c. per gallon of motor fuel, compared to 5c. per gallon for gasoline production cost in the United States. This indicates that little will be done commercially in this country until the price of motor fuel rises materially. If oil from shale were to replace petroleum it is estimated that the oil-shale industry would need to be twice the size of the present coal-mining industry.

The hydrogenation method for producing liquids from coal, declared Dr. Reed, is more promising than carbonization or synthesis from coal gasification products. Approximately 35,000,000 tons of coal would be required annually to satisfy the motor-fuel demands in the Illinois area. This estimate is based on the use of four tons of coal to one ton of motor fuel. Five to one is the ratio in an English plant now operating, and a ratio of 3½ to 4 is expected in a plant now building in Germany.

The Illinois Mineral Industries Conferences are under the sponsorship of the Illinois State Geological Survey, the Engineering Experiment Station of the University of Illinois and the Illinois Mineral Industries Committee. These

annual conferences include forums on coal, oil, gas, clay and clay products, and rock and rock products.

Surcharges Only Temporary, Operators' Brief Holds

The National Coal Association and eighteen local operators' associations filed a joint brief on May 15 in Ex Parte No. 115 with the Interstate Commerce Commission opposing any continuation beyond the present expiration date, June 30, of the freight-rate surcharges on bituminous coal. The brief contended that "the very essence of the increase authorized by the Commission was its temporary character, with a definite termination on June 30, 1938." The surcharges became effective on April 18, 1935, and the operators' brief contends that the additional charge on bituminous coal, which ranges from 3c. to 15c. per ton, with an estimated average of more than 12c., has cost coal shippers more than $30,000,000 in increased freight charges.

With respect to the gradual displacement of coal by gas, oil and hydro-electricity the brief stated that "gradually increasing freight rates on coal have deprived this commodity as the predominant source of energy until today it is fighting a hard but losing battle to hold even a fair share of this market. If a substantial share of the huge energy market is to be preserved to the coal industry and if the railroads are to continue to carry the huge revenue tonnage used by this market, the delicate balance between the unit costs of the several sources of energy should not be further disturbed."

In submitting the brief the following associations, in addition to the National Coal Association, were signers: Alabama Mining Institute, Big Sandy-Elkhorn Coal Operators' Association, Coal Control Association of Western Pennsylvania, Eastern Bituminous Coal Association, Harlan County Coal Operators' Association, Hazard Coal Operators' Association, Illinois Coal Traffic Bureau, Kanawha Coal Operators' Association, Logan Coal Operators' Association, New River Coal Operators' Association, Ohio Bituminous Coal Producers, Operators' Association of Williamson Field, Pocahontas Operators' Association, Smokeless Coal Operators' Association of West Virginia, Southern Appalachian Coal Operators' Association, Virginia Coal Operators' Association, West Kentucky Coal Bureau, and Winding Gulf Coal Operators' Association.

Studies of Silicosis Begun

Studies of the various phases of silicosis have been begun by the committees appointed by the U. S. Department of Labor at the conference on silicosis held on April 18 (*Coal Age*, May, 1936, p. 235). Following these studies the committees purpose submitting reports to a further conference meeting next autumn. E. B. Oliver, general counsel, Glen Alden Coal Co., has been appointed a member of the committee on regulatory and administrative phases, and T. D. Conover, secretary, American Mining Congress, of the committee on economic, legal and statistical aspects.

R. L. Adams

Personal Notes

R. L. Adams, formerly chief engineer, Old Ben Coal Corporation, has been appointed general superintendent with headquarters at West Frankfort, Ill. He succeeds James Dunn, who retired May 1 after 25 years as general superintendent and close to sixty years in the mining industry. J. W. MacDonald, formerly assistant chief engineer, was elevated to chief engineer, with headquarters also at West Frankfort.

Clarence V. Beck, president of the St. Louis Coal Co., has resigned as executive director of the St. Louis (Mo.) Coal Exchange.

William Burress, Powellton, W. Va., has been appointed superintendent of the Beards Fork mine of the Elkhorn Piney Coal Mining Co., Beards Fork, W. Va.

W. C. Chase was appointed general superintendent of coal mines for the Alabama By-Products Corporation effective May 18. He was succeeded as superintendent of Bradford mine by B. S. Patterson. John W. Hause, formerly superintendent at Sumoset mine, has been appointed superintendent at Gamma mine, succeeding M. Heard, resigned.

James Condon, Sr., president John Condon Coal Co., anthracite producer, with operations at Hudson, Pa., was the guest of honor at a party on May 6 in observance of his 75th birthday. Messages of congratulation were received from President Roosevelt, Governor Earle, Senator Guffey, Representative McGroarty and many others.

Jim Cowie, of Carnelton, W. Va., has been appointed safety director of the Carnelton Coal & Coke Co.

Jim Fuller has been appointed superintendent at the Coal Valley (Ala.) operations of the Tennessee Coal Corporation, where he succeeds Chess Cobb.

P. M. Gillie, formerly assistant superintendent, has been made superintendent of the Dexter and Warwick mines of the Kingston-Pocahontas Coal Co., with headquarters at Hemphill, W. Va. Mr. Gillie assumed his new duties May 1.

Ely G. Hutchinson, formerly editor of *Power* and more recently president of the Edge Moor Iron Co., has joined the staff of the J. G. White Engineering Corporation, New York City.

J. T. Kessinger has been appointed general manager of the Sheridan-Wyoming Coal Co., vice J. E. Lee, deceased. Mr. Kessinger has been with the company since its organization, in 1920. Other promotions announced by the company are: C. M. Schott, to become general superintendent of operations; Gotthard Bylund, treasurer.

Ralph E. Kirk, formerly safety engineer, Philadelphia & Reading Coal & Iron Co., has been appointed general superintendent of coal mines of the Tennessee Coal, Iron & Railroad Co., effective May 1, with headquarters at Pratt City, Ala.

Lacy Mitchell has been appointed foreman of the new mine of the Logan By-Products Coal Co., Shamrock, W. Va.

Arthur Roeder was renamed president of the Colorado Fuel & Iron Corporation at the first meeting of officers and directors following approval of a plan for reorganization. Other officers named are: W. A. Maxwell, Jr., Newell H. Orr and Thomas Athelius, vice-presidents; S. G. Pierson, vice-president and treasurer; D. C. McGraw, secretary.

John L. Steinbugler has retired as president and director of William C. Atwater & Co., with operations in West Virginia, and has been succeeded by William C. Atwater, Jr.

Charles E. Stuart has resigned as vice-president of the Export-Import Bank of Washington (D. C.) to resume his duties as president of the firm of Stuart, James & Cooke, Inc., engineers, New York.

Conley Wallace has been made assistant foreman at the Keystone mine of the Houston Collieries Co., Keystone, W. Va.

S. L. Watson, formerly section foreman, has been appointed a coal inspector for the Consolidation Coal Co., Fairmont, W. Va.

Institute Reorganized

The Alabama Mining Institute has been reorganized in accordance with recommendations made several months ago by a committee appointed for this purpose at the annual meeting in last December. The most important change is the election of I. W. Rouzer as full-time president. This change, it was decided, would make for more effective promotion of the interests of the institute, especially since Mr. Rouzer has no personal interests in the coal industry; for several years he was head of the Soil Pipe Manufacturers' Association. Mr. Rouzer assumed his new duties on May 1, succeeding A. S. Aldridge, resigned. Mr. Aldridge, who is vice-president of the Sloss Coal Co., was executive head of the institute for several years. The board of governors has approved the appointment of W. S. Lewis as traffic manager. James L. Davidson, executive secretary, and H. E. Mills, assistant secretary and statistician, who have served in these capacities for a long term of years, will continue in their posts.