COAL AGE

A McGRAW-HILL PUBLICATION—ESTABLISHED 1911

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

New York, April, 1931

VOLUME 36....NUMBER 4

New Life for Safety

A NEW ERA of intensive efforts toward accident-free operation of the coal mines is promised by the program approved at the conference of operators and federal and state mine departments held at Chicago last month by the safety committee of the National Coal Association. The implications which flow out of that meeting and the decisions there reached are so significant that it would be difficult to overestimate their importance.

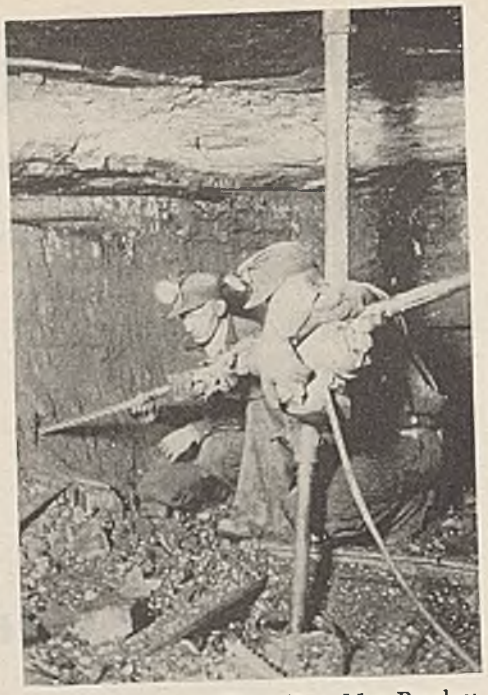
INDIVIDUALLY and in small groups, many coal operators who have been both shocked and angered by the blood-toll in coal mining have done and still are doing yeoman service to lower the accident record of the industry. But the present movement to organize every coal-producing district of the country for an unceasing safety campaign marks the first time that the bituminous producers have definitely pledged themselves as a national group to active co-ordinated support of such a program.

ONE of the best guarantees of success for the movement is the fact that every participant in the Chicago conference recognized and acknowledged that the campaign to be started would be neither short nor easy. The conferees approach their task as realists who will not falter in their labors because immediate results of their endeavors do not prove revolutionary.

ORGANIZATION of every district and of every producing company for safety—irrespective of membership in the National Coal Association, which is sponsoring the movement—is the objective of the campaign. Wisely and with a breadth of vision not always shown in trade association activities, the moving spirits in the bituminous operators' organization have seen and embraced an opportunity to render a paramount service to the industry as a whole without strings and without conditions save a real interest in the conservation of human life and limb.

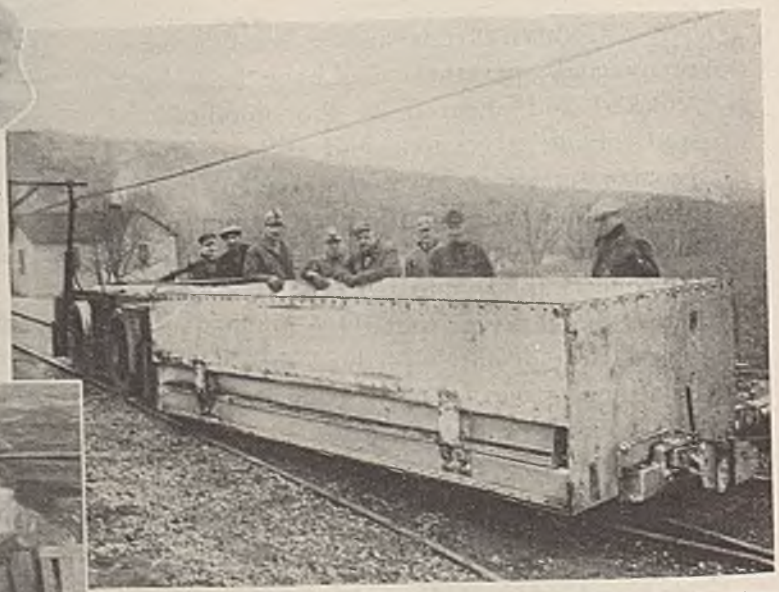
SUCH A PROGRAM offers common ground for every genuine worker in the safety field in coal mining. It gives head within the industry itself to all the scattered groups who have been toiling to eliminate injuries and death in coal production. Such a program, honestly followed, must inevitably mean better supervision and fewer accidents. The National Coal Association increases its stature in launching this movement.

Upper Left: Head End of Loader, Under Drawslate



These Two Men Bugdust, Drill, and Shoot Ten Room Cuts in a Shift

Bad Roof Demands Close Timbering; Four Rows of Posts in a Room 22 Ft. Wide



This Car Is of a Type New to Coal Mining; It Holds 5 Tons and Dumps to Either Side

One of the Storage-Battery Locomotives in a Room Neck; Note the Wide Radius of This Track Turnout

MACHINE LOADING

+ Meets Test in Ohio

Under Adverse Natural Conditions

By ALPHONSE F. BROSKY

Associate Editor, Coal Age

5 Feet of Coal
1 Foot of Drawslate
10 Rooms
17 Workers

300 Tons in 8 Hours

AT THEIR best, mining conditions in the Pittsburgh No. 8 seam as it occurs in eastern Ohio are far from ideal for mechanization. Yet, if the mines in this field are to continue operation into the future, mechanization must be given place. That, at least, is the feeling of the Wheeling & Lake Erie Coal Mining Co., which operates three mines in this seam and field, as a subsidiary of the Hanna Coal Co. It is the opinion of this company that the unmechanized mines will within a relatively few years be compelled to close down.

Acting on this conviction, mechanization units are gradually being introduced into these mines. Furthest advanced in this program of mechanization is the No. 9 mine, at Fairpoint, where the foundation was laid by the erection of a mechanical cleaning plant. Here have recently been installed, in the way of major underground equipment, three loading machines, three track-mounted cutting machines, and three storage-battery locomotives. In No. 6 mine, at Lafferty, there have been put into operation one loading machine and five track-mounted cutters, four of which for the time are being used in connection with hand loading, as also are three duplicate cutters in No. 1 mine. At Mine Nos. 6 and 9, incidentally, shaking conveyors have for several years been in successful operation for development work (*Coal Age*, Vol. 35, p. 226).

Experience with conveyors proved the feasibility of mechanization in the Pittsburgh No. 8 seam and emphasized the necessity for systematic thoroughness all along the line of operation. First material attention was given to loading machines last summer, when a three-month competitive test was conducted between two types most suited to the conditions. Time studies were made and careful records kept of performance and maintenance figures. A weighing of these and more general considerations led to the selection of the Myers-Whaley automatic coal-loading machine.

The first unit was installed at No. 9 in July, last year; the second and third were added this year. Installation of a fourth coal-loading machine and accessory equipment, solely for development work, is under consideration. This unit would round out the equipment needs for doubling in two shifts the day-shift production of the plant. For single-shift production, development work can be handled by the machines now confined to wide work, using them in narrow work on the second shift. Double-shifting production with only three machines would require triple-shifting to assure development. That procedure is thought inadvisable. What follows is largely confined to No. 9 mine.

The seam, which lies fairly level except for an occasional roll, in few places exceeds a thickness of 5 ft. The cover varies from 90 to 250 ft. in depth. Below the coal is a moderately soft fireclay and over the coal is a drawslate which rarely is less than 1 ft. thick and which must be taken down after every cut and, in room work, gobbed. Even then, the room openings must be closely timbered, for otherwise the next higher roof-rock series, consisting of 0 to 18 in. of roof coal and 6 to 8 ft. of soft shale, gives way. Directly above the latter occurs the Pittsburgh limestone, 18 to 30 ft. thick and massive in structure. At an interval of 15 to 20 ft. higher is a fractured low-grade limestone which is 12 to 15 ft. thick. Because of the cover characteristics — comparatively shallow depth and a hard massive limestone in combination with easily broken softer strata—pillar extraction is not feasible and recovery, consequently, does not exceed 60 per cent.

A new layout of workings, in which rooms are driven at an angle of 45 deg. to the entry, has been projected for all future mining. Thus far, however, only one loading unit, that in the 24-East section, has been given a thorough trial in this layout. The primary purpose of the plan is to facilitate the movement of rolling stock and machines in and out of the room. It also permits use of both the loading machine and the track-mounted cutter for mining room necks. Shearing, however, is not feasible in the first two cuts.

Room headings are on the double-entry system and are driven on the quarter; that is, at 45 deg. to the butt and face of the coal. As rooms are driven right and left, those on one side will be on the face and those on the other side will be on the butt. A triple-entry room layout is being

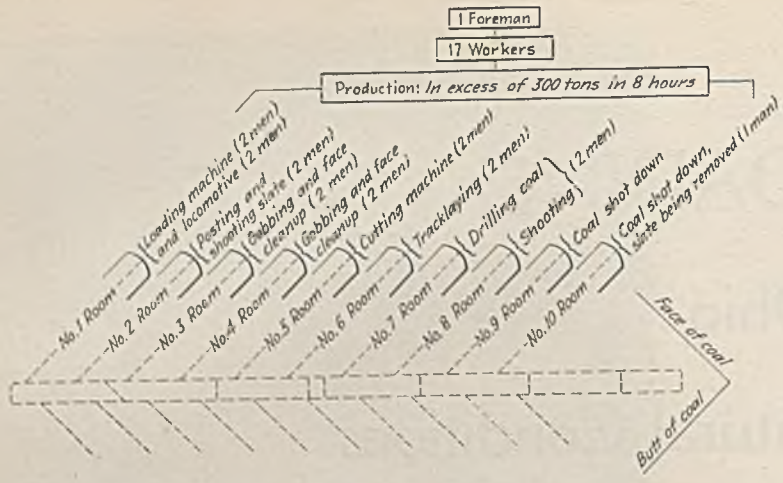


Fig. 1—Operating Cycle of Loading Unit in New Angular Layout

considered with a view to minimizing interference between haulage movements on the two sides. This arrangement naturally would increase the production efficiency of a loading machine on development work and, incidentally, improve ventilation.

Rooms are laid out in panels of ten. All ten rooms are advanced abreast; they are driven 22 ft. wide on 30-ft. centers, and 325 ft. deep. Between adjoining panels is left a room-block barrier, 38 ft. wide, which minimizes the tendency of the roof to ride, from the worked-out area to the panel being mined. The layout is so projected that the majority of room entries will accommodate at least five room panels on each side.

Operation of a loading unit is confined to one of these room panels. In that unit, besides the loading machine, are one 5½-ton Ironton storage-battery locomotive carrying 49 cells of 27-plate Exide batteries, one Oldroyd (track-mounted) cutting machine, and one post-mounted Chicago Pneumatic "Little Giant" drill, which, with other drilling and blasting accessories, is carried on a hand-propelled truck. The crew on a loading unit is composed of 18 men, including one panel foreman. In Fig. 1 is indicated the cycle of operation within the panel, the ten places being worked consecutively.

Time studies were made in arriving at the general arrangement and refined aspects of this plan. They were made not haphazardly but in conformance with the accuracy and following the principles and practice of industrial engineering. Direct changes made by the operating department, together with those suggested by these detailed studies, have succeeded in reducing the number of men on a loading unit from the original crew of 23 to the present crew of 17, exclusive of supervision in each case. In Table I are given the summary results of these studies.

During the three-month test period, the loading machine type now in use worked in a section of 16 rooms. Studies showed that this machine loaded coal in any one room, roughly, every other day. With avoidable delays at 18.7 per cent, the machine averaged 136 cars, or 283 tons, per shift during a period of two weeks. The basic report states that "if the operating time of the loader would be increased to 90 per cent (allowing 10 per cent for fatigue and unavoidable delays), on this basis the production would be 153 cars, or 318 tons, per shift—the yield from nine cuts." Standard times established for the derivation of this schedule were: Tram, 7.10 minutes; load car, 1.18 minutes; change car, 1.25 minutes; total time for unavoidable delays and fatigue, 4.84 minutes. The schedule is built on the taking of 17 2-ton cars of coal from a place. However, with the one hand-loaded car in the clean-up many cuts yield 20 or more cars. There have been days when the first-installed machine met and even exceeded this tonnage schedule.

Time studies of the cutting-machine operation showed that the machine should cut 12.8 places, or 454 tons, in eight hours, which is 42 per cent more than the rate established for the loading machine. Standard times per cut used in arriving at this schedule were: Tram, 5.3 minutes; change bits, 4.2 minutes; prepare to cut, 1.8 minutes; cut, 14.8 minutes; prepare to shear, 1.3 minutes; and shear, 4.5 minutes. With an allowance of 3.2 minutes for unavoidable delays and fatigue (10 per cent), the total time per cut was 35.1 minutes. An allowance of 30 minutes per shift was made for oiling and otherwise inspecting and adjusting the machine. In actual practice the eleven track-mounted cutting machines in the three mines of this company are cutting and shearing an average of 350 to 375 tons each in eight hours.

It was determined by time study that a coal drilling crew should work 10.1 places, blasting 357 tons in eight hours, bugdusting as well as performing all the other duties incident to shooting. The time for putting in each of four holes was set at 2.4 minutes (average of long and short holes, about 7½ ft. per unit). Total elapsed time was fixed at 43.3 minutes, including tramming, with a 10 per cent delay and fatigue allowance. Actual working time of the crew was found to be 80 per cent.

Studies showed that of all crews the track layers actually had in practice made the nearest approach to the standard subsequently set, their working time being 88.5 per cent. At 90 per cent, it was determined the crew should lay 10.2 cuts, equivalent to 361 tons, in eight hours, including time for traveling and for digging bottom, a job which theretofore employed an extra man. For the cutting operation, the track ends 9 ft. from the face; for loading, it must be extended to the cut.

Table I—A Consolidation of Time Studies Which Indicated the Present Working Plan

Operation	Time per Unit*	No. Units (in 8 hours)	Men per Crew
Loading Machine and Battery Locomotive	53.2 min.	9 cuts–318 tons	2 2 2
Cutting Machine	35.1 min.	12.8 cuts–454 tons	2
Drilling and Shooting (coal)	95.2 man-min.	10.1 cuts–357 tons	2
Track	94.8 man-min.	10.2 cuts–361 tons	2
Drilling slate and Posting	101.3 man-min.	9.5 cuts–336 tons	2
Gobbing Slate	252.7 man-min.	9.5 cuts–336 tons	5
Supervision	.....	.....	1
Total	.....	.....	18

*Unit of production is one 8½-ft. cut in a 22 ft. wide room.

Individual studies of slate drilling (two men) and timbering (one man) resulted in a consolidation of the two jobs and the elimination of one man. It was found that the slate drillers spent 135.8 minutes and the timber man 23.6 minutes unproductively walking the territory.

Gobbing of drawslate is the highest deadwork item of cost in the operation. Study showed that a round-numbered crew must be composed of five men. To conform with the standard set for their job, they must in eight hours gob 9.5 full cuts of slate, clean up what coal is left in a place by the loading machine—usually one carful or less—and remove

that slate which comes down in the blasting of coal. The total time per cut, 252.7 man-minutes, allows 4 man-minutes for walking between places, 15.3 for taking down slate, 165 for gobbing, 50 for cleaning up last of coal, and 18.4 for unavoidable delays and fatigue.

Loading into 2-ton mine cars, the first installed machine, which is working in the new layout, is now producing close to a base of 300 tons per shift; sometimes appreciably more, sometimes less. In the first 151 shifts the machine averaged 269.47 tons per start. This includes production during a period of double-shifting and takes into account below-average production while the machine was being used in development work and while the crew was being trained. Performance data for this machine covering a recent period appear in Table II.

A 300-ton per shift production rate is not considered an established base beyond which improvement is not to be expected; neither is the 318-ton base set up by time studies covering present operation and given in earlier paragraphs. Such bases are looked upon as "floating bogies," to be elevated from time to time as avoidable delays are reduced and general efficiency is bettered, without, however, overexerting the crew or neglecting safety.

Future plans call for replacement of the 2-ton mine car now in use by larger cars; in fact, two 5-ton cars of a new type have been installed for test purposes in a determination of the ultimate transportation plan. A larger car undoubtedly will add an appreciable increment to the productivity of the loading machine. Further improvement can be expected from the minimizing of avoidable delays. With steadier and more gainful operation, the time allowance for fatigue may be reduced somewhat, even though productivity is increased. These improvements combined would reflect a material increase in the tonnage from even the best functioning machine unit, and on that basis a production in excess of 400 tons per machine shift is expected. At this rate, four machine units, one on development work, would meet a production schedule of 1,360 tons in eight hours, which is the capacity of the preparation plant.

The second loading machine installed in January of this year, is being double-shifted in the 17-West section. This territory was developed before the new angular layout was adopted, and the rooms, consequently, are at right angles to the entry. In the first 33½ shifts, this machine produced 7,508 tons, or an average of 224 tons per start. It is attended by a standard crew of seventeen men and a boss on the day shift only. At night the crew is composed of only ten workers with the part-time supervision of a foreman. The reason for this is that the desired additional tonnage over and above that produced by the day shift is limited, as also is the supply of empties. If and when this crew runs short of empties, it spends the remainder of the shift at odd jobs in the section.

The company has had some experience with double-shifting but not on a regularized basis, what with curtailed production demand in recent months and the necessity of adjusting the operation as to both methods and equipment. As soon as additional production is required the mine will go back to double-shifting. That this is the plan is evidenced by the fact that the storage-battery locomotives have each been provided with two trays of battery.

So laborious and expensive is the handling of rock, that the company is bending every effort to mechanize it, as are other operators using machines under similar conditions. At this mine, experiments are being conducted with the Whamond loader toward solution of this problem, which is made doubly difficult for the reason that rooms are closely timbered. On each side of the track are two rows, 18 in. apart, in which timbers are set on 4-ft. centers. These are split props, with a cross-sectional area of 24 to 36 sq.in. Approximately 75 per cent of the sound props are recovered and used over again.

(Turn to page 187)

In Position for Undercutting. This Machine, of the Track-Mounted Type, Is Equipped With a Special Chain. Note the Core Breaker. Chain Was Under Test When Photograph Was Taken

Table II—Productivity of Men and Machines of One Loading Unit in New Layout During Two Pay Periods

Month	Day	Cars	Tons	Man Hours of Crew per Shift								Tons per Man-hour	8-hour prod. rate on basis of 8x17 or 136 man-hours	Actual prod. on basis of 8-hr. Load. mch. operation
				Loading Mch. (2 men)	Locomotive (2 men)	Cutting Mch. (2 men)	Drilling and Shooting (2 men)	Track (2 men)	Timbering (2 men)	Handling Slate (cleanup) 5 men	Total (17 men)			
Feb.....	16	184	362.45	20	20	16	20	18	20	49	163	2.22	302	290
	19	132	261.40	18	18	16	16	18	18	45	149	1.75	274	235
	20	185	363.70	18	18	16	20	16	18	46	152	2.39	325	328
	23	146	293.20	18	18	12	16	16	18	44	142	2.06	281	264
	26	142	295.70	18	18	16	16	16	17	40	141	2.10	286	266
	28	172	337.95	18	18	16	16	16	18	43	145	2.33	316	304
Mar.....	2	174	347.85	18	18	16	16	16	18	51	153	2.26	308	312
	4	184	368.15	20	20	16	16	16	19	45	152	2.40	326	294
	6	149	296.25	18	18	20	19	14	18	42	149	1.99	271	266
	7	173	337.85	20	20	16	18	16	20	45	155	2.18	296	271
	9	184	356.90	20	20	16	16	16	16	48	152	2.35	320	286
	10	158	302.65	20	20	16	18	16	16	40	146	2.06	280	242
	12	149	288.30	18	18	16	16	16	16	40	140	2.06	280	259
	13	183	352.90	18	18	18	18	16	18	44	150	2.36	321	318
Total....	14	2315	4565.25	262	262	226	241	226	250	622	2089	.....	...	...
Av.....	..	165.4	326.09	18.71	18.71	16.14	17.21	16.14	17.86	44.43	149.21	2.18	298	279

FIRST COST LAST

+ To Receive Consideration

In Equipping New Mayflower Plant

Main Shaker in Action

ON OCT. 1, 1930, the Blue Diamond Coal Co. started production from its million-dollar Mayflower mine, in Little Black Mountain at Bonny Blue, Lee County, Va. The project added a 2,000-ton mine to the group of seven having a combined daily capacity of 10,000 tons, which the company, organized in 1915, has been operating in Kentucky, Tennessee, and Virginia. Carrying the coal with minimum breakage 3,200 ft. down the mountain to an elevation 1,200 ft. below the car dump—the outstanding problem in designing the plant—is effected by a combination belt and rope-and-button conveyor system the layout of which was based on an inquiry covering many conveyor installations. The whole plant is the result of extensive effort to obtain the last word in coal-handling efficiency and operating economy.

The mine is in an area of the No. 12 seam which averages 50 in. in thickness and lies 400 ft. above the No. 10 seam, in which the company operates its Bonny Blue mine, using monitors for the mountainside haulage. The new Mayflower tipple is less than half a mile from the Bonny Blue. Both are served by the Southern and Louisville & Nashville railroads. The town is close to the Virginia-Kentucky line and much of the coal lies in Harlan County, Kentucky.

Greater thickness (60 in.) was the principal reason for the No. 10 seam being opened first (1923). This No. 10 coal was fairly well known and was rather thoroughly prospected. When, in recent years, the sales department desired to add another premium coal to its offerings, an investigation showed that it would be more economical to open the No. 12 high splint seam, above the Bonny Blue mine, than to go out and obtain a new coal property. Local overhead would be reduced by serving both mines from one operating office and from one company village.

The No. 12 is a high-grade domestic coal. It is very hard and it blocks quite large. The latter characteristic had to be considered in the design of much of the equipment. Because the seam lies on a 2-per cent grade against the loads if opened where the line of the conveyor system intersects the outcrop, the haulage portal was located at a low point 4,500 ft. distant as measured along an outside haulway. The inside projection is favorable to haulage and drainage. The outside tramroad is graded for double track and the entire grade is 1 per cent in favor of the loads. Sixty-pound steel is used and the track gage is 48 in. At a point near the center of its length the tramroad crosses the ridge into Kentucky through a rock tunnel 200 ft. long that is protected with steel sets.

For mine haulage, drop-bottom cars were selected. It is significant that the company has had extensive experience with this general type at two of its mines. The present equipment consists of 200 all-steel cars of American Car & Foundry manufacture. They stand 27 in. above the rail, are averaging 3½ tons hand loaded, and are equipped with Timken roller bearings. Mining methods other than hand loading were not considered in selecting cars and in designing other coal-handling equipment.

The first move toward selecting the method of lowering coal down the mountain was to obtain information as to monitor and conveyor systems generally over the country. This in-

formation together with the company's own experience with both systems indicated that a favorably designed conveyor would add 5 to 9 per cent to the yield of prepared sizes as compared to the monitor system. This and a preliminary estimate of costs brought an early decision in favor of the conveyors.

Considering contour and distances, it was apparent that the combination to consider was a rope-and-button conveyor for the steepest section and a belt conveyor for a length adjacent to the tipple. From operators, engineers, and designers information was collected as to practical lengths and pitches. From these data it was concluded that the rope-and-button conveyor preferably should not be over 31 deg. or under 22 deg. and that the belt conveyor should not have a pitch of over 16 deg. The rope-and-button conveyor would have to be constructed in two sections of approximately 1,000 ft. each and the rest of the haul could be one length of belt conveyor.

Contours were run over the entire side of the mountain and after numerous trials a location was established using at the top a rope-and-button conveyor 930 ft. long between centers and with a pitch of 24 deg. minimum and 31 deg. maximum, next a rope-and-button conveyor 970 ft. between centers on a 26-deg. pitch, and at the bottom a belt conveyor 1,315 ft. between centers on a pitch of 14 deg. 42 min. for the first 995 ft., and then on a level for 160 ft. with a 500-ft. radius concave vertical curve section of 160 ft. between.

The upper section of button conveyor has a convex vertical curve of 2,000-ft. radius and the next section a concave vertical curve of 2,750-ft. radius. Pitches for the button conveyors are almost ideal. Ordinarily the coal flows so as to overhaul the motors and regenerate a small amount of power. At their transfer point, the button conveyors meet at a horizontal angle of 4 deg. 57 min. and the lower button conveyor transfers to the belt at a horizontal angle of 14 deg. 20 min. The belt enters the tipple at a horizontal angle of 45 deg. Considering the ruggedness of the mountainside, the location required a relatively small amount of grading and high trestle work.

Three principal contractors built the plant. A 300-ton bin and dump trestle at the top was built by the Champion Bridge Co., Wilmington, Ohio; the two button conveyors and the tipple by the Fairmont Mining Machinery Co., Fairmont, W. Va.; and the belt conveyor by Stephens-Adamson Manufacturing Co., Aurora, Ill.

Transfer from one button conveyor to the other is effected by a shaker chute divided to carry the coal by the rope sprockets and deposit it without drop in the trough of the lower unit. The shaker chute is driven by a flat belt from an intermediate shaft of the drive of the lower button conveyor. Transfer from this latter unit to the belt conveyor is by direct stationary chute.

Rope-and-button conveyors use a 4-ft. button spacing, operate at 80 ft. per minute, and are equipped with 1¼-in. Roebling blue-center 6x19 rope of alternate regular and Lang lay with independent steel center. The Fairmont patent self-adjusting head sheaves are used on both conveyors.

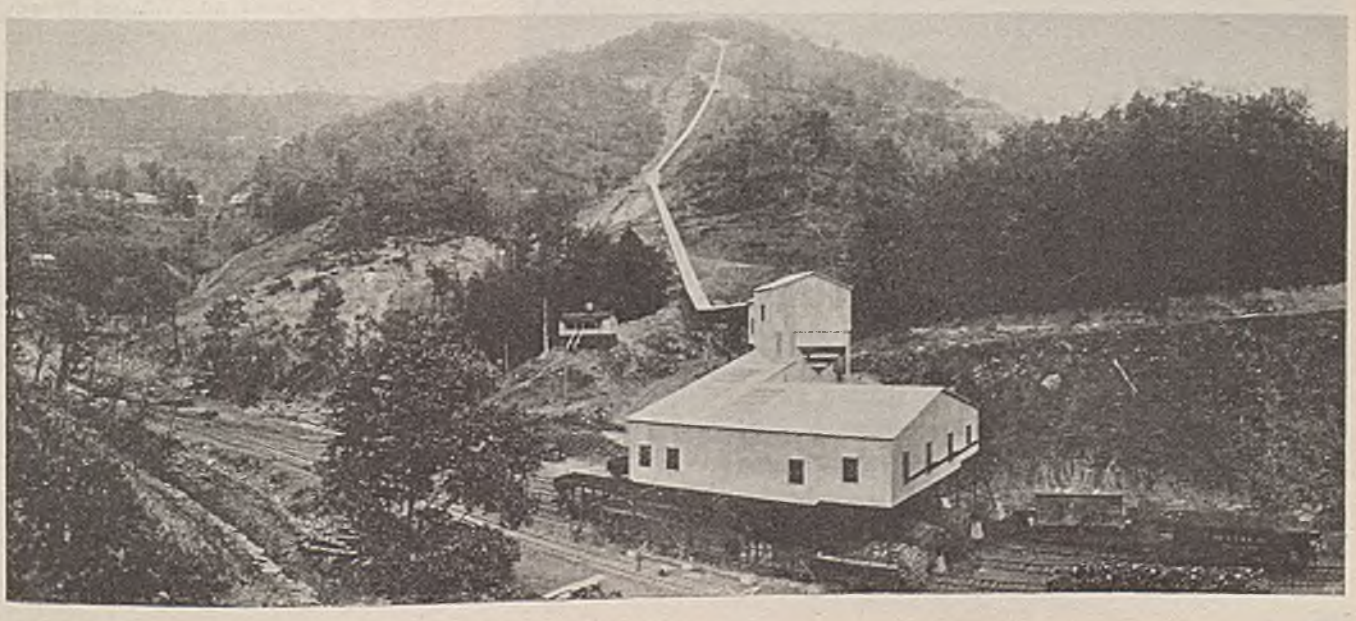
The belt is a 9-ply Goodyear. It is 48 in. wide and weighs approximately 22 tons. The idlers are equipped with Timken bearings. This belt width is greater than necessary to handle the rating of 300 tons per hour; it was determined by the size of lumps that might have to be handled rather than by capacity. The operating speed is 275 ft. per minute.

Objects of attainment in tipple design were as follows: Provision for hand picking all sizes except slack (which can be mined with an acceptable ash content); efficient screening; provision for making any size or for remixing; handling with minimum breakage; and a storage bin between the main conveyor and shaker screen to make it convenient to empty the conveyors at night and eliminate starting and stopping of the entire conveyor system when making car changes and when slight tipple delays occur; and to make it possible to finish the loading of railroad cars without restarting the main conveyors.

Emptying the main conveyors at night is desirable from several standpoints; to prevent hard starting by reason of wet coal being frozen in the button trough; to relieve the belt of injurious steady strains that would be imposed standing idle under load; and to make it possible to operate any one of the three conveyors separately for inspection or minor adjustments.

The problem of using a storage bin without introducing insufferable breakage was solved by installing a typical loading boom between the belt discharge and the bottom of the bin. As the bin fills or empties, an operative raises or lowers the end of the

Panoramic View of the Mayflower Surface Plant; Conveyors Lower the Coal Nearly Three-Quarters of a Mile



boom to suit the coal level. The amount of coal in transit in the three conveyors is 145 tons, and the tipple bin capacity is 75 tons.

The tipple is an all-steel-and-concrete structure. Conveyor galleries, transfer houses, and bin at top (excepting for a wood floor over this bin) also are all-steel-and-concrete. There are four loading tracks, three equipped with apron-type booms and one with slack loading chute. Across the downgrade side of the tipple there is a scraper-type mixing conveyor into which the booms can be discharged when raised to the limit, and above the three boom tracks there are telescoping chutes for loading mixed grades. The main shaker is 7 ft. wide, is equipped with a lip screen, and has a wide nose which, in combination with a sloping end of the lump conveyor, distributes the coal evenly across the picking table with a minimum drop.

Loading Booms Are Hung Direct From Hoists Without Counterweights

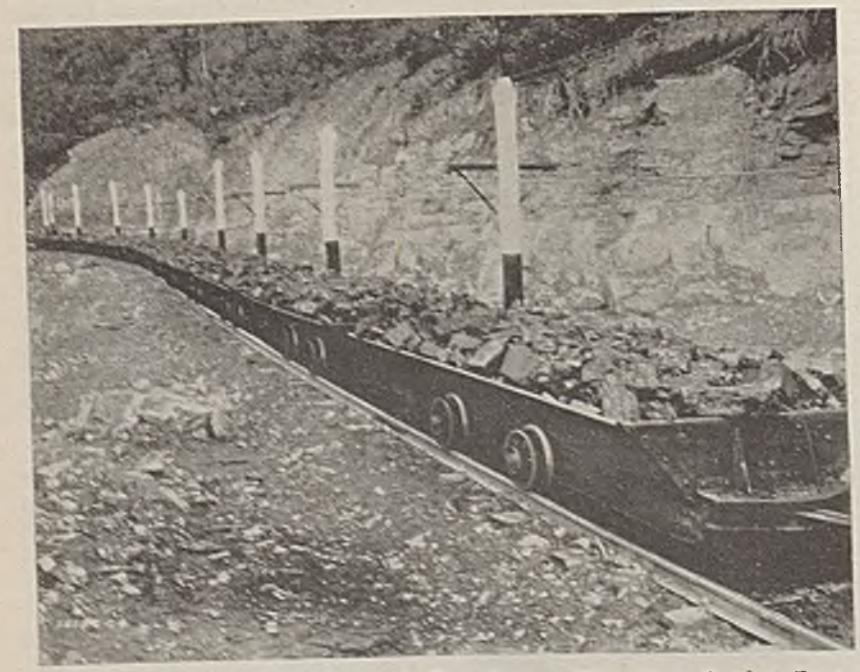
Loading booms are without counterweights and are suspended at the ends from the centers of bridle bars. The hoists are Robins & Myers 3-ton, equipped with 3-hp. motors and with torque motor brake and controller actuation. The boom in the storage bin is wider and must handle a heavier load of coal than the loading booms, so is equipped with 5-ton hoist of the same type, but driven by an 8-hp. motor.

Drive equipment for the conveyors and tipple consists of seventeen 220-volt a.c. motors ranging from 3 to 60 hp. and totaling 267 hp. V-belts are used on the 40- and 50-hp. motors of the two button conveyors, gear reducers on the 60-hp. belt conveyor, also on the two reciprocating feeders, egg, and nut booms, and refuse conveyor. Flat belts connect the motors to the bin filling boom, lump loading boom, and shaker screen. The flat belt, instead of a reduction gear, is used on the lump boom and the bin boom to provide a point of slippage in case a large lump should bind and stop the conveyor. The three motors of the main conveyors are the slip-ring type, but the others, except the boom hoist motors, are the FTR double-wound type.

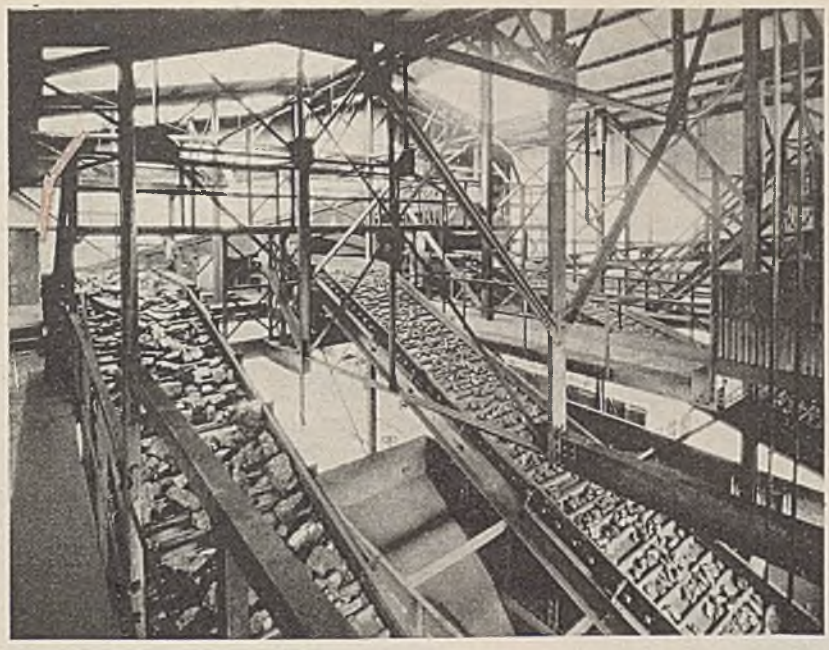
Reduction Gear Motor Drive of the 1,315-Ft. Belt Conveyor; 60-Hp. Motor

Because the button conveyors are close to the ideal pitch and excessive braking should not be necessary, the only brakes are those of solenoid type on the motor shafts. When the loads overhaul the motors, the latter act as governors and brakes by regenerating power to the line. The solenoid brakes set only when line voltage fails or when the motors are stopped intentionally. Experience to date has demonstrated that the coal flows easier in the button conveyors than was expected and that precaution must be taken to adjust the motors on their sliding bases so as to keep the V-belt drives tight enough to prevent slippage and resultant overspeeding of the conveyors.

Approximately 700 tons of steel and 400 tons of concrete materials were used in building the plant. The tipple proper contains about 100 tons, the belt conveyor 200 tons, the two button conveyors and transfer houses 250 tons, and the bin at top, together with three trestles of a man-and-



Trip of All-Steel, 3-Ton, Automatic-Drop-Bottom Mine Cars Coming From the Mayflower Mine



Shaker Screen Appears in the Background

material incline, 150 tons. In the design of the steel structures for the conveyor galleries expansion joints were provided about every 300 ft.

The total cost of main conveyors including grading and masonry was approximately $175,000. It is estimated that a monitor system could have been installed for $75,000 to $100,000. The bin and dump trestle at the top cost approximately $17,000 and the tipple, including grading and masonry, approximately $70,000.

Comparisons with the 3,500-ft. monitor system in use at the adjacent 3,000-ton Bonny Blue mine indicate an operating cost advantage for the conveyor system. Four men operate the conveyors. One is stationed in the drive house at the top, one in each of the two transfer houses, and one at the end of the belt above the tipple bin. The principal duty of the latter is to raise and lower the boom which delivers into the bin, so perhaps only three men should be charged against the conveyor operation, including ordinary inspection, oiling, and maintenance. Three operatives and an average of four track men are required with the monitor system, which consists of 20-ton monitors operating on a three-rail incline road equipped with numerous rollers. Monitor rope renewal cost averages $3,000 per year.

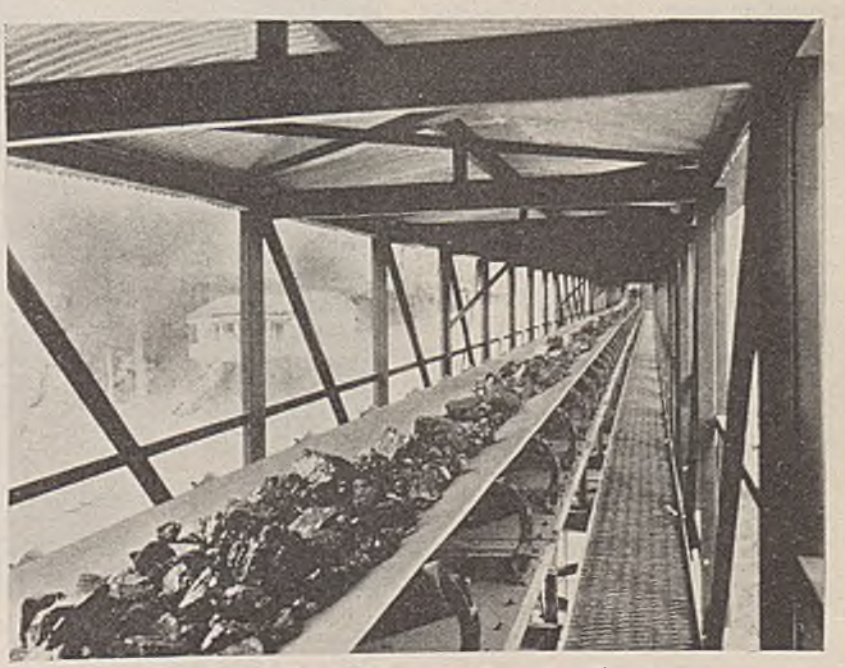
Sequence control could be applied to the magnetic controllers of the conveyors to eliminate the operatives, but it is not considered advisable to allow equipment of such cost to operate unobserved, and at least one of the men would have to be retained for greasing and inspection. At present, each conveyor can be started only by the man stationed at the drive, but in an emergency all equipment can be stopped from the tipple and from each drive station. The operatives start and stop the conveyors by electric signals originating from the top of the hill and from the tipple.

One of Two Shaker Chutes That Bypass Coal Around Sides of Rope-and-Button Sheaves

With the exception of 200 ft. of 2-in. rigid conduit used for main-line entrances, flexible armored BX cables are used for all wiring. Signal and power wiring paralleling the conveyor is on poles. In the power wiring of the tipple the following quantities of three-wire BX cable were used: 600 ft. No. 6; 900 ft. No. 10; and 900 ft. No. 12. The control and lighting in the tipple required 600 ft. of two-wire No. 12. The labor and material using BX cable amounted to approximately 65 per cent of the estimated cost of a rigid-conduit job. In the tipple power wiring, fuses are used only with the main safety switch. Overload relays of magnetic controllers are the only protection for the individual motors.

Preliminary tests indicate that the belt conveyor regenerates about 50 hp. and that the two rope-and-button conveyors regenerate a total of 50 hp. During the handling of 14,000 tons the net power required to operate the belt conveyor and tipple was but 1,100 kw.-hr. To operate a man-and-material incline hoist equipped with a 150-hp. motor and the two rope-and-button conveyors required a net of but 5,400 kw.-hr.

When construction work now under way is completed, Mayflower mine



Conveyor Gallery at Mayflower Operation, Showing Steel Construction and Subway Flooring

can boast of one of the most elaborate systems at any coal mine in the country for handling men and materials. A second track is being laid on the construction incline, which parallels the conveyor system for over half its length. The man-and-material incline near by at Bonny Blue Mine will be abandoned and the new incline will handle men and material for both mines.

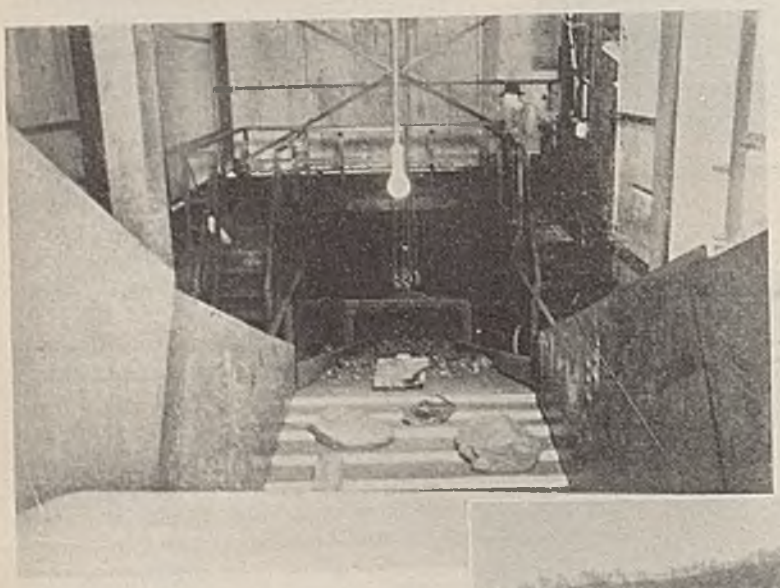
The present single-drum 150-hp. hoist is being replaced by a new Lidgerwood traction hoist equipped with two 150-hp. motors, one for regular operation and one to serve as a spare. By the installation of two reduction gears, one of 20/142-tooth ratio and the other of 40/122-tooth ratio, and two jaw clutches, either motor can be used to drive the hoist for either a 350-f.p.m. rope speed for hoisting materials or for a 700-f.p.m. rope speed for hauling men. Two 60-man capacity cars will be operated in balance, and likewise two material cars when the man cars have been uncoupled and stored on spurs. The ropes will spool around two drums in tandem, one a drive drum and the other an idler. By regeneration the driving motor will act as a governor and as an operating brake if lowering a load causes overhauling. Lilly control in conjunction with drum brakes will provide against overspeed. For safety there will be two 1-in. ropes attached to each car, either one having an ample factor of safety to carry the load. The track is 3,750 ft. long and at one point it is on a 76-per cent grade. The man cars will be canopy covered and will have several rails arranged crosswise for the men to hold to or lean against as they stand.

Before opening the Mayflower mine the company had 250 houses at Bonny Blue. By the end of last year, in connection with the new development 150 more have been built, and the program for 1931 calls for construction of 200. The 150 new houses are of the single-family, four, five or six room, plastered type, underpinned, and having concealed electric wiring. The painting is stone gray with cream trim. Homes for the mine officials are equipped with bath and running water. An amusement building of brick construction was added to the group of town buildings. This and the 150 houses were built on contract by the R. H. Hamill Co., of Huntington, W. Va. Near the foot of the new incline there is now under construction a bath house to be equipped to accommodate 500 men.

Mining equipment purchased and delivered to Jan. 1, 1931, exclusive of the cars already mentioned, consists of one Jeffrey 15-ton haulage locomotive, four Jeffrey 6-ton cable reel gathering locomotives, three Goodman track-mounted bottom cutting machines, and two Jeffrey A—1½ electric coal drills. The 15-ton locomotive is equipped with hand control except that two magnetic switches break the arcs that would otherwise have to be broken in the drum controller. In a brick building providing room for two units and located beside the tramroad near the mine opening is a new 200-kw. synchronous converter with full-automatic control.

Up to the beginning of this year, all work in the new mine had been confined to development, and no rooms had been driven. To assure successful working of the mine, pillars are not being taken in the seam below. Production was 600 tons per day and it is the expectation to be producing the rated 2,000 tons by May 1, 1931. Approximately $800,000 has been expended to date on the Mayflower mine.

Officials who have been especially active in planning, designing, and building the new plant are: Alex Bonnyman, chairman of the board, Knoxville, Tenn.; James Bonnyman, president, Cincinnati, Ohio; W. H. Sienknecht, vice-president in charge of operation, and D. L. Lindamood, chief engineer, both of Middlesboro, Ky.; Smith Williams, general superintendent, Bonny Blue; and W. J. Greene, construction engineer, also of Bonny Blue.



Adjustable Filling Boom in the Tipple Storage Bin—Viewed From the Main Conveyor Belt at a Point Close to the Discharge

1,200 Ft. Difference in Elevation Between Mine Track and Railroad; Skylights in Tipple Roof Are Above Main Screen and Picking Tables

UNDERGROUND PROBLEMS

Dominate Fairmont Meeting

Of Coal Division of A.I.M.E.

"MACHINE loading is increasing at such a rapid rate that it is not out of place to examine those general reasons which are responsible for the change," said C. C. Hagenbuch, mining engineer, Consolidation Coal Co., at the meeting of the Coal Division of the American Institute of Mining and Metallurgical Engineers, held at Fairmont, W. Va., March 26-27. Profitable installation of mechanical loading equipment is possible where existing hand-loading contract rates prevent further cost reduction; where coal is so low that either top or bottom must be removed to place cars in rooms; when labor shortage or limited house capacity prevents the production of the required tonnage; where tonnage requirements are in excess of possible hand-loaded production from developed areas; where working places are scattered and it is possible to concentrate production, and therefore supervision, by the installation of mechanical equipment; and when rapid development is essential.

"In any given case," Mr. Hagenbuch observed, "having admitted the applicability of one, two, or more of the foregoing basic points, the problem then arises as to which type of loading equipment is best adapted for a particular mine or coal bed." The choice lies between mobile track equipment, pit-car loaders, scrapers, shaker conveyors, belt conveyors, and drag conveyors. Before determining the type of equipment to be used, the following twenty major factors should be studied:

1. Grades.
2. Thickness of bed.
3. Nature of pavement.
4. Nature of roof.
5. Mining systems.
6. Gaseous or non-gaseous mines.
7. Amount of fine dust which may be stirred into suspension.
8. Impurity bands.
9. Effect on size of product.
10. Impurity extraction at the face.
11. Structure of the coal.
12. Size of mine car.
13. Cutting machines available.
14. Maintenance cost.
15. Effect of breakdowns on output.
16. Rate of advancement possible.
17. Tonnage increase per man.
18. Possible reduction in loading rates.
19. Organization.
20. Cost credits and debits.

Grades, observed Mr. Hagenbuch, while allowing other types to operate, may prevent the use of shaker conveyors. Thickness of coal will limit the choice of machines if top or bottom is not to be removed. Soft or scaly bottoms work against the use of any type of digging loader, scraper loaders, and shaker conveyors. Drives for the latter frequently work loose under such conditions. To obtain maximum tonnage per move per set-up, either a wide or deep cut, or a combination of both, must be provided. If the nature of the roof is such as to require excessive support, cost of timber, labor, and delays will reduce the possible saving.

It is extremely improbable, Mr. Hagenbuch asserted, that a mining system that has proved satisfactory with hand-loading can be used with machine-loading without change. After roof, bottom, and rib action has been ascertained by hand-loading, it is then advisable to consider a loading machine that possesses adaptability to a system closely related to the hand-loading system.

High Spots at Fairmont

Mechanization—Twenty points to be considered before buying mechanical loading equipment; C. C. Hagenbuch, p. 179.

Transportation—Possibly 50 to 75 per cent of West Virginia mines suffer from shortage of mine cars, says D. L. McElroy; cars in use determine mine performance; see p. 182.

Measuring a Mine—Operations should be balanced so as to equal limiting factor that will not allow of revision; N. A. Elmslie, p. 181.

Coal Recovery—Pennsylvania and West Virginia reduce losses since 1921 by more efficient operation and installation of preparation plants; James D. Sisler, p. 180.

Organization—Facilitating contact between division personnel and mine operating force at Consolidation mines described by A. R. Matthews on p. 181.

Mining Methods—Extraction of the Pittsburgh seam in the Scotts Run region of West Virginia without destroying the overlying Sewickley coal; S. D. Brady, Jr., p. 181.

Pittsburgh Seam—Roof requires careful timbering in northern West Virginia; Lee M. Morris, p. 182.

An impurity band close to the bottom of the bed may, if not too hard, be cut out by a shortwall or longwall mining machine, and the coal loaded by either a mobile or immobile loading machine. If the impurity band is high, however, and must be removed by cutting, then it is advisable to use track-cutting machines and mobile loaders. Where size of finished product is important, careful consideration of the amount of handling should precede selection of a loading machine. If the coal contains impurities that cannot be removed by the mining machine, it is necessary that the men at the face have an opportunity to remove them, which is not offered by those machines which "shovel their own coal."

When conveyors and scrapers are used, size of mine car is not of paramount importance, as cars are spotted at the loading point in trips and car changes are made without interrupting loading. When pit-car loaders or track-loading equipment are considered, car-changing becomes of prime importance. It is quite evident in this case that a large car will reduce changing losses materially. Usually, loading equipment is installed without changing the type of cutting machines. With bottom-cutting machines, which can be operated off the track, there is no restriction on the type of loading equipment. If only track-cutting machines are available, however, conveyors and scrapers should not be selected.

Maintenance probably is the most important item affecting the cost-saving possibilities of loading machines, said Mr. Hagenbuch, and data should be collected relative to the upkeep costs of the various types under similar mining conditions before equipment is selected. Effects of breakdowns on production also should be considered. Examination of the advantages and disadvantages may govern the choice of one large production machine, or several with smaller outputs. When mechanical loading is adopted for rapid development, a machine should be selected that will give maximum advancement in a narrow place.

It is almost invariably true, Mr. Hagenbuch remarked, that mechanical loading installations are considered with an eye to increasing the tonnage per loader. Therefore, the possible percentage increase of machine-loaded tonnage over hand-loaded tonnage should be considered for the various types before a selection is made. An increased output will permit reductions in the loading scale, and such possible reductions should be investigated, together with the method of payment; whether day rate, straight contract, or contract and bonus.

"Before selecting the type of mechanical loading machine," said Mr. Hagenbuch, "a clear idea should be had of just where cost savings may be expected and of where additional expense may be incurred." The principal savings which may be expected are: decreased loading wage, due to increased tonnage per man; decreased gathering cost, as a result of spotting cars in trips; saving in yardage where low heights prevent placing cars in rooms without brushing; savings in material and labor by the elimination of switches and track where scrapers and conveyors are used; savings in gathering haulage, main-line haulage, and rock-disposal where brushing is eliminated; savings in track, wire, drainage, and ventilation resulting from concentration of production in a smaller area; savings in timber and ties resulting from the fact that quick extraction eliminates replacements; savings in supervision and maintenance, due to concentration; reductions in capital expenditures for housing facilities, resulting from increased tonnage per worker; and increased sales in times of good market, due to ability to increase tonnage quicker than with hand-loading.

Against the savings just enumerated, the following debits against mechanical-loading equipment must be considered: increased power cost; increased depreciation; added maintenance cost of machines; cost of moving and setting up conveyors and scraper-loaders; increased cost of tipple picking where coal cannot be cleaned at the face; and, under certain conditions, increase in timber.

Coal Losses Lower Since 1922

LOSSES of coal in Pennsylvania and West Virginia have decreased from the totals determined by the U. S. Coal Commission in 1922, while those in Ohio are unchanged after nine years of operation, declared James D. Sisler, State Geologist of West Virginia, Morgantown, W. Va. The Commission had forecast little change in Ohio recovery, except in the Belmont district; gradual improvement in Pennsylvania; and rapid increase in West Virginia.

In discussing the changes since 1922, Mr. Sisler was of the opinion that the development of the mechanical stoker and of pulverized fuel equipment has increased the sale of slack coal, for which there was little demand before the war. Consequently, fine coal is sent to the market instead of being thrown out on the dump, thus increasing the recovery. On the other hand, consumers now demand a better coal. When competition is severe, inferior coal is left in the mines, and will ultimately be abandoned in the absence of some unnatural market stimulation.

Adequate systems of mining, proper planning of operations, and reductions in costs, particularly by the larger companies, have resulted in a decrease in avoidable losses, Mr. Sisler continued. This decrease has been more rapid in Pennsylvania and West Virginia than in Ohio. However, the gain in recovery by the employment of efficient operating methods is offset by losses resulting from irregularity of operation caused by the more pronounced seasonal character of the markets.

Installation of preparation equipment is resulting in a better recovery in Pennsylvania and West Virginia. Coal which formerly was discarded because of the shortcomings of hand-cleaning now goes to the market, and the percentage of recovery will increase as more plants are put in operation.

Mr. Sisler remarked that the 1.5 per cent decrease in avoidable losses in Pennsylvania was largely due to consolidation of numerous large mines and to more efficient operating policies. Unavoidable losses in that state showed no change, though some reduction may be expected in the future under the operation of the new barrier pillar law. Reasons for the

Coal Losses in 1922 and 1931

	Losses						Recovery	
	1922			1931				
	Avoidable	Unavoidable	Total	Avoidable	Unavoidable	Total	Increase	Decrease
Ohio	26.0	14.0	40.0	26.0	14.0	40.0	....	....
Pennsylvania	15.5	13.1	28.6	14.0	13.1	27.1	1.5	....
West Virginia	10.5	12.3	22.6	9.0	13.0	22.0	0.6	....

reduction in avoidable losses in West Virginia parallel those in Pennsylvania, though preparation played an important part in the drop. Unavoidable losses increased in West Virginia, largely due to the more effective protection of oil and gas wells.

"The next ten years should see a slight increase in percentage of recovery in Ohio," predicted Mr. Sisler, "but it probably will not be more than 2 per cent of the total quantity of coal which is mined. Recovery in Pennsylvania and West Virginia will gradually increase as experience and research in mining operations begin to yield their fruit. Installation of preparation equipment and mechanization of mines will tend to increase recovery. It is doubtful, however, if the increase in recovery will exceed 3 per cent in these states."

Measuring a Mine

PERSONNEL, the mine itself, operating methods, production, costs, and possible revisions all enter into the measure of a mine, said N. A. Elmslie, superintendent, Marion division, Bethlehem Mines Corporation, Barrackville, W. Va. Too much care cannot be used in evaluating a mine's personnel, and investigation will often show units that are out of step, not from lack of ability but from displacement or erroneous estimate of their abilities.

In measuring the mine itself, ventilation and drainage are the most important items in cost, in addition to being every-day loads. Transportation, Mr. Elmslie stated, constitutes 90 per cent of most mine problems. This subject should include close examination of face, secondary, and main haulage, as well as hoisting and dumping. Power questions take in most of the major features of coal mining. Consideration of the methods in use should take in mining, timbering, loading, and coal-fracture.

Study of mining systems is necessary, because it is not always true that because coal has been worked a certain way, the method will not permit of variations. Production is worthy of examination from the angles of total output, tonnage per man, and tonnage per unit, with an eye to determining the most economic tonnage for the particular mine in question. Costs should be examined from the two angles of market conditions and production cost.

Before the time for revisions in methods and systems, Mr. Elmslie continued, all of the foregoing items must be thoroughly digested and studies made upon which conclusions can be based. Production, for example, always is limited by one factor or another, which must be considered the bottle neck of the operation. When the bottle neck is removed or widened, the limiting factor will be moved to some other operation.

Mining Two Beds Simultaneously

OPERATION of the Pittsburgh seam of coal in the Scotts Run region of West Virginia does not necessarily mean the destruction of the Sewickley bed, which lies 90 to 100 ft. above it, was the conclusion of S. D. Brady, Jr., superintendent, Osage Coal Co., Osage, W. Va. The Sewickley bed he explained, has an average thickness of 4½ to 6 ft. in Monongalia County, while the Pittsburgh seam is 8 to 9 ft. thick where mining is carried on. The intervening strata are easily broken in pillaring. In a majority of cases, different owners mine the two seams, and lack of co-ordination in the past has resulted in considerable destruction of workable coal.

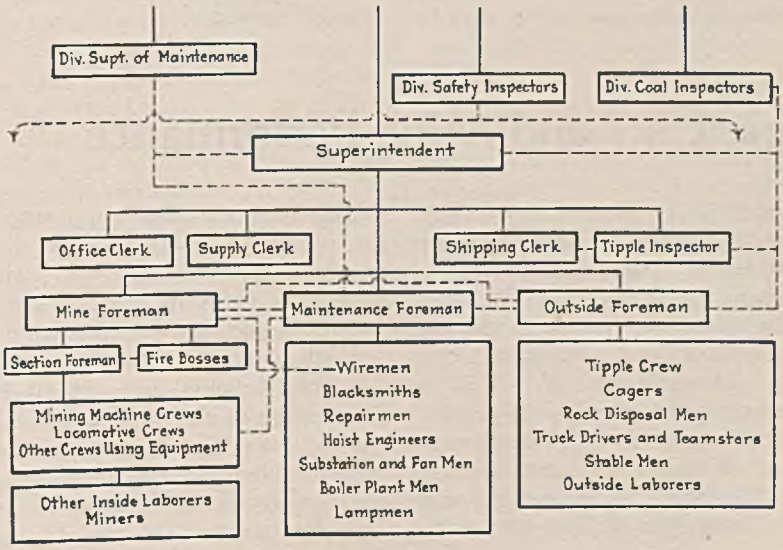
Effects of pulling of pillars in the Pittsburgh seam on three Sewickley mines were described by Mr. Brady, who detailed the experience at the Osage mine of the Osage Coal Co., where operation of the two seams was co-ordinated. After three years of mining, a Sewickley pillar line 2,200 ft. long is going forward with a recovery of 98 per cent of the coal. At the same time, a line in the underlying Pittsburgh seam is following 100 ft. behind the Sewickley line, with no ill effect on mining operations in the upper seam.

Mr. Brady concluded that the Sewickley and Pittsburgh seams can be mined simultaneously and an average recovery made at a reasonable mining cost; that the Pittsburgh bed can be removed and the Sewickley worked afterward, with only a slight additional cost for timbering where the intervening rock is soft; or that the Sewickley bed can be removed before the Pittsburgh, with no harm to the latter.

Consolidation Operating Organization

WHILE the Consolidation Coal Co. "has a staff and line organization, and most of the contact between the two wings is made between officers" above "those charged with the responsibility of the actual operation of an individual mine," the field representatives of several of the staff departments play such an important rôle in the control of certain activities at the mines that a true organization picture cannot be had unless they are included, declared A. R. Matthews,

Graphic Representation of Relations Between Division Representatives and Mine Organization at Consolidation Mines



division superintendent of the company, Fairmont, W. Va.

The authority and responsibility of each mine official is shown in the accompanying chart, together with the relationship of certain staff departments to these men. The solid lines are the usual lines of authority found on any organization diagram, and have the same significance. The dotted lines, Mr. Matthews termed "lines of consultation." These are used to indicate contacts between individuals—"contacts that are recognized and encouraged in so far as discussion of problems and consultation are concerned, but carry with them no element of authority. They are, of course, reversible; that is, they are not cognizant of rank."

All contacts between the mine organization and the division personnel are shown by lines of consultation, though certain division men have emergency authority. Members of the division personnel perform three functions in connection with an individual mine: to co-operate and assist the mine officials in promoting the activity in which the division representative is primarily interested; to observe and report for correction any undesirable condition or practice; and to note desirable conditions or practices at one mine which might be applied to another.

Pittsburgh Coal Roof

SYSTEMATIC timbering is necessary in the Pittsburgh seam in northern West Virginia because of the character of the overlying strata, said Lee M. Morris, assistant geologist, West Virginia Geological Survey, Morgantown, W. Va., in a detailed analysis of roof conditions in Monongalia, Marion, and Harrison counties. "The basal member of the immediate roof," said Mr. Morris, "is a black or gray clay, which usually is slickensided. This material is termed drawslate by the miner. The color is due to the carbonaceous matter, and the slickenside is the result of pressure or movement which may have come during or subsequent to its consolidation. The drawslate is the part of the roof requiring special consideration, because it is not self-supporting after the coal is removed."

From 8 to 24 in. of roof coal is left to support the clay, and also to protect it from temperature changes and moisture, which cause it to disintegrate and fall. It is unwise, asserted Mr. Morris, to depend on this roof coal for supporting the drawslate, as it has but little strength. The roof coal also conceals weak spots in the overlying material, and for these reasons systematic timbering is necessary.

Discussion following Mr. Morris' paper centered largely on variations in the sulphur content of the Pittsburgh coal. Mr. Sisler observed that it seemed to be a rule that tight roofs meant low-sulphur coal. He remarked that one theory explaining the reduction in sulphur in certain areas was that it was removed by tree roots penetrating the coal. These trees grew in the usual shale covering of the seam. Where the shales were removed by erosion, growth of vegetation was stopped. In addition, such eroded areas were filled with sandstone, explaining the apparent association of a sandstone roof and high-sulphur content.

Mine Cars and Mine Performance

"POSSIBLY 50 to 75 per cent" of the mines in West Virginia are suffering from a shortage of mine cars, declared D. L. McElroy, assistant director, mining extension department, West Virginia University, Morgantown, W. Va., in presenting some conclusions arrived at in making a study of transportation at 42 mines in eight fields in West Virginia. While mining conditions vary too widely to permit establishing a mathematical rule for the number of cars a mine should possess, he continued, the problem should be carefully studied, and an ample number purchased.

With plenty of cars, their efficient use still depends upon distribution. Realization of the importance of this question in West Virginia is shown by the increased employment of men to regulate the distribution of haulage equipment. Of the 42 mines studied, ten of the twelve producing 2,000 tons or more per shift and eight of the 30 operations producing less than 2,000 tons per shift employed dispatchers. Relative performance rates for the two classes of mines are given in the following table:

	Tons per Shift per Main-Line Locomotive	Ton-Miles per Shift per Main-Line Locomotive	Tons per Shift per Gathering Locomotive	Tons per Shift per Unit of Stock
Dispatcher employed	678	1,217	199	109
No dispatcher employed	614	846	155	72
Increase at mines employing dispatchers	64	371	44	34

"If we assume that such factors as thickness of bed, character of coal, depth of cut, width of place, and quality of loading to be the same for two mines, the one with the more efficient haulage will have the greater tonnage per loader." For this reason, "the daily tonnage per loader is considered by many mining men to be one of the best measures of the efficiency of a haulage system."

Some of the factors which affect the tonnage per loader in eight West Virginia fields are given in an accompanying table. Except for bed thickness and tonnage per inside man, all the items presented deal in some manner with mine cars. Curves drawn by using the data in the table show a close relation between cars in use per loader, tons capacity of cars in use per loader, and tonnage per loader. The number of cars available for the use of a loader, as well as their individual capacity, are reflected in the total car capacity in use per loader. The latter has a greater effect on the tonnage per loader than any other factor, according to the data collected, Mr. McElroy remarked.

"Car capacity, therefore, appears to be an important factor in determining the tonnage per loader, because it is the combination of the number of cars in use and their capacity which has the greatest effect." Seam thickness and height of car are affected by or reflected in the individual capacity. Maximum height of a car should not be more than 48 in. for efficient loading, in Mr. McElroy's opinion. Allowing 18 in. as the minimum clearance between the car and the roof, 66 in. would be the minimum seam thickness before height of car is affected.

For inches of car height per ton of capacity, a low figure indicates the use of a new car of low, wide, and

(*Turn to page 185*)

ELECTRICAL DAYLIGHT

+ For Coal Picking Tables

By E. W. BEGGS
Commercial Engineering Department
Westinghouse Lamp Co.

and GEORGE H. OWEN
Fuel Engineer
Imperial Coal Corporation

THE effort to produce a standardized fuel makes the problem of uniform preparation of the utmost importance to the operators of bituminous coal mines. New appliances and new ideas to aid in the cleaning of coal are constantly being tried, and, where practical, are put in use. The nature of the impurities found in bituminous coal makes necessary the use of manual labor in the preparation of all but slack sizes to remove all visible impurities. The newest aid to better quality is a lighting system to facilitate inspection at the picking table.

Because of its lusterless appearance, slate is relatively easy to distinguish from the pure coal. Pyrite may be readily discerned by the whitish or yellowish appearance characteristic of it. Pyrite, however, may occur in small lump deposits, entirely surrounded by coal, when it can be determined only by its weight or by the sight of some small portion of the yellowish substance showing through the coal. Bone, by far the most difficult of the three impurities to remove, is pure coal separated by paper-thin layers or laminations of rock slate. To the untrained eye, bone appears to be pure coal and, even to the eye of a skilled picker, bone may pass for coal unless subjected to the proper sort of illumination under which the laminations of slate may be perceived.

Since the workers employed in the cleaning of coal must be protected from the weather, and since the coal itself should be shielded from rain and snow, in order to facilitate its handling, the coal must be cleaned under cover. Windows, of course, are provided for both light and ventilation, and small ordinary electric lights are in use over all picking tables. However, at times the coal is dry and dusty as it comes from the mines and the fine black dust that rises from the moving coal soon settles thickly over windows, obscuring the daylight. As a result, the pickers generally depend to a large degree upon the artificial lights over the tables. These lights usually are small size Mazda lamps, mounted in a variety of reflectors, often chosen at random. At times even the commonplace reflector is omitted. Since an open reflector also is exposed to the coal dust, its surface is soon smudged over.

Under ordinary working conditions, insufficient and inadequate light is cast upon the moving surface of the coal to allow for proper cleaning. The companies co-operating in the present study, however, believed that with better light—perhaps as good as daylight—most of the impurity still remaining in the coal after cleaning could be removed. Although daylight is variable and rarely properly directed to the work, daylight at its best was taken as a standard of comparison, and engineers of the Westinghouse Lamp Co. set out to produce an electric lighting system which would equal or, if possible, surpass daylight illumination.

An experimental model picking table was set up in the commercial engineering laboratory of the lamp company at Bloomfield, N. J., where all variations in lighting could be readily produced. Coal specimens were sent in from both the Cambria and the Cardiff mines of the Imperial Coal Corporation. These specimens were selected by the coal company's fuel engineer and his associates. The specimens represented pure coal and varying grades of bone, slate, and pyrites. Extensive observations were made of all of these samples under the various types of illumination produced during the investigation.

Each specimen was marked so that its identity might not be lost. Inspections of the coal samples were first carried out by the Westinghouse laboratory staff and their conclusions were then checked by engineers and officials of the Imperial Coal Corporation.

Experimental procedure laid down and followed during the tests was formulated to determine:

1. Effect of light intensity
2. Effect of light direction
3. Effect of color of light
4. Effect of light distribution
5. Effect of glare
6. Practicability of the lighting system.

The effect of light intensity was quite simple. Mine samples were inspected under varying intensities of light from lamps mounted directly overhead. The range in intensities tested was from approximately 5 to 100 foot-candles. The advantage of the high intensities was instantly perceived, as would be expected from the greater visual acuity generally provided by high degrees of illumination. During this test, however, it was noted that the lustrous surfaces of the coal faces became sources of glare if the lighting system used involved high local brightnesses. This matter was further investigated under parts 4 and 5 of the test. The conclusion drawn was that the highest practicable

intensity should be used and that from 50 to 100 foot-candles would be effective and quite suitable *with glare eliminated*.

The effect of direction of light might have become a complex matter, but turned out to be quite simple. Observations were made with strong beams of light thrown onto the table from various directions. While these beams emphasized the contours of the larger pieces by the highlights and deep shadows developed, the smaller ones were often hidden and the extreme contrast of light and shade became irritating to the eye. Moreover, the brilliance of the light reflected from the coal facets was glaring and reduced the visibility of the details which should be seen.

In studying the effect of the color, pure and mixed colors were used, ranging from red at one end of the spectrum to blue at the other, and including combinations of all. Whenever colored light was used, most of the details were lost and an effect of fairylike mystery was created. The amber light alone of the so-called pure colors was of value, but this was only in connection with the distinguishing of pyrites; for other inspections, this, as well as other colors, was definitely unsuitable, because of reduced visibility. The mixed colors proved almost equally confusing and only when all colors combined to produce white light was the work of inspecting the coal reasonably easy. These tests led to the trial of a color of light approaching daylight as closely as practicable. This proved to lead to a point farthest from the mysterious and confusing condition produced by colored light and was finally set upon as ideal.

Distribution of light had a marked effect. This subject was covered in part by observations made during earlier steps in the experiment. It had been found that strong directional light produced shadows and highlights; so, in several steps, tests were made under light ranging from strongly directional to extremely diffused light, as from the sky. This final step showed immediately that diffused light was desirable because of the elimination of concealing and changing shadows as well as the reduction of glare, which was considered separately in part 5. The final experimental set-up consisted of a skylight of large panels of diffusing glass mounted directly over the table and arranged to illuminate all of the working area. The large effective size of the luminous source provided the desired effect and produced a shadowless illumination needed for quick and easy coal inspection.

The effect of glare noted all through the series of tests was very serious. Coal is black, but at the same time the facets are highly lustrous. This results in an extreme contrast, likely to result in eyestrain. The large area of the experimental lighting fixture, providing highly diffused light, reduced this glare to a minimum.

Mounting of apparatus designed for local lighting only became involved in the experiment on glare. Placing the light sources low caused an improved utilization of light and, when carried far enough, kept the

Fig. 1 — Flashlight of First Special Picking-Table Lighting System, Cardiff Mines, Imperial Coal Corporation

Fig. 2—Electrical Daylight at Work Over the Coal Picking Table. Note Ease of Vision and Also Ready Access of Dust-Tight Cover Glasses for Cleaning

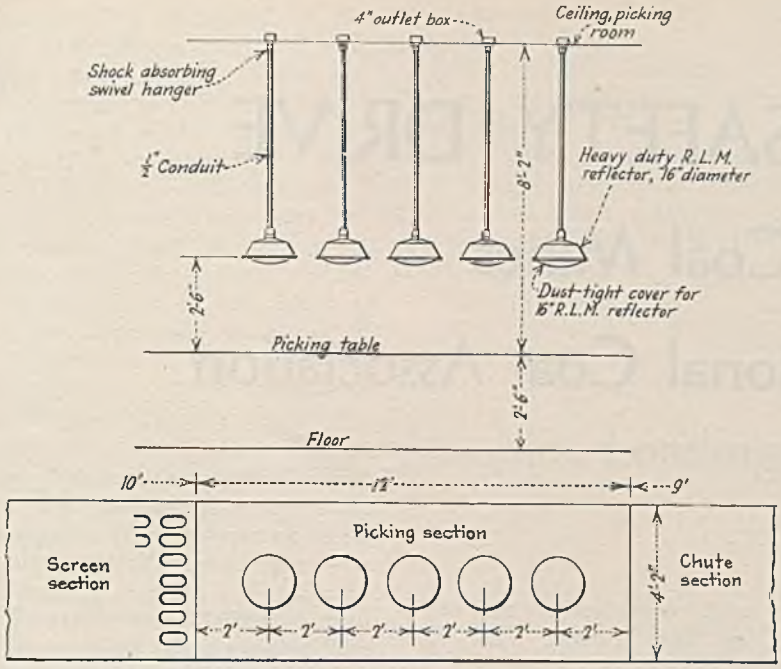


Fig. 3—Detail Drawing of Lighting Installation as Designed for an Inspection Table 12 ft. Long by 4 Ft. 2 In. Wide

bright areas of the lighting fixtures out of the line of vision. Low mounting was finally decided upon, with the lower edges of the glass windows at about eye level. This, with the large diffusing areas of the source, reduced the direct glare as well as the glare of reflex light from the coal itself and proved highly effective.

The practicability of the test lighting fixture (artificial skylight) used in the experiment, of course, was questionable. The same effect was found to be producible by the use of commercial apparatus and such an installation was tried and found highly suitable. The final arrangement is shown in diagrammatic form in Fig. 3.

This lighting unit was first installed at the Cardiff mine of the coal corporation. An immediate benefit was discernible. The daylight-blue light was declared by the pickers to be excellent. They asserted that the impurities stood out in clear relief. Not only were they able to remove far more impurity, thereby producing exceptionally clean coal of a uniform cleanliness, but there was less chance of discarding pure coal sometimes mistaken in poor light for impurity. The pickers remarked the entire absence of eyestrain and seemed to be cleaning as efficiently at the end of the day as they had been at the beginning. Lighting units are easily cleaned simply by wiping off the dust-protecting lens with a soft cloth, and the volume and intensity of the light is maintained constantly. While figures are not available at this time, it is known that a much larger percentage of impurity is removed and that this increased percentage is maintained, evincing a uniform improvement.

The Cardiff installation involves the use of industrial-type reflectors with dust-tight cover glasses. Mazda Daylight lamps with bulbs of a special blue glass are used, providing the desired color, approximating average daylight quality. The bowl of each bulb is coated with white enamel to reduce the local brightness and to diffuse the light. An alternative plan using regular clear bulb lamps involves the use of diffusing cover glasses of "daylight-blue" color. All the equipment is of standard commercial material, from the reflector hanger to the Westinghouse Mazda lamps, but at the same time the lighting results meet the requirements of each of the conclusions of the six theoretical investigations made. It even becomes a simple matter to maintain these low hanging units, as they can be simply wiped off, as occasion demands, by one of the operators working under them.

The proof of a pudding is the eating (and the digestion), and even though this inspection light was found good by laboratory test, the actual operating experience with it must decide its real worth to the coal industry. That the coal company is arranging to install similar units at other collieries testifies to the reaction of management to the development. But, besides the executive who must show profit in his business, there is the worker at the mine who earns his daily bread handling with his own hands the coal that flows out to turn the wheels of industry. That man has no prejudice and his word in this business is quite often final. One of them, when asked about the new light, said: "Is this light good—is it as good as daylight? Hell, man, it's better than daylight!"

Mine Cars

(Continued from page 182)

long design. In this connection, an important fact is that, in general, as the tonnage per loader decreases, the inches of car height per ton of capacity increase. While Mr. McElroy was loath to fix a minimum value for the capacity of cars in use per loader, the study showed that when this figure became less than 8 tons, the tonnage per loader decreased slightly faster, and the inches of car height per ton of capacity increased rapidly.

In general, said Mr. McElroy, as the car turnover increases, the tonnage per loader decreases. This probably is due to the fact that a mine which is short of cars has three alternatives of improving the condition: purchase of additional cars, purchase of cars of increased capacity, or an increase in the turnover. As an increase in the latter requires little or no investment, this method is used to better the situation.

Factors in Loading in West Virginia

Field	Tons per Loader per Shift	Tons per Inside Man per Shift	Cars in Use per Loader	Capacity of Cars in Use per Loader Tons	Thickness of Bed, Inches	Height of Cars, Inches	Car Capacity, Tons	Inches of Car Height per Ton of Coal Capacity	Car Turnover
1	17.10	11.29	4.61	11.82	76.8	36.2	2.90	12.47	1.61
2	16.04	9.99	3.75	13.27	73.2	40.0	3.60	11.10	1.28
3	15.55	9.45	3.23	8.68	56.4	29.0	2.70	10.73	1.86
4	13.50	8.42	3.08	7.90	56.0	29.2	2.62	11.14	1.80
5	12.57	8.31	2.64	7.76	72.6	40.4	2.98	13.55	1.57
6	10.90	6.46	2.88	6.74	60.8	32.8	2.43	13.49	1.73
7	9.12	5.88	3.38	6.51	46.6	31.0	1.82	17.01	1.46
8	8.55	6.58	2.38	4.82	61.0	42.0	2.03	20.68	1.92
Avg.	12.57	8.21	3.07	8.31	62.8	35.08	2.61	13.77	1.67

NATIONAL SAFETY DRIVE

★ In Bituminous Coal Mines

Launched by National Coal Association

but the alleviating of hazards in our industry is something upon which all should be single-minded. I know you will be interested to hear that there is every likelihood of the National engaging a safety man within the near future to help conduct this campaign."

The Chicago conference was the fourth meeting held by the safety committee since December. Acting on a suggestion of R. M. Lambie, chief of the Department of Mines of West Virginia, who addressed the annual convention of the association at Detroit last October, a meeting with state mine department heads was held at Washington in December. Early in the year another meeting of the committee was held at Chicago, and a third gathering was staged at Washington.

Members of the committee at the Chicago conference in addition to Chairman Fies were: R. V. Clay, assistant general manager, M. A. Hanna Coal Co. (representing R. L. Ireland, Jr.); C. W. Connor, superintendent of mines, American Rolling Mill Co.; P. L. Donie, vice-president, Little Betty Mining Corporation; Otto Herres, assistant manager, U. S. Fuel Co.; W. B. Lewis, president, Oakdale Coal Co. (representing Howard Willetts); Lee Long, vice-president, Clinchfield Coal Corporation; J. William Wetter, general manager, Madeira-Hill Coal Mining Co.

Seven heads of state mining departments were present: James Dalrymple, Colorado; John F. Daniel, Kentucky; Walter H. Glasgow, Pennsylvania; W. B. Hillhouse, Alabama; R. M. Lambie, West Virginia; John G. Millhouse, Illinois; John J. Rutledge, Maryland. The U. S. Bureau of Mines was represented by Daniel Harrington and J. J. Forbes.

Association officials at the meeting included J. J. Ardigo, Operators' Association of the Williamson Field; Harvey Cartwright, Indiana Coal Operators' Association; James L. Davidson, Alabama Mining Institute; John R. Doolin, Utah Coal Producers' Association; R. E. Howe, Southern Appalachian Coal Operators' Association; D. F. Hurd, Eastern Ohio Coal Operators' Association; W. L. A. Johnson, Southwestern Interstate Coal Operators' Association; D. C. Kennedy, Kanawha Coal Operators' Association; L. W. Mitchell, Southern Wyoming Coal Operators' Association; T. N. Moran, Fairmont Coal Operators' Association; F. O. Sandstrom, Colorado & New Mexico Coal Operators' Association; C. B. Humrees, National Coal Association; Oliver J. Grimes, Committee of Ten.

Others present included: T. J. Thomas, president, and James A. Gillen, attorney, Valier Coal Co.; John F. Lynch, general manager, and M. J. Grogan, assistant general manager, Lynch Coal Operators' Reciprocal Association; W. W. Hunter, safety engineer, C. C. B. Smokeless Coal Co.; A. J. Moorshead, president, and G. E. Lyman, general superintendent, Madison Coal Corporation; John Marland, general superintendent, King-Harlan Coal Co.; Rice Miller, vice-president, Hillsboro Coal Co.; F. S. Pfahler, general manager, Superior Coal Co.; L. D. Smith, vice-president, Chicago, Wilmington & Franklin Coal Co.

▼ ▼ ▼

Machine Loading in Ohio

(Continued from page 173)

Transportation is held in unusually high importance at this operation, as instanced by the 45-deg. layout, which permits a 43-ft. radius in room turns and accommodates No. 2½ turnouts. These latter are furnished complete by the Lorain Steel Co., and the West Virginia Rail Co. and are made up with riveted plate frogs, kick switches, and interchangeable left and right steel ties. Main-line locomotives spot empties closer to the loading machine than the side track when feasible; in an adjacent room where possible. Until the rooms are driven approximately 165 ft. in, empties and loads are switched on the entry. Switches are laid in crosscuts, right and left, at the half-way mark. These serve in the changing of cars and the shifting of equipment beyond that mark. Owing to roof conditions, switching track at closer intervals would be no economy. A battery locomotive holds to a maximum of five cars.

Thirty-pound rail in room entries and rooms and 60-lb. rail on main hauls are the standards. Wood has been replaced by steel in all ties. Those under the lighter rail weigh 3½ lb. per foot and those under the heavier rail weigh 9 lb. per foot. On straightaways all ties are laid on 2-ft. centers.

Heavy Steel Ties and Screened Slag Under 60-Lb. Rail Are a Standard Practice

Experiments are being conducted to determine whether ties weighing 6 lb. per foot will satisfactorily support 60 lb. rail. Turnouts for use on main haulage are purchased complete. Specifications covering these call for manganese frogs and parallel ground-throw switch stands with spring connecting rods.

Main track is ballasted with 1x¼-in. screened slag, a practice which the Hanna company has followed in all its mines since 1918. Since that time it has used over 900 tons underground and 400 tons for covering surface grounds. A single ton will go a long way as ballast, taking care of approximately 80 to 100 lin.ft. of track. The slag shows little sign of breakage after extended use; it costs about $1 a ton f.o.b. the crushing plant.

At No. 9 mine total consumption of power underground is at this time about 3.1 kw.hr. per ton. Of this, the loading machines account for 0.204 kw.hr. and the track-mounted cutters take 0.353 kw.hr.

TRADEMARKING COAL

+ By Automatic Paint Machines

At Blackwood Mines

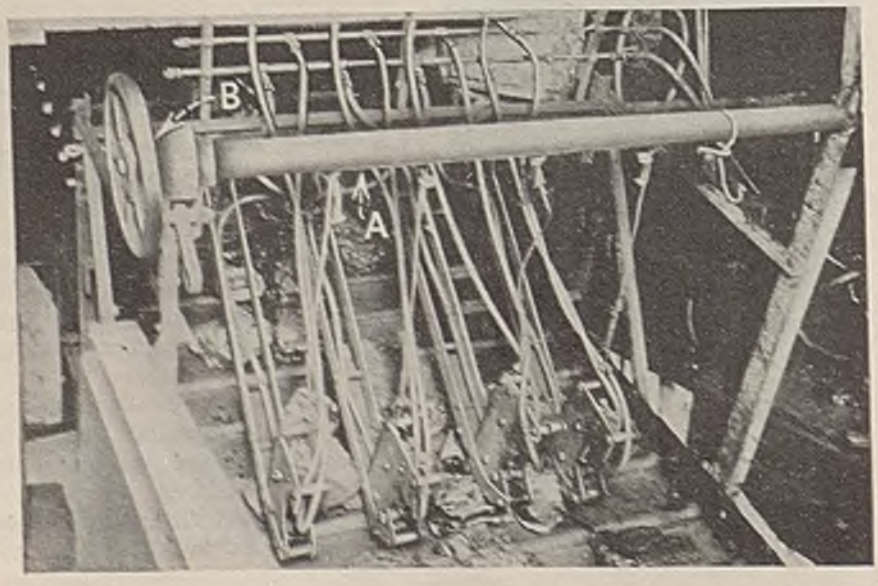
Fig. 1—Eighty Per Cent of the Lumps Carry the Red Bar

"I CAN'T believe that the dealer knowingly switched coals on me, but I do know that the coal I bought this year is entirely different from what I got from him last year. It has about the same appearance, but doesn't burn the same. In heating satisfaction it doesn't compare with what I had last year. If I only knew for certain where to get that same coal, I'd never change again."

These words of a domestic consumer tell the story of a damaging vexation that has been experienced by a significant percentage of users and that causes no end of worry to distributors. The apparent answer is "trademarking," but the delay in general application is evidence of the difficulties from the standpoints of cost, thoroughness, and practicability which have beset efforts along this line. Recent improvements in its patented automatic painting equipment have enabled the Blackwood Coal & Coke Co., Blackwood, Va., to apply at a satisfactory cost its copyrighted "Red Bar" to approximately 80 per cent of the lumps in a shipment.

Several years ago officials of this company saw the possibilities of applying a narrow bar or stripe of paint to each lump or piece of coal and as an early move copyrighted the trademark "Red Bar" and others bearing names of various colors. The company records show the first "Red Bar" coal was shipped on Dec. 20, 1927, and in spite of mechanical difficulties with the original painting equipment this trademarked coal has been shipped continuously since that date.

Fig. 2—Four Automatic Painting Machines on the Lump Boom at Pardee



The first installation consisted of injector-type spray guns which required but one air-hose connection. Several of these paint guns were mounted on pivoted arms which in the lowest position held the guns just clear of the loading-boom conveyor. Triggers below the gun nozzles at the end of the arms caused opening of the self-closing valves and emission of paint by contact with the lumps. With this equipment 50 gal. of paint sufficed for but 8 cars, or 400 tons.

With the improved machines now in use 3,744 tons of 4-in. round lump was trademarked with 50 gal. of paint.

Fig. 2 shows the present installation of four new painting heads on the lump boom, 4 ft. wide, at the Pardee mine. Each contains a DeVilbis pressure-type gun fitted with a patented and improved tripper which is highly efficient in accuracy of action in starting and stopping the spray of paint so as to put a bar or stripe across the lump, regardless of shape, and without wasting paint on the boom conveyor.

The arms are supported from a frame attached to the sides of the loading boom so that the adjustment will not be disturbed as the boom is raised or lowered. The ends of the arms containing the painting heads are supported by small flexible steel cables from a pipe *A* (Fig. 2) which, when rotated from handwheel *B*, winds the cable and raises the heads clear of the coal in case it is desired to run an unmarked product.

A close-up of a painting head containing a spray gun is shown in Fig. 3. A shoe, *C*, hinged at the left-hand end, opens the starting valve when contact with a lump of coal pushes this shoe up close to the frame. The valve remains open as the head rides over the lump and closes suddenly as the shoe is allowed to drop when the trailing edge of the lump passes beyond contact with it.

There are three hose connections to each spray gun, and two air pressures are used. The paint container is under 40 to 50 lb. pressure, and a lower pressure of 22 to 28 lb. supplies the air jet which deposits the paint on the lump of coal.

At the Pardee mine a 4½x5-in. compressor of 20 cu.ft. displacement supplies the air. The proper capacity for operating eight or nine of the automatic paint guns, the equipment for two booms, would call for a compressor of about 60 cu.ft. capacity. At the Calvin mine, also operated by the Blackwood company, the paint guns are supplied from the air compressor installed to operate a rotary dump. At this mine the lump boom is 5 ft. wide and consequently five guns instead of four are used.

The guns are adjusted to paint a bar ½ to ¾ in. wide. Most of the painted lumps show only one bar, but the larger or wider pieces of coal may span two or even three of the painting heads and receive the equivalent number of parallel bars. The number of guns now being used per boom results in approximately 80 per cent of the lumps receiving the trademark.

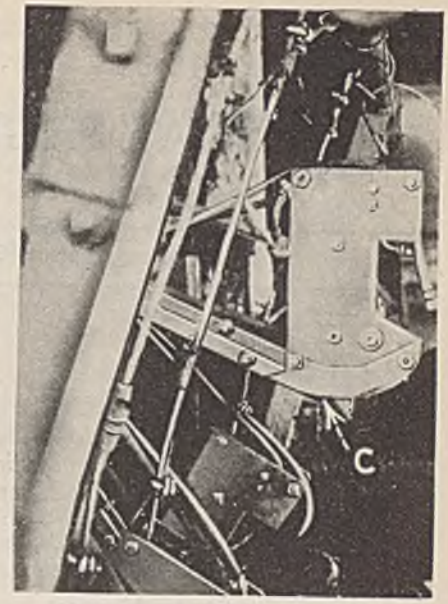


Fig. 3—One Machine Raised to Afford a Close-Up

Fig. 4—Prominent Display of Trademark Proclaims This Dealer Sells "Red Bar" Instead of Just Coal

Fig. 5—"Red Bar" Leaving the Pardee Tipple

Pardee mine produces 1,500 to 1,700 tons per day and Calvin mine 1,500 tons. Approximately 45 per cent of the total output of the two is painted and shipped as "Red Bar" coal. Lump sizes up to 8-in. block and intermediate sizes down to 4x6 and 3x6 are painted.

A bright red oil paint of medium drying speed is used, and the cost is approximately $1.05 per gallon. At this price and with an application of 50 gal. per 3,744 tons, the paint cost is roughly 1.4c. per ton.

Experience of the Blackwood company has proved that by handling trademarked coal, dealers have been able to build up a trade which is permanent. The trademark is the manufacturer's guarantee to the buyer that the product is up to standard. The consumer knows exactly what he is buying and is not easily swayed by the "just as good" arguments of other dealers.

An exclusive franchise to but one dealer per town is the merchandising plan. Last winter a "Red Bar" program was broadcast weekly from WSPA, Spartanburg, S. C. Dealer helps in the form of advertising copy for local newspapers are supplied and the cost of space is shared with the small dealer. If the dealer handles above a stipulated tonnage, the cost of local advertising is borne entirely by the producer.

COAL AGE

SYDNEY A. HALE, *Editor*

NEW YORK, APRIL, 1931

Cash or ink?

FEW BALANCE SHEETS on coal-mining operations these days fail to show more or less impressive totals charged off for depletion and depreciation. But an outsider sometimes wonders in just how many cases these charges represent actual cash earmarked and set aside and in just how many cases these reserves are purely bookkeeping paper transactions. Setting up liberal depletion and depreciation charges brings a warm glow of satisfaction to the stockholder who looks over the balance sheet, but, unless these charges are backed up by money in the bank, the stockholder will be in a sorry position when the day of final reckoning comes.

Living standards

ONE of the basic planks in the McGraw-Hill Platform for American Business, published as a supplement to the March issue of *Coal Age*, is the maintenance of the living standards which have contributed so much to national prosperity and individual well-being. The necessity for this maintenance was recognized early in the present depression when President Hoover obtained the pledges of industrial leaders that every effort would be made by them to preserve then existing wage rates. How well that pledge has been kept is evidenced by the fact that, whereas in the 1920-21 depression, 92 per cent of the employers reporting such figures to the U. S. Department of Labor cut wages, only 8 per cent of the employers now reporting have readjusted basic rates downward.

There have been, it is true, substantial reductions in the earning power of the worker since 1929, because of sharp increases in total unemployment and in part-time employment. Nevertheless, industry as a whole appears to have accepted the high-wage prosperity philosophy popularized by Ford and recently reaffirmed by Farrell; there are few captains of industry willing to indorse publicly the old-school deflation theories given fresh currency some weeks ago by Wiggin. Progressive management first seeks reductions in production costs outside the pay envelope.

Narrowing the spending margin of the purchasers of the bulk of the products of American industry is not the way to rout depression or to revive and maintain prosperity. Unfortunately, this is a lesson which many employers in the coal-mining industry have not learned. Successive wage reductions in some fields have squeezed pay envelopes to tragic flatness without adding profit to the balance sheets of the managements taking this ruinous short cut to inefficiency. When mines revert to excessive hours and inadequate wages for labor, the record is not one of which the coal industry may be proud.

Such a breakdown reflects no credit on the managements initiating it. On the contrary, it is a menace not only to the stability of the coal industry but to the re-establishment of business as a whole upon a sound basis. The economic interdependence of the separate units which make up our national industrial life is too close to hug the delusion that any large group may long continue upon a basis of pauperization for either the capital or the labor employed therein, or for both, without that impoverishment eventually affecting all business. That the reactions in many cases may be indirect in nowise diminishes their damaging force.

Stimulating quizzes

NOTHING has been more effectual in making students out of would-be mine foremen than the annual quizzes held for the certification of aspirants for mine foremanship. Nothing makes the college student "grind" more industriously than his daily and annual examinations. Why, then, is not this stimulating feature introduced in the later training of mine officials, either to ascertain that facts already learned or supposed to have been learned have not been forgotten or to find out whether the new facts demanded by industrial progress have been acquired and assimilated?

With the advent of compensation have come in some states the rating-bureau schedules which are a body of regulations which some companies accept in their entirety as binding on their operations, because they believe them essential to safety and because they, as self-insurers, desire to obtain the savings that may be made by following such provisions or as insurers they seek the favorable rating that is awarded to those who do what the schedule demands. One company in Pennsylvania is using such a quiz and has written a hundred questions for its underground and twenty-five for its outside officials, all based on its own safety standards and the rating-bureau schedules. It presented them with ten of the first questions, and the contestants were awarded ratings for their answers as low as 25 and as high as 85 per cent. The other ninety questions were then turned over to them to take home, study, and answer.

The questions awakened a new interest in the rules of the company and of the rating bureau. The rules appeared in a light not so obvious before, for when there will be a quiz on a certain day and hour, there is a feeling that something must be done about it; whereas there is a delightful uncertainty about the time when some particular

standard will have to be tested or followed, even though the time for observing it may come tomorrow and, indeed, every working day. Another company has held a similar quiz regarding its rules and standards and made passing that examination a requisite for continued employment. It also has found that such a quiz stimulates attention.

All of mathematics and of bookkeeping is not in figures and symbols, but without such aids neither mathematics nor bookkeeping can be conducted. Nor is the ability to answer a quiz all there is in the making of a mine foreman, but measurable advance is made when the right type of man absorbs those principles of operation that a group of men as a result of careful study and long experience designate as the safest, most economic, and most effective methods of operation. If the rules cannot thus be characterized, they should be rewritten or revised.

Twilight zones

RECENT DEVELOPMENTS in the fair-trade-practice field darken the twilight zone of co-operative effort. The future of the fair-trade-practice codes under the Federal Trade Commission is still unsettled; the Department of Justice has followed up the consent decree dissolving the Bolt, Nut and Rivet Manufacturers' Association with a legal attack upon the Sugar Institute, and, in the announcements of the filing of the latter suit, great stress is laid upon fact that the sugar refiners have materially increased their profits. What seems praiseworthy today may be damned tomorrow. Nor, reviewing the history of recent years, does there seem to be much hope that uncertainty will be effectually dissipated so long as the fundamental law remains unchanged. What is needed to give security to co-operative business planning is not more liberalization by interpretative "rules of reason" but definite modification of the statutes.

Feet of clay

PRIOR to the construction of the Empire State Building the Chrysler Tower with its aspiring height led the way upward into the empyrean. Much of it is tower; hence the load laid on the rock foundation by its 1,046 ft. of height is only about 3 tons per square foot, the weight of 40 ft. or less of solid rock; a small load indeed as compared with that laid on the coal and clay of a mine. Any working with only 40 ft. of cover would be regarded as too shallow to be safe, not because the rock if solid would be too weak to bridge the working but because air and water inevitably would have deteriorated the roof to such a degree as to make it unreliable.

A booklet published by the Chrysler Tower Co. describes the bedrock under the building as a mica schist and declares that the foundation was well drilled to demonstrate the fact that the rock extended down into the earth far enough to give unquestioned support. Compare this condition with that of a coal mine resting on several feet of clay strata which the air soon turns to something a little better than mud. The roof above is not a cell-like tapering tower like the building to which reference has been made but a solid block of stone almost as deep as, perhaps, or even far deeper than, the Chrysler Building is high. The weight per square foot on the floor of the mine certainly is far greater in the shallowest of workings than is laid on the rock under this skyscraper. In America the deepest coal mine is subject to possibly 40 times the weight of this tower and in Belgium perhaps to 75 times.

When some of the coal has been mined away and the stresses per square foot have accordingly been increased and when, as sometimes happens, the coal is entirely removed during the progress of mining, it is no wonder that one questions how the trick is turned. A little coal is lost; bumps occur; and accidents happen; all these seem quite predictable events. The wonder is that anything at all can be done under such rock masses. It would seem almost as if Nature, marveling at man's temerity, stays her avenging hand.

Brave words

PRESIDENT LEWIS' ringing denunciation of union employees of the Glen Alden Coal Co. who struck last month in violation of the contract between the anthracite operators and the United Mine Workers reflects credit upon the international officials of the miners' organization. Indianapolis has every right to be angry with the men who jeopardize the position of themselves, their neighbors, their employers, and their union. That such a blast of condemnation is necessary, however, and that local strikes still plague the poor remnants of the once powerful bituminous territory of the United Mine Workers emphasize anew a deep internal weakness in the union organization.

Internal disintegration probably played as big a part as external pressure in the collapse of union power in the bituminous fields. If union officialdom had been as militant the past twenty years in educating the rank and file to a proper appreciation of their obligations to themselves and to their industry as it was in warring against friendly employers, the picture today might be different. If organized labor is to be rebuilt upon a solid basis in the soft-coal regions—and if it is to survive in the hard-coal field—the foundation of that rebuilding must be the re-establishment of confidence upon the part of employers in the sincerity of the men and the integrity of contracts entered into by their union agents.

NOTES

. . . from Across the Sea

IN THE department of Landes, just off the Bay of Biscay in southern France, where the shepherds travel on stilts as they watch their flocks and the sands pile into dunes along the coast, a lignite field has recently been outlined by geophysical methods, equipment being used that tests the electric resistivity of the subsoil materials. It will be seen from the map on which this deposit is shown that the lignite is nowhere deep—at best 100 ft. This survey was made by C. and M. Slumberger, who refer to it in a paper on the ground resistivity method and its practical applications, published in the February issue of the *Canadian Mining and Metallurgical Bulletin* of February.

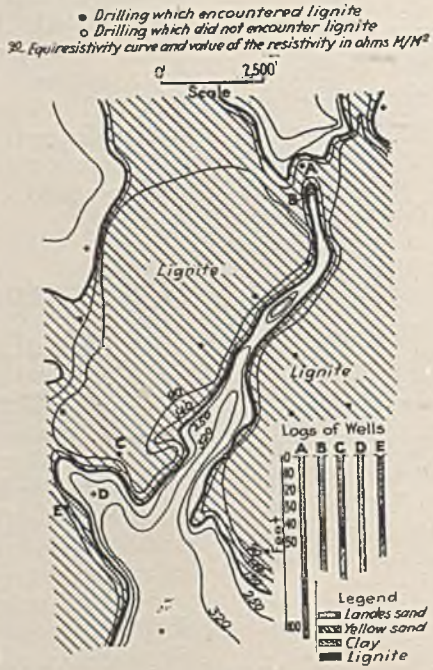
Areas containing only sand were found to have a high resistivity, and those having lignite, one that is lower. The map of the lignite deposit was tested by drillholes and it was proved that the lignite had been washed away at *D* and at *B*, but was present at *A*, *C*, and *E*, as had been prognosticated from the observation of soil resistance. Apparently during the Quaternary age the lignite formation was washed away and the valley filled with the ubiquitous Landes sand.

The electrical method of determining the deposit made it possible, despite the irregularities, to ascertain that the true edge of the coal field was that shown on the map as line 190, which was the value of the resistivity of that locus. It is not an outcrop line where the air and coal meet but the edge of a past erosion, a sort of buried outcrop, such as may be found in parts of Illinois and in the anthracite region, where sand has been laid down after the coal has been eroded, so that the coal, though shallow enough for stripping, does not exhibit itself as "blossom."

May one be pardoned for speculating how the deposit will be mined—perhaps by hydraulic stripping, for that will, temporarily, at least, "lay" the sand it removes, whereas with a shovel the air-blown sand would leak onto the exposed lignite and, laid down behind the excavator, would be blown back into the excavation.

Whether French lignites have a future as noteworthy as those of Germany remains to be seen. M. Defline, writing in 1913 for the Twelfth International Geological Congress, does not seem to favor any such idea. He says, "One finds at different levels of the Secondary and Tertiary rocks, beds of lignite. One of these, that of Fuveau, has a real importance; the other beds offer a mediocre interest, or even one that is negligible by reason of their limited tonnage, the low quality of their mineral, or the difficulties of exploration." The Fuveau basin lies north of Marseilles, far away from the Landes deposit.

In the endeavor to keep coal's markets for coal, one of the great desiderata is to find a way of reducing the cost of making gas. The byproduct oven is prodigal in its use of heat. All the sensible heat in the coke, which is 35 to 50 per cent of the total heat supplied to the ovens in the coking process,



Geophysical Survey of a French Deposit

is lost by watering; most of it is lost needlessly.

An anonymous author in *Colliery Engineering*, of London, England, advocates that steam at 150 deg. C. be passed through the hot coke to form water gas (hydrogen and carbon monoxide) till the temperature of the coke is reduced from 1,100 deg. C. to 1,000 deg. C., or even somewhat lower. Steamed at a lower temperature, carbon dioxide would be formed in excessive quantity, thus spoiling the gas.

He then advocates cooling down to 700 or 800 deg. C. by a current of inert gas. This gas heated in the quenching of the coke would be used to heat boilers and preheaters. The remaining heat would be removed by water, which heat would have to be wasted. Though the volume of this residual heat is large, its intensity is so low as to make its utilization difficult and too costly to conserve.

In steaming, both chemical action and conduction speed up the removal of heat, whereas in the passing of inert gases through the coke, conduction is the only cooling process. Quenching cools the coke off rapidly, but should be used only where the coke is at such a low temperature that to remove heat by radiation or conduction is too slow to justify the installation expense.

Practical education is receiving renewed attention at German mines. At the Hamborn group of mines of the United Steelworks Co. (Vereinigte Stahlwerke A.G.), the young men employed are given, first, educational and medical tests, and then two years of instruction above ground, partly theoretical and partly practical. They work in the various shops and surface works of the colliery. They also get a thorough training in mining theory and practice; they learn to use tools and become thoroughly familiar with the construction and maintenance of mining machinery.

Thus equipped they go below ground to complete their instruction, according to F. Senft, in *Glückauf*, from which these details are taken. Systematic instruction continues to be given. The preliminary instruction is supplemented by advanced courses for those who expect to follow occupations requiring more particular knowledge. By this means accidents have been reduced, and when more of these completely trained men leaven the mine force, better results may be anticipated. Improved relations between employers and employed is another advantage.

Perhaps, in the future some university will operate a real mine, and the students of mining will work in it; experiments will be made as to methods. The cost of coal will be high, but so is the cost of classroom instruction and of college halls and workshops. The sale of the coal will help to pay the college bills for the operation of the mine, the preparation costs, and so forth. The Hamborn experiment seems to shadow forth this possibility.

Illumination of mine workings is a matter of growing interest, and in the discussion of a paper on "Steel Roof Supports," at a session of the Midland Counties Institution of Engineers, at Nottingham University College, Nottingham, England, some remarks were made on this engrossing subject by Prof. W. H. McMillan. He states that

Reflection of Surfaces Found Underground

Surface	Reflection Ratio Per Cent
Dull coal (hards)	1.5—2.5
Bright coal (brights)	2.5—4.0
Aluminum paint on wood	37
Aluminum paint on metal	47
Plain white "deal" (fir or pine board)	62
Pit prop (dirty), no bark	16.5
Pit prop (new) stripped of bark	53
Matt white (whitewashing)	79.5
Pink brattice cloth	26.5
Various shades of bind (clay shale)	12.5—35

G. W. Dickinson, agent, Clay Cross Co., Ltd., Clay Cross, Derbyshire, England, had been painting his props with aluminum paint. Professor McMillan presented the accompanying table on the reflection of surfaces.

Professor McMillan said that when props were whitewashed, illumination at the face increased 10 per cent; when props and packs were whitewashed, 45 per cent; and where props, packs, and roof were whitewashed, 95 per cent—all approximate determinations.

J. R. Felton added that many collieries in the Midland district had started whitewashing the cars, which seemed a ridiculous idea, but had proved useful. Much could be done by whitewashing props, roof, and sides of roadways. Even where the sides were whitewashed and so gave a background of a like tenor, the whitewash on the cars aided haulage men in noting their approach.

R. Dawson Hall

On the ENGINEER'S BOOK SHELF

Washability Tests of Illinois Coals, Conducted by the Engineering Experiment Station, University of Illinois, in Co-operation with the Zeigler Coal & Coke Co., by A. C. Callen and D. R. Mitchell. Bulletin 217 Engineering Experiment Station, University of Illinois, Urbana, Ill. 112 pp., 6x9 in. Price, 60c.

Careful and well-executed tests of six coals in various parts of Illinois are recorded in this bulletin. The description of the tests is preceded by a discussion of the reasons for the methods adopted and so gives a good basis for a study of the subject of coal testing, for be it understood this bulletin concerns itself not with washing proper but with the sampling of coal and the making of float-and-sink tests preliminary to introduction of wet or dry cleaning. The accompanying table shows some of the results of the investigation in the order of the ash percentage in the coal.

In the Franklin County coal the sulphur, unusually low for Illinois coal, cannot practically be decreased at all by treatment, though that in other coals can be. Eliminating the Franklin County and the Peoria 2-in. coal samples from consideration, the average raw coal can be cleaned from 4.88 per cent sulphur to 3.57, or 27 per cent, and from 17 per cent ash to 10.6, or 37.5 per cent, with a loss of coal of 17.9 per cent. This, however, is a theoretical result. In practice the loss might be greater and the coal not quite so clean as the figures suggest. The middlings could be crushed, of course, and more clean coal obtained by a second cleaning of the product.

The Economics of Strip Coal Mining. By O. E. Kiessling, F. G. Tryon, and L. Mann. Economic Paper 11, U. S. Department of Commerce. 32 pp., 6x9½ in.; paper. Price, 10c.

Statistical and other economic information relative to the past, present, and future of strip-pit mining are given in this paper. Little is said as to anthracite stripping, though it is stated that "Pennsylvania anthracite, selling for an average of $5.70 a short ton at the mines, will justify the handling of a greater thickness of cover than will Texas lignite, selling at $1.14 a ton."

Of course, there is a limit to the depth of cover suitable for stripping by simple casting. The coal in the anthracite region usually dips so much that it soon gets under a cover in excess of the 70 or so feet that can be removed without the use of transportation units, and the average ratio of 5.45 to 1, or the maximum ratio of 17.6 to 1 ruling in the bituminous region and so readily feasible with thin coal cannot be approached with thick coal because of the limitation of depth of cover.

The ability to dig deep, says the bulletin, is increased by shifting with the dragline, over a broad area, the upper third of the overburden and by shifting with the stripping shovel the other two-thirds. At a pit in the Coal City-Wilmington field of northern Illinois two draglines (one with a 170-ft. boom and another with a 150-ft. boom and with bucket capacities of 12 and 7 cu.yd. respectively) are working each in conjunction with a 12-yd. shovel.

In some pits no tracks are laid in the pit but the coal is lifted to cars on the high bank, which is in process of excavation. In this way the berm in the pit is eliminated, thus reducing the angle of swing of the shovel and saving time in stripping. Caterpillar tractors shove or pull the track into position. Some operators still load their coal as run-of-mine into railroad cars at the pit site, thus eliminating the expense of pit cars, locomotive, and tipple. In commercial operations the trend is toward the use of preparation plants, and 80 per cent of the strip pits have them. Where there is a large percentage of "horsebacks" in the coal, as in the Cherokee seam of Kansas, a small revolving shovel, or "horseback machine," works ahead of the loading unit and removes the clay and impure coal.

From face samples the Illinois Geological Survey found that the average heating value of coals from eleven strip mines was within 0.3 per cent of the average from adjacent underground mines. Since 1921, sales realization on strip coal has been lower than on that of underground mines, because of smaller proportion of prepared sizes, differences in preparation practice, and sheer ability to undersell as much as to inherent differences in quality.

In the southeastern Kansas field many of the large strip mines operate the stripping shovels three shifts for approximately four months in the year, two shifts for six months, and one shift for two months. The author shows Kansas as having enough strippable coal to last 26 years at the present rate of stripping; Illinois to last 327 years; Indiana, a shorter time; North Dakota, Montana, and parts of Wyoming, many years. Lower wages, the authors suggest, keeps some Eastern states from stripping, but perhaps still more the hilly conditions, which make large areas of strippable coal of infrequent occurrence.

R. Dawson Hall.

* * *

"Coal," by A. T. Shurick, Consulting Engineer. 61 sheets, 3¾x6¾ in.; cloth. Price, $12.

A series of charts, prepared by the author for his own professional use, are now released to the public for a limited circulation. These charts are prefaced by a short mimeographed introduction describing the graphs and their use. On active graphs space has been provided, with co-ordinate dividing lines, for projection one or two years ahead. The graphs number in all 56 and cover weekly coal production and movement, prices, consumption and stocks, general and annual distribution, coal substitutes, economics of operation, and values of coal securities.

Something of this kind has long been needed to provide the statistical background of future operations, and it is hoped that at suitable intervals Mr. Shurick will extend and expand this unequaled service to the industry. Many engineers, bankers, and railroad men will be pleased to get a collection of charts of this kind, realizing that the accumulation of them in handy symposium form would take months of collection, thought, and redrafting.

Float and Sink Tests, Illinois Coal

County	Coal Bed	Size, In.	Clean Coal Less Than 1.40 Sp.Gr. Wt.	Ash	Sulphur	Middlings 1.40–1.70 Sp.Gr. Wt.	Ash	Sulphur	Refuse Over 1.70 Sp Gr. Wt.	Ash	Sulphur	Total Wt.	Ash	Sulphur	Bed Moisture	Coal Unit B.t.u.
Franklin	6	6x0	90.5	5.5	0.83	6.0	24.7	0.87	3.5	64.1	1.00	100	8.7	0.84	9.8	14,530
Peoria*	5	2-in. lump*	84.6	8.2	3.92	13.7	18.4	8.90	1.7	55.1	17.70	100	10.4	4.84	15.6	14,610
La Salle	2	5x10	82.3	8.7	3.93	8.3	26.8	9.52	9.4	62.3	16.27	100	15.2	5.57	12.4	14,740
Williamson	5	6x0	82.8	8.9	3.77	11.9	23.2	8.73	5.3	60.8	13.71	100	13.4	4.89	7.6	15,000
La Salle	5	5x0	83.3	9.1	3.50	10.0	28.7	7.20	6.7	62.4	20.60	100	14.8	4.97	12.3	14,450
Peoria	5	6x0	84.8	14.0	3.29	10.1	33.3	5.85	5.1	56.0	7.64	100	18.5	3.77	16.5	14,610
Marshall	7	6x0	77.1	14.4	3.34	12.4	28.8	5.51	10.5	66.0	18.50	100	23.1	5.20	15.6	14,630

*Crushed to 1 in. crusher size prior to treatment.

THE BOSSES TALK IT OVER

Dump Fires—
How Can They Be Avoided?

IN OPENING up an informal meeting of his staff, last Tuesday, the Old Man wasted no words in his say: "We're not going to let outside disposal of mine refuse get us into a jam at our new plant. We can't just think of the problem as we did in earlier days, when we dumped wherever was convenient with no thought of sulphurous, smudgy dump fires or their effect on our own people, neighbors, and the countryside. Besides, we have a new set-up, what with the cleaning plant and mechanical loading. What's to be done?"

"I have heard of many schemes to avoid the firing of dumps," said Mac, "but nary a one is sure. The best I can suggest is to stack the refuse, and let nature take its course."

"That won't do," broke in Jay Brown, the engineer. "We are short on dumping grounds and the dump will have to be built in the hollow between the mine plant and the town. So we can't afford to have a burning dump."

"Here are the suggestions so far made," continued the Old Man, reading:

"'Stack the refuse in a layer; say, 6 ft. deep; let it stand a while and then add a second layer, etc.

"'Keep out wood.

"'Allow our people to pick out good coal for their own use; haul it for them; and even pay them something for their work, in addition. Let out the removal of coal on contract.

"'Stack the reject from the cleaning plant separate from the mine refuse.'"

WHAT DO YOU THINK?

1. What general precautions do you take to avoid dump fires?

2. Which of the suggested schemes, singly or in combination, do you recommend?

3. Would it be well to stack cleaning-plant reject and mine refuse separately?

4. Are there any objections to the plan of allowing non-employees on the dump?

All superintendents, foremen, electrical and mechanical men are urged to discuss the questions on page 194. Acceptable letters will be paid for ▶ ▶ ▶ ▶

Would it be advisable to put day-labor jobs under the supervision of a special foreman? Jim told Mac last month that he intended to adopt this plan. What the readers think is told in the letters following.

Getting Off on the Wrong Foot

THE trouble which Jim and Mac are having with the control of day work may go further back than one might suppose. Perhaps Mac is an old-timer who once was a worker in the very mine which he now supervises. If that is so, his friendship for certain men may conflict with his better judgment. The whole situation may be summed up in a remark I heard some time ago: "Mac never cut coal; he always kept a good company job until he became a boss; and he never worked hard."

This is intended as no reflection on the man who has come up through the ranks. As a matter of fact, I don't believe a man should be appointed to foremanship until he knows the jobs of his workers; knowledge gained by actually doing those jobs. Certainly no man will succeed who depends almost entirely upon paper calculations.

An experienced foreman can closely estimate how much time is required to lay a switch, to set a timber, or to lay a foundation for an engine, provided all the necessary materials are on hand. I would not be satisfied if the men told me a certain job took about one hour extra to complete it than I had figured on. The next time I would stay with them for a while and study out their methods of doing the job. There may be something wrong with their tools, the ax may be dull, the saw may not cut; all of which kills time.

Some days ago I saw in a certain mine a curved heading leading into a section which employed eight men. It took the motor crew about one hour to pull out the loads and to put in eight empty cars. The curve wasn't laid out properly and the cars were running on two wheels only, so they went off the rails. That delay of one hour to eight men certainly was costly. The tracklayers were called upon to repair this curve, but their effort made no noticeable improvement. In this case the inefficiency lay with the foreman and not with the men, and his failure added something to the production cost.

Although it is very difficult to set a standard time for every kind of company job, standard time can be established for the laying of track, setting of timbers, extending trolley wire, installing pipe lines, and similar work. If it is impossible to give a standard time, the foreman should have sufficient experience to estimate fairly accurately what time is required. An experienced foreman will do more work with six men than an inexperienced foreman will do with ten or twelve. As the section foreman knows just how and when a job should be done, day work should be under his supervision. As a matter of fact, it might be well under certain circumstances to have the special bosses, whose supervision extends over several sections in some particular phase of the work—such as timber bosses and cut bosses—report directly to the section foreman in matters pertaining to the latter's territory. This may be necessary because Mac is not getting to every section every day.

FREDERICK NEUMAN.

Scranton, Pa.

Inefficiency and Low Cost Point to Low Wage Standards

DAY labor can be controlled and face efficiency maintained by adequate and intelligent supervision. At best there is an inordinate ratio of guess work that allows the management in these strenuous times to go so far, which is not infrequently to the walls. It has been my contention and observation that the extra man required to supervise the face workings efficiently, as well as day labor, will reduce the labor costs many times the man's wages. Inefficient and insufficient supervision cannot keep the mine going indefinitely, except where low wage levels and standards of living make it possible.

I was recently told of a certain mining operation with three different openings in which 75 miners and day men are scattered isolatedly throughout them and which is supervised by one official. In addition to giving attention to his heavy inside responsibilities, he ships the coal, makes up the payrolls, and tries to meet the many issues that come from the rank and file of his employees. This official could be nothing less than a whirlwind of energy and capacity, attending to all these phases of mining. Whether or not the plant is efficiently operated, the salient fact remains that $2.40 per day is about the maximum wage received for a ten and eleven-hour day underground.

Thorough face supervision will not only maintain an uninterrupted tonnage and minimize mine accidents but will eliminate a very large item of day labor otherwise necessary in cleaning up caves, retimbering neglected places, maintaining poor trackwork, and other items of cost incidental and belonging to lax activities at the working faces. As the result of poor supervision of day labor we have excessive labor costs or important work unfinished, or both, and this accumulates until haulage delays and decreased tonnage reacts in a nightmare of increased costs and a decline in the morale of the mine and the management.

I am of the opinion that Jim is right and that one man or more specialized in controlling and standardizing day work should be included in the supervision personnel to keep the maintenance of the mine up to its potential possibilities for economy, quality, and production. The right official thus employed will be a big factor for permanence in these objectives. Where section foremen, firebosses, and others are necessary to direct and control face activities and day labor, however competent they may be or how many times they may see and check up on these day men, each will have a different standard for handling their work and measuring their results.

Where conditions vary in sections a slight increase in labor cost might reflect disadvantageously on sections with adverse conditions. A section boss functioning efficiently at the faces might unconsciously antagonize a valuable day man to an extent where the management would lose two good men. There are genuinely capable section bosses, as far as face supervision goes, who do not know how to handle some day men with the best results. Specialization in face supervision and the control of day labor do not always run hand in hand any more than the average professional or business man has a flair for specializing in everything relating to his profession or business.

Benbush, W. Va. W. H. NOONE.

Automaticity and Continuity Can at Least Be Approached

WHEN I was a boy, working in a furniture factory, it was my duty to take boards off a planing machine and pile them on a truck. Another workman fed them in, and there was no opportunity for me to shirk because as soon as I had taken off one board, another followed. My efficiency was automatic. The same general system is now employed by the highly developed motor industry. Work is fed to the workmen at the rate which experience and time-studies have proved to be practical and efficient, and there is nothing to do but do it.

While it might at first appear that

such methods are not applicable to the tasks involved in coal mining, it is nevertheless true that the nearer we approach this condition, the more efficient our labor becomes and the less supervision is required to maintain efficiency. Let us trace the movements of a well-managed coal operation and note their automatic action: the track layer's task is to lay for a given number of loaders; the gathering locomotive crew is expected to assemble so many cars per day; the haulage motor is scheduled to haul so many to the bottom; it is up to the spraggers and cager to get them on the cage; the couplers to couple the empties; the hoisting engineer to hoist them; the weighman to get the weights; the tipple crew to screen and clean the coal; and the car-riders to handle the railroad cars; and so on all along the line. Any interruption to this schedule is instantly and apparently localized and the man responsible is placed in the spotlight, and he knows it. Therefore each man is up in the collar.

The whole movement originates at the face, and for this reason it is essential that section bosses give extra attention to this point to insure that face conditions are such that there be no failure at this point. When face conditions are such that cars are promptly started on their way, efficiency is assured if the working force is not overmanned.

As to standardizing day-labor operations as to time, there is no job which cannot be so standardized, and it is up to every section boss to familiarize himself with the average length of time necessary to accomplish each kind of task. The time will vary somewhat in individual cases but the average will hold remarkably true to form. The boss should consult his watch frequently, not only to check the time required to complete the various jobs he is watching but also to maintain a schedule for his own movements, so that he may be at the right place at the most effective moment.

In the all-mechanical mine success is obtained only by scheduled operations. Orderly and systematic methods at every point are necessary instead of the somewhat easier habits of the hand-loading tonnage-scale operation of former days. Each function must be accomplished in its regular order, and when it is so, the question of day-labor efficiency control again becomes automatic. Extra supervision may be needed up to a certain point, but can easily be overdone since it divides responsibility.

Mechanical and electrical repairs should be checked by a system of report cards which show the time spent on the repair of each machine, together with a list of the new parts installed in each. The machine should be given a number for reference, and it is thereby possible to ascertain accurately the cost of upkeep of each machine. This enables a comparison of the runner's care in the operation of the machine as well as a check on the amount of work accomplished by the repair department.

Do You Know?

Shall fire ever continue the mighty master of the mine dump? Shall the rise of its smoke to pall the landscape and the acridity of its fumes to torture lung tissues continue to be accepted as a necessary evil? How many of the fires are actually of spontaneous origin? How many are ignited through carelessness? Is there no solution? Hope lies in the fact that one of two or more dumps disposed under similar conditions at a single plant may escape combustion while the others are in conflagration. There must be some reason. If you know a cause for these fires and a way to avoid them, you should contribute your discussion to the problem stated on page 194. Send in your letter today.

It may be seen from the foregoing that I have placed the control of day-labor in three classifications, all of which should be employed in a well-managed operation. First, those tasks which may be automatically "fed" to the workmen; second, those which are capable of being checked by a system of reports; third, those tasks which are not capable of being controlled by the two foregoing methods but must receive direct and frequent supervision on the part of the boss in charge. W. E. Buss.

Vincennes, Ind.

Time Studies and Cost Control

TIME studies of all work should be made by men familiar with the details. From them should be established standard allowances for the various jobs. Experience has taught management that men, even when given these standards, will find many excuses for using more time when they fall short of the standard unit allowed them. Good practice will not allow quick makeshift work, for quality is a factor, as well as speed. Standard jobs that are completed ahead of time by an energetic crew must be recognized with a bonus or other reward or there will be no incentive to push a job through ahead of the allowed time.

Time studies are materially helpful to management in controlling costs. The men know then that those in charge have "the know of it" and that when records are kept more fairness in administration is the result. It is of inestimable value to the super and other bosses in general charge to be able to plan work by means of time studies. With these facts in hand and by weekly conferences they can keep control of the costs. The leaks will soon assume outstanding prominence as the guessing is eliminated.

Concord, N. H. C. H. Willey.

If They Are Not Specialists Just What Are Your Bosses?

I DON'T get the idea of Jim and the Old Man saying that they were going to put day-work jobs under specialized supervision. Just what do they call their bosses? If the foremen are not specialists, they should be demoted and put to work at the bottom to learn the time it takes to do a job. A mine foreman or super who has never worked in the mines is not in a position to criticize or pass judgment on the time it takes to do a job. Not only must a foreman tell his men how long it should take to do a job but he must be prepared himself to demonstrate the accuracy of his estimate.

If the Old Man thinks the mine needs an efficiency expert, he should hire a good mining man to inspect the operation, advise him on the way the plant should be run, and then take up the report with Jim and Mac. He must remember that speed does not always mean economy. There are safety, permanency, and accuracy to be considered. I try to control my day work by controlling my men. I do not hesitate to criticize or to discharge when necessary. My men know this, and so I don't have to do either. I am careful in keeping time and, consequently, my men know that when they get their statement their pay will be right, and that they will not have to run about to have it straightened out.

Because they know these things they are constantly trying to help me in the accomplishment of work. I may be old fashioned, but I think the only way to get low costs is to get a good foreman. And when I say "good," I mean just that. He is not one whom you employ because you like him personally, and then employ lesser men to do his work.

Glo, Ky. Walter Hornsby.

Jim's System Works, All Right

JIM certainly is on the right track in applying special supervision to his day work, and in his time-study analyses on all of his routine day-work jobs. That will certainly help reduce his cost. The plan outlined by Jim is very similar to the one we have used at our operation for some time. It works.

Before going to this system, the mine foreman and his assistants tried to supervise the day men, but that plan resulted in low efficiency. We then placed one man in charge of all day men and all day work. His big job is to plan, schedule, and supervise all day work. He receives most of his work orders from the production foremen after they have been approved by the mine foreman.

To further assist the day-work foreman in his work, time studies on all routine day-work jobs were taken and a copy of this was given to the foreman, so that he might compare the actual time with the time study. Before start-

ing the time-study program, all the foremen were requested to state what they thought was a good standard time for doing a certain piece of work. The answers varied from 1½ to 8 hours, while the time study showed it to be 2 hours. With this as a background, very little difficulty was experienced in selling the time-study idea to all concerned.

Jim should not stop with the time-study analyses but should try and place all day-work jobs on some kind of an incentive plan. We have started on this and already have some of our day work on an incentive system. The system adopted is one widely used: the day-work piece-work system. In this system the workman is paid an hourly rate plus a rate per job. This system insures the worker of a minimum daily wage plus the possibilities of making more by applying himself. A. J. RUFFINI.

Cadiz, Ohio

Neglect of the Small Jobs Pyramids the Mine Costs

BY close supervision the cost of day work can be cut appreciably. The trouble lies most in the neglect of the small job and the small details of the large job. So absorbed is the average man in the bigger things, he unconsciously allows thousands of dollars to slip between his hands which might be saved by equal attention to the smaller things.

Undoubtedly, the Old Man is right in suggesting a special boss for day work. The foreman and his assistants have a lot of other duties which also need specialization; so much so, that if they take care of the one they neglect the other. In the press of duties they are bound to miss opportunities for saving, not the least of which is the economical utilization of materials. The special foreman has more time to study and to analyze the work under his care. It is practically impossible to estimate a job unless you are in constant contact with the men doing it.

Stickney, W. Va. S. J. HALL.

You Are Slipping, Mac

JIM should not put on special supervision to look after Mac's day work. If the section foremen are in charge of face activities and special supervisors take care of day work, what job will be left to Mac? It is my belief that Mac and Jim should talk the matter over, to the end that Mac get in closer touch with his men. It looks as if Mac is slipping. Wake up, Mac! You do not have your men under control.

It is only by control of the men directly that the mine foreman can control his day work. He must let them know that he is the boss, and that his orders are to be carried out to the letter. When a job is to be done, the foreman should provide for the delivery of supplies and materials to that job, put the right man on it, give him the necessary instructions, and then tell him to go to it. Provided the men are of the right sort and under control, they should not need much supervision. The visits of the foreman should be made chiefly to determine why the job has not been accomplished efficiently if such is the case. J. C. CRAWFORD.

Apollo, Pa.

In Setting Standardization, Commence With the Foreman

IN NO sense can any kind of mine work be controlled or standardized as can, say, the product of a machine shop or factory on the surface. Where uncommon disturbances present an unusual problem, which is quite to be expected in all mine operations, such a condition can be controlled only by comparison with a similar condition elsewhere. Given a condition of uniformity with little or no unusual occurrences, then we can say with certainty just how many day men can perform the maintenance work compatible with expeditious loading possibilities and a well-balanced cost sheet.

One of the least thought of, as well as the most detrimental, factors against maximum efficiency of day men is the smug self-sufficiency of certain types of management. The phrase "Yankee ingenuity" apparently has no place in the lexicon of the average mine boss and his legion of associates, who modestly assume the first option on resource. I have said before in these columns, and I repeat, that none should be allowed to direct working forces who hasn't gone through the mill himself. It is the only sound method whereby those who direct the working force can appreciate the workman and his accomplishments.

An efficiency formula, which is contained in no mining treatise that I have ever consulted, might well read: "The efficiency of the day force in a coal mine varies directly with the experience and knowledge of those who direct that force." To follow this formula, first, carefully pick your day man from the point of conduct and efficiency. Tell him what you want him to do and where you want the work done; then trust to his resourcefulness in performing a workmanlike job. This puts him on his mettle, and I have yet to see it fail to get gratifying results.

ALEXANDER BENNETT.

Panama, Ill.

Leave It to Mac's Judgment

MAC'S move in shifting the entry man to day work shows that he knows his man. The ready acceptance of his offer proves that the entry man is a steady, reliable miner, the kind of man the foreman must depend upon. It was through no fault of his own that John was deprived of his usual day's work. The question of shifting labor should be left to the judgment of the mine foreman. FRANK LA FOLLETTE.

Francisco, Ind.

Who Should Be Penalized?

JIM'S protest over the fact that Mac shifted the idle entry man to a job of cleaning up an entry is understandable only if that man is paid a rate higher than customary for the job. When a man is shifted he should be paid the rate for the work at which he is temporarily employed and not the rate he would receive at his old job. In order that no waste shall result from such practice, some way should be found to control it. Avoidable breakdowns are a serious matter to both management and men. When they occur the management, or its direct representatives, should be penalized, and not the men who have no control over the situation.

England. W. E. WARNER.

Abolish the Overdraft

CREDIT should not be extended to any employee, either for company-house rent or for merchandise purchased through the company store, to the extent that it would cause an overdraft on the payroll. Exception should be made only in cases of misfortune beyond the control of the employee or the company, as sickness or death in the family. Unfortunately, most of us need a guardian when our credit is too good. It is easy to buy on credit, but mighty hard to pay. If the account is allowed to accumulate, payment may jeopardize future wages or salary. The order the superintendent gave Mac is about all he could do under the circumstances to cure and put an end to the evil evidently practiced.

Overdrafting not only tends to lower the efficiency of most employees; it makes them indifferent to their work and creates a dislike for their employer while collection of indebtedness is being made. No employee can be at his best when he holds malice toward his employer or while worrying about debts and depriving himself and family of the necessities of life. This is the condition the employee would find himself in if he were allowed to make overdrafts from pay day to pay day. Furthermore, what chance has he to better himself or family, educationally or socially, if allowed to overdraw his pay? The practice prevails in too many coal fields and should have the careful attention of the management. This, of course, would result in the abolition of payroll overdrafts as well as the evil of showing a discrimination between employees who pay their own way and watch their credit and those who expect extra time and considerations for getting in debt to the company. P. G. CONRAD.

Vincennes, Ind.

LETTERS
. . . to the Editor

What Is Prosperity?

Prosperity is merely the proper functioning of the economic machine—production in proper quantity of what people want and can buy—advertising and distribution so that consumer and producer are brought together. The rest takes care of itself—wages are paid and spent and the wheels go around.

Our business apparatus goes off the track because we expect it to run forever. We sell $100,000 in one year and expect to sell $120,000 of the same goods the next year; in the meantime, the people have changed their habits and styles and want something we cannot furnish. Even in the times of deepest depression, there are many things that can be sold like hot cakes.

Our last era of prosperity was made possible by the progress of invention—the automobile, the radio, airplane, and such—taking up the slack in employment caused by mechanization of industry, and yet this didn't last forever. Our new prosperity, when it comes, will not run in the old ruts. It will be a new machine on a new road and based on the creation of new needs and the better satisfaction of old ones.

There is no telling when and where prosperity will start again—maybe it has started already. Something there must be to give it a boost—don't you remember how Henry Ford started full production in 1921?

Many of the truest words are spoken in jest. Perhaps no one knows who wrote the old Mother Goose story of the "Pig Who Wouldn't Go Over the Stile," or how long ago it was written, but it contains a word of truth much needed today. You will remember that everything was properly set, but the pig wouldn't go over the stile, and the various actors who might have helped the situation just stood around with their hands in their pockets. Finally, the cat made the proposition that she would start things if the old woman would give her a dish of cream. So the old woman did and—the cat began to catch the rat, the rat began to gnaw the rope, the rope began to hang the butcher, the butcher began to kill the ox, the ox began to drink the water, the water began to quench the fire, the fire began to burn the stick, the stick began to beat the dog, the dog began to bite the pig—and the pig went over the stile.

So now American inventive and producing genius must supply the dish of cream for the consuming public. In the meantime, let us all put our houses in order to produce better goods, more economically than before, and to study old wants and new ones; so that our new prosperity, when it comes, will be built on enduring lines to run for a long time before it goes off the track again.

Chicago. ANDREWS ALLEN.

[The above letter, written at Jasper, Ala., Jan. 11, was accompanied by a personal note from the late Mr. Allen which began: "I am marooned here on a rainy Sunday—my 61st birthday—and having nothing better to do have set down on paper some thoughts I have long had in mind."]

A Job for Moses

A certain banker had been considering long and earnestly means and methods of keeping his bank out of the coal business. He even carried his problem home with him. Then, when the banker's young hopeful asked the answer to the old saw: "Where was Moses when the light went out?" the father promptly answered, "In the coal business."

Afterward, the banker admitted that it wasn't quite the answer he should have given his son. But in view of the chain of thought the answer started, the banker agreed that it might pay to be facetious once in a while.

Suppose Moses was in the coal business when the light of prosperity went out; what would the energetic Moses do? Ergo, the answer was obvious: Moses would lead the coal industry out of the wilderness of demoralization into a land flowing with milk and honey and profits.

Following through this chain of thought, the banker engaged an advertising man and charged him with the duty of finding all the ills of the coal business in general and those of West Virginia in particular. The investigator investigated, found his job included too much territory, and finally submitted a detailed report covering only a portion of southern West Virginia. From this report the following paragraphs were gleaned.

To begin, one must hark back to the halcyon days of coal. The days when every operator was concerned with a good baseball nine, getting more cars, and producing greater tonnage. To the times when coal moved to the tidewater for ship bunkers and to the Lakes in constantly increasing streams. Turn back to the good old days when coal was a daily necessity.

Smaller men, envious of the opulence of successful operators, aped the methods of the great and the near great. More mines were opened. Easy money poured in to take a share of easy profits. Mining methods were improved and still further improved. The future of the coal business seemed as roseate as a California sunset.

Then came the matter of sales competition. First the competition was mild, then intense, then cut-throat, and finally a cat-and-dog affair. Associations were formed; resolutions were passed; and markets slipped away.

Middlemen discovered that they could have the opulence formerly enjoyed by the operators. All that was necessary was to wait until demurrage started eating into a car of coal and they could buy at their own figures. What did it matter if coal consumers found one ton high in B.t.u. and the other high in clinker content? All the other dealers were selling, and every kind of demurrage coal. It was and is a free and easy life for the coal dealer—sailing a modern Spanish Main without the danger of decorating a gallows.

The operators rolled over, took another forty winks, and discovered it was a job for all the operators. A good number felt that it was an association matter and that the secretary could best handle it. When the association appeared lax, another association was formed. The Interstate Commerce Commission was appealed to; high-pressure lobbyists were sent to Washington; and still the demoralization continued. The time had come to do something; do anything to bring back customers and the halcyon days of peace and plenty. The operators pulled separately; they pulled together; and they pulled anyway at all just to be pulling.

In the meantime new fuels were taking the place of coal. Oil and gas producers were quietly working with manufacturers; they pointed out how much easier oil and gas could be used in industry and in the home. Electricity came into the field and built huge laboratories for testing ways and means of using the product. Gas and oil men followed suit. Markets slipped away from the coal man to the gas man, the oil man, and the electric man.

The new fuels maintain extensive research departments where every problem of heating is met and solved. If you doubt their willingness to serve, just dream that you have a new method of using gas, oil, or electricity, and a research man will see you tomorrow.

Truly the coal business needs a Moses . . . if one can be found. A Moses with the vision of modern business—one who can create anew the markets that should be served by coal. If one could find a Moses capable of cementing the loose ends of the coal business together, a big testing laboratory like Nela Park or the American Gas Association could be maintained at full capacity. Then by selling those discoveries to the American consumer—domestic and industrial — prosperous days could come again to the coal industry.

The bugaboo of overproduction could be forever laid if coal men would get together, not to uphold prices but to recapture markets. So long as one group continues to fight another group, just that long will a come-back be delayed. But when the big and the little start putting their heads together for a common cause they should forget the halcyon days. Halcyon days will never come again. Competition has forever wiped that period from the calendar.

Huntington, W. Va. B. B. LOVINS.

OPERATING IDEAS

From PRODUCTION, ELECTRICAL

And MECHANICAL MEN

Field Current Value Vitally Affects Synchronous Motors

WITH FEW exceptions motor-generator sets used throughout the coal fields are driven by synchronous motors, yet in many cases the basic principles of this type of motor are not clearly understood, with the result that the machines do not give the service that can reasonably be expected of them, according to E. R. Biggers, Crichton, W. Va. Repair bills may be high and power delays frequent.

One of the common troubles is stalling or pulling out of step on a heavy load or momentary peak, which are both characteristic of mining duty. It will prove disastrous to the damper or pole face winding if either the oil circuit breaker or d.c. breaker fail to open; however, if the d.c. breaker opens, the motor probably will pull back into step. Another trouble with some sets when subjected to frequent overloads is tripping of the oil circuit breaker before the d.c. breaker opens, necessitating frequent starting, which will cause heating and resultant damage to starting transformers and motor damper windings.

Often these troubles are thought to be caused by the substation being located so far from the power transformers as to produce excessive voltage drop, by faulty operation of breakers or by the motor-generator being too small for the duty. A careful check usually will reveal that the real cause is under-excitation of the synchronous motor field, and that an increase of 2 or 3 amp. will solve the difficulty. If the recommended field current is not stamped on the name plate, this information can be obtained by writing to the manufacturer.

The following method—entirely wrong—is sometimes pursued in setting the field current of the synchronous motor: With the d.c. breakers open and the generator operating at no load, the field rheostat is adjusted until the a.c. ammeter in the stator circuit shows minimum current. If this method has been used, the power factor will "go to pieces" when a heavy fluctuating load is imposed on the generator, and the troubles begin.

Under this condition the motor will be drawing a heavy wattless current at a lagging power factor. The wattless component of this current is not useful for doing work but it will heat the windings of the motor and also the a.c. feed lines. This wattless current will not register on the watt-hour meter but there will be an increase in the kilowatt-hours equalling the energy required for the unnecessary heating. Some power companies exact a penalty for an inductive load (load at lagging power factor), because it imposes a load upon the transmission lines from which revenue is not otherwise collected.

A good method of determining and setting the synchronous field for correct excitation where a power-factor meter is not available is to load the generator until the d.c. ammeter in the feeder circuit shows full-load current, then adjust the synchronous field rheostat until the ammeter in the stator circuit shows a minimum reading. This will provide a setting for approximately 100 per cent power factor at full load.

One convenient method of supplying a steady, full load for the generator is to use a water rheostat. A 50-gal. wood barrel does very well if the machine capacity is not much over 150 kw. The desired current is obtained by adding salt to the water and by adjusting the spacing or submersion of the electrodes. Another method is to set the brake of one of the largest locomotives and try to pull it with another large locomotive.

For a machine subjected to the usual varying mine load, adjusting the power factor to 100 per cent for full load is only a compromise. At light loads or no load, the power factor becomes leading and at overloads it lags. Excessive leading power factor also produces undesirable heating of windings and consequent increase in power consumption. In order to take full advantage of a motor-generator set for handling a peak

load (the load which usually controls the size of machine necessary to handle a mine load), the synchronous field should be operated at its highest value. This, however, will further increase the extent of lead for light loads and will limit average machine capacity, because of the heating produced by the high current in the synchronous field.

From this it is evident that for best results and greatest power economy the synchronous field should be adjusted for every change of generator load. This can be accomplished by the use of automatic power factor regulators, several types of which are now available. One, which makes use of an exciter with its series field connected across a shunt in the d.c. feeder line, provides smooth regulation by inherent voltage changes. Others regulate in steps by relays which short-circuit sections of the synchronous field resistance.

In the majority of cases switchboards are not equipped with power-factor meters. The lack of this instrument is primarily responsible for much of the power loss and trouble from improper operation and for the slight knowledge that many of the practical mine electricians have of power factor and proper operation of synchronous motors.

—◇—

Sign Not Enough Protection From Falling Coal

High-speed hoisting with attendant quick dumping makes possible some coal spillage around the shaft at No. 86 mine of the Consolidation Coal Co., Carolina, W. Va. According to new safety standards, the old method of protection, simply a sign at the shaft warning of falling material, is inadequate; therefore a fence has been erected around the

No Danger if One Stays Outside of the Fence

area where coal is liable to fall. This area and fence are shown in the accompanying illustration.

At the front, the fence is 25 ft. from the landing gates. It is built of worn hoisting rope and of used steel pipe. A rope gate is provided across the track leading from the landing to the shop, but there is little traffic through this gate, inasmuch as the mine is equipped with another shaft for handling men and materials.

Foot Pedal Switch Provides Official Line Outside

In a mine equipped with a magneto telephone system without switchboard it is desirable to have the circuit arranged so that, from a central point, such as the shop or inside office, officials can telephone to the outside without the conversation being subject to eavesdropping from other telephones in the mine. Unless a separate line to the outside is provided it is necessary to have a switch to sever connection temporarily with the balance of the inside telephone system. If the switch is not arranged to close by gravity or a spring, the arrangement will constitute a nuisance, for the switch is sure to be left open rather often. A convenient and simple method of turning the trick is to employ a foot switch such as shown in the accompanying photograph.

This was taken in the underground shop of a slope mine of the North East Coal Co., at Auxier, Floyd County, Ky., and shows G. E. Minns, mine foreman, telephoning to the outside. When the foot is removed from the pedal the weight of the rod connecting it to a switch mounted on top of the telephone pulls the switch handle down to the closed position, thereby restoring connection between the outside telephone and all telephones in the mine. Obviously a hand-operated switch held open during conversation would be impractical, because the free hand is often needed for making notes.

A further advantage of disconnecting is to rid the line of the noise that usually exists on a system of inside telephones with conductors paralleling power circuits and insulated none too well, considering the moist condition existing during much of the year.

A Private Line Until He Removes His Foot From the Pedal

No Mere Substitutes

An analysis of these pages will convince you that the ideas presented are more than useful—they are invaluable—in the daily pursuit of operating a mine. None of them is a plant-made substitute for some piece of equipment, method or practice already developed to a high degree and in general use. Each is chosen on merits of originality and capability of filling a pressing need. For these reasons and others you should review the pages of this department month after month. Another thing, you can earn extra money by sending in a single idea of your own, together with a sketch or photograph. If it is published you will receive $5 or more for it. An idea usually can be expressed in a few words, which means the writing will take but a few minutes.

Is Time Interval a Factor In Sledging Rock?

When using a sledge hammer to break up hard limestone and round boulders sometimes encountered in the roof immediately above a coal seam, is the time interval between blows a factor influencing the rate at which the rock can be broken? W. H. Luxton, Linton, Ind., believes that this time interval is quite a factor and gives an experience to prove the point.

Rock of the kind already described was encountered in taking down about 6 ft. of top during the making of a shaft bottom in an Indiana mine. The pieces varied in size and shape; in slickness and hardness. All were difficult to handle. The crew was preparing to break up the larger sizes with dynamite when the mine boss happened along and explained that such procedure was unnecessary and told how the job could be done otherwise.

Here is how it was done. A sledge hammer was set near the pile of boulders and each time the driver came upon the scene to pull a loaded car he hit a boulder a light, sharp blow. To one who had never seen the practice before, this antic of the driver appeared ridiculous. But his actions were not as foolish as they seemed; a number of the blows delivered at intervals soon broke the boulder or rock in two. It was explained that an equal number of blows delivered one immediately after the other would not have the same effect.

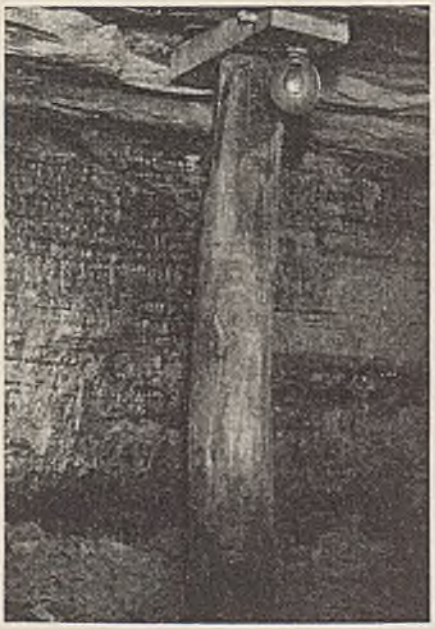
Parabola Reflector Effective For Haulway Lighting

How to eliminate glare usually is the principal concern when attempting any form of mine lighting. The use of an ordinary bracket or desk lamp type parabola reflector with holder at the side has proved a satisfactory shielding for lamps on the main haul-

Light Is Projected Into Manhole but Shielded From View Along Track

way in No. 9 mine of the Carbon Fuel Co., at Wevaco, Kanawha County, W. Va.

Porcelain sockets are mounted on the bottom side of cap pieces of props that are erected across the track from the safety manholes. On the socket is clamped a Faries stamped reflector with aluminum finish on the inside. A 50-watt 300-volt lamp in this reflector



Typical Mounting of Lights

effectively lights the manhole and the adjacent section of track. At distances over 150 ft. from the light, the lamp is shielded from the eyes of men approaching from either direction. This protection is desired principally for the motormen.

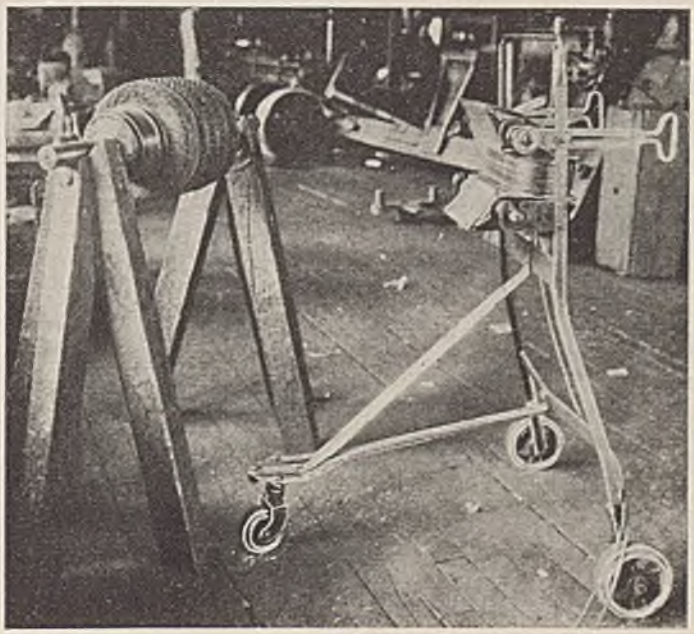
An advantage of the reflector is that it can be turned to provide the best adjustment. On straight track the face of the reflector, of course, should be parallel to the track, but on or near curved sections the proper adjustment depends upon the location of the lights with respect to the curves. A thorough coating of rock dust is maintained along the haulway, and this materially increases the efficiency of the lighting.

Caster and Pivot Mounting Handy for Test Bug

The division repair shop of the Consolidation Coal Co., Coalwood, W. Va., uses a home-made "bug" mounting which has proved handy to operate and can be moved to any place in the room. This is shown in the accompanying illustration.

The bug is pivoted on the pin which goes through the lower pole piece, and at the top is secured by slotted levers or handles. In the vertical position the bug is adjusted to use on an armature of 18-in. maximum diameter when supported at the normal winding-stand height. For smaller armatures down to 6 in. in diameter the bug position is adjusted by pushing the handles forward, thus tipping the bug down to the required point, where it can be locked by the thumb nuts. The wheels are rubber tired, and the one that projects out under the armature is caster mounted.

Ready to Roll up Against the Armature



Parkway Cable Finds Favor For Mine Telephones

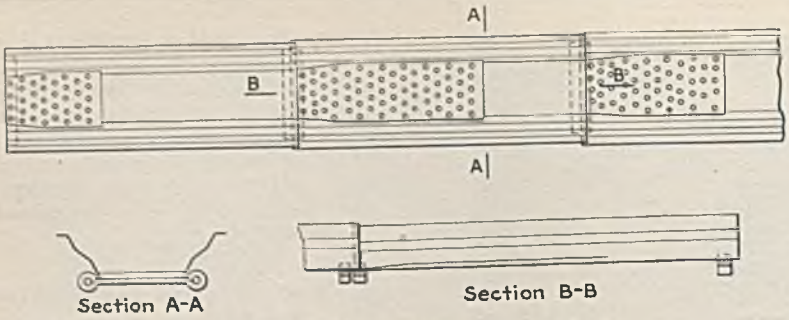
But a few years ago frequent interruptions to telephone service were tolerated as a necessary evil, even in many of the better class mines. Falls of roof on the open wiring were the principal cause of trouble. Use of the telephone system for car dispatching has demanded an improvement in the service. A few mines have installed lead cable in ducts buried in the mine floor, but of late there is a tendency to use parkway cable buried without duct protection.

For two-conductor service, size No. 12 is the usual preference. At the present quantity cost of $70 to $80 per thousand feet, this type of installation costs much less than a duct system. Unless the cable lies in acidulous water, there should be little question as to its lasting qualities.

Screen Shaker Retards Speed In Dip Conveying

Downhill operation is admittedly the most efficient scheme of utilizing shaker conveyors, but the arrangement is not without its difficulties. If the grade is steep—as much as 15 deg.—lumps of coal may attain dangerous speeds and a cloud of dust may hover constantly above the pans.

In a recent issue of *Glückauf*, Bergas-



With the Dust Screened Out, Lump Coal Moves More Slowly

sessor C. Eisenmerger describes an arrangement which avoids these troubles. As indicated in the sketch, screen plates are placed at intervals in the shaker trough. These plates are cut slightly wider than the extreme bottom of the conveyor pans. The feed end of the plate is flanged to engage the conveyor joints and is slightly flared to elevate the main body of the plate about ⅜ in. above the bottom of the conveyor trough.

With much of the fine coal screened out, the speed of the lump coal over the plates is retarded. When lump coal leaves the plates it falls on a bed of dust which acts as a buffer. The screen holes in the plates are made roughly 10 mm. (⅜ in.) in diameter, and the length of the plates depends upon the steepness of the grade. It has been determined by experience that 1 lineal foot of screen plate is sufficient for every 3 ft. of trough length on a dip of 20 deg.; on a 30 deg. dip the ratio is 1½ to 2.

Machine-Made Dummies For Mechanical Mine

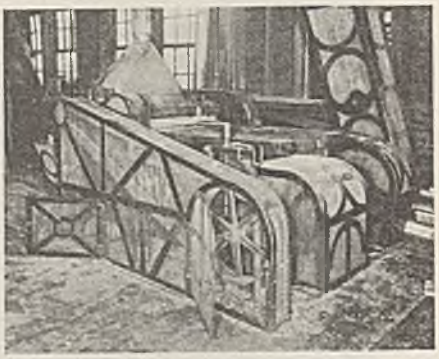
At the new full-mechanical mine of the Carbon Fuel Co., Wevaco, Kanawha County, W. Va., even the loading of shooting dummies is done by electric power, as indicated by the accompanying picture snapped in a small building near the mine portal.

It is the intention to use clay in the dummies, but at the time the photograph was taken they were being loaded with rock dust from a shipment which got slightly wet. The equipment, known as the Gay tamping machine, made by the Guyan Machine Shops, Logan, W. Va., is driven by a 1-hp. motor. This machine is of the single-spindle type and operates on the principle of a screw conveyor. An operative is required to place the empty tube over the discharge pipe and to support the tube as it is filled and forced off the pipe. A conveniently located lever is provided for stopping and starting the machine when changing tubes.

Fills a Tube in Less Than Five Seconds

Guards of Wire Mesh With Doors Allow Inspection

In many instances guards which do not allow inspection of the moving equipment are a nuisance and for that reason careless workmen are liable to leave them off after removal to correct trouble. The accompanying picture made in the Jenkins (Ky.) shop of the Consolidation Coal Co., shows the guarding of a wood working planer which does not have the fault mentioned. The guard frames are made of strips and shapes cut from steel plate and of angle iron welded together. The lining is ½-in. galvanized wire mesh. Doors are built in opposite the pulleys.



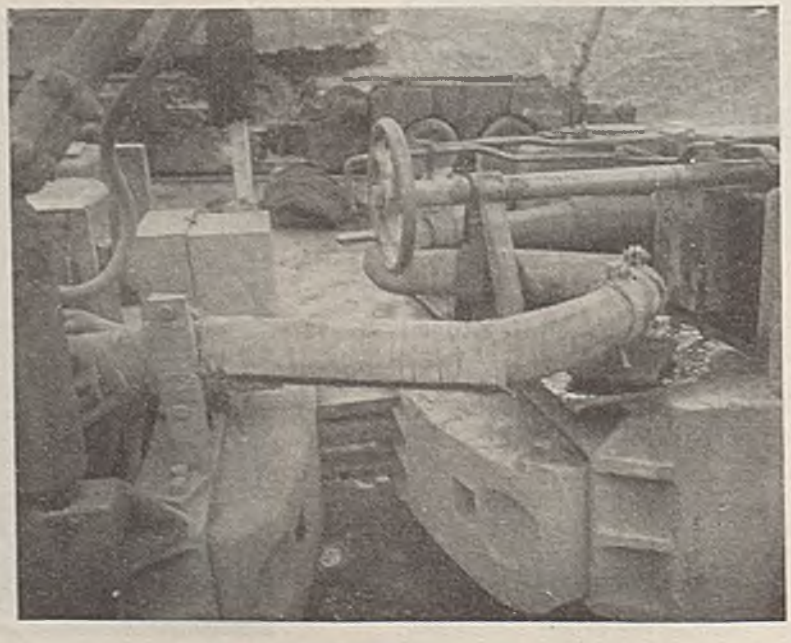
Doors Open to Indicate Their Position

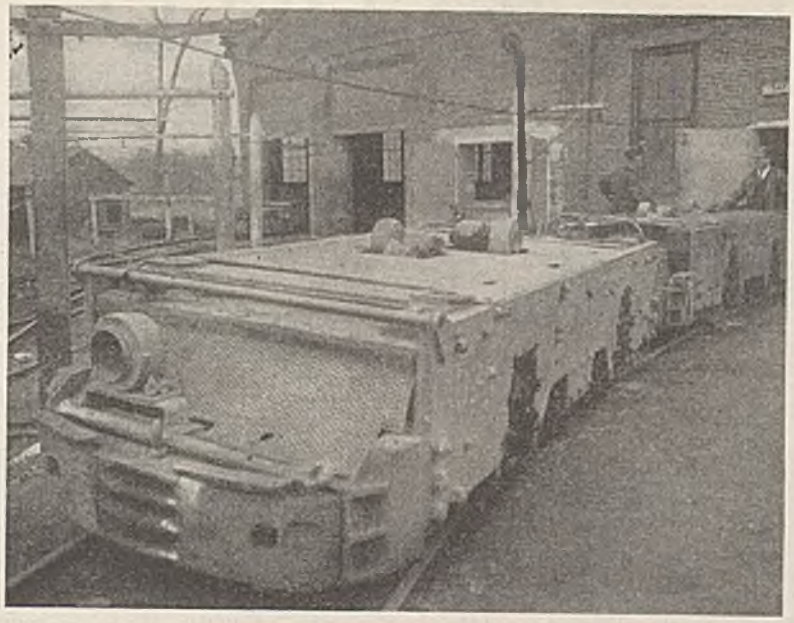
Sliding Support Provides for Tie Cable Flexibility

One of the accompanying photographs shows a close-up of the arrangement used to minimize cable bending on a tandem haulage unit recently rebuilt at the Stanaford (W. Va.) mines of the Elkhorn Piney Coal Mining Co., a subsidiary of the Koppers Coal Co.

The heavy trunk forming a permanent tie and consisting of a number of 4/0 flexible Tirex insulated wires taped in a bundle is supported near the center of the "S" bend by a clamp with shoe which rides over a greased plate. When the locomotive is traversing a short-radius curve this shoe moves several inches, thus relieving the cables of sharp bending.

Sliding Support Prevents Abrasion and Sharp Bending





Tandem Unit Showing Blowers Protruding Above Covers

Both of the 10-ton 250-volt locomotives making up this tandem unit have been in use 13 years. The original type 34B ball-bearing motors were retained, but forced ventilation was added. New equipment includes an MB Class 33 controller equipped with Arcmaster. The blower units, four in number, were made up by combining Buffalo No. 2 blowers with ¼-hp. 3,450-r.p.m. d.c. motors. A resistance is connected permanently in series with each blower motor to ease the strain of frequent starting. The connection is such that the blowers start when the controller is advanced to first point. A Westinghouse "Sentinel Breaker" containing a bi-metal strip protects the blowers and serves as a means of cutting them out of the circuit.

The tandem unit operates over a main haul 7,900 ft. long to the first side track and averaging 4½ per cent grade against the loads. As now arranged the locomotive is considered a highly satisfactory machine for the service.

Turbine Instead of Motor Drives Heating Fan

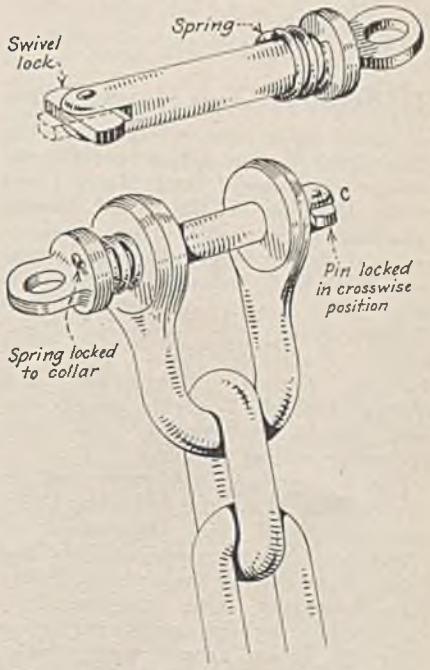
In a store building of the Raleigh Coal & Coke Co., Raleigh, W. Va., built to replace an old structure destroyed by fire, heating is by an indirect system which employs a steam turbine to drive the circulating fan. The turbine exhausts into a bank of heating units through which the fan blows the air. By condensation this steam gives up its latent heat to the air entering the storeroom. The energy cost to operate the turbine is thus practically nothing as compared to what it would be if operated by an electric motor supplied from purchased power.

This turbine, a 5-hp. unit made by the Carling Turbine Blower Co., Worcester, Mass., operates at 60 lb. steam pressure which is supplied from a central heating plant. When exhaust from the turbine is not sufficient to heat the building, live steam is turned into the coils through a reducing valve. The steam coils consist of radiator units made by the Aerofin Corporation, of Newark, N. J. Before passing through this bank of heaters the air is pulled through oil-saturated filters, made by the Real Air Filter Co., to remove dust which would otherwise settle in the storeroom.

Safety Clevis Pin Holds In Hard Service

"My interest in the safety type of clevis illustrated on p. 688 of the November issue of *Coal Age*," writes Charles H. Willey, Concord, N. H., "leads me to submit another type of safety shackle which I developed as an engineer officer in the U. S. Navy and used to a considerable extent on coaling-vessel equipment. While this particular type may not be directly applicable to mine-car couplings, nevertheless it is likely to have application to other uses in and about the mines."

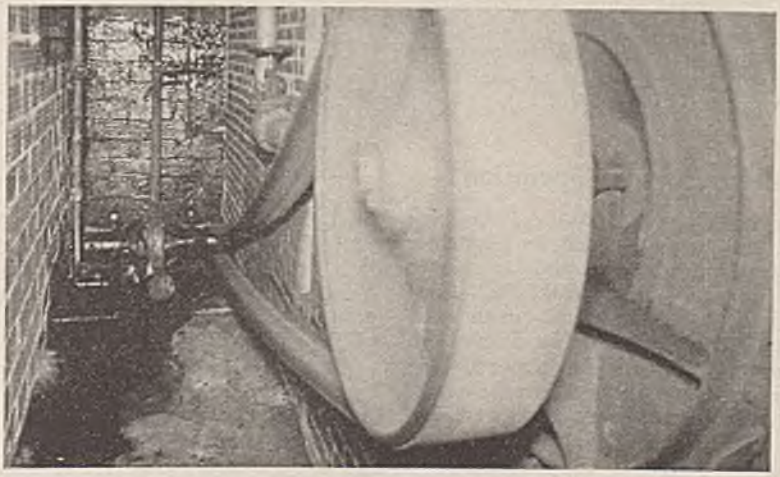
The shackle is of the regular type and



Spring and Pivot Bar Hold Pin in Locked Position

is made both safe and quick-acting for both inserting and removal. As the sketch shows, the pin has a collar and an eye at one end, to which is attached a spring. The other end of the pin is slotted and has a pivoted lock bar in it as at *C*. When inserting the pin the bar is turned parallel with the body of the pin, which is pressed against the shackle to compress the spring and the lock bar turned crosswise into a holding position. These pins proved satisfactory and stood the rough naval service.

The Turbine Is Belted to a Fan Which Forces Air Through the Heating Units and Into the Store



WORD from the FIELD

To Recodify Ohio Mining Laws

Created by a joint resolution of the Ohio General Assembly, a special commission consisting of James Berry, Chief of the Division of Mines and Mining (chairman); Stephen Williams, Coshocton, and Elmer Slagle, Roseville, mine inspectors; R. L. Ireland, Jr., vice-president, M. A. Hanna Co., Cleveland, and William Emery, Jr., president, Cambridge Collieries Co., Cleveland; Richard Brown, Nelsonville, and Walter Jakovich, Yorkville, miners, has been named to recodify the laws governing mining in Ohio.

The commission will carry out its investigation along the following lines: organization of the Department of Mines and Mining; qualifications and duties of the chief of the division, deputy mine inspectors, mine superintendents and foremen, and fire bosses; regulation of persons in and around mines; duties of owners and lessees of mines; and regulation of ventilation, electrical wiring and electrical control, use and storage of explosives, employees in and around mines, and weighmen and methods of weighing.

Central Breaker Started

The Philadelphia & Reading Coal & Iron Co., on March 11, awarded the contract for construction of the new St. Nicholas central breaker, between Mahanoy City and Shenandoah, Pa. The project will cost approximately $5,000,000, it is reported, and will have a capacity of about 2,000 tons per hour. Coal from the Hammond, Gilberton, West Shenandoah, Maple Hill, Mahanoy City, North Mahanoy, Tunnel Ridge, Knickerbocker, and Shenandoah mines and five strippings of the Reading company will go to the new breaker. Construction work will start in April.

Mines Resume Operation

Lehigh Valley Coal Co., Wilkes-Barre, Pa., has reopened its Centralia mine, at Centralia, Pa., and its Packer No. 5 mine, at Lost Creek, Pa. Centralia has worked six months in the past five years, while Packer No. 5 has been idle for two years. Five hundred men will be employed at the Centralia plant, which will operate twenty days a month, while Packer No. 5 will take on 300 men.

The West Brownsville (Pa.) mine of the Lilly Coal Co. again started operations after a four-year shutdown, when the first coal was shipped on March 25. When production comes up to the maximum of 2,000 tons per day, 300 men will be employed.

The Philadelphia & Reading Coal & Iron Co. announced on March 28 that the Bear Valley colliery, Shamokin, Pa., would be operated on a double shift beginning March 30. Three hundred more men will be given employment.

Business Still Slow

"The delicate balance of business convalescence has been a bit disturbed this week by the rumbling or renewed political rumpuses here and abroad," says *The Business Week* of April 1. "The threatened revival of farm relief agitation by the Farm Board's abandonment of price pegging is politically pessimistic, but its decision is fundamentally favorable for business readjustment. The row over the German-Austrian effort to translate French rhetoric into reality, however, exposes again the volcano of political passion upon which European economic stability is precariously perched, and clinches the conviction that American business recovery must come from the cultivation of our own cabbage patch. Governor Norman's visit here holds some hope of international action on a scale comprehensive enough to overcome the credit crisis which uncontrolled price deflation has precipitated.

"Domestic developments are still dubious. Our index, down slightly this week to 81 per cent of normal, shows no significant change in the static statistical picture. Hesitancy in steel activity, renewed weakness in commodity prices, and softness in the still selective bond market indicate that confidence in continuous recovery, or initiative in the adventure of creating new wealth, is still crippled by the paralyzing pressure of the deflation complex, which has prolonged the depression."

New Plant Construction

New contracts for topworks and construction under way or completed at various coal operations reported for the month of March are as follows:

Berger Coal Co., Lejunior, Ky.; contract closed with the Morrow Mfg. Co. for a three-track tipple equipped with shaker screens and loading booms; capacity, 125 tons per hour.

Electro Metallurgical Co., No. 2 Gas mine, Boncar, W. Va.; contract closed with the Kanawha Mfg. Co. for all-steel headhouse equipment; capacity, 175 tons per hour. American Steel & Wire Co. will furnish an aerial tramway to carry coal to the company's power hour.

Hume-Sinclair Coal Co., Hume, Mo.; contract closed with the United Iron Works Co. for an all-steel, four-track tipple, equipped with shaker screens, rescreens, loading booms, picking tables, mixing conveyor, refuse conveyor, crushers, dumping hopper, and drag conveyor, for preparing five grades of coal, including two sizes of slack; capacity, 300 tons per hour; to be completed about July 1.

Independent Coal & Coke Co., Kenilworth, Utah; contract closed with the Pittsburg Boiler & Machine Co. for an all-steel, eight-track tipple, equipped with seven picking tables, six loading booms, and rescreening plant; capacity, 1,000 tons per hour.

Lamar Colliery Co., Lamar, W. Va.; contract closed with the Kanawha Mfg. Co. for all-steel, five-track tipple, equipped with trip feeder, rotary dump, reciprocating feeder, mine-run scraper conveyor, shaker screens, four loading booms, a washery for nut, stove, and egg; and an air plant for pea and slack; capacity, 200 tons per hour of six grades of coal.

Lehigh Valley Coal Co., Packer No. 4 colliery, Lost Creek, Pa.; contract closed with the Hydrotator Co. for two Hydrotator units to wash rice and barley coal; capacity, each unit, 35 tons per hour.

Pennsylvania Coal & Coke Corporation, No. 3 mine, Ehrenfeld, Pa.; contract closed with the Roberts & Schaefer Co. for a complete Marcus tipple to prepare three sizes of coal; capacity, 450 tons per hour.

Pittsburgh Coal Co., Sandwich, Ontario; contract closed with the Morrow Mfg. Co. for two-track tipple equipped with shaker screens and loading booms to prepare two sizes from mine-run; capacity, 150 tons per hour.

Glen Alden Coal Co. Miners Stage Strike; Illinois Compromise Effected

TWENTY thousand miners employed by the Glen Alden Coal Co. in the Wyoming Valley anthracite district were on strike at the end of March in protest against alleged unfair practices of the company officials. The walkout started when 21 locals at Glen Alden mines in District 1 of the United Mine Workers voted on March 23 to follow the recommendations of the general grievance committee and called a general strike. Only three thousand miners obeyed the call on March 24, but the stoppage spread to all the other Wyoming Valley collieries of the company before the month was out. John Boylan, president of District 1, refused to sanction the action of the miners, but the walkout proceeded in defiance of his recommendations.

The general grievance committee remained in continuous session after the start of the strike, and on March 28 a sub-committee drew up a number of resolutions containing complaints and grievances. The resolutions committee also requested that the spokesmen of the striking miners meet with the union officials for the purpose of presenting them with the grievances and demanding a speedy settlement. The date of the meeting was set for March 30, but Mr. Boylan was unable to be present, with the result that no action was taken. On March 31, delegates instructed that a telegram be sent to John L. Lewis, requesting his assistance in settling the strike. Lewis, on April 1, said in a telegram that he considered the suspension "unwarranted and illegal," and urged the men to return to work.

In th quarrel between the insurgent and regular factions of the United Mine Workers, the long court fight in Illinois apparently was brought to a permanent end when Judge Harry N. Edwards, Jr., Lee County (Ill.) Circuit Court, Dixon, Ill., on March 6, signed a consent decree which was approved by both factions. The decree held: that the constitution of the United Mine Workers did not expire by reason of the failure to hold an international convention in 1929; that John L. Lewis, Philip Murray, and Thomas Kennedy, and all the other international officers were duly elected and were qualified to direct the union; that District 12 (Illinois) is and was a subordinate branch of the union: that the order revoking the charter of District 12, issued by Lewis on Oct. 10, 1929, was illegal and of no force and effect; that dues paid John H. Walker as secretary of the insurgent branch and John T. Jones, as secretary-treasurer, were paid in good faith; that the District 12 election held last year was valid and the officers then elected are qualified to serve; and that the District 12 members who participated in the Springfield convention acted in good faith and did not secede or form a dual union.

In addition, the decree permanently prohibited Lewis or the provisional officers named by him when he attempted to revoke the District 12 charter in 1929 from interfering in the affairs of the Illinois union. On March 9, Harry Fishwick, president of the district, and John H. Walker, president-elect, withdrew the contempt charges growing out of the attempted charter revocation, and urged a move to "end all warfare." In a statement issued after the settlement, the Illinois officials declared that "to continue this fight would mean the absolute destruction of the United Mine Workers of America."

About two weeks after the settlement of the Illinois imbroglio, Alexander Howat, president of the insurgent group which Judge Edwards refused to recognize, issued, on March 23, a call for an international convention of the faction which he headed, to meet in St. Louis, Mo., April 15. The purpose of the convention, he declared, is to determine the future course of action of the insurgent group, and to give the rank and file an opportunity to vote on the Illinois compromise.

Representatives of the Indiana shaft operators and District 11, United Mine Workers, adopted a new wage agreement April 3, concluding negotiations which began at Terre Haute, Ind., early in March. The contract, which must be ratified by the miners at a district convention, continues the old wage scale with a few changes in working conditions. Day laborers will receive $6.10 a day; loaders in mines equipped with cutting machines, 67c. a ton; and loaders in pick mines, 91c. per ton.

Another development in the Indiana field in March was the action of the Princeton Mining Co. in bringing suit against the Indiana Coal Operators' Association and District 11 of the United Mine Workers. Each of the groups was sued for $100,000, the Princeton company alleging that they had entered into a conspiracy in violation of the Sherman and Clayton acts to impede the production of coal from the Kings Station mine.

In Illinois, two additional mines of the Old Ben Coal Corporation, at Buckner and West Frankfort, were closed on March 6 by striking miners, who demanded a more equitable division of working time between the mines of the company. On the other hand, the United Electric Coal Cos.' strip mine at Duquoin resumed operations on March 17 after a three-day stoppage. Miners agreed to return to work pending a settlement of differences over working conditions.

A new miners' union, to be known as the West Virginia Mine Workers, was formed in Charleston, W. Va., March 19 at a meeting attended by 47 delegates, according to an announcement by C. Frank Keeney, who was elected president. Keeney, according to reports, stated that the new organization was an outgrowth of the Illinois compromise. Headquarters have been opened in Charleston, and 6,000 members were claimed by Keeney, who declared that the group soon expected sufficient membership to enable it to ask for a joint conference on a wage agreement.

Possibility of a wage cut by the Sunday Creek Coal Co., to affect 1,200 miners in the Hocking Field of Ohio, loomed up last month as the result of a conference between Oral Daugherty, superintendent of labor and safety for the company, and the miners, which was held at Nelsonville. The Sunday Creek company has been paying a day wage of $5. In eastern Ohio, the Joseph Meister Fuel Corporation, Martins Ferry, announced a wage boost of 5 per cent, based on a favorable long-term contract.

—⟡—

Bird Celebrates Safety Record

Employees of the Bird Coal Co., Tire Hill, Pa., were tendered a banquet March 18, at the Kelso (Pa.) Community Hall, to celebrate the mining of 2,378,000 tons of coal over a period of three years without a fatal accident. Richard Todhunter, general manager of mines, acted as toastmaster. Speakers included Richard Maize, Uniontown, Pa.; T. D. Williams, Westmont, Pa.; and Charles Crocker, Johnstown, Pa., all state mine inspectors; H. H. Hamilton, Barnesboro, Pa., an official of the company; Joseph Lewis, South Fork, Pa., inspector for the Maryland Coal Co. of Pennsylvania; and Malcolm MacDougall, rating inspector for the Pennsylvania compensation bureau.

—⟡—

Trade Practices Discussed

Forty-two representatives of coal bureaus and operators' associations in the Southern high-volatile fields met at Cincinnati, Ohio, March 16, to discuss the trade-practice movement. A diagnosis of the ills of the industry and methods of eliminating them developed out of the conference. Following the general discussion, a motion was made for the formation of a committee of one delegate and one alternate from each association, to develop a plan that would be helpful to the industry. Associations to be represented in the membership are: Alabama, Harlan, Hazard, Kanawha, Logan, Southern Appalachian, Virginia, West Kentucky, and Williamson.

—⟡—

Stoker Association Elects

R. C. Goddard, Goshen, Ind., president, Combustioneer, Inc., was elected president of the Midwest Stoker Association at the annual meeting held at the Medinah Athletic Club, Chicago, last month. Harry H. Kurtz, Chicago branch manager, Iron Fireman Manufacturing Co., was elected vice-president; and W. N. Edwards, W. J. Edwards Co., Chicago, was re-elected secretary-treasurer.

Middle West Coals Subject Of May Conference

Twenty-three speakers, according to the tentative program, will discuss the value and utilization of Middle Western coals at the 1931 Midwest Bituminous Coal Conference, to be held at the University of Illinois, Urbana, Ill., May 21-22. The afternoon of the first day will be devoted to consideration of the value of Middle Western coals, and the following subjects have been scheduled for discussion: "Methods of Determining the Relative Value of Coals," "Extent to Which Midwestern Coals Meet Competitive Demands for Better Preparation," and the "Economic Aspects of Competition of Midwestern Coal With Natural Gas."

At the dinner meeting in the evening, the subject of the speaker of the evening will be "What Does the Future Hold for Midwest Coal?" The evening session on May 21 will be devoted to research and co-ordination. Subjects scheduled are: "Comparative Heating Value of Fuels in the Research Residence," by Prof. A. C. Willard, University of Illinois; "Mineral Research Program of the State Geological Survey," Dr. M. M. Leighton, Illinois State Geological Survey; "Boiler Room Requirements for Coal-Burning Plants, Both Industrial and Domestic"; and "The Committee of Ten—Its Activities and Purposes."

Domestic utilization will be the theme of the morning meeting on May 22, and the following topics have been selected for discussion: "Recommended Setting Heights for Heating Boilers Equipped With Mechanical Stokers," "Operating Tests of Stokers in Service," "Burning Area Requirements as Established by Actual Boiler Tests," "A Study of Small Stokers for Semi-Industrial and Plant Uses," and "Preparation and Sizing of Midwest Coal for Stoker Use."

The concluding session will be given over to industrial utilization of Middle Western coal. Subjects scheduled are: "Adapting the Power Plant to Local Coals in the Original Design or in the Reconditioning of the Plant," "Pulverized Coal," "Midwest Coal Combustion Tests at Purdue University and the University of Illinois," and the "Training of Plant Operators to Use Illinois and Indiana Coals."

Association Secretaries Meet

Fourteen secretaries of local operators' associations participated in a round-table discussion of associational activity at a meeting at the Union League Club, Chicago, March 19. The conference was designed to add momentum to the co-operative work of the local groups. Means of stimulating safety work were discussed at length. A résumé of the work being done on the question of uniform sizes was presented. The secretaries were of the opinion that more attention should be given to the question of sizes and nomenclature.

An increasing realization of the need for collective effort on the part of operators in the battle against substitute fuels was reported. Other subjects covered were: public relations, including co-operative advertising, consumer service, civic activities, and city, county, and state taxes; reports, including exchange of credit information, comparative cost-accounting, and past sales; and national legislation, with emphasis on depletion tax proposals and the Norris anti-injunction bill.

Anthracite Prices Announced

Substantial reductions in mine prices of broken, egg, stove, and chestnut sizes of anthracite; advances on the remaining sizes; a change from the gross ton to the net ton as the unit of sales and quotations; and revival of "cash" discounts for prompt payment featured the new anthracite price lists issued last month. These lists, while officially effective April 1, were made retroactive to March 19. Action this year marks a return to the practice of making spring reductions on April 1 after a departure from the established rule in 1930, when reductions took place officially on May 1. An advance of 20c. per net ton on all sizes from broken to pea will be made on May 1 of this year, it is reported. Adoption of the net-ton basis, however, brought a protest from the New York State Coal Merchants' Association which, on March 26, adopted a resolution condemning the action of the producers on the grounds that the wishes of the retailers were not consulted.

On the basis of the old gross ton, reductions in company prices from the level established on May 1, 1929, amount to the following: broken, 72c.; egg, 54c.; stove, 76c.; and chestnut, 26c. Cash discounts of 20c. per ton will be allowed for payment within fifteen days. Company prices on pea, buckwheat, rice, and barley were increased the following amounts, as compared with the May 1, 1930, gross-ton prices: pea, 92c.; buckwheat, 64c.; rice and barley, 7c. Cash discounts for payment in fifteen days will apply as follows: pea, 15c.; buckwheat, 10c.; and rice and barley, 5c.

Anthracite prices at New York, effective March 19, are given in the following table:

Oil Burner Sales Decline

The total number of oil burners called for in new and unfilled orders decreased materially in the first two months of 1931, as compared with the corresponding period in 1930, according to the monthly report of the U. S. Bureau of the Census. Total burners ordered in January and February, 1931, were 7,268, against 9,869 in the same months in 1930. Shipments in the United States in the first two months of 1931 totaled 6,902 burners, a decrease of 2,565 from the 1930 figure of 9,467.

Miners Get Bonuses

Five hundred miners at the Kathleen mine of the Union Colliery Co., Dowell, Ill., received bonuses last month for setting a new production record of 5,415 tons in eight hours.

Coming Meetings

United States Chamber of Commerce; annual meeting, April 28 to May 1, at Atlantic City, N. J.

Mine Inspectors' Institute of America; annual meeting, May 4-6, John Marshall Hotel, Richmond, Va.

American Mining Congress; annual convention, May 11-15, Cincinnati, Ohio.

Midwest Bituminous Coal Conference; May 21 and 22, at University of Illinois, Urbana, Ill.

Rocky Mountain Coal Mining Institute; annual meeting, June 3-5, Cosmopolitan Hotel, Denver, Colo.

National Retail Coal Merchants' Association; annual meeting, June 4-6, Hotel Lord Baltimore, Baltimore, Md.

Illinois Mining Institute; midsummer meeting, aboard steamer "Cape Girardeau," leaving St. Louis, Mo., Friday, June 5, and returning June 7.

National Association of Purchasing Agents; annual convention and "informa-show," June 8-11, Royal York Hotel, Toronto, Canada.

Colorado and New Mexico Coal Operators' Association; June 17, 513 Boston Bldg., Denver, Colo.

American Society for Testing Materials; annual meeting at the Stevens, Chicago, June 22-26.

Anthracite Prices at New York, Effective March 19, 1931

	(Per Net Ton, F.O.B. Mines)							
	Broken (Grate)	Egg (Furnace)	Stove	Chestnut	Pea	Buckwheat	Rice	Barley
Delaware, Lackawanna & Western Coal Co.	$6.50	$6.75	$7.00	$7.00	$4.75	*$3.25	†$1.85	$1.40
Philadelphia & Reading Coal & Iron Co.	6.50	6.75	7.00	7.00	4.75	3.25	1.85	1.40
Lehigh Valley Coal Sales Co.	6.50	6.75	7.00	7.00	4.75	3.25	1.85	1.40
‡Lehigh Navigation Coal Co.	6.50	6.75	7.00	7.00	4.75	3.25	1.85	1.40
Hudson Coal Co.	6.50	6.75	7.00	7.00	4.75	3.25	....	....
M. A. Hanna Co.	6.50	6.75	7.00	7.00	4.75	3.25	1.85	1.40
Dickson & Eddy	6.50	6.75	7.00	7.00	4.75	3.25	1.85	1.40
Madeira, Hill & Co.	6.50	6.75	7.00	7.00	4.75	3.25	1.85	1.40
Payne Coal Co.	6.50	6.75	7.00	7.00	4.75	3.25	1.85	1.40
General Coal Co.:								
Raven Run, Maryd, Westwood	....	6.75	7.00	7.00	4.75	3.25	1.85	1.40
Hazle Brook	....	7.00	7.25	7.25	5.00	3.50	2.05	1.60
Midvalley	....	6.90	7.15	7.15	4.90	3.40	2.00	1.60
Cross Creek	....	6.85	7.10	7.10	4.85	3.25	1.85	1.40
Fuel Service Co.:								
Beaver Meadow, Kingston, Westwood	....	6.75	7.00	7.00	4.75	3.25	1.85	1.40
Jeddo	....	7.25	7.50	7.50	5.65	3.50	2.00	1.50
Highland	....	7.10	7.35	7.35	5.65	3.55	2.10	1.50
Cross Creek	....	6.85	7.10	7.10	4.85	3.25	1.85	1.40

*Domestic buckwheat, $3.70. †Stoker rice, $2.30. ‡Birdseye, $1.50.

Andrews Allen Dies

Andrews Allen, president of the Allen & Garcia Co., Chicago, and nationally known engineer, died suddenly at Jasper, Ala., March 22. Mr. Allen was born in Madison, Wis., 61 years ago, and was graduated from the University of Wisconsin in 1891. After leaving school he accepted a position with the U. S. Geological Survey, and later was engaged in engineering work in Wilmington, Del. In 1899 he founded the Allen & Garcia Co., which he headed from that time on. He also was president of the Allith-Prouty Co., Danville, Ill. Many of the outstanding developments in bituminous preparation owe their existence to the genius of Mr. Allen and his associates. At the time of his death, Mr. Allen was engaged in directing engineering projects in the South in preparation for a trip to Russia to oversee work of his company under contracts with the Soviet government. Mr. Allen was a frequent contributor to the technical pages of *Coal Age*.

The Late Andrews Allen

Anthracite Group to Place Seal On Approved Equipment

Use of a seal of approval, to be issued by the Anthracite Institute and placed on hard-coal burning equipment fulfilling the requirements of the institute's laboratory, has been announced by C. A. Connell, acting executive director. The seal is expected to serve as a mark of identification for the hard-coal consumer or purchaser of equipment, and producers and equipment manufacturers consider it a forward step in providing the most efficient service in the merchandising of anthracite.

Argyle Mine Reopened

After six months' work, a new tipple at the Bennington (Pa.) mine of the Argyle Coal Co. has been completed and put in service. Modern machinery has been installed and the mine is again operating. Two hundred men are employed.

Mulga Makes Safety Record

The Mulga mine of the Woodward Iron Co., Mulga, Ala., has operated for four calendar months without a single lost-time accident. The last such accident was charged against the mine on Oct. 27, 1930.

Coal Freight Rate Cut

The Chicago, Burlington & Quincy R.R. has reduced its freight rate on bituminous coal to certain Western destinations to permit coal producers to meet the competition of natural gas.

Financial Reports Issued

M. A. Hanna Co. and subsidiaries for the year ended Dec. 31, 1930, report a net profit of $2,266,814 after interest, depreciation, depletion, and taxes, equivalent, after $967,820 dividends paid on the $7 preferred stock and $13,116 dividends paid on the 7 per cent first preferred stock, now retired, to $1.26 a share on 1,016,961 no-par common shares. Net profit in 1929 was $3,698,624 after interest, depreciation, depletion, federal taxes, minority interest, and other charges, equivalent, after deducting dividends on the preferred stocks listed above, to $2.67 per share on common stock.

Hatfield-Campbell Creek Coal Co. and subsidiaries report for the year ended Dec. 31 a net profit of $100,407 after interest, federal taxes, and other charges, equivalent to $5.13 per share of the 19,553 shares of $100 par 8 per cent preferred stock outstanding. This compares with a net profit of $279,063 in 1929, equivalent after preferred stock dividends to $1.53 a share on 79,500 shares of no-par common stock.

Hudson Coal Co., for the year ended Dec. 31, reports a net income, after interest, depletion, and depreciation, applicable to dividends on common stock, all of which is owned by the Delaware & Hudson Co., of $1,166,929, against net earnings of $651,224 in 1929.

Glen Alden Coal Co., for the year ended Dec. 31, reports a net income of $12,245,907 after interest, depreciation, depletion, federal taxes, and other charges, equivalent to $6.64 a share on the stock outstanding and in the treasury. No previous comparisons are available.

Lehigh Coal & Navigation Co., for the year ended Dec. 31 (first annual report since segregation of its coal and mining properties), reports a net income of $2,534,565, after taxes, interest, and other charges. After giving effect to undistributed earnings and losses of subsidiaries, the net income was $2,189,729, equivalent to $1.13 a share on the common stock after allowing for conversion of 531 old shares. Lehigh Navigation Coal Co., including operation of the Navicoal Co., showed a net loss of $453,324 in 1930 after taxes, sinking fund, depreciation, depletion, and other charges.

Lehigh Valley Coal Corporation, for the year ended Dec. 31, reports consolidated net income of $714,336, after interest, federal taxes, depreciation, depletion, and other charges, equivalent, after dividends on minority stock of subsidiaries and preferred dividends, to 1c. a share on the common stock, against a net income in 1929 of $1,190,655, or 41c. a share.

United Electric Coal Cos., for the quarter ended Jan. 31, reports a net profit of $48,834 after depletion, depreciation, federal taxes, and other charges, equivalent after preferred dividends, to 18c. a share on the common stock, against net income of $109,765, or 39c. a share, in the corresponding period in 1929.

Westmoreland Coal Co., for the year ended Dec. 31, reports a net profit of $270,967 after taxes, depreciation, depletion, and other charges, equivalent to $1.35 a share on the 200,000 shares of no-par common stock, against net income in 1929 of $144,479, or 72c. a share.

Rochester & Pittsburgh Coal Co., including Jefferson & Indiana Coal Co., for the year ended Dec. 31, reports a net profit of $531,001 after taxes, depreciation, depletion, and interest, equivalent, after preferred and Class A dividends, to 75c. a share on Class B stock. This compares with earnings of $378,002 in 1929, equivalent, after preferred dividends, to $2.34 a share on the $3 Class A stock.

Pennsylvania Coal & Coke Corporation for the quarter ended Dec. 31, reports a net profit of $42,935 after depreciation and depletion, but before federal taxes, compared with $102,281 in the previous year.

Virginia Iron, Coal & Coke Co., for the year ended Dec. 31, reports a net loss of $34,625 after interest, depreciation, depletion, and other charges, compared to a net loss of $14,205 in 1929.

Pittsburgh Coal Co. and subsidiaries, for the year 1930, report a net loss of $1,078,696 after accrued taxes (exclusive of federal income tax), reserves, depletion, depreciation, interest, and earnings of minority interests in subsidiary companies, but before federal income tax of certain subsidiaries. In the year 1929, the company reported net earnings of $15,192 after above charges but before federal taxes. Gross income of the company in 1930 was $42,118,115, of which $41,511,415 was realized from the operating income. The company mined in 1930 13,308,659 tons of coal, against 13,378,304 tons in 1929.

Consolidation Coal Co. and subsidiaries, for the year ended Dec. 31, report a net loss of $131,868 after interest, dividends on the preferred stock of the Carter Coal Co., depreciation, and depletion. In 1929, the company reported net earnings of $287,046, after above charges and federal taxes. Gross oper-

ating income in 1930 was $30,526,346, of which $25,973,910 was realized from the sale of coal to the public. Total production from mines operated by the company was 10,232,722 tons. Including coal mined from lessees, total production of coal from the company's property was 12,343,720 tons in 1930. Earnings before depreciation and depletion were $2,229,503 in 1930, against $2,580,547 in 1929, $2,161,472 in 1928, and an average of $1,615,472 in the five-year period 1924-1928. Earnings for 1924 to 1928, however, include a total of $1,128,000 from profits in the sale of capital assets; in 1929-1930, less than $26,000 was derived from this source, making average earnings per net ton before deduction of depletion and depreciation 13.5c. for 1924-1928 and 22.1c. for 1929-1930.

Colorado Fuel & Iron Co., for the year 1930, reports a net profit of $298,649, after interest, depreciation, depletion, and federal taxes, but before deductions for equipment dismantled. This compares with net earnings of $2,250,048 in 1929 on the same basis.

Clinchfield Coal Corporation, for the year 1930, reports a net loss of $180,656 after fixed charges, depreciation, and depletion, against a net loss of $216,806 for 1929 after the above deductions.

Island Creek Coal Co., for the year 1930, reports net profits of $2,402,782 after depletion, depreciation, federal taxes, and other charges, equivalent after preferred dividends, to $3.74 a share on the common stock. This compares with net earnings of $3,198,000 in 1929, equivalent to $5.04 a share on the common stock.

Philadelphia & Reading Coal & Iron Co., for the year 1930, reports net earnings of more than $1,000,000 after interest, depletion, depreciation, and reserves. In 1929, the company reported a net loss of $793,076.

Pittston Co., for the year 1930, reports net earnings of $2,037,870 after interest, federal taxes, and other charges, equivalent to $1.89 a share on the capital stock.

New River Co., for the year 1930, reports a net profit of $539,392 after charges, depreciation, depletion, and federal taxes, equivalent to $7.32 a share on the preferred stock on which dividends have accumulated. Net earnings in 1929 were $588,426, equivalent to $7.98 a share on the preferred stock outstanding in that year.

Elk Horn Coal Corporation, for the year 1930, reports a net loss of $67,635 after depreciation, depletion, interest, and other charges, against a net profit of $47,729 in 1929.

Pittsburgh Terminal Coal Corporation, for the year 1930, reports a net loss of $642,945 after depreciation, depletion, and other charges, against a net loss of $696,527 in 1929.

West Virginia Coal & Coke Corporation and subsidiary companies, for the year 1930, report a net loss of $94,295 after interest, federal taxes, depletion, and depreciation. The company produced 3,215,260 tons of coal in 1930, an increase of 60,000 tons over 1929.

Pond Creek Coal Co., for the year 1930, reports a net profit of $340,118 after interest, depletion, and depreciation.

Dominion Steel & Coal Co., Ltd., for the year 1930, reports net earnings of $858,433 after interest, depletion, and depreciation, equivalent to $1.02 per share on the 841,760 shares of Class B stock.

Inspectors Will Discuss Safety

Papers and discussions dealing with safety will be the principal feature of the annual meeting of the Mine Inspectors' Institute of America, to be held at the John Marshall Hotel, Richmond, Va., May 4-6. Subjects already scheduled for presentation are as follows: "Direct and Indirect Cost of Mine Accidents," "Value of Local Mining Institutes," "Value of Organized Safety to the Mining Industry," "Method of Sealing and Reopening Barrackville (W. Va.) Mine Fire," "Prevention of Accidents From Roof Falls," and "Value of Systematic Air Analyses in Relation to Mine Ventilation."

Industrial Coal Reserves Drop

Stocks of anthracite and bituminous coal in the hands of industrial consumers in the United States and Canada on March 1 were 31,595,000 net tons, according to the monthly report of the National Association of Purchasing Agents, Inc. This figure is equal to 31 days' supply, based on the February consumption of 30,000,000 tons. Total stocks dropped off about 2,000,000 tons in February. Of the total decrease, Canada reported a reduction of 400,000 tons, and the rest was distributed over electric utilities, byproduct coke plants, and miscellaneous industries.

To Curb Oil Imports

A voluntary agreement between the government and the major oil importing companies to restrict oil imports by several million barrels yearly was announced March 13 by Secretary of the Interior Wilbur. The only company not in the agreement was the Standard of Indiana, and efforts are being made to induce it to join the group. It is understood that no written agreement was made but that each company pledged itself to curtail importations.

Mines Order Equipment

The Blue Diamond Coal Co., Bonny Blue, Va., has placed an order for 50 drop-bottom mine cars with the Huntington (W. Va.) plant of the American Car & Foundry Co. The Leckie Smokeless Coal Co., Anjean, W. Va., also has ordered 100 cars of the same type from the company.

Personal Notes

ERNEST L. BAILEY, formerly of Wadleigh & Bailey, consulting engineers, Washington, D. C., has been made general superintendent of the coal-mining operations of the Davis Coal & Coke Co., with headquarters at Thomas, W. Va. Mr. Bailey succeeds S. B. Jeffries, who, as assistant to the president of the company, was in charge of coal-mining operations and engineering. Mr. Jeffries will turn his attention to other duties, retaining, however, his position as chief engineer. ANDREW F. DIAMOND, an official of the company at Thomas, will be Mr. Bailey's assistant.

R. R. ESTILL, formerly division superintendent of the Kingston and Westerly plants of the Kingston Pocahontas Coal Co., has been made division superintendent of the Exeter and Warwick plants, with headquarters at Hemphill, W. Va.

DR. T. E. W. SCHUMANN, coal research expert for the West Virginia University Graduate School, Morgantown, W. Va., has resigned to accept a position with the Fuel Research Board of South Africa.

F. W. GRAY, assistant general manager, Dominion Steel & Coal Corporation, Sydney, N. S., was elected president of the Canadian Institute of Mining and Metallurgy at the close of the annual meeting, March 6.

EDWARD GRIFFITH, general superintendent for the southern division of the Glen Alden Coal Co., with headquarters in Wilkes-Barre, Pa., was elected a director of the company at the annual meeting on March 19. Mr. Griffith succeeds the late S. B. Thorne, of New York City.

EDWARD BLACKWELL, formerly safety director for the New River Co., Macdonald, W. Va., has been made superintendent of the Cranberry (W. Va.) mine of the company. EDGAR GRAFF, formerly of Norton, W. Va., succeeds Mr. Blackwell as safety director of the thirteen mines of the New River Co.

J. ARTHUR BOTTOMLEY, until recently in the employ of the Sheridan-Wyoming Coal Co., Kleenburn, Wyo., has been transferred to the engineering department of the Pittston Co., Scranton, Pa., the parent company of Sheridan-Wyoming.

D. F. WILLIAMS, after a temporary retirement from the coal business in 1928, last month assumed the duties of resident manager for the North American Coal Corporation at Detroit, Mich. For seventeen years prior to his retirement, Mr. Williams was identified with the anthracite trade as assistant sales agent, general sales agent, vice-president, and director of the Hudson Coal Co. and affiliated companies.

E. D. CLARK, Birmingham, Ala., has been appointed general superintendent of the Sayreton division of the Republic Steel Corporation. Mr. Clark will be in charge of the Sayreton No. 1 and No. 2 mines, vice J. G. Meagher, resigned.

Natural Gas Permit Refused

The Pennsylvania Public Service Commission last month refused to allow the Allegheny Gas Co. to extend its lines through the hard-coal counties of Luzerne and Lackawanna. The Commission, however, approved the company's application for extensions in Tioga, Lycoming, Sullivan, Wyoming, Clinton, Cameron, Elk, and Bradford counties, with the proviso that gas must not be sold to concerns or individuals already being served by existing companies.

The Texas Public Service Co. is to begin the construction of a 12-in. line from the Big Lake field in Reagan County to San Angelo, Texas, and an 8-in. line from the same field to Rio Pecos, Texas. Construction of the 300-mile pipe line of the Eastern Colorado Gas Co. from the Hugoton field of Kansas to Colorado Springs and eleven other towns in Colorado was to start on April 1. C. E. Bivens, Denver, Colo., has applied to the Wyoming Public Utilities Commission for a permit to build a 160-mile line from Carbon County to Laramie and Cheyenne, Wyo. Columbia Gas & Electric Co. has started construction of the second section of a 450-mile gas line extending from Coatesville, Pa., into Kentucky.

Pennsylvania Police Bill Passed

The Musmanno coal and iron police bill passed the Pennsylvania House of Representatives by a large majority on March 24, despite the opposition of administration forces. The bill, which must be passed by the Senate, would repeal the present industrial police act and set up a system of property guards with jurisdiction limited to the employers' property and to guarding prisoners, payrolls, and transmission lines. The administration bill, backed by Governor Pinchot, would set up an industrial police force to be hired, trained, and supervised by the state and assigned to companies needing their services. These companies would reimburse the state.

Canadian Rate Extended

Extension for another year of the special freight rate of $6.75 per ton on coal moving from the western Canadian mines to the Province of Ontario has been announced by the Canadian Government, which, it is reported, absorbs a direct loss of $1@$1.20 a ton in order to combat the inroads of American coal.

Obituary

G. W. Megeath, 76, president of the Roundup Coal Mining Co., Roundup, Mont., died at Omaha, Neb., March 28. Mr. Megeath, who had been in poor health for a number of years, was one of the pioneers in the Western coal industry. He also was president of the Sheridan Coal Co., operating in Kansas and Wyoming.

Sidney William Farnham, chief mining engineer for the Goodman Mfg. Co., Chicago, died March 12, at the age of 59. Mr. Farnham's first connection with the coal industry came when he accepted a position as purchasing agent for the coal-mining interests of the Missouri Pacific R.R. in 1895. In 1901, he entered the service of the Goodman company shortly after its organization, and became sales engineer, a position he held until 1911. After two years with the Western Cartridge Co., Mr. Farnham returned to Goodman as mining engineer, which position he held until his death.

Herman Dittmar, 31, vice-president of the East Kentucky Coal Co., London, Ky., died in Cincinnati, Ohio, March 25, following an operation.

Charles A. Collins, vice-president of the M. A. Hanna Co. and president of the Hanna Furnace Co., Cleveland, Ohio, died of pneumonia April 1. Mr. Collins, who was 53, had entered the employ of the Hanna company in 1896.

Alvan Markle, Sr., a leader in anthracite affairs for several decades, died at his home at Conyngham Pass, near Hazleton, Pa., March 19, from heart trouble. Mr. Markle, who was 70, entered the anthracite business in 1882, when he succeeded his father as head of Markle Bros. & Co. Later, he served as chairman of practically every joint committee of operators and miners in the negotiation of anthracite wage agreements from 1898 on. Aside from conduct of coal parleys, however, his active connection with the coal industry ceased in 1892, when banking, street railway, and public utility interests absorbed the greater part of his attention. Mr. Markle was the father of Donald Markle, now president of the Jeddo-Highland Coal Co., Jeddo, Pa.

Louis des Cognets, president of the Himyar Coal Co., an operating company at Domino, Ky., and the Louis des Cognets Coal Co., one of the largest retail firms in Lexington, Ky., died in that city March 9, at the age of 72.

King Coal's Calendar for March

March 6—Judge Harry Edwards, Lee County (Ill.) Circuit Court, Dixon, Ill., signs a decree recognizing John L. Lewis as president of the United Mine Workers and providing complete autonomy for District 12, comprising the State of Illinois.

March 9—Harry Fishwick, president, and John H. Walker, president-elect, District 12, United Mine Workers, withdraw contempt proceedings against John L. Lewis and other officers of the union and ask all coal miners to end the factional warfare of previous months.

March 10—Five thousand miners in South Wales strike against a wage cut of 14c. a day awarded by an independent conciliator. Men employed in the district total about 140,000. Question of a general strike will be brought up at a meeting of miners' representatives at Cardiff, March 21.

March 10—Extraordinary session of the national council of the French Federation of Mine Workers meets at Paris to consider calling a general strike in protest against wage reductions proposed by the owners.

March 13—Coal conciliation board in Scotland ratifies an agreement extending the present wage scale and "spread-over" working schedule to July 1, thus assuring peace until that time.

March 15—Order of the Canadian government, apparently aimed at dumping of American coal, goes into effect. The order places a value for duty purposes of $1 on slack and $1.25 on mine-run coal. Any difference between the sales price of the coal at American mines and the value fixed by the Canadian government will be added to the regular duty.

March 18—National safety campaign, to be conducted by the National Coal Association, agreed upon by representatives of the association, local association secretaries, U. S. Bureau of Mines men, and mine chiefs at the conclusion of a two-day meeting held in Chicago.

March 19—Independent miners' union, to be known as the West Virginia Mine Workers, organized at a meeting in Charleston, W. Va., attended by 47 delegates, according to an announcement by C. Frank Keeney.

March 19—Delegate conference at London, England, embitterd by a wage cut of 14c. a day in the South Wales coal field, votes against acceptance of the "spread-over" working arrangement provided for in the Coal Mines Act and urged by the owners. An arbitration plan on the question also is rejected. Action at the meeting forces the abandonment of the "spread-over" plan of working after March 31.

March 22—Representatives of the South Wales miners, at a meeting in Cardiff, by a narrow margin vote against a general strike in protest against a wage cut of 14c. a day awarded by an independent conciliator.

March 23—Alexander Howat, president of the insurgent United Mine Workers, which was refused recognition in the Illinois courts, announces that he will call an international convention of his faction, to be held in St. Louis, Mo., the middle of April. The purpose of the convention is to determine the future policy of the insurgents.

March 23—Twenty thousand miners employed by the Glen Alden Coal Co. strike as the result of action taken by locals in District 1 of the United Mine Workers, following recommendations of the general grievance committee. The walkout is termed unlawful by union officials.

March 28—Grievance committee representing 20,000 striking miners employed by the Glen Alden Coal Co., at a meeting in Wilkes-Barre, Pa., approves a list of complaints and grievances and recommends that leaders of the striking miners confer with district union officials with a view to ending the stoppage.

March 29—Threats of a general strike of 300,000 French coal miners averted when representatives of the employees, after intervention by Premier Laval, vote to accept in certain districts the 6 per cent wage cut insisted on by the owners, and to continue work in other sections on the present basis, pending arbitration.

Coal-Mine Fatality Rate Declines in February; Accidents Kill 99 Workers

ACCIDENTS in the coal-mining industry of the United States during February, 1931, caused the death of 99 men, according to information received from state mine inspectors by the U. S. Bureau of Mines. This is a decline of 81 from the number reported for the previous month and of 66 from the total in February, 1930. Production of coal in February, last, was 36,799,000 tons, a decrease of 7,900,000 tons from the preceding month of January and 8,804,000 tons from February a year ago. The death rate per million tons of coal mined in February, 1931, was 2.69, a decrease of 26 per cent from February, 1930, and of 33 per cent from January, 1931.

February reports for bituminous mines alone showed that accidents resulted in a death rate of 2.07, based on 65 deaths and 31,408,000 tons of coal. This rate indicated a reduction of 34 per cent from the rate for February, a year ago, and 43 per cent from January of the present year. The January record was 139 deaths and 38,542,000 tons, and that for February a year ago was 125 deaths and 39,555,000 tons.

Thirty-four deaths occurred in the anthracite mines of Pennsylvania in February, 1931, and the output of coal was 5,391,000 tons, resulting in a death rate of 6.31. During the corresponding month a year ago, there were 40 deaths and 6,048,000 tons of coal produced, which indicated a death rate of 6.61. In January, 1931, the death rate was 6.66, based on 41 deaths and 6,157,000 tons.

Reports for the first two months of 1931 show that accidents at coal mines caused the loss of 279 lives. The production of coal during this period was 81,498,000 tons, resulting in a death rate of 3.42, as compared with 3.86 for the same two months of 1930, based on 395 deaths and 102,295,000 tons. Separated into bituminous and anthracite, the fatality rates for 1931 were 2.92 and 6.49, based on 204 deaths and 69,950,000 tons for bituminous mines and 75 deaths and 11,548,000 tons for anthracite mines.

There were no major disasters—that is disasters in each of which five or more lives were lost—at any coal mine during February, but three such disasters occurred in January of the present year, resulting in the death of 41 men. During the corresponding two-month period of 1930, there were three major disasters with a total of 38 deaths. Thus the death rates from major disasters were 0.503 per million tons of coal produced in 1931 and 0.371 in 1930. The major disasters thus far in 1931 occurred at the rate of 3.68 separate disasters (as distinguished from the number of deaths resulting from the disasters) for each hundred million tons of coal produced, as compared with 2.93 separate disasters per hundred million tons for the corresponding two-month period last year.

Comparing the accident record for the first two months 1931, with that for the same months of 1930, a reduction is noted for falls of roof and coal, haulage, explosives, and electricity. The increased rate for gas or dust explosions is due to the major disasters which occurred during January of the present year, as the rate for local or non-major explosions for the first two months of 1931 was reduced. The comparative rates are as follows:

Cause	1929	1930	Jan.-Feb. 1930	Jan.-Feb 1931
All causes	3.592	3.798	3.861	3.423
Falls of roof and coal	1.941	2.012	2.112	1.730
Haulage	.678	.572	.557	.527
Gas or dust explosion:				
Local explosions	.082	.115	.156	.037
Major explosions	.238	.404	.372	.503
Explosives	.145	.147	.156	.074
Electricity	.133	.143	.156	.086
Miscellaneous	.375	.405	.352	.466

Research Fellowships Offered

College of Mines of the University of Washington offers five fellowships for research in coal and non-metallics in co-operation with the U. S. Bureau of Mines. The fellowships, beginning July 1, are open to graduates of universities and technical colleges who are qualified to undertake research investigation. For the year 1931-32, two coal problems have been selected, as follows: studies of the character of coals in relation to their utilization, particularly with reference to the friability of coal; and studies of the mechanism of coal-cleaning methods, especially coal flotation.

Coal-Mine Fatalities During February, 1931, by Causes and States

(Compiled by Bureau of Mines and published by *Coal Age*)

State	Underground												Shaft					Surface							Total by States	
	Falls of roof (coal rock, etc.)	Falls of face or pillar coal	Mine cars and locomotives	Explosions of gas or coal dust	Explosives	Suffocation from mine gases	Electricity	Animals	Mining Machines	Mine fires (burned, suffocated, etc.)	Other causes	Total	Falling down shafts or slopes	Objects falling down shafts or slopes	Cage, skip, or bucket	Other causes	Total	Mine cars and mine locomotives	Electricity	Machinery	Boiler explosions or bursting steam pipes	Railway cars and locomotives	Other causes	Total	1931	1930
Alabama	....	1	....	....	....	....	....	....	....	....	....	1	....	....	....	....	....	....	....	....	....	....	....	....	1	5
Alaska	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0
Arkansas	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	2
Colorado	6	....	2	....	....	....	....	....	....	....	....	8	....	....	....	....	....	....	....	....	....	....	1	1	1	2
Illinois	....	....	1	....	....	....	....	....	....	....	....	1	....	....	....	....	....	....	....	....	....	....	....	....	8	6
Indiana	1	....	....	....	....	....	....	....	....	....	....	1	....	....	....	....	....	....	....	....	....	....	1	1	2	4
Iowa	....	....	....	....	1	....	....	....	....	....	....	1	....	....	....	....	....	....	....	....	....	....	....	....	1	2
Kansas	5	....	1	....	....	....	1	....	....	....	....	7	....	....	....	....	....	....	....	....	....	....	....	....	1	2
Kentucky	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	7	15
Maryland	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	1
Michigan	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0
Missouri	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	2
Montana	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	1
New Mexico	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0
North Dakota	3	....	1	....	....	....	....	....	....	....	....	4	....	....	....	....	....	....	....	....	....	....	....	....	0	0
Ohio	....	....	....	....	....	....	....	....	....	....	1	1	....	....	....	....	....	....	....	....	....	....	....	....	4	4
Oklahoma	9	5	3	....	....	....	....	....	....	....	2	19	....	....	....	....	....	....	....	....	....	....	....	....	1	0
Pennsylvania (bituminous)	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	19	24
South Dakota	....	....	....	....	....	....	1	....	....	....	....	1	....	....	....	....	....	....	....	....	....	....	....	....	0	0
Tennessee	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1	2
Texas	1	....	....	....	....	....	....	....	....	....	....	1	....	....	....	....	....	....	....	....	....	....	....	....	0	0
Utah	....	1	1	....	....	....	....	....	....	....	....	2	....	....	....	....	....	....	....	....	....	....	....	....	1	26
Virginia	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	2	1
Washington	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0
West Virginia	4	2	4	....	....	....	2	....	2	....	....	14	....	....	....	....	....	1	....	....	....	....	....	....	14	26
Wyoming	1	....	....	....	....	....	....	....	....	....	....	1	1	....	....	....	....	....	....	....	....	....	....	....	2	0
Total (bituminous)	30	9	13	....	1	....	4	....	2	....	3	62	1	....	....	....	1	....	....	....	....	1	1	2	65	125
Pennsylvania (anthracite)	14	2	5	....	3	1	....	1	....	....	5	31	....	....	....	....	....	....	....	....	....	....	1	3	34	40
Total, February, 1931	44	11	18	....	4	1	4	1	2	....	8	93	1	....	....	1	1	....	....	....	....	1	1	2	99	....
Total, February, 1930	80	9	17	34	5	1	8	....	3	....	4	161	1	....	....	....	2	1	....	....	....	1	....	2	....	165

A.M.C. Convention Program Goes Forward

Modern coal-mine management, safe operating practices, mining systems, mechanical mining in thick and thin seams, anthracite mining, recents developments in mining practice and in coal-cleaning, and fuel utilization will be the general subjects for discussion at the eighth annual convention of practical operating men and national exposition of coal-mining equipment, to be held at Cincinnati, Ohio, May 11-15, under the auspices of the Manufacturers' Division of the American Mining Congress. One hundred and twenty-five manufacturers of mining equipment will have exhibits at the exposition, and a separate show of industrial stokers will be housed in a separate building adjoining the main hall.

There have been a number of changes in the tentative program (published in the March issue of *Coal Age*). At the session on modern coal-mine management, "Trends Toward Better Management," will be the subject of P. C. Thomas, vice-president, Koppers Coal Co., Pittsburgh, Pa. Discussion will be offered by T. R. Johns, Bethlehem Mines Corporation, Johnstown, Pa.; Horace Moses, Gallup-American Coal Co., Gamerco, N. M.; R. L. Ireland, Jr., M. A. Hanna Coal Co., Cleveland, Ohio; W. J. Freeman, Bon Ayr Coal Co., Terre Haute, Ind.; Paul Weir, Bell & Zoller Coal & Mining Co., Chicago; W. D. Brennan, Utah Fuel Co., Salt Lake City, Utah; and Eugene McAuliffe, Union Pacific Coal Co., Omaha, Neb.

Four names have been added to the men who will present discussion following the delivery of a paper on "Maintaining Discipline," by T. G. Fear, general manager of operations, Consolidation Coal Co., Fairmont, W. Va. These are Jerome C. White, Pittsburgh Coal Co., Pittsburgh, Pa. (vice Dr. L. E. Young, of the same company); I. N. Bayless, Union Pacific Coal Co., Rock Springs, Wyo.; D. A. Stout, Colorado Fuel & Iron Co., Denver, Colo.; and Edward C. Weichel, Hudson Coal Co., Scranton, Pa.

At the session on mining systems, George Heaps, president, Iowa Coal Association, Albia, Iowa, will be the second speaker to discuss methods in the Middle West. Robert Hamilton, consulting engineer, Tennessee Coal, Iron & R.R. Co., Birmingham, Ala., will present a paper on "Mechanical Mining in the Thin Seams in the Birmingham District," at one of the sessions on mechanical mining. Discussion will be offered by E. H. Jenks, Rochester & Pittsburgh Coal Co., Indiana, Pa.

A paper on wood preservation, by D. D. Dodge, general superintendent, W. J. Rainey, Inc., Uniontown, Pa., has been added to the list to be read at the session on recent developments in mining practice. Chas. Gottschalk, vice-president, Big Vein Coal Co., Evansville, Ind., will describe the new coal-washing plant of the company at Buckskin, Ind.

Trade Rule Review Completed

The Federal Trade Commission announced on March 30 the completion of the task of reviewing the rules of business practice adopted by close to eighty industries at trade practice conferences held at various times, mostly in the last five years. The rules for each industry will be announced separately in the near future after they have been given an opportunity to adopt changes made by the Commission.

While details will not be made known until the statements concerning each industry are released for publication, it is said that the Group II rules, which relate to expressions of the trade, are being generally retained in the language of the industries, although there are some changes suggested by the Commission. Group II rules relate to practices and methods in doing business that the industry believes are opposed to economic principles or to fairness, or ethics, or good morals, although such practices or methods are not required by law. Rules concerning practices regarded as unfair methods contrary to law are placed in Group I.

—✧—

Setting the Record Straight

Due to a typographical error, the caption under the illustration of the tipple of the Utah Fuel Co., Castle Gate, appearing at the top of page 20 of the advertising section of the February, 1931, issue of *Coal Age* misstated the name of the builder of the plant. The tipple illustrated was designed and constructed by Allen & Garcia Co., Chicago.

Industrial Notes

E. M. Vehmeyer, an employee of Joseph T. Ryerson & Son, Inc., for 22 years, has been made manager of the Detroit (Mich.) plant.

Northern Equipment Co., Erie, Pa., has appointed the following sales representatives for Copes feed-water regulators, differential valves, pump governors, and allied equipment: Bell & Eiss, Inc., Minneapolis, Minn.; Economy Equipment Co., St. Louis, Mo.; and Jos. W. Eshelman, Birmingham, Ala.

Malcolm T. Ritchie has been made salesman for New England territory of the Rockbestos Products Corporation, New Haven, Conn.; Carleton W. Fletcher has been added to the Pittsburgh (Pa.) sales force; and Philip O. Weston has been appointed to the New Haven sales force.

John A. Mair has been made field engineer for the Buffalo (N. Y.) plant of the Worthington Pump & Machinery Corporation. Mr. Mair has been a member of the Buffalo works staff since 1922, and was lately foreman in charge of the manufacture of two-cycle Diesel engines.

D. Connelly Boiler Co., Cleveland, Ohio, has been acquired by the Foster Wheeler Corporation, New York City. This purchase marks the entry of the Foster Wheeler company into the boiler manufacturing field.

John W. Blackford, formerly manager of the Detroit (Mich.) office of the Torrington Co., has joined the sales organization of the Norma-Hoffman Bearings Corporation, Stamford, Conn.

T. S. Perkins, formerly general manager of distribution engineering, has been made general manager of merchandising engineering, and will head the new merchandising department of the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

American Chain Co., Inc., Bridgeport, Conn., has announced that its subsidiary, the American Cable Co., has granted the rights to manufacture preformed wire rope to the American Steel & Wire Co. The American Cable Co. also has granted manufacturing rights to five Canadian companies and seven European companies.

L. M. Lunning and Herbert A. Holmes have been made Chicago and Pittsburgh (Pa.) sales representatives, respectively, of the Reliance Electric & Mfg. Co., Cleveland, Ohio.

W. B. McCauley, who recently joined the staff of the Fairfield Engineering Co., Marion, Ohio, has been placed in charge of sales in the Baltimore (Md.) territory. Fred S. Sawyer also has joined the Fairfield staff, with headquarters at Cynwyd, Pa.

The Name of the Monighan Mfg. Corporation, whose sales activities recently were taken over by the Bucyrus-Erie Co., South Milwaukee, Wis., has been changed to the Bucyrus-Monighan Co.

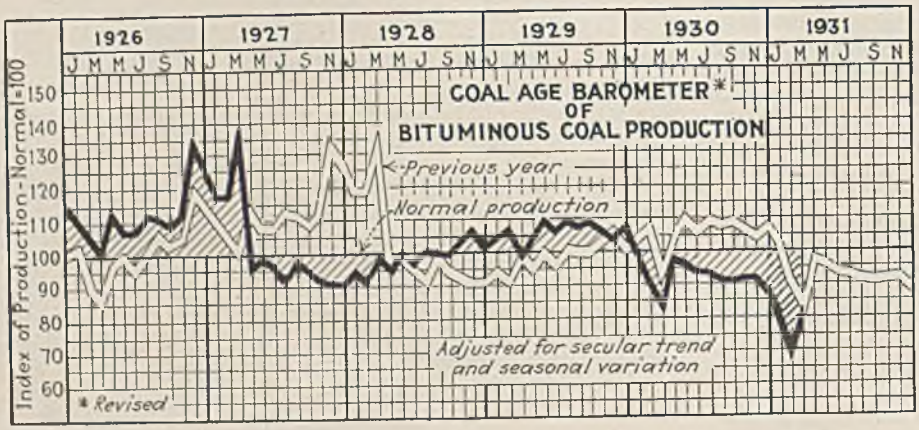
H. W. Renick has been elected president of the Racor Pacific Frog & Switch Co., Los Angeles, Calif. Mr. Renick was formerly vice-president of the Racor company, and succeeds J. B. Strong, who has been elected vice-chairman of the board of directors.

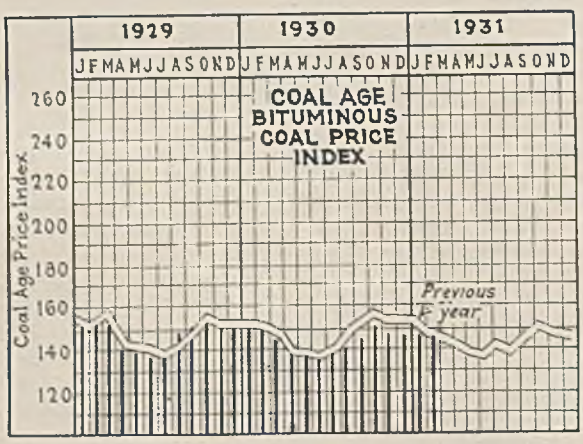
The Plant of the Lukens Steel Co., New Orleans, La., has been purchased by the Jones & Laughlin Steel Corporation, Pittsburgh, Pa., for the purpose of expanding plant and service facilities at the mouth of the Mississippi. Possession will be taken at once.

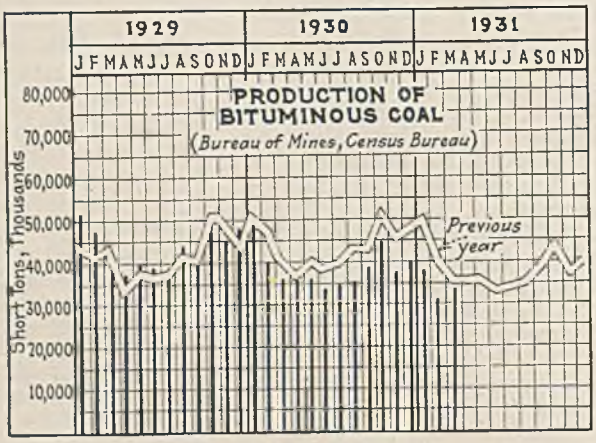
Walter W. Wiewel, for several years manager of steel sales in New York City, has been made sales manager of the Timken Steel & Tube Co., vice A. J. Sanford, resigned. Mr. Wiewel will make his headquarters at Canton, Ohio.

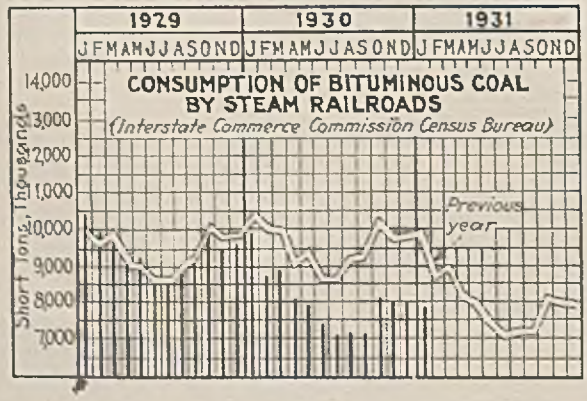
Edgar R. Phillips, for several years connected with the Timken Roller Bearing Co., has been appointed district manager for the Hulbert Oil & Grease Co., Philadelphia, Pa. Mr. Phillips will have charge of merchandising in the anthracite field.

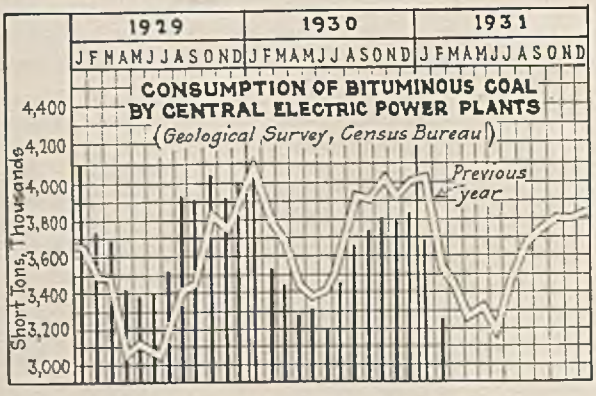
Indicators of Activities in the Coal Industry

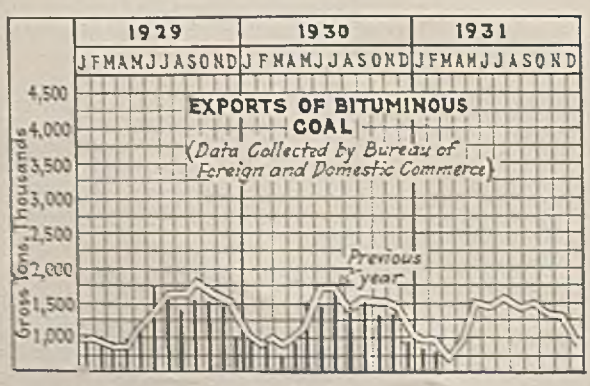


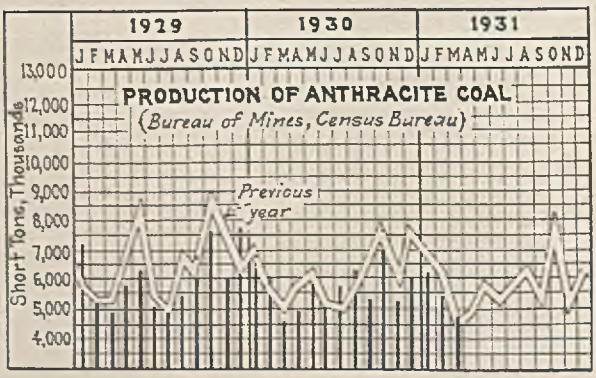












MARKETS in Review

LACK of demand and anticipation of spring price reductions depressed the demand for domestic coal in the bituminous markets of the country in March. Despite low reserves, retail dealers refused to consider buying for stockpiles, even with inducements in the form of lower prices. Demand for industrial coal, reflecting the continued business depression, also was low in March. In spite of this fact, the curtailed production resulting from the slack demand for domestic coal created such a shortage of slack and screenings that prices on these sizes closed materially higher. March was a fair month for contracting, though price differences caused many buyers to defer entering into an agreement. Lower prices were a part of such contracts as were signed, however.

Unseasonable weather and anticipation of price reductions materially curtailed the sale of coal in the anthracite markets of the country in March. Adoption of the net ton as the unit of sales and quotations; material reductions in the prices on broken, egg, stove, and chestnut sizes; and increases in the prices on pea, buckwheat, rice, and barley, were announced late in the month, but failed to stimulate buying to any marked degree. A detailed account of the revisions, together with a list of April prices appears on page 206 of this issue of *Coal Age*.

March production of bituminous coal is estimated by the U. S. Bureau of Mines at 33,873,000 net tons, an increase of 2,465,000 tons over the February total and a decrease of 1,900,000 tons from the production in March, 1930. Anthracite production is estimated at 4,727,000 net tons for March. This compares with 5,391,000 tons in the preceding month and 4,471,000 tons in March, 1930.

Coal Age Index of spot bituminous prices (preliminary) was: 140, March 7, 14, and 21; and 136, March 28. Corresponding weighted average prices were: $1.70, March 7; $1.69, March 14; $1.70, March 21; and $1.64, March 28. Revised Index figures for February were: 147, Feb. 7 and 14; and 145, Feb. 21 and 28. Corresponding weighted average prices were: $1.78, Feb. 7 and 14; $1.76, Feb. 21; and $1.75, Feb. 28. The monthly Index for February was 146, as compared with the unrevised figure of 139 for March.

PRICE revisions, coming on the heels of an extremely slack demand, were the feature of the Chicago market in March. Southern Illinois producers led the procession after being driven to reductions by low spot prices on competitive coals. A cut of 50c. on the large sizes was announced March 23, and though effective April 1, was made retroactive to March 23. Immediately after, central Illinois producers cut prepared sizes 25c., and a few days later western Kentucky lump and egg dropped to $1.35, a decrease of 25c. Revisions by Indiana operators followed, after which the smokeless operators came out with new spring price lists, indicating a continuance of the unsettled smokeless price situation. Three or four smokeless circulars invited buyers to "write for prices" on all sizes. Others quoted lump and egg at $2.25; stove, $2@$2.35; pea, $1.75; and mine-run, $2. Some operators, in fact, had two prices on mine-run—unscreened, $1.75, and screened, $2. Spot prices were: mine-run, $1.50@$2; lump, egg, and stove, $1.85@$2.

Eastern high volatiles were extremely sluggish and downward price revisions were made early in the month. Top quotations on premiums were: block, $2.75; egg, $2.25. Ordinary grades were slow at the following: block, $1.50@$2; egg, $1.25@$1.75. Eastern high-volatile interests found their market restricted in March as the result of the discouraging attitude of the railroads and the Ore and Coal Exchange, who are attempting to avoid congestion at the docks.

Steam sizes, though scarce and tight as the result of curtailed domestic production, found little demand from industrial users. Delivery of slack and screenings on contract was restricted by part-time operation of plants or complete suspension. Some interest in contracting developed, but buyers and operators clashed on the price question, one side demanding lower levels and the other attempting to promulgate increases. On the whole, however, contracting was satisfactory, with renewals at about last year's prices, though a large tonnage is still outstanding.

SPOT prices in the steam market were slightly higher than contract prices, especially for the better grades. Secondary grades were low, however. Some Illinois and Indiana varieties sold at 90c.@$1. Southern Illinois operators announced that screenings would be advanced 15c. on April 1 to $1.65@$1.75. Certain railroads refused to renew contracts for steam coal at the old figures, planning to purchase requirements for the coming season in the open market.

Cold weather in the first two weeks of March resulted in a good demand for domestic coal in the St. Louis market

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

		Week Ended							
		Mar. 7, 1931		Mar. 14, 1931		Mar. 21, 1931		Mar. 28, 1931	
	Market Quoted	Independent	Company	Independent	Company	Independent	Company	Independent	Company
Broken	New York	.....	$8.50	.....	$8.50	.....	$8.50	.....	$8.50
Egg	New York	$8.50@$8.65	8.65	$8.50@$8.65	8.65	$8.50@$8.65	8.65	$8.40@$8.65	8.65
Egg	Philadelphia	8.65@ 8.90	8.65	8.65@ 8.90	8.65	8.65@ 8.90	8.65	8.65@ 8.90	8.65
Egg	Chicago*	7.77	7.77	7.77	7.77	7.77	7.77	6.75	6.75
Stove	New York	8.75@ 9.15	9.15	8.75@ 9.15	9.15	8.75@ 9.15	9.15	8.75@ 9.15	9.15
Stove	Philadelphia	9.15@ 9.40	9.15	9.15@ 9.40	9.15	9.15@ 9.40	9.15	9.15@ 9.40	9.15
Stove	Chicago*	8.21	8.21	8.21	8.21	8.21	8.21	7.00	7.00
Chestnut	New York	8.65	8.65	8.40@ 8.65	8.65	8.40@ 8.65	8.65	8.40@ 8.65	8.65
Chestnut	Philadelphia	8.65@ 8.90	8.65	8.65@ 8.90	8.65	8.65@ 8.90	8.65	8.65@ 8.90	8.65
Chestnut	Chicago*	7.77	7.77	7.77	7.77	7.77	7.77	7.00	7.00
Pea	New York	5.00@ 5.50	5.00	5.00@ 5.25	5.00	5.00@ 5.25	5.00	5.00@ 5.25	5.00
Pea	Philadelphia	5.00@ 5.25	5.00	5.00@ 5.25	5.00	5.00@ 5.25	5.00	5.00@ 5.25	5.00
Pea	Chicago*	4.46	4.46	4.46	4.46	4.46	4.46	4.75	4.75
Buckwheat	New York	3.75@ 4.00	3.00†	4.00@ 4.50	3.00†	4.00@ 4.50	3.00†	3.50@ 4.00	3.00†
Buckwheat	Philadelphia	3.00@ 3.25	3.00	3.00@ 3.25	3.00	3.00@ 3.25	3.00	3.00@ 3.25	3.00
Rice	New York	2.00@ 2.15	2.00	2.10@ 2.25	2.00	2.10@ 2.25	2.00	2.00@ 2.10	2.00
Rice	Philadelphia	2.00@ 2.10	2.00	2.00@ 2.10	2.00	2.00@ 2.10	2.00	2.00@ 2.10	2.00
Barley	New York	1.15@ 1.40	1.50	1.15@ 1.40	1.50	1.15@ 1.40	1.50	1.15@ 1.40	1.50
Barley	Philadelphia	1.50@ 1.60	1.50	1.50@ 1.60	1.50	1.50@ 1.60	1.50	1.50@ 1.60	1.50

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

and enabled operators to clean up their tracks. With the end of the cold snap, however, domestic movement slackened, and was stagnant at the end of the month. The steam coal market quiet. Spring prices went into effect on the first of the month.

Two belated touches of winter resulted in a moderate improvement in the Southwest market in March. However, all the deep-shaft mines in Arkansas, Oklahoma, Missouri, and Kansas remained closed, except for a few in Kansas which ran to supply railroad contracts. Announcement of summer storage prices, scheduled for April, is expected to carry low prices with it, but the present attitude of the domestic buyer presages lack of interest in storage coal. Kansas and Missouri shovels supplied most of the production in March. Screenings prices were firm, but domestic quotations weakened.

Dock operators at the Head of the Lakes, influenced by a dull market, played a waiting game in March. Smokeless coals moved in fair volume and led the list. Prices were unchanged from those prevailing in February.

Unfavorable weather conditions in March continued to stifle the Colorado market. Hand-to-mouth buying prevailed, and production continued to fall. Prices were unchanged from those prevailing in February, but revisions on storage coal are expected in April.

Quietness featured the Louisville market in March, in spite of the fact that a short cold snap at the middle of the month created a better demand for steam and domestic sizes for heating purposes. Industrial, utility, and railroad demand, however, was light. Consummation of contracts was delayed, largely because buyers were either unable to see the advantages in the light of prevailing spot prices or because they were unable to anticipate their requirements. A few agreements were signed at the old prices. Operators asked a better price on contract screenings moving north of the Ohio, largely because the increased use of automatic stokers has brought in its train a call for a better grade of coal.

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

	Market Quoted	Week Ended Mar. 7, 1931	Mar. 14, 1931	Mar. 21, 1931	Mar. 28, 1931
LOW-VOLATILE, EASTERN					
Smokeless lump	Chicago	$2.00@$2.25	$2.00@$2.25	$2.00@$2.25	$2.00@$2.25
Smokeless egg	Chicago	2.00@ 2.50	2.00@ 2.50	2.00@ 2.60	2.00@ 2.50
Smokeless stove	Chicago	2.25@ 2.50	2.25@ 2.50	2.25@ 2.50	2.25@ 2.50
Smokeless nut	Chicago	2.00@ 2.25	2.00@ 2.25	2.00@ 2.25	2.00@ 2.25
Smokeless pea	Chicago	1.75@ 2.25	1.75@ 2.25	1.75@ 2.25	1.75@ 2.25
Smokeless mine-run	Chicago	1.75@ 2.00	1.75@ 2.00	1.75@ 2.00	1.50@ 2.00
Smokeless slack	Chicago	.75@ 1.35	1.00@ 1.35	1.00@ 1.35	1.00@ 1.35
Smokeless lump	Cincinnati	2.25@ 2.50	2.00@ 2.25	2.00@ 2.25	2.00@ 2.25
Smokeless egg	Cincinnati	2.25@ 2.50	2.00@ 2.50	2.00@ 2.50	2.00@ 2.25
Smokeless stove	Cincinnati	2.25@ 2.50	2.00@ 2.25	2.00@ 2.25	2.00@ 2.25
Smokeless nut	Cincinnati	1.75@ 2.00	1.75@ 2.00	1.75@ 2.00	1.75@ 2.00
Smokeless mine-run	Cincinnati	1.75@ 2.00	1.75@ 2.00	1.75@ 2.00	1.75@ 2.00
Smokeless slack	Cincinnati	.90@ 1.25	.90@ 1.25	1.00@ 1.25	1.00@ 1.25
*Smokeless nut-and-slack	Boston	3.58@ 3.64	3.58@ 3.64	3.58@ 3.64	3.64@ 3.75
*Smokeless mine-run	Boston	4.00@ 4.15	4.00@ 4.15	4.00@ 4.25	4.00@ 4.25
Clearfield mine-run	Boston	1.50@ 1.75	1.50@ 1.75	1.50@ 1.75	1.50@ 1.75
Clearfield mine-run	New York	1.75@ 2.00	1.75@ 2.00	1.75@ 2.00	1.75@ 2.00
Cambria mine-run	Boston	1.85@ 2.10	1.85@ 2.10	1.85@ 2.10	1.85@ 2.10
Somerset mine-run	Boston	1.75@ 2.00	1.75@ 2.00	1.75@ 2.00	1.75@ 2.00
Pool 1 (Navy Standard)	New York	2.10@ 2.35	2.10@ 2.35	2.10@ 2.35	2.10@ 2.35
Pool 1 (Navy Standard)	Philadelphia	2.10@ 2.35	2.10@ 2.35	2.10@ 2.35	2.10@ 2.35
Pool 9 (super low-vol.)	New York	1.75@ 2.00	1.75@ 2.00	1.75@ 2.00	1.75@ 2.00
Pool 9 (super low-vol.)	Philadelphia	1.75@ 2.00	1.75@ 2.00	1.75@ 2.00	1.75@ 2.00
Pool 10 (h. gr. low-vol.)	New York	1.60@ 1.75	1.60@ 1.75	1.60@ 1.75	1.60@ 1.75
Pool 10 (h. gr. low-vol.)	Philadelphia	1.60@ 1.75	1.60@ 1.75	1.60@ 1.75	1.60@ 1.75
Pool 11 (low-vol.)	New York	1.40@ 1.50	1.40@ 1.50	1.40@ 1.50	1.40@ 1.50
Pool 11 (low-vol.)	Philadelphia	1.40@ 1.60	1.40@ 1.60	1.40@ 1.60	1.40@ 1.60
HIGH-VOLATILE, EASTERN					
Pool 54-64 (gas and st.)	New York	$0.95@$1.15	$0.95@$1.15	$0.95@$1.15	$0.95@$1.15
Pool 54-64 (gas and st.)	Philadelphia	1.00@ 1.15	1.00@ 1.15	1.00@ 1.15	1.00@ 1.15
Pittsburgh sc'd gas	Pittsburgh	1.70@ 1.80	1.70@ 1.80	1.70@ 1.80	1.70@ 1.80
Pittsburgh egg	Pittsburgh	1.65@ 1.75	1.65@ 1.75	1.65@ 1.75	1.65@ 1.75
Pittsburgh gas mine-run	Pittsburgh	1.45@ 1.60	1.45@ 1.60	1.45@ 1.60	1.45@ 1.60
Pittsburgh mine-run	Pittsburgh	1.30@ 1.60	1.30@ 1.60	1.30@ 1.60	1.30@ 1.60
Pittsburgh gas slack	Pittsburgh	1.00@ 1.15	1.00@ 1.15	1.00@ 1.20	1.00@ 1.20
Pittsburgh slack	Pittsburgh	.65@ .75	.60@ .80	.65@ .85	.65@ .85
Connellsville coking coal	Pittsburgh	1.40@ 1.75	1.40@ 1.75	1.40@ 1.75	1.40@ 1.75
Westmoreland lump	Philadelphia	2.25@ 2.50	2.25@ 2.50	2.25@ 2.50	2.25@ 2.50
Westmoreland egg	Philadelphia	1.75@ 1.85	1.75@ 1.85	1.75@ 1.85	1.75@ 1.85
Westmoreland h.-p. lump	Philadelphia	1.80@ 1.90	1.80@ 1.90	1.80@ 1.90	1.80@ 1.90
Westmoreland mine-run	Philadelphia	1.65@ 1.75	1.65@ 1.75	1.65@ 1.75	1.65@ 1.75
Westmoreland slack	Philadelphia	1.05@ 1.25	1.05@ 1.25	1.05@ 1.25	1.05@ 1.25
Fairmont lump	Fairmont	1.45@ 1.90	1.35@ 1.90	1.25@ 1.85	1.15@ 1.75
Fairmont egg	Fairmont	1.55@ 1.65	1.30@ 1.65	1.20@ 1.50	1.20@ 1.50
Fairmont h.-p. lump	Fairmont	1.25@ 1.50	1.25@ 1.50	1.20@ 1.45	1.10@ 1.35
Fairmont nut	Fairmont	1.30@ 1.55	1.30@ 1.50	1.20@ 1.40	1.10@ 1.30
Fairmont mine-run	Fairmont	.90@ 1.40	.90@ 1.35	.90@ 1.25	.85@ 1.25
Fairmont slack	Fairmont	.40@ .75	.40@ .75	.50@ .70	.60@ .80
Kanawha lump	Cincinnati	1.35@ 2.00	1.35@ 2.00	1.35@ 1.75	1.35@ 1.75
Kanawha egg	Cincinnati	1.25@ 1.65	1.25@ 1.65	1.15@ 1.65	1.20 1.60
Kanawha nut-and-slack	Cincinnati	.60@ 1.00	.60@ 1.00	.65@ 1.00	.75@ 1.10
Kanawha mine-run (gas)	Cincinnati	1.35@ 1.50	1.35@ 1.50	1.30@ 1.50	1.35@ 1.50
Kanawha mine-run (st.)	Cincinnati	1.10@ 1.35	1.10@ 1.35	1.10@ 1.35	1.10@ 1.35
Williamson (W. Va.) lump	Cincinnati	1.85@ 2.00	1.85@ 2.00	1.25@ 1.75	1.35@ 1.75
Williamson (W. Va.) egg	Cincinnati	1.20@ 1.50	1.20@ 1.50	1.20@ 1.50	1.25@ 1.60
Williamson (W. Va.) nut-and-slack	Cincinnati	.60@ 1.00	.45@ 1.00	.65@ 1.00	.75@ 1.10
Williamson (W. Va.) mine-run (gas)	Cincinnati	1.25@ 1.50	1.25@ 1.50	1.25@ 1.50	1.30@ 1.50
Williamson (W. Va.) mine-run (st.)	Cincinnati	1.10@ 1.25	1.10@ 1.25	1.10@ 1.25	1.10@ 1.25
Logan (W. Va.) lump	Cincinnati	1.35@ 1.75	1.25@ 1.65	1.35@ 1.65	1.35@ 1.75
Logan (W. Va.) egg	Cincinnati	1.25@ 1.50	1.25@ 1.50	1.25@ 1.50	1.25@ 1.50
Logan (W. Va.) nut-and-slack	Cincinnati	.60@ .75	.60@ .75	.75@ .85	.70@ .90
Logan (W. Va.) mine-run	Cincinnati	1.10@ 1.25	1.10@ 1.25	1.10@ 1.25	1.10@ 1.25
Logan (W. Va.) slack	Cincinnati	.50@ .75	.50@ .75	.60@ .75	.65@ .85
Hocking (Ohio) lump	Columbus	1.90@ 2.00	1.75@ 1.90	1.75@ 1.90	1.75@ 1.90
Hocking (Ohio) egg	Columbus	1.55@ 1.65	1.55@ 1.65	1.55@ 1.65	1.55@ 1.65
Hocking (Ohio) nut-and-slack	Columbus	.75@ .90	.75@ .90	.75@ .90	.75@ .90
Hocking (Ohio) mine-run	Columbus	1.40@ 1.65	1.40@ 1.65	1.40@ 1.65	1.40@ 1.65
Pittsburgh No. 8 (Ohio) lump	Cleveland	1.50@ 1.65	1.50@ 1.65	1.50@ 1.65	1.50@ 1.65
Pittsburgh No. 8 (Ohio) egg	Cleveland	1.20@ 1.35	1.20@ 1.35	1.20@ 1.35	1.20@ 1.35
Pittsburgh No. 8 (Ohio) h.-p. lump	Cleveland	1.15@ 1.30	1.15@ 1.30	1.15@ 1.30	1.15@ 1.30
Pittsburgh No. 8 (Ohio) mine-run	Cleveland	1.10@ 1.15	1.10@ 1.15	1.10@ 1.15	1.10@ 1.15
Pittsburgh No. 8 (Ohio) slack	Cleveland	.65@ .75	.65@ .75	.65@ .75	.65@ .75

* Gross tons, f.a.b. vessels, Hampton Roads.

Deadly dullness and general softness featured the Cincinnati market in March. Inquiries fell almost to the vanishing point, while demand for spot coal was extremely meager, except for one short stretch of cold weather. Even the advent of the latter failed to reach back to the mines, with the result that "no bills" increased materially. Shipments to the lakes totaled 147 cars, and lake buyers were conspicuous by their absence.

Slack was the one bright spot in the general gloom. Low-grade smokeless, which sold at 75c. on the first of the month, rose 50c. in some instances. Contract prices were held at $1.25 in spite of drastic reductions in the price of lump, egg, and stove, which sizes sold lower in March than in any other month for fifteen years. Prices on high-volatile slack also were advanced 50c. Some Harlan grades sold at $1.25 at the end of the month, and almost any variety was able to command 75c.

Adverse weather conditions and the continued business depression worked against the Columbus market in March. A short cold spell managed to instill a little life in the domestic trade for a while, but demand at the end of the month was weak and prices slumped. Retailers continued stock reductions, and their purchases were further curtailed by hand-to-mouth buying on the part of the public and disturbed credit conditions. The steam trade was quiet. Contracting was the principal activity, and practically all old agreements were closed and some new ones signed. Prices ranged 5@10c. lower than last year.

An increase of 10c. in slack prices was the principal feature in the Cleveland market in March. Mild weather caused domestic demand to lag. Retailers refused to stock up because of weather conditions, and industrial concerns and railroads continued to buy only for current needs.

Quietness featured the Pittsburgh market in March. Domestic demand lagged, but some movement of coal to the lakes was reported at the end of the month. A few railroads closed contracts, but the effect at the mines was

WESTERN Kentucky block, lump, and egg were gradually weaker as the month wore on, while mine-run showed no change and slack strengthened. Hazard coals also weakened slightly. Harlan and Elkhorn varieties showed no change. Quotations on the bulk of the Kentucky coals were as follows: block, $1.50@$1.75; 2-in. lump and egg, $1.25@$1.75; nut, $1.15@$1.60; slack, 75c.@$1.10. Slack became increasingly stronger as the month wore on, and indications were that top grades would hit $1.25 or more in future months.

not noticeable. Industrial contracting was not so evident. Demand for industrial coal was uniform, as improvement in activity was not reflected in increased buying.

Conditions in the northern West Virginia market were unfavorable in March, though operators moved to resist any further decrease in prices. Orders for large quantities of slack coal for stoker use were booked, with the result that prices of that size rose 15c. to 60@80c., while prices on prepared coals dropped about 10c. Lump sold at the end of the month at $1.15@$1.75.

QUIETNESS pervaded the central Pennsylvania market in March though an even movement of tonnage prevailed. Some contracting was reported at prices lower than last year. Spot prices were off slightly at the end of the month to the following: Pool 1, $2.05@$2.35; Pool 71, $1.80@$2.10; Pool 9, $1.75@$1.90; Pool 10, $1.55@$1.70; Pool 11, $1.35@$1.50.

Softness pervaded the New England market in March, with few indications of improvement in April. Efforts to curtail production in the smokeless districts seemingly were fruitless, and operators showed an increasing tendency to "go it alone." Buying was extremely quiet, largely because most industries were operating on reduced schedules. Prices were reasonably steady, offers on Navy Standard smokeless mine-run varying from $4@$4.30, on board vessels at Hampton Roads. A few specialties commanded higher prices, but the demand was slow. All-rail coals from Pennsylvania were extremely dull.

Shippers to the New York market found in March that consumers with storage piles were inclined to defer buying until reserves were used up. Other users, however, took tonnage at about the February rate. Industrial consumption held up well, but failed to register a gain. Some brisk buying by retailers reflected at times the prevalence of cold snaps. Low bids on certain public utility business caused other classes of buyers to demand price concessions on contracts. As a result, new agreements embodied prices 10@15c. lower than a year ago, though a number of contracts were deferred. Spot prices on lump and mine-run softened, while slack quotations were firmer.

More than usual quietness pervaded the Philadelphia market in March. A fair amount of contract tonnage was closed during the month, but at lower prices.

In spite of the stimulation of retail sales in the Birmingham market in March by low temperatures, movement of domestic sizes from the mines was slow, and even the announcements of spring price reductions ranging from 15c. to $1 failed to cause any material increase in buying. The new quotations, which will hold in April, are: Big Seam lump, egg, and nut, $1.60; Carbon Hill lump and egg, $1.75; nut, $1.60; Cahaba lump and egg, $2.75@$3.25; nut, $2.50; Black Creek lump and egg, $2.75@$3; nut, $2.50; Corona lump and egg, $2.10; Montevallo-Aldrich lump, $3.75; egg, $3.50; nut, $2.50; Straven lump, $3.25; egg, $3; nut, $2.25; Dogwood lump, $3.75; egg, $3.50. Demand for steam coal lagged in March. Industrial conditions showed no improvement, and railroad and bunker demand failed to rise above previous low levels. Quotations were: mine-run, $1.65@$2.25; washed, $1.85@$2.15; and small screenings, $1.25@$1.50.

Weather conditions and price uncertainties sharply curtailed anthracite sales in the New York market in March. Above-normal temperatures affected the demand for domestic sizes, while anticipated reductions in mine prices caused dealers to buy only for current needs. Some extra business was brought in by the spring price reductions, announced late in March, but the amount was not large.

Conditions in the Philadelphia anthracite market were similar to those in New York in March. The shortage of pea and buckwheat continued, while stove and nut lagged.

Exports of coal and coal products in February, the latest month for which figures are available, were as follows: bituminous coal, 644,736 gross tons, as compared with 699,640 gross tons in the preceding month and 834,572 tons in February, 1930; anthracite, 158,855 gross tons, against 206,991 tons in the preceding month and 262,013 tons in February, 1930; coke, 67,365 tons, as compared to 70,564 tons in January and 74,551 tons in February, 1930.

Imports were: bituminous coal, 2,131 gross tons, as compared to 5,571 tons in the preceding month and 2,224 tons in February, 1930; anthracite, 59,213 tons, against 63,741 tons in the preceding month and 150,473 tons in February, 1930; coke, 5,183 tons, as compared to 5,507 tons in January, and 6,084 tons in February, 1930.

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

	Market	Week Ended			
MIDDLE WEST	Quoted	Mar. 7, 1931	Mar. 14, 1931	Mar. 21, 1931	Mar. 28, 1931
Franklin (Ill.) lump	Chicago	$2.75	$2.75	$2.75	$2.25
Franklin (Ill.) egg	Chicago	2.40@ 2.55	2.40@ 2.55	2.40@ 2.55	2.25@ 2.50
Franklin (Ill.) mine-run	Chicago	2.15	2.15	2.15	2.15
Franklin (Ill.) screenings	Chicago	1.50@ 1.60	1.50@ 1.60	1.50@ 1.60	1.50@ 1.60
Central Ill. lump	Chicago	1.90@ 2.15	1.90@ 2.15	1.90@ 2.15	1.75@ 1.90
Central Ill. egg	Chicago	1.75@ 2.00	1.75@ 2.00	1.75@ 2.00	1.75@ 1.90
Central Ill. mine-run	Chicago	1.70@ 1.85	1.70@ 1.85	1.70@ 1.85	1.70@ 1.80
Central Ill. screenings	Chicago	1.25@ 1.50	1.25@ 1.50	1.25@ 1.50	1.00@ 1.25
Ind. 4th Vein lump	Chicago	2.50@ 2.65	2.50@ 2.65	2.50@ 2.65	2.10@ 2.50
Ind. 4th Vein egg	Chicago	2.40@ 2.50	2.40@ 2.50	2.40@ 2.50	2.00@ 2.50
Ind. 4th Vein mine-run	Chicago	1.90@ 2.00	1.90@ 2.00	1.90@ 2.00	1.75@ 2.00
Ind. 4th Vein screenings	Chicago	1.25@ 1.50	1.25@ 1.50	1.25@ 1.50	1.25@ 1.50
Ind. 5th Vein lump	Chicago	2.00@ 2.10	2.00@ 2.10	2.00@ 2.10	2.00@ 2.10
Ind. 5th Vein egg	Chicago	1.85@ 2.00	1.85@ 2.00	1.85@ 2.00	1.75@ 2.00
Ind. 5th Vein mine-run	Chicago	1.20@ 1.75	1.20@ 1.75	1.20@ 1.75	1.20@ 1.75
Ind. 5th Vein screenings	Chicago	.95@ 1.25	.95@ 1.25	.95@ 1.25	.85@ 1.25
Mt. Olive (Ill.) lump	St. Louis	1.90	1.90	1.90	1.75
Mt. Olive, (Ill.) egg	St. Louis	1.65@ 1.75	1.65@ 1.75	1.65@ 1.75	1.60
Mt. Olive (Ill.) mine-run	St. Louis	1.50@ 1.80	1.50@ 1.80	1.50@ 1.80	1.50@ 1.75
Mt. Olive (Ill.) screenings	St. Louis	.90@ 1.10	.85@ 1.10	.85@ 1.10	.85@ 1.10
Standard (Ill.) lump	St. Louis	1.75	1.75	1.75	1.65
Standard (Ill.) egg	St. Louis	1.50@ 1.65	1.50@ 1.65	1.50@ 1.65	1.50@ 1.65
Standard (Ill.) mine-run	St. Louis	1.25@ 1.50	1.25@ 1.50	1.25@ 1.50	1.25@ 1.50
Standard (Ill.) screenings	St. Louis	.70@ 1.00	.70@ 1.00	.70@ 1.00	.70@ 1.00
West Ky. lump	Louisville	1.50@ 1.75	1.50@ 1.75	1.50@ 1.75	1.40@ 1.75
West Ky. egg	Louisville	1.50@ 1.65	1.50@ 1.65	1.50@ 1.65	1.40@ 1.75
West Ky. mine-run	Louisville	.90@ 1.25	.80@ 1.25	.85@ 1.35	.85@ 1.25
West Ky. screenings	Louisville	.60@ .85	.65@ .75	.75@ .85	.75@ .90
West Ky. lump	Chicago	1.60	1.60	1.60	1.50@ 1.65
West Ky. egg	Chicago	1.40	1.40	1.40	1.25@ 1.40
West Ky screenings	Chicago	.65@ .85	.75@ .90	.75@ .90	.70@ .80
SOUTH AND SOUTHWEST					
Big Seam lump	Birmingham	$1.60	$1.60	$1.60	$1.60
Big Seam mine-run	Birmingham	1.60@ 1.75	1.60@ 1.75	1.60@ 1.75	1.60@ 1.75
Harlan (Ky.) block	Chicago	2.00@ 2.50	2.00@ 2.50	2.00@ 2.50	1.50@ 2.00
Harlan (Ky.) egg	Chicago	1.40@ 1.85	1.40@ 1.85	1.40@ 1.85	1.25@ 1.75
Harlan (Ky.) slack	Chicago	.70@ 1.00	.80@ 1.00	.80@ 1.00	1.00@ 1.10
Harlan (Ky.) block	Louisville	1.75@ 2.00	1.75@ 2.00	1.75@ 2.00	1.75@ 2.00
Harlan (Ky.) egg	Louisville	1.40@ 1.75	1.50@ 1.75	1.40@ 1.60	1.40@ 1.60
Harlan (Ky.) nut-and-slack	Louisville	.75@ 1.00	.90@ 1.25	.85@ 1.00	.85@ 1.00
Harlan (Ky.) mine-run	Louisville	1.30@ 1.60	1.30@ 1.60	1.25@ 1.60	1.30@ 1.60
Harlan (Ky.) block	Cincinnati	1.50@ 2.25	1.50@ 2.25	1.50@ 2.25	1.50@ 2.25
Harlan (Ky.) egg	Cincinnati	1.10@ 1.65	1.10@ 1.65	1.10@ 1.65	1.25@ 1.65
Harlan (Ky.) nut-and-slack	Cincinnati	.65@ 1.00	.75@ 1.25	.75@ 1.25	.75@ 1.25
Harlan (Ky.) mine-run	Cincinnati	1.10@ 1.50	1.10@ 1.50	1.00@ 1.50	1.10@ 1.50
Hazard (Ky.) block	Chicago	2.00@ 2.50	2.00@ 2.50	2.00@ 2.50	1.50@ 2.00
Hazard (Ky.) egg	Chicago	1.40@ 1.65	1.40@ 1.65	1.40@ 1.65	1.25@ 1.75
Hazard (Ky.) slack	Chicago	.70@ .90	.80@ 1.00	.80@ 1.00	1.00@ 1.10
Hazard (Ky.) block	Louisville	1.50@ 2.00	1.50@ 1.85	1.50@ 1.85	1.50@ 1.75
Hazard (Ky.) egg	Louisville	1.25@ 1.50	1.25@ 1.50	1.25@ 1.50	1.25@ 1.50
Hazard (Ky.) nut-and-slack	Louisville	.75@ 1.00	.75@ .90	.75@ .90	.75@ 1.00
Hazard (Ky.) mine-run	Louisville	1.15@ 1.45	1.15@ 1.35	1.15@ 1.35	1.15@ 1.50
Hazard (Ky.) block	Cincinnati	1.25@ 2.00	1.25@ 2.00	1.25@ 1.75	1.25@ 1.75
Hazard (Ky.) egg	Cincinnati	1.00@ 1.60	1.00@ 1.60	1.10@ 1.60	1.10@ 1.60
Hazard (Ky.) nut-and-slack	Cincinnati	.60@ 1.00	.60@ 1.00	.75@ 1.00	.75@ 1.10
Hazard (Ky.) mine-run	Cincinnati	1.00@ 1.25	1.00@ 1.25	1.00@ 1.35	1.00@ 1.35
Elkhorn (Ky.) block	Chicago	1.75@ 2.00	1.75@ 2.00	1.75@ 2.00	1.75@ 2.00
Elkhorn (Ky.) egg	Chicago	1.50@ 1.60	1.50@ 1.60	1.50@ 1.60	1.50@ 1.60
Elkhorn (Ky.) slack	Chicago	.75@ 1.00	1.00@ 1.25	1.00@ 1.25	1.00@ 1.25
Elkhorn (Ky.) block	Louisville	1.50@ 2.00	1.50@ 1.85	1.50@ 1.85	1.50@ 1.85
Elkhorn (Ky.) egg	Louisville	1.25@ 1.50	1.25@ 1.50	1.25@ 1.50	1.25@ 1.50
Elkhorn (Ky.) nut-and-slack	Louisville	.75@ 1.00	1.00@ 1.25	.85@ 1.00	.85@ 1.10
Elkhorn (Ky.) mine-run	Louisville	1.25@ 1.50	1.25@ 1.50	1.25@ 1.50	1.25@ 1.50
Elkhorn (Ky.) block	Cincinnati	1.35@ 2.50	1.35@ 2.50	1.35@ 2.25	1.35@ 2.25
Elkhorn (Ky.) egg	Cincinnati	1.10@ 1.75	1.10@ 1.65	1.10@ 1.65	1.20@ 1.75
Elkhorn (Ky.) nut-and-slack	Cincinnati	.60@ 1.00	.65@ 1.10	.75@ 1.10	.75@ 1.25
Elkhorn (Ky.) mine-run	Cincinnati	1.10@ 1.50	1.10@ 1.50	1.10@ 1.50	1.10@ 1.50
Kansas shaft lump	Kansas City	3.00@ 3.50	3.00@ 3.50	3.00@ 3.50	3.00@ 3.50
Kansas strip lump	Kansas City	2.25	2.25	2.25	2.25
Kansas mine-run	Kansas City	2.00	2.00	2.00	2.00
Kansas screenings	Kansas City	1.50	1.50	1.50	1.50

WHAT'S NEW
IN COAL-MINING EQUIPMENT

Track-Mounted Coal Loader Has Belt Conveyors

Clarkson Mfg. Co., Nashville, Ill., has developed a rigid-steel, open-frame, track-mounted coal loader with a 24-in. I-beam loading head. The loading and digging head, according to John L. Clarkson, the designer, has the power and ability to undermine a standing shot, while the gathering conveyor is strong enough to withstand the shock of a heavy fall of coal.

Motive power consists of one 35-hp. motor for crowding and propelling the

Digging Head of Clarkson Loader, Showing Front and Rear Belt Conveyors

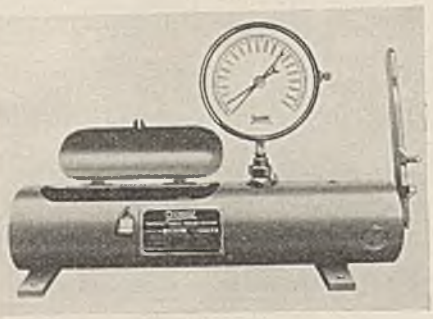
loader, and for operating the pump which supplies power to the hydraulic lift and swing jacks; one 20-hp. motor for operating the digging head; and one 7½-hp. motor for driving the rear conveyor. Motor capacity, it is declared, is 75 per cent in excess of the requirements for normal operation under ordinary conditions. Electrical controllers have been eliminated, and all forward and reverse movements are accomplished through clutches. This system, the designer states, eliminates electrical troubles and reduces controller equipment to a minimum.

The principal feature emphasized by the company is the belt conveyor system, which operates in troughs composed of 24-in. I-beams. As compared to chain conveyors, the following advantages are claimed: one belt under ordinary conditions will outlast two chain conveyors; belts can be replaced for half the cost of chain conveyors; coal breakage is reduced; return side of the belt does not break or drag coal off the mine car, thus enabling the car trimmer to load cars more heavily; wear on the I-beams is practically eliminated, together with conveyor trough replacements.

Loading capacity of the machine under ordinary conditions is 2 tons per minute, the company says. Other details of construction are as follows: weight, 18,500 lb.; length of main frame, 13 ft.; width of main frame, 66 in.; height above the rail, 48 in.; width of place which can be cleaned up from a single track, 22 ft.; tramming speed, 3 to 4 miles per hour; average current required for loading, 90 amp. at 230 volts, d. c.

Machine for Testing Welds Is Portable

The Oxweld Acetylene Co., New York City, has developed the Oxweld portable tensile-testing machine, designed to facilitate the testing of welds in the field or shop. It weighs, according to the company, 165 lb., and is 28 in. long and 6¼ in. in diameter. The machine is self-contained and totally inclosed. When closed for shipment it is said that it presents a comparatively smooth cylindrical surface. It consists of a tubular compression member with a set of grips in the head and a hydraulic cylinder block in the base. The cylinder block contains a communicating pump and cylinder, and the cylinder pressure



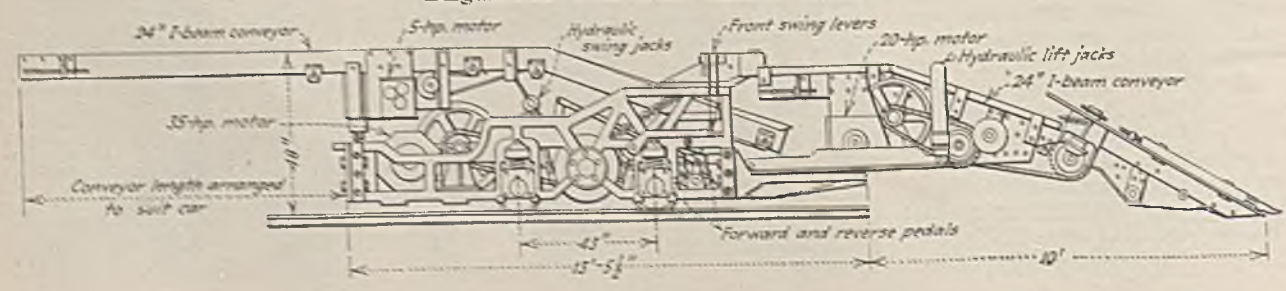
Portable Tensile Testing Machine

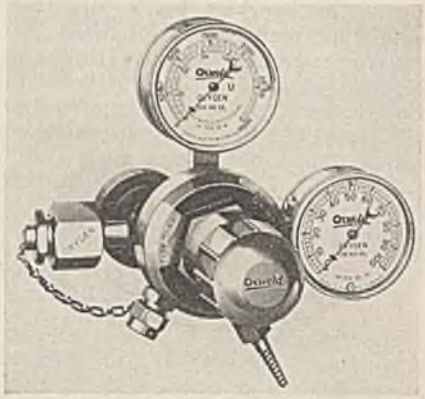
operates a piston carrying a second set of grips.

The specimen to be tested is placed between the jaws, which are equipped with spring grips. The release valve is closed and the pump handle is moved back and forth to apply tension. A set of conical blocks may also be fitted into the head in place of the grips to test ½-in. round specimens. The load is measured directly in pounds per square inch by a calibrated pressure gage. When the test is finished, the pressure may be released and the piston returned to its original position by using the pump handle as a lever. This machine, the company states, makes it possible to secure a tensile test immediately after the welds are made, and also facilitates the conduct of periodic tests of the operatives' ability. In addition, it is said, the machine provides a ready means of testing sections cut at random from completed work.

The Oxweld company has introduced the Type R-43 oxygen welding regulator, which, it declares, guarantees a constant line pressure by means of a two-stage pressure reduction, accomplished through two separate and independent sets of diaphragms, valves, and springs. Oxygen at the full cylinder pressure of 2,000 lb. per square inch enters the regulator through a stem-type valve and is controlled by the first-stage diaphragm, which reduces the pressure in this stage to less than 250 lb. per

Diagrammatic View of the Clarkson Loader

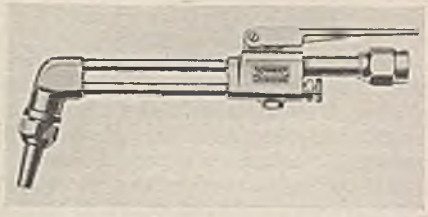




Type R-43 Oxygen Welding Regulator

square inch. The pressure here is non-adjustable. Oxygen then passes to a second stem-type valve and diaphragm assembly, where the pressure is reduced to the working range desired by the operative. This pressure is regulated by an adjusting screw, and the company says that any operating pressure may be obtained without fluctuation.

Two new attachments for the Oxweld W-17 blowpipe also have been developed which, the company says, make it



CW-17 Cutting Attachment in Operating Position

capable of doing almost any type of work that may be required of an oxy-acetylene blowpipe. The Type CW-17 cutting attachment, it is asserted, enables the blowpipe to perform a reasonably wide range of cutting work. A long handle is used for operating the cutting oxygen valve. When not in use the handle can be pulled forward parallel with the tubes, enabling the operative to carry the whole attachment in his pocket. At the rear of the attachment is a regulating screw for oxygen for the heating flames. The equipment is joined

W-17 Blowpipe With Adaptor and W-15 Welding Head

to the blowpipe handle in the same manner as a welding head.

An adaptor which makes it possible to use any of the welding heads available for the W-15 sheet metal welding blowpipe with the W-17 welding blowpipe handle is the second of the new accessories. This means, the company says, that the W-17 blowpipe may be used for work ranging from the lightest to the heavy welding work required of such equipment.

The Oxweld company offers the No. 23 aluminum welding rod, which it recommends for welding either aluminum sheet or castings when the metal is tightly held in jigs and, consequently, is not free to move. At temperatures just below their melting point, the company says that aluminum casting alloys possess little strength and have a high contraction coefficient. The combined effects of these properties may, under certain conditions, cause cracks to occur adjacent to the welds.

No. 23 welding rod is recommended by the manufacturer for welding these alloys because its melting point is lower than that of the metal being welded, so that it will remain in a molten state after the base metal has solidified. The weld metal will therefore fill any voids that might be created by the solidification and contraction of the base metal, it is claimed, and any stresses that might be caused by contraction will shift their effect from the base metal to the weld metal. The latter, being free from hot shortness, will absorb the stresses without development of cracks. The new rod is available in $\frac{1}{16}$-, $\frac{1}{8}$-, and $\frac{1}{4}$-in. sizes.

Carbide Unloader Developed

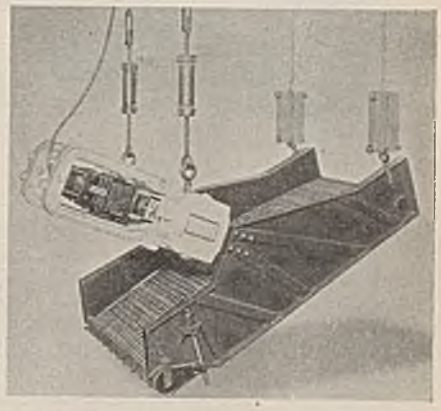
The Tennessee Mill & Mine Supply Co., Knoxville, Tenn., offers a carbide unloader, the use of which, it is asserted, makes for economy, convenience, cleanliness, and safety in handling carbide. It further, the company says, reduces loss from disintegration and protects carbide from moisture. To install the machine, the bracket is bolted to the wall. The lid is removed from the car-

Tennessee Carbide Unloader

bide can, which is then bolted to the hopper. The can is then turned upside down, and the lugs of the hopper are hooked into the bracket.

Conveying and Screening Done on Same Unit

Traylor Vibrator Co., Denver, Colo., has developed the "Trayco Conveyanscreen." The power unit of the screen, designated as the vibrator unit, is mounted above the screen sash and imparts its vibration at an angle to the screening plane. Rapid oscillation produces a sharp screening action as well as a conveying motion, the company says. Thus, the screen can be operated practically flat and, therefore, does away with the necessity of setting the screen at an angle to allow gravity to assist the flow of the material across



Traylor Vibrator Co. "Conveyanscreen"

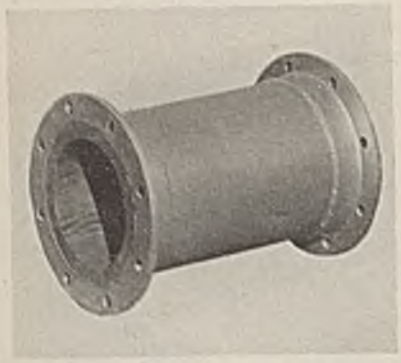
the surface. The manufacturer states the "Conveyanscreen" produces more accurate sizing because the angle of vibration causes the material to keep in closer contact with the screen cloth.

Power units, which vibrate the sash, are the same in type and design as those used on Traylor vibrating conveyors, which have been in use in conveying practice a number of years. The vibrator is suspended so that all the vibration is absorbed within the unit and none is transmitted to building supports. Each power unit takes its energy from any standard alternating current and through the use of a small motor generator set, furnished with the screen, the intensity of the vibration is under rheostat control and can be varied to meet individual requirements.

The screen is furnished in four standard widths and in any length necessary to accomplish the duty. On single- and double-deck screens, up to 6 ft. in length, one vibrator is used. On screens from 6 to 12 ft. in length, two vibrators are used. On screens over 12 ft., in length, three or more vibrators are used to oscillate the screen sash. The steel sash of the screen, over which the screen cloth is tightly stretched, is vibrated as a unit. All cross ribs, for the support of the screen cloth, are equipped with specially molded rubber strips which protect and prolong the life of the screen cloth. A complete renewal of cloth can be made without special tools in ten minutes, the company says.

Wood-Lined Pipe Offered

Michigan Pipe Co., Bay City, Mich., offers a wood-lined, alloy pipe for use with acid or corrosive liquids. According to the company, the interior consists of smoothly machined Douglas fir, cypress, spruce, white or yellow pine, or maple staves with longitudinal tongue-and-groove joints tightly installed under heavy pressure. Inside diameter of the



Construction of Michigan Wood-Lined Pipe

wood shell determines the diameter of the pipe. Shell thickness is 1 in. The exterior consists of a light-weight shell of "Toncan" alloy, with flanged ends and A.S.M.E. drilling. The pipe may be secured for pressures up to 200 lb. per square inch. Elbows and tees are available with the same construction.

Advantages listed by the company are: long life; reasonable cost; convenient installation and connection with any bolt circle; exact length lines in sections up to 24 ft. in length; ability to withstand end thrusts because of the flanged joints; leakage eliminated by testing all tubes before lining; light weight; no specks, rust, or corrosion; and suitability for either suction or discharge lines.

Insulated Aluminum Cables

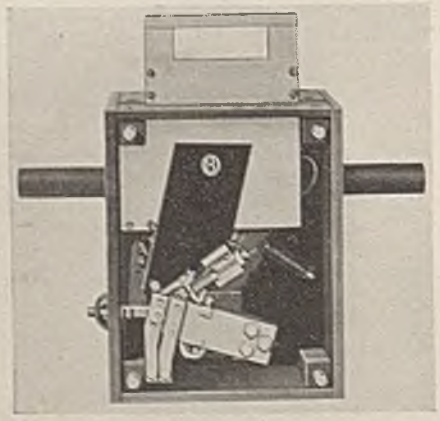
General Cable Corporation, Rome, N. Y., has announced a varied line of insulated aluminum wires and cables under the trade name "Alectral." Heretofore, it is said, practically all of the aluminum used for the transmission of electrical energy has been in the form of bare conductors. Introduction of the new cables, it is claimed, allows the electrical engineer to employ the economic features of aluminum in a much broader field. The initial group of conductors includes network cable, nonmetallic underground cable, insulated line wire, tree wire, armored cables, magnet wire, starter cable, and car-wiring cable. Connections can be made, it is said, by applying high pressure to sleeves by means of a specially designed, light-weight, hydraulic press.

For applications where tensile strength is not the controlling consideration, the conductors are all aluminum. For aerial service, certain stranding combinations of aluminum and steel have been developed. These, it is said, will show favorable costs in installation and upkeep in both rural and urban systems. "Alectral" cables, it is said, are materially lighter than the equivalent insulated copper conductors. In both underground and overhead power distribution, insulated aluminum conductors are said to have marked advantages in certain classes of work. System disturbance resulting from underground short-circuits is less with aluminum than with other conductor materials, it is asserted. It also is declared that "Alectral" cables will remain cooler under a given load, as their large cross-section gives greater heat radiation.

Circuit Breaker Switch Features Time-Limit Setting

Ohio Brass Co., Mansfield, Ohio, has developed a time-limit circuit-breaker switch said to combine the ability to sustain a given overload for a definite period of time with complete protection to the machine in the event of a short-circuit. Primarily a circuit breaker, this switch, it is claimed, will kick out instantaneously when a short-circuit occurs. There are, however, numerous operating conditions existing in mines which actualy represent overloads, but which are only of a temporary nature and do not endanger the machinery.

With the new circuit breaker, overloads of a definite value may be sus-



Ohio Brass Time-Limit Circuit Breaker Switch With Back Cover Removed

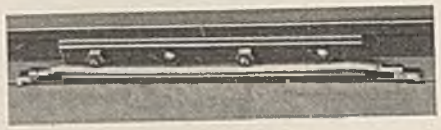
tained for any desired period of time from a few seconds to twenty minutes, depending upon the setting of a time element. Mine locomotives, for instance, may be protected by having the breaker set to throw out just before dangerous overheating of the motors occurs. In this way, full protection from short-circuit is always afforded, yet, at the same time, starting loads and other temporary excessive demands on the machine do not result in the breaker disconnecting.

Another use for the time-limit circuit-breaker switch is that of setting it to sustain an overload for a period just within the time interval of the demand meter, arranging for it to throw out before this demand limit is exceeded. Push-button releases are provided on all sizes of these circuit breakers, which range in capacity from 350 to 1,200 amp. They operate on currents of 250 to 600 volts d.c.

Power Bond Developed

American Steel & Wire Co., Chicago, now offers the BF-3 "Tiger-Weld" power bond, with solid steel terminals flash butt-welded to the copper conductor. By completing the latter process in the factory, the company says, the welder is relieved of the difficult task of welding the wires to the terminal, thus allowing him to do a better job more quickly and easily than in the past.

The bond is so made, it is declared,



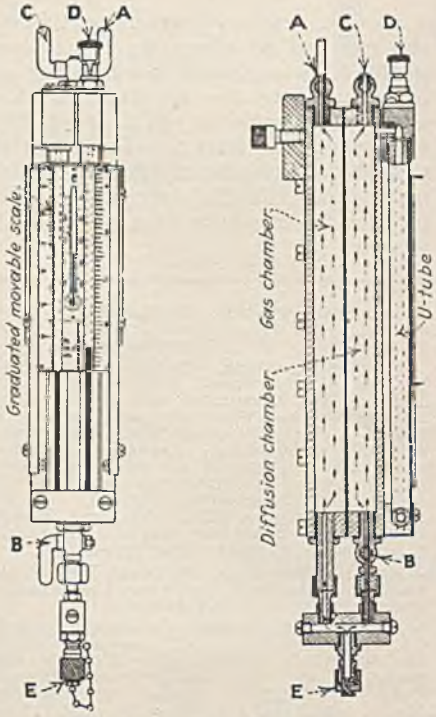
"Tiger-Weld" Power Bond Applied to Rail

that the full cross-section of the conductor is maintained throughout its length and the possibility of wires becoming "crushed" or "necked-down" is completely eliminated. Also, it is said, there are no abrupt deformations to concentrate vibratory stresses. Consequently, resistance to fatigue is high, insuring longer mechanical life.

Gas Analyzers Offered

Industrial Apparatus & Instrument Co., Newark, N. J., offers the "Vulkan" gas indicator, Sewerin system, for detecting and determining the quantity of individual gases in gas-air mixtures, and the "Vulkan-moment" gas analyzer, Callenberg system, for the rapid determination of quantities of gases in mixtures. Both these instruments are manufactured by Vulkan-Werke G.mb. H., Gutersloh i.W., Germany. The Sewerin system indicator consists essentially of two aluminum chambers separated by a porous wall; a U-tube attached to one of the chambers and filled with an indicating fluid; and a graduated movable scale.

Relative positions of the gas and diffuser chambers and the U-tube (or manometer) are shown in the accompanying illustration. The gas-air mixture to be studied is introduced into the gas chamber. If it is a light gas, it diffuses through the porous wall, increasing the pressure in the diffusion chamber and causing the indicating liquid to rise in the right leg of the manometer. If a heavy gas, such as carbon dioxide, is introduced into the



Sewerin System Gas Analyzer

gas chamber, the air in the diffusion chamber diffuses through the porous wall, decreasing the pressure and causing the indicating fluid to rise in the left leg of the manometer. If the character of the gas is unknown, the position ot the indicating fluid will indicate whether it is lighter or heavier than air, after which it may exactly be determined by a separate analysis.

Samples to be analyzed may be obtained directly by setting up the instrument in the atmosphere to be tested, or samples may be collected in rubber bulbs. The latter are attached by means of a rubber hose at *E*. Moisture is removed from the sample by a dryer between the rubber bulb and the valve *E*. The apparatus is first flushed with air by opening the stopcocks *A, B,* and *C*. Gas-air mixtures to be tested are then introduced into the gas chamber by closing *B*. Stopcock *C* also is closed during the test to allow the positive or negative pressure to register on the indicating fluid. Temperature variations, which cause contraction or expansion of

"Vulkan-Moment" Gas Analyzer

the air in the diffusion chamber, with the result that the tops of the columns of indicating fluid become stationary at different levels, are compensated for by momentarily opening the valve *D*.

The analyzer is made in three forms. Type G is said to be adaptable for coal-mining use. Type K is designed for tunnels, canals, sewers, and foundations, while Type J is recommended by the maker for use in factories, laboratories, and hospitals.

The "Vulkan-moment" gas analyzer also operates on the principle of diffusion of gases through a porous wall, and, according to the maker, may be used for the detection and determination of both light and heavy gases. The handle end of the instrument contains a battery, while the other end consists of a diffusion chamber. In the center are the indicating scale, adjusting devices, and a pilot light. The latter automatically lights or disappears, depending upon the presence or absence of gas, and by adjusting the instrument to cause disappearance or reappearance, the quantity of gas may be measured on the indicating scale. Length of the analyzer is 11 in. and it weighs about 1 lb. It is, according to the makers, safe to use in the presence of inflammable or explosive mixtures.

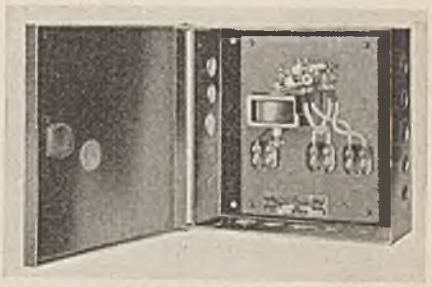
Pneumatic Sump Pump Is Air-Operated

Ease of transportation is the principal feature claimed for the new CP Quimby sump pump, manufactured by the Chicago Pneumatic Tool Co., New York City. It is driven by a CP No. 88 rotary air motor and, according to the company, weighs but 44 lb. Capacity claimed is 100 g.p.m. at a 28-ft. head. The company says that in comparison with the usual sump pump of the suction type, which, when placed above the level of the water, requires priming, the CP Quimby needs only to be lowered into the sump with the motor running to start pumping. By using a 2½-in. water hose for an outlet and a ¾-in. air hose, the maker says that the outfit can easily be transported from job to job, eliminating the pipe or heavy reinforced hose used on suction pumps.

Mercury Tube Relay Designed For Control Work

The Hart Mfg. Co., Hartford, Conn., announces a mercury tube relay for controlling loads up to 25 amp. at 125 volts by means of a low-amperage secondary circuit. Coils are of the continuous-current type, and are wound for 110 or 220 volts, a.c. Direct-current special low-voltage coils can be obtained as low as 6 volts. The relay, according to the company, is positive in action, silent, foolproof, and will stand abuse for a long time. Solenoid windings, it is claimed, are designed for continuous operation, and can be controlled by any suitable pole switch.

Open arcs are eliminated, it is said, because the current is broken by the mercury in the tube. The relay coils consume only a few watts, according to the company, and can be left in the



Hart Mercury Tube Relay

circuit without danger of burning out. This equipment, the maker says, is designed for controlling automatic machines, signal systems, and for temperature regulation. It may be obtained in single-, double-, triple-, and four-pole types; single-pole, double-throw and double-pole, double-throw models; or double-throw combinations.

Portable Fire Extinguisher

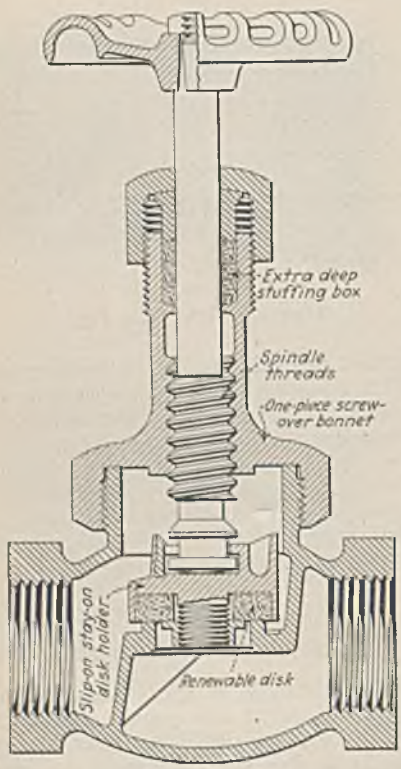
D. B. Smith & Co., Utica, N. Y., offer the Indian fire pump, designed to be carried on the back, thus leaving the arms free and permitting the operator to advance through heavy brush without picking up the extinguisher. According to the makers, the tank is curved to fit the back, and, on account of its shape, does not slide around. The pump has no leather packing or parts to wear out and, being entirely of brass, gives positive action at all times,

Curved Tank Fits the Back

the company says. A continuous stream may be thrown 50 ft. in any direction, it is said. Clear water is used and the 5-gal. tank may be quickly refilled. The equipment is designed for fighting grass and brush fires.

Bronze Valves Offered

Jenkins Bros., New York City, offer a new line of bronze globe, angle, cross and check valves for all standard services up to a working pressure of 150 lb. per square inch for steam and up to 250 lb. per square inch for oil, water, or gas. Features emphasized by the company are: extra-deep stuffing box;



Construction of the Jenkins Bronze Valve

more spindle threads in contact with the bonnet, decreasing wear and prolonging the life of the valve; one-piece screw-over bonnet, which provides exceptional strength and is easy to remove and replace any number of times without distortion or springing; slip-on, "stay-on," disk holder, by which the bonnet may be removed without the disk holder falling off the spindle by opening the spindle one or two turns; and a renewable disk, especially developed for the service the valves are expected to withstand.

New Belt Conveyor Carrier Has Roller Bearings

A new, roller-bearing, belt-conveyor carrier, known as the "Pacific Type," has been developed by the Stephens-Adamson Mfg. Co., Aurora, Ill. Timken bearings are used throughout, and the company recommends the equipment where a high-grade conveyor of medium price is desired. Construction details, as set forth by the manufacturer, follow:

The equipment is of the three-roller, 20 deg. trough design. Heavy-gage pressed steel is used in the construction, with the exception of the end stand castings, making the carrier light, strong, rigid, and practically unbreakable. Each roller turns upon two Timken roller bearings housed within an inner hub of steel tubing and protected from dust and moisture by an intermeshing labyrinth grease seal for each bearing. The bearings are arranged to carry both thrust and radial loads, and the inner hub extends the full length of each roller, preventing misalignment. Provision has been made for adjusting and setting the bearings. Each bearing is equipped with an Alemite fitting for positive lubrication.

Each roller, with its bearings, shaft, and grease seal, is a self-contained unit that can easily be interchanged with any other roller without disturbing the bearing adjustment. The cross member is a single, structural-steel angle, formed and punched to eliminate all but one standard, pressed-steel bracket that is interchangeable for all sizes of carriers. The angle is self-cleaning and eliminates any tendency for material to collect and hinder the free action of the rollers. "Pacific" carriers are built in sizes for conveyor belts of from 18 to 48 in.

Trade Literature

Pumps. Vertical Triplex Pumps are illustrated and described in a 43-page bulletin, D-423, and Deep Well Pumps in bulletin D-450, 31 pp.; Worthington Pump & Machinery Corporation, Harrison, N. J.

Gears. Herringbone Gears, issued by W. A. Jones Foundry & Machine Co., Chicago. Catalog 48; 39 pp., illustrated, contains description of gears made by the Sunderland process, dimensions, horsepower tables, and list prices.

Storage Tanks. Vitrified Glazed Tile Ash Storage Tanks are illustrated and described in a 16-pp. bulletin of United Conveyor Corporation, Chicago.

Crane. 52-B Diesel Shovel-Dragline-Clamshell-Crane is described and illustrated in a 16 pp. bulletin of Bucyrus-Erie Co., South Milwaukee, Wis.

Engines and Generators. Vertical Steam Engines are illustrated and described in a 23-page bulletin, No. 304, and Bracket and Engine Type Generators in Bulletin No. 602, 23 pp.; Troy Engine & Machine Co., Troy, Pa.

Pulverizer. Bulletin 5-80, of Fuller Lehigh Co., Fullerton, Pa., illustrates and describes the spherical-ball and grinding ring principle of the Type B Pulverizer.

Pumps. Allis-Chalmers Mfg. Co., Milwaukee, Wis.—Bulletin No. 1647, illustrated, 15 pp., describing Type "SSU" Centrifugal Pumping Units. Head capacity tables and pumping charts are included.

Compressors. Sullivan Machinery Co., Chicago — Bulletin No. 83-U. Folder illustrating and describing the "WK-22" two-cylinder vertical model for mines of ordinary working height, also with two horizontal cylinders for low-vein conditions, and the "WK-44" four-cylinder "V"-type twin units.

Electrical Equipment. "Corona Prevention and Ozone Elimination With Rubber Insulated Wires and Cables," by E. W. Davis and G. J. Crowdes, is the title of a paper presented before the National Electric Light Association at Montreal, Canada, and published as a 20-pp. illustrated bulletin by the Simplex Wire & Cable Co., Boston, Mass.

Motor Drives. Diamond Chain & Mfg. Co., Indianapolis, Ind.—Drive Book No. 78; 65 pp., illustrated. Contains data necessary for the purchase of chain drives, including tables on revolutions per minute, horsepower, and prices.

Meters. Brown Instrument Co., Philadelphia, Pa.—Folder illustrating and describing CO_2 meter uses.

Coal Cutters. Sullivan Machinery Co., Chicago. Bulletin No. 82-H: 12 pp., illustrated. New style cutter chain is one of the features described in this bulletin entitled "Ironclad Coal Cutters, Class CE-7."

Shovels. Bucyrus-Erie Co., South Milwaukee, Wis.—Bulletin No. D-1203; 24 pp., illustrated. Describes the 120-B, 4-yd., electric-steam, revolving shovel.

Materials Handling. Covered in Bulletin 77 issued by Robins Conveying Belt Co., New York City.

Welding. Fusion Welding Corporation, Chicago. Descriptions and prices of accessories are contained in this 11-pp. illustrated bulletin.

Shovels. Bucyrus-Erie Co., South Milwaukee, Wis.—Pp. 16, illustrated. Discusses the mechanical principles involved in the operation of this three-engine gasoline machine and describes its advantages.

Explosives. "Brands of du Pont Explosives and Uses to Which They Are Adapted" recently issued by E. I. du Pont de Nemours & Co., Wilmington, Del.; sixth edition of chart for users of explosives.

Automatic Control. Illustrated and described in an 11-pp. booklet issued by the Reeves Pulley Co., Columbus, Ind.

Flexible Couplings. Circular 1,887, 8 pp., illustrated, and Speed Reducers, Circular 1,891, 12 pp., illustrated, are two bulletins issued by the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. The former contains descriptions, capacities, dimensions, and weights of the different types, and the latter gives information about the application, construction, ratings, and dimensions of Types SVR, DVR, and DVRA, vertical-type units for single and double reductions and right-angle drives.

Drives. Medart Co., St. Louis, Mo., 12 pp. brochure, illustrated, describes the development and use of V-belt drives.

Electrical Equipment. General Electric Co., Schenectady, N. Y., recently issued the following: CR3012 Cam-Type Master Switches for Use on Control Circuits Only, GEA-1,283. Super Synchronous Motor, GEA-885A. Electric Cable-Reel Equipment (Gearless), GEA-1,297. CR-9441 Geared-Type Limit Switches—Cam-Operated, GEA-1,284. CR9441-LS-438 Track-Type Limit Switches for Control Circuits, GEA-1,285. Induction Motor-Generator Sets, 7/8 to 35 kw., 125 or 250 volts, GEA-394B. Fractional Horsepower Capacitor Motors, Type KC, GEA-977B. CR9132 Edgewise-Wound Resistors for Alternating and Direct-Current Service, GEA-1,295. These bulletins are all illustrated.

"Story of Carbide" is the title of a 16-pp. illustrated booklet issued by the National Carbide Sales Corporation, New York City.

Shaker Conveyors. Electric Drives—Gebr. Eickhoff, Bochum, Germany. Catalog No. 1,271; 64 pp., illustrated. Included in this bulletin are descriptions of electric shaker conveyor drives, shaker conveyors, driving connections, duckbill and accessories.

Paint. Light Reflection Value of Color in Paint. New Jersey Zinc Co., New York City. Pp. 18, illustrated, including color chart.

Speed Reducers. Parallel-Shaft Herringbone Speed Reducers. Falk Corporation, Milwaukee, Wis. Bulletin 230; 68 pp., illustrated. Describes standard Falk herringbone reducers and gives standard ratios and capacities for general industrial applications.

Electric Equipment. Elliott Co., Jeannette, Pa., has issued the following bulletins: Engine-Type Alternating Current Generators, Bulletin J-3, 8 pp., illustrated, discusses efficiency, voltage regulation, etc. Compensated Machine, Bulletin J-2, 16 pp., illustrated; describes construction features and the principle of compensation is explained by diagrams and oscillograms. Synchronous Motors—The Modern Industrial Drive, Bulletin L-5, 16 pp., illustrated; contains general discussion of synchronous motors, power factor, flywheel effect, etc. Tube Cleaners, issued by the Liberty Mfg. Co., a subsidiary of the Elliott Co., Bulletin Z-8, 24 pp., illustrated, describes the use of these cleaners for removing scale from tubes or pipes.

Compressors. General Electric Co., Schenectady, N. Y. GEA-1,280; 12 pp., illustrated. Describes the salient features of construction and application.

Valves. Jenkins Bros., New York City—Form 141; illustrated folder describing the advantages of standard bronze valves and giving dimensions and prices.

Motors. Allis-Chalmers Mfg. Co., Milwaukee, Wis.—Leaflet 2,124; folder illustrating and describing new ARZ totally inclosed fan-cooled motors.

Locomotives. General Electric Co., Schenectady, N. Y.—GEA-7-7B; 10 pp., illustrated. Gives a brief description of representative modern devices and parts and also describes alterations in locomotive equipment.