COAL AGE

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

SYDNEY A. HALE, *Editor*

New York, January, 1935

Mineral Planning

THE REPORT of the National Resources Board on mineral policy, summarized elsewhere in this issue, offers no revolutionary panaceas for stabilization. On the whole, the recommendations made for the extension of the NRA system of control over production, capacity and prices do little more than reecho the present-day views of a large part of the industry itself. If objection is raised that this means a continuation of government supervision, the obvious answer is that the bituminous branch of the industry already has gone on record in favor of permanent control. Indeed, enthusiasm for the report might be wholly unalloyed were it not for the fact that another part of that document envisages further large-scale development of hydro-electric power. Many coal men may find it difficult to reconcile such activity with the stabilization program for mining outlined in the mineral policy section of the report.

Modernization in Little

TOO OFTEN modernization is viewed solely as a large-scale replacement of existing plants, but some companies do not have the funds for such large improvements in their tipples and breakers. Yet even they can modernize; certainly whenever replacements become necessary. Long mechanical transmission can give way to electric; open gears can be replaced by closed speed reducers and V-belts; plain bearings can be superseded by ball or roller bearings with self-aligning hangers. Because the tipple or breaker is old, it does not follow that all the units be of the same vintage.

Every possibility of increased efficiency should be canvassed. Loss of power is mechanical as well as electrical, and many a mine would save money by cutting out the losses resulting from wear, bad alignment, exposure to dust, bearings wasteful of oil and poorly lubricated, vibration, corrosion and misarrangement. The result of improvement may not be complete modernization but it will spell greater economy, less breakage and greater certainty in operation.

Social Insurance

COAL MEN have been so engrossed in the problems peculiar to their own industry that they have given little serious consideration to the active campaign under way for legislative establishment of a broad base for social-security insurance. Although the address of President Roosevelt at a conference on the subject a few weeks ago was widely interpreted as limiting the immediate administration program to unemployment insurance, it appears highly probable that both old-age pensions and unemployment insurance will be recommended by the President's coworkers in this field of social endeavor.

Admittedly the problem of unemployment insurance is much more complex than that of old-age pensions. Available vital statistics compiled by the government and the actuarial experience tables of the insurance companies would furnish a solid foundation for a retirement plan. Major difficulties at this time would revolve around questions of administration, contributions and the creation of the necessary reserve funds. Part-time employment, so common in coal mining, cyclical depressions and the lack of comprehensive employment data are big stumbling blocks to the initial determination of any basis for unemployment insurance. With these out of the way, literally scores of detail questions remain to be settled.

The point to be emphasized, however, is the fact that the drive for mandatory insurance is supported by a strong body of public opinion which will make itself felt in the coming session of Congress. As suggested by the report of the White Sulphur conference on business recovery last month, the need for a thorough and sympathetic study of the whole problem is imperative. Without such a study, industry risks the imposition of legislation which may burden commerce and fail to give the superannuated and the unemployed workers the security they have been promised.

Powder Puffs

THAT no fair maiden might suffer the ignominy of greeting Santa Claus with a shiny nose, NRA last month gallantly authorized the powder-puff industry to work its employees five hours per week in excess of maximum code hours to take care of holiday business. The plea that there should be a reasonable degree of flexibility in maximum hours in bituminous mining to enable that industry to meet sudden and urgent surges in demand, however, apparently leaves Washington as cold as inflexibility may leave some luckless consumers in the great open spaces should icy Boreas go on a winter rampage. Thus utility again runs a poor second to beauty.

Whitewash

IN THE MINES the possibilities of whitewash hardly have been realized. The type of management that adopts careful rock-dusting for safety is the kind of management that would favor the use of whitewash for that purpose and for efficiency, and perhaps the reason why whitewash has not been more generally used has been because whitewashing will not make rock-dusting unnecessary, whereas rock dust will destroy much of the effect of whitewash and possibly will be far less disposed to cling to whitewashed than to naked surfaces.

Rightly or wrongly, whitewashing of haulageways is progressing in Great Britain. One company has a machine for mixing and screening it and a spray machine to distribute the milky fluid at a material and labor cost of only 4c. per lineal yard. It lightens the gloom of the roadways, prevents accidents, should have some effect in preventing air from leaking through pillars, probably would inhibit fungus spores from attaching themselves to timber, and would kill spores on the surface of timber and bind them to it if present, so that they could not be dislodged and carried to uninfected timber. Even when rock-dusted, whitewash would furnish a lighter background to the dust.

Experiments might be tried using hot or warm water in mixing the whitewash, for hot or warm water gives the whitewash a brighter luster. However, such whitewash might not be as retentive of rock dust as cold-mixed material and, being more syrupy, perhaps could not be sprayed. Unfortunately, whitewash is not durable and will flake and rub off and must be renewed if it is to be really effective. Experimentation into the advantages and disadvantages of whitewash is desirable.

Open Gearing

YEARS AGO, open gears expressed the ideas of Boulton and Watt and the earlier mechanics. They were often made of unmachined cast-tooth design, were improperly aligned and spaced and were covered with coal dust which made them grind and vibrate in operation, shaking tipples grievously. Their lubrication was almost an impossible task and their presence added a hazard to the tipple operatives. Assurance that they might at any time be broken made it necessary to keep repair parts always available, and, as such gears are expensive, the cost of such repair parts added greatly to inventory.

Reduction gears working completely under cover and immersed in oil give a much greater freedom from grit, vibration and backlash, less breakage, maximum efficiency and safety, so that the days of open gears in mine tipples are drawing rapidly to a close. Such speed reducers also take up less of the available space. No wonder that in all newer installations they have formed a part of the equipment. Yet open gears still are found in older tipples wherever the practice has been to replace the old with replicas rather than with new and better devices.

HIGH TONNAGE

+ Assured by Mechanical-Loading Plan

At Knox Consolidated Mines

By **IVAN A. GIVEN**
Associate Editor, Coal Age

REFLECTING attention to fundamentals, mobile loaders at the American Nos. 1 and 2 mines of the Knox Consolidated Coal Corporation, Bicknell, Ind., consistently average between 330 and 360 tons per unit per shift of seven hours, and single units have loaded as much as 504 tons in the same period of time. These tonnages are secured with unit crews of thirteen men, including the boss, and at No. 1, excluding the men assigned solely to hand-loading sections, 83 underground men and four loading machines account for an average daily output of 1,325 tons, while at No. 2, excluding pit-car loaders driving main entries, 66 underground men and three loading machines deliver an average of 1,100 tons to the shaft bottom in one day.

Mechanization of loading at the Knox Consolidated mines was started three years ago, and since that time the entire No. 2 operation has been converted from hand loading. An average of 50 hand loaders with the necessary service men still are employed at the No. 1 mine, and account for approximately one-third of the daily output of 2,000 tons.

Both mines are shaft operations in the Indiana Fifth Vein. Average depth of cover is 318 ft. at No. 1 and 227 ft. at No. 2. Average thickness of the seam, which is without partings, is 6½ ft., and it is directly overlaid by 6 ft. of gray slate, over which is an exceptionally hard 2-ft. limestone stratum, or "steel band." Limestones constitute the major portion of the remaining cover. The gray slate makes a reasonably strong roof, which does not fall readily in places of normal width. Limestone boulders over the coal are frequent, and the best roof is encountered where they are approximately three-fourths buried in the roof. If the major portion of the boulders is below the top, however, they usually come down soon after the coal is mined out.

The general plan of development at the Knox Consolidated mines is based on the use of main, cross and room entries in a right-angle layout. Main entries consist of three headings 12 ft. wide on 33-ft. centers, protected by a 100-ft. barrier pillar on each side. Cross

Fig. 1—Loading Cut in a 30-ft. Place.

and room entries consist of two headings of a similar width and on the same centers. No. 1 rooms on room entries are turned 97½ ft. from the cross entries, leaving a 90-ft. barrier pillar (Fig. 6). A similar pillar is left at the top of the room entry to protect the cross entry above.

As shown in Fig. 6, a total of 32 rooms are worked from each side of a room entry, although there are exceptions to meet special conditions. Rooms are driven 53 ft. apart, measured from center to center of room necks. Width of room necks is 15 ft. to provide ample clearance for the loaders and other equipment. Widening on a 45-deg. angle starts after the second cut and continues until the full width of 30 ft. is reached, leaving a 23-ft. room pillar. Present depth of rooms is 256 ft., measured from the center of the entry, and, as room entries are driven on 575-ft. centers, a 30-ft. protective pillar is left between the right-hand group of rooms on one entry and the left-hand group on the next. Provided none of the pillars are cut through, the rooms on an entry are inclosed by solid pillars on three sides. Usually, however, approximately every other room entry is holed through the next cross entry (Fig. 6) to shorten the travels of the firebosses.

A barrier pillar dividing the rooms on either side into two groups of twenty and twelve each generally is established between Nos. 20 and 21 rooms by omitting the breakthroughs in this particular room pillar. In case of trouble in either the inner or outer groups of rooms, the presence of the barriers permits sealing off the particular section in which it occurs, although this seldom has been necessary. In case the outer group of rooms is affected, it is possible to come into the inner group from the next cross entry.

Experiments are now under way to determine the feasibility of increasing room-entry centers to 863 ft. and extending room depth to 400 ft. to cut down the amount of entry-driving for a given tonnage from room workings, and also to permit a longer stay in a particular entry, thus reducing the loss of time and interference growing out of moves from one section to another. At the same time, it is planned to determine whether any benefits will accrue from increasing room centers to 60 ft. and room width to 30 ft.

Retreat operation is the general rule in an individual room entry (or panel), although this rule is subject to modifications as conditions may warrant. Room necks are driven in two cuts as the entry advances, and when the room entry is driven up, or nearly up, operations are begun in the inner group of rooms on one side of the entry. Entries may be driven by hand (No. 1), pitcar loader (No. 2) or by the loading machine itself. In the latter case, which is the exception to the retreat rule, mining on the advance (Fig. 6) is employed. As indicated, however, retreat working is the general policy, and when one of the inner groups of rooms is finished, the loading unit moves over to the corresponding group on the other side, and then works out the two outer groups in the same general sequence.

Ordinarily, only one loading unit is assigned to a retreating room entry, but all the places are kept ready so that in case another unit is forced to move out of its section by falls or other abnormal conditions it can be set to work with the other in the same entry in the possible event that no other section is ready. Also, in the event that a panel gets behind for any reason, another machine can be sent in to help out.

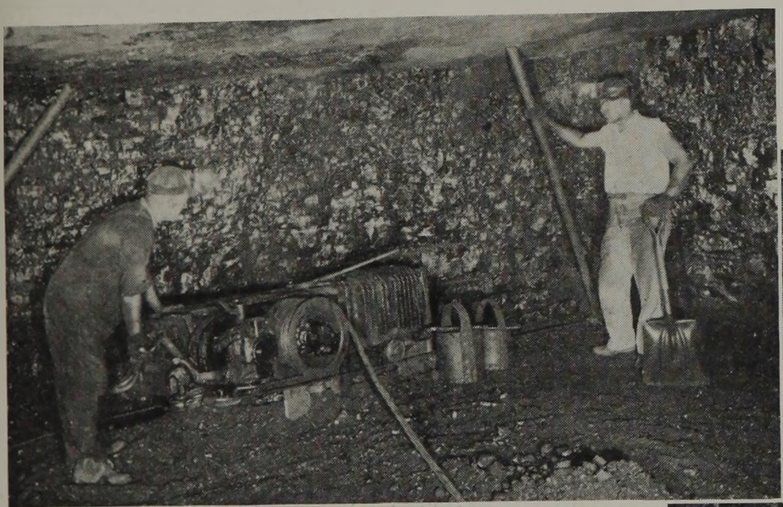


Fig. 2—Shortwall Machines Are Employed for Undercutting the Coal. This View Shows the Bit Boxes Used at Knox Consolidated Mines (p. 33).

Fig. 3—Drilling Crew at Work in a Wide Place.

Fig. 4—Portable Transformer Unit Employed at Knox Consolidated Mines.

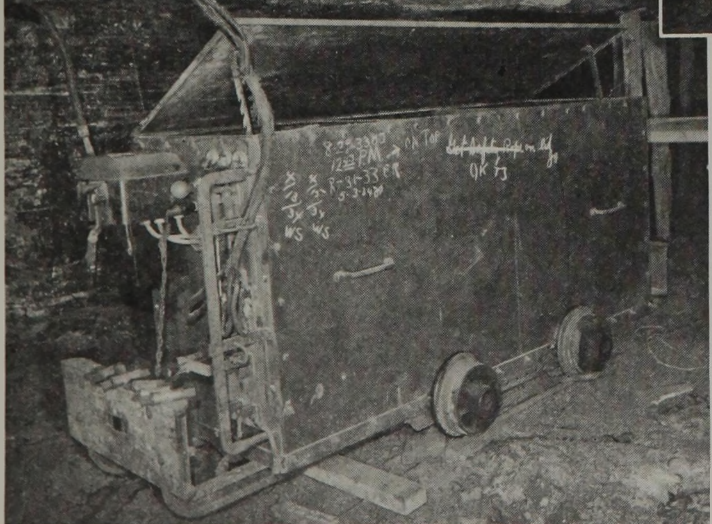
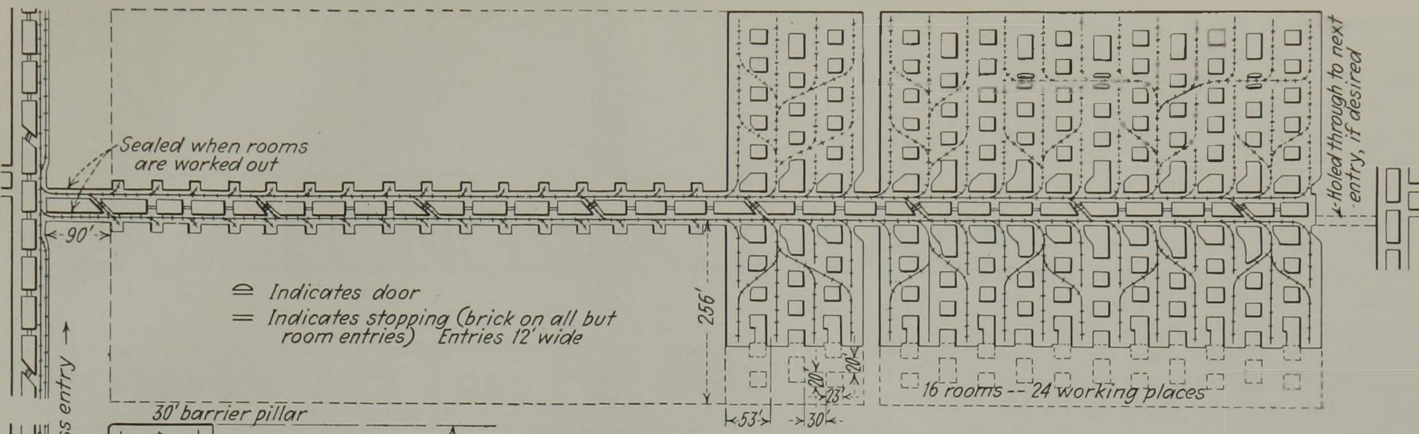


Fig. 5—Bug-Dusting in Preparation for Snubbing on the Night Shift.



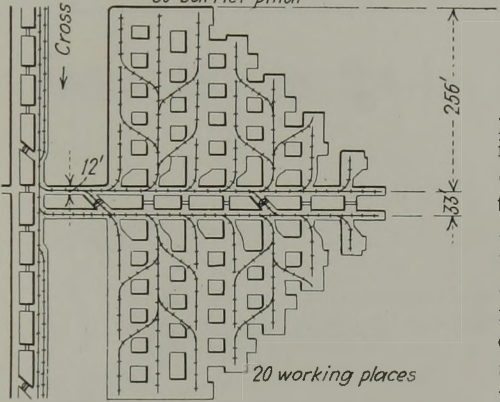


Fig. 6—Above, Retreat System of Operation in a Room Entry; Left, Advancing System.

When work is completed in a room panel it is sealed at the mouth and also at the inner end in case it has been holed through. This also is done when a section is abandoned for any reason before completion. Sealing is practiced to eliminate the necessity for ventilation, examination and also to confine any gas liberated. Most of the gas encountered at the two mines originates in the roof, and is freed by falls. Seals are constructed of brick set in a mortar of sand and cement. Thickness of the seals is 3 ft., and they are hitched 3 ft. into each rib and 2 ft. into the bottom.

To guard against curtailment of production through a shortage of coal, operations are arranged, where possible, so that each loading unit has a minimum of sixteen places. As snubbing is the standard practice, and is done on the night shift, only one cut is taken out of a place a day. Pillars between rooms are left in place. Recovery within a room panel is approximately 72 per cent.

All operations except snubbing and shooting take place on the day shift, and the major equipment included in a loading unit is as follows: one Joy 7BU loading machine; one Goodman "Universal" shortwall cutting machine with 7-ft. cutter bar; one Chicago Pneumatic post-mounted portable electric drill with push truck for carrying drilling and hole-loading equipment and supplies; and one 7-ton GE "serving" locomotive.

Standard crews, as indicated above, consist of thirteen men, as follows: unit boss, receiving $6.75 per shift of seven hours; cutting-machine operator and helper, each $6.75; driller and helper, $6.15; loading-machine operator, $6,75; helper, $6.75; clean-up man, who prepares the places for cutting, bugdusts in preparation for snubbing and wets down the coal before loading, $4.57½; tracklayer, $4.57½; motorman, $5.14; and triprider, $4.69. In addition, four men are employed at No. 1 and three at No. 2 to snub and shoot the coal for all loading units at the respective operations. Snubbers and shooters usually work in groups of two, and have with them a locomotive and truck for transporting snubbing pans. The locomotive also is employed to pull the pans out from under the cut after the snubbing shots are fired.

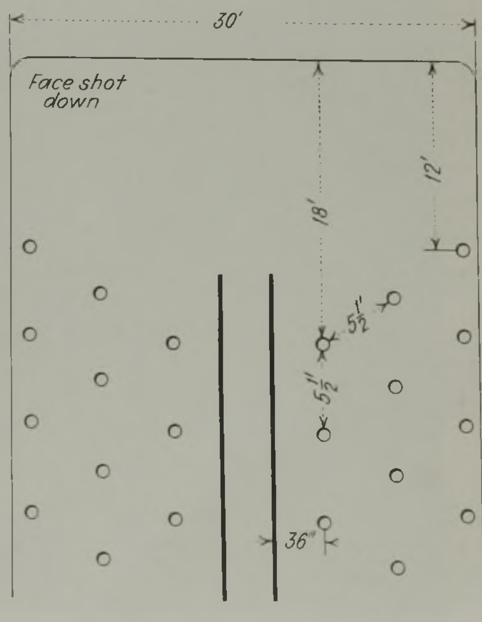
Assuming loading completed, the first operation in a place is timbering, employing the V system illustrated in Fig. 7. With this system, the farthest timber, on the inside of the V, is 18 ft. from the face; the nearest, 12 ft. Within the V, the loading machine can go into the corners without interference or knocking of timbers. In fact, no crew member is allowed to knock a timber, once set, without permission from the unit foreman, who first makes a personal inspection. The clean-up man then shovels back the loose coal, cleans up falls, if any have occurred, takes down any loose slate and otherwise prepares the place for cutting. He returns after the shortwall has completed its work, removes the bugdust from the kerf and shovels it back so that the snubbing pans can be inserted under the cut.

Drilling generally is the next operation, although both this and loading the shotholes are interchangeable with bugdusting, depending upon conditions. Eight holes normally are drilled in a room face, one row near the top, as shown in Fig. 8, and the second, or snubbing row, down toward the bottom. Entries and other narrow places generally are drilled with six holes. The drill crew then loads the snubbing holes with one stick each of a very bulky permissible (1⅛x6-in.) running 200 sticks per 50-lb. box, tamping them with clay. Two sticks of Hercules "Red H" C permissible (100 sticks per 50 lb.) generally are used in the center holes in the top row, and three sticks in the rib holes. Loaded holes are left until the next shift, the final operation on the day shift being extension of the track.

The success of snubbing at Knox Consolidated mines is due in large part to the design of the pans, officials believe. Instead of a solid pan, old lip or slotted or round-hole screen sections are used, thus materially lightening the weight and eliminating much of the difficulty of handling and dumping pans. Furthermore, they can be straightened in the place and will not slip out from under the coal. Pan width is 2½ ft.; length, 5 ft. Two 2½x2-in. angles are welded to the screen section, one at the back end and the other in the center. Before shooting the snubbing shots, two pans are placed under each hole, after which the shots are fired and the pans pulled out by the locomotive for dumping, which is done by hand. Top holes are fired in a section after all the snubbing shots, and the places are then ready for the loading machine after being wet down by the clean-up man, who also washes down the ribs on the entries periodically to remove dust.

Partings for each panel are established by widening a heading on the

Fig. 7 — V-System of Timbering Gives Maximum Protection With a Minimum of Interference With Loader Operation.



cross entry, as in Fig. 6. Between these partings and the bottom the 13-ton GE haulage locomotives pull trips averaging 35 cars (nominal car capacity, 4 tons; average capacity, mechanically loaded, 3 tons). Relay locomotives (7-ton, GE) operate between the partings and the loading sections, hauling 10 to 15 car trips, which are thrown into the nearest possible place to the loading machine. Four cars are taken to the loader by the serving motor each trip, and loads are kicked into the closest storage place, usually the adjacent room, where loaded trips are made up for the relay locomotive.

To reduce the distance traveled by the serving motor, and thereby the car-changing time, the track pick-up system shown in Fig. 6 is generally used in the present 256-ft. rooms. In the advancing system, this consists of picking up the outer two of three rooms from the center place. This is done twice, as shown, as the places advance to their maximum depth. In the retreating system, the pick-up scheme is carried still farther, the second pick-up consisting of nine places, four on each side of the center room, when possible. In effect, this system results in the establishment of a secondary haulage road, and has the advantage that all equipment is kept off the entry, thus leaving it free for the transportation units. A part or all the track behind the pick-up track usually is left in place for the convenience of the serving and relay locomotives, or for storing supplies. Room track consists of 20-lb. rail on wood ties, and the same construction is employed on both room-entry headings. Cross entries are laid with 40-lb. rail; mains with 60-lb.

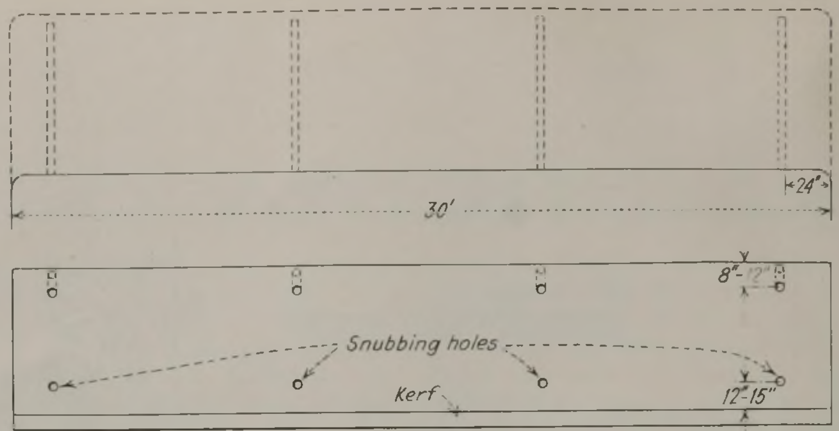
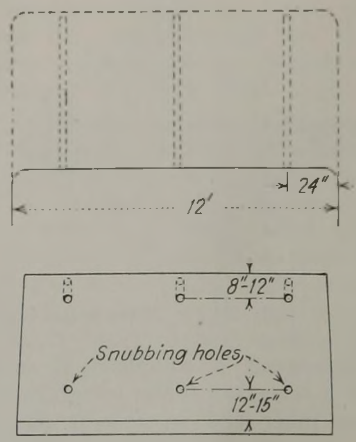


Fig. 8—Placement of Shotholes in Wide and Narrow Places.



With the exception of the locomotives, all equipment operates off alternating current, and to insure adequate voltage each loading unit is served by its own portable transformer station. These stations consist of three 37.5-kva. 2,300/240-volt transformers mounted on a wheeled truck and inclosed in a steel case. Oil switches, fuses and other control equipment are mounted on one end of the case. Uusually, the transformer units are stationed in a breakthrough, as shown in Fig. 4. Circuits from the transformer stations to the surface consist of three-conductor wire-armored cables, each conductor a 4-0 wire. For convenience and safety in plugging in on the 240-volt circuits, the nip boxes described on p. 36 of this issue are employed. On the average, 25 nip boxes are installed per loading section at convenient points on the entries or in the rooms.

Proper maintenance of all equipment in the working sections is assured by the employment of a regular force of greasers, who go in on the night shift to make any necessary repairs and grease all equipment. Broken cables are brought out to the repair shop, where the splices are made and vulcanized with Mines Equipment Co. vulcanizers. Heavy repairs are made in the company's central shop, which also builds rear conveyors, hoppers and similar parts, modified to suit the conditions at the two operations.

Underground employees and loading-machine performance in an average day are summarized in Table I. Records for maximum production in single 8- and 7-hour shifts are 182 and 168 cars respectively, equivalent to 546 and 504 tons of coal per shift. These records were established by the same unit in the No. 2 mine, including Mose Hunter, loading-machine operator; Carl Julian, helper; John Hess, motorman; Jack Summers, triprider; and Charles Deal, Sr., unit boss.

Table 1—Men Employed Underground and Average Daily Performance, Mechanical Loading Units, American Nos. 1 and 2 Mines.

		No. 1 Mine (Four Joy Loaders)		No. 2 Mine (Three Joy Loaders)	
Day:	Rate per Shift	Number Employed	Total Hours Worked	Number Employed	Total Hours Worked
Machine men	$6.75	4	28	3	21
Helpers	6.75	4	28	3	21
Drillers	6.15	4	28	3	21
Helpers	6.15	4	28	3	21
Loader operators	6.75	4	28	3	21
Helpers	6.75	4	28	3	21
Clean up men (a)	4.57½	4	28	3	21
Tracklayers	4.57½	4	28	3	21
Timbermen	4.57½	4	28	3	21
Gathering motormen	5.14	4	28	3	21
Tripriders	4.69	4	28	3	21
Loading-unit bosses	6.75	4	28	3	21
Cagers	4.57½	1	7	1	7
Couplers	4.57½	1	7	1	7
Car greasers	4.57½	1	7	1	3½
Main-line trackmen	4.57½	1	7	1	7
Main-line motormen	5.14	2	14	2	14
Tripriders	4.69	2	14	....	....
Relay motormen	5.14	2	14	2	14
Tripriders	4.69	2	14	2	14
Electricians, chief	5.64	1	7	1	14
Helpers and repairmen	5.64	3	21	2	14
Wiremen	4.57½	2	14	2	14
Pumpers	4.57½	1	7	1	7
Firebosses	5.50	3	21	2	14
Night:					
Snubbers and shooters	6.15	4 (b)	28	3 (b)	21
Loading spilled coal, mechanical-loader places	6.75	2	14	2	14
Recovering steel	4.57½	2	14	2	14
Supply men	5.14	1	7	1	7
Road cleaners	5.14	2	14	1	7
Road cleaners	4.69	....	....	1	7
Repairmen	5.64	1	7	1	7
Greasers, mechanical—loading units	5.64	1	7	1	7
Total	.....	83	581	66	458½
Tons of coal produced by mobile loaders per day		1,325		1,100	
Total tonnage produced by mine per day		2,000 (c)		1,250 (d)	

(a) Prepare places for cutting, including shoveling up loose coal and taking down slate; also bugdust cuts in preparation for snubbing and sprinkle coal before loading. (b) Snub and shoot for all loading units in mine. (c) Including 675 tons from hand-loading sections. (d) Including 150 tons from nine men on three pit-car loaders driving entries—two on the day shift and one on the night shift.

FOUR LONGWALL FACES

+ Provide 345 Tons Per day

From 18- to 24-In. Paris Seam

WORKING in coal varying from 18 to 24 in. in thickness, normal operation at the Eureka mine of the Eureka Coal Co., Paris, Ark., is based on cleaning up a total of approximately 1,600 ft. of face with four conveyor units in one shift of seven hours. This total is based on the extraction of one cut from each of four conveyor faces, or walls, 350 ft. long, plus one cut each from four headings 50 ft. wide, from which the walls are worked. With the coal thickness prevailing at the time this article was written, this system results in an average output of 345 tons per shift.

The Paris coal basin, in which the Eureka mine, operating the clean Paris seam, is located, is roughly oval in shape and is approximately 8 miles long and 4 miles across at the widest point. Its long axis, which runs east and west, is practically the Franklin-Logan County line. The basin has been developed, with one or two exceptions, by slopes driven down from the outcrop toward the center, and a modification of this plan was followed at Eureka, the major deviation growing out of the fact that a rock slope was sunk to reach the coal from a point about one-quarter of a mile inside the south crop. Inclination of the rock slope, which is 230 ft. long, is 17 deg.

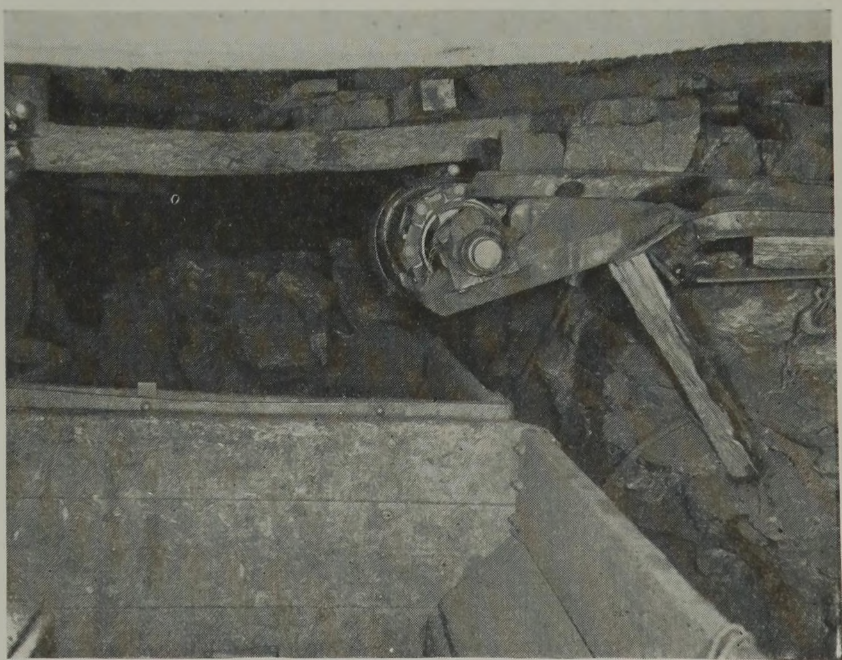
After the initial rock portion, however, the slope follows the coal seam down the pitch, which varies from 7 deg. at the foot of the rock slope to 3 deg. at the No. 6 headings. Slope-sinking practice at Eureka is based on removing the coal for a width of 50 ft., after which a roadway 8 to 9 ft. wide is made in the center by lifting enough bottom to give an initial clear height of 6½ ft. over the rail and under the crossbars.

Slope advance is intermittent, the usual practice being to extend it sufficiently during the normally slack summer season to provide for two walls on each side, after which operations are stopped until new territory is required. As the walls are started directly from both sides of the slope, barrier pillars naturally are omitted. Instead, a row of solid timber cribs 4 ft. square is set on the bench on each side of the roadway, as shown in Fig. 2. These cribs are placed 18 in. apart, and each pair serves as supports for the first timber crossbars. In the course of the natural subsidence of the top as a result of the almost complete (95- to 100-per cent) extraction of the coal, most of the original crossbars are broken. New crossbars are then set on legs placed in the 18-in. spaces between the cribs. Average clear height along the roadway after settlement is 5 ft.

Headings serving the walls are turned in pairs, one to the right (east) and one to the left (west), as shown in Figs. 2 and 3, and are driven on the same plan as the slope, enough bottom being lifted to bring the tops of the pit cars down to a line just below the bottom of the coal. One heading is offset slightly from the other, as indicated, to allow individual switches to be installed for each. Pairs of walls are started and advanced simultaneously as soon as the headings are driven in far enough (50 to 60 ft. past the walls) to accommodate a trip of cars.

The first operation in starting a wall is, naturally, installation of the conveyor. In anticipation of this task, a crib is omitted about every 50 ft. along the slope to allow the conveyor sections to be slid into the space between the crib line and the rib, which becomes the working face. The 10-ft. intermediate sections are then coupled up and the head and tail sections placed in position, whereupon work on the wall is started. As soon as the wall has advanced sufficiently, two additional rows of cribs are installed

Fig. 1—Wall-Face Conveyor Discharging Into 3-Ton Mine Car on Heading.



along the slope, as shown in Fig. 2, and open spaces are packed tightly with machine cuttings and other refuse to prevent air from leaking away from the wall. Canvas also is stretched along the crib line. However, after the wall has advanced 50 ft. or so, loss of air becomes of minor importance.

The standard center-to-center distance between adjacent headings, measured along the pitch, is 425 ft., but in actual practice this varies somewhat in accordance with changes in the inclination of the seam. Standard length of wall is 350 ft., to which must be added the width of the coal in the heading, making the effective length of face per heading 400 ft. A 25-ft. pillar is left at the top of the wall as additional protection for the heading above during not only its actual life but also to keep it open for emergency use until work on the lower heading is completed. This pillar is cut through about every 75 ft. to pass the air and also men in case the lower heading or wall is closed by a fall or other accident. A row of solid timber cribs 3 ft. square on 5- or 6-ft. centers is built 7 ft. below the pillar (Fig. 2) to form an airway and escapeway back from the upper end of the wall to the last breakthrough.

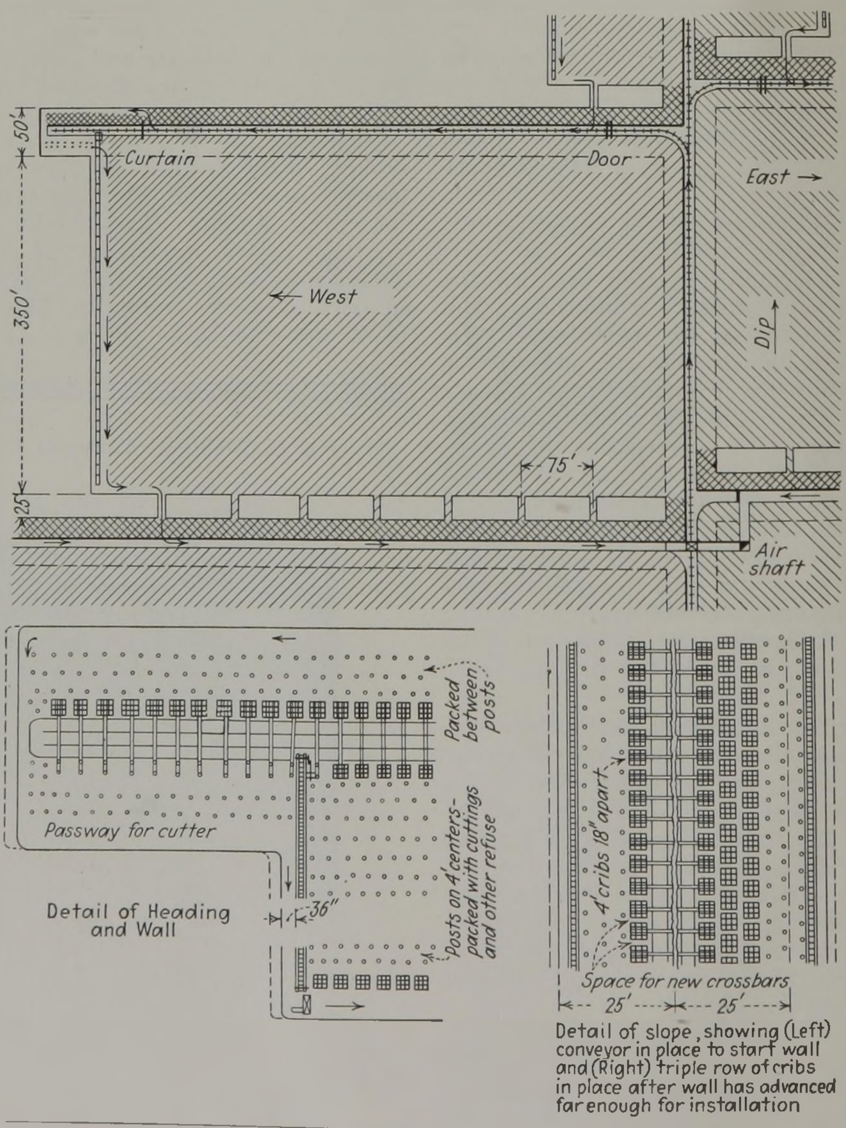
Major equipment on a wall includes a United Iron Works Co. longwall face conveyor with a 12-in. chain driven by a 15-hp. motor, a Sullivan longwall cutter and a Sullivan single-drum hoist for moving trips. Cutting is done on the second shift, a crew consisting of an operator, helper and mucker who throws the cuttings across the conveyor into the gob. Both the heading and the wall are cut at the same time, the starting point being in the heading one day and the top of the wall the next. If the start is made in the heading, the machine cuts across the full 50 ft., and then is skidded back on the bench to the wall, where cutting is resumed. When the wall is completed, the machine is pulled back past the end of the conveyor and left until the next shift. In starting at the top of the wall, the process is reversed and the cutter is parked on the right-hand bench in the heading.

Cutter-bar length is 4 ft. and the average depth of cut is approximately 3½ ft. The cut is made in the shale just beneath the seam, an 11-position chain with Stellited bits being employed for this purpose. The coal drops down behind the cutter and is broken up and loaded by the loaders on the day shift without the use of powder. Twelve loaders are now employed on a standard wall of 350 ft., and each man is assigned a definite length to clean up. Originally, only eleven loaders were employed on a wall, but with the decreasing demand for large lump and the advent of the seven-hour day an additional man has been put on to facilitate breaking up the large chunks. The immediate roof consists of approximately 27 ft. of laminated slate, the lower 18 to 24 in. of which, in places, resembles drawslate in its action, although the entire series is weak and requires support to keep it up along the headings and slope. Falls along the wall, together with other refuse material, are thrown over the conveyor and packed along among the timbers. Occasionally, when the fall is unusually heavy and available space is filled, the rock is loaded onto the conveyor and sent to the outside for disposal.

Safety posts are set between the conveyor and the face as the coal is removed. These are knocked out when the wall is cleaned up, and the conveyor is moved to within 3 ft. of the face, using sylvesters. The wall crew then timbers behind the conveyor, using split props set on approximately 4-ft. centers. Props in adjacent rows are staggered. Extension of the crib lines along the heading and on the upper end of the wall completes the timbering job, whereupon the place is ready to cut. To insure completion of the cutting in seven hours, however, two "sumpers" are employed on the day shift. These men oil and grease the cutting machines, turn them around and sump them in ready for operation. When heavy falls or other interruptions prevent cleaning up a wall in the allotted time, an extra crew of three men is sent in on the second shift to clean up the place, move the conveyor and extend the timbering, as necessary.

With the timbering and packing system employed, total subsidence varies from 6 to 12 in., the roof finally coming to rest on the supports about 12 in. off the floor as a general rule. Subsidence ordinarily is gradual, but occasionally

Fig. 2—Standard Plan of Mining at Eureka, With Details of Conveyor Wall, Heading and Slope.



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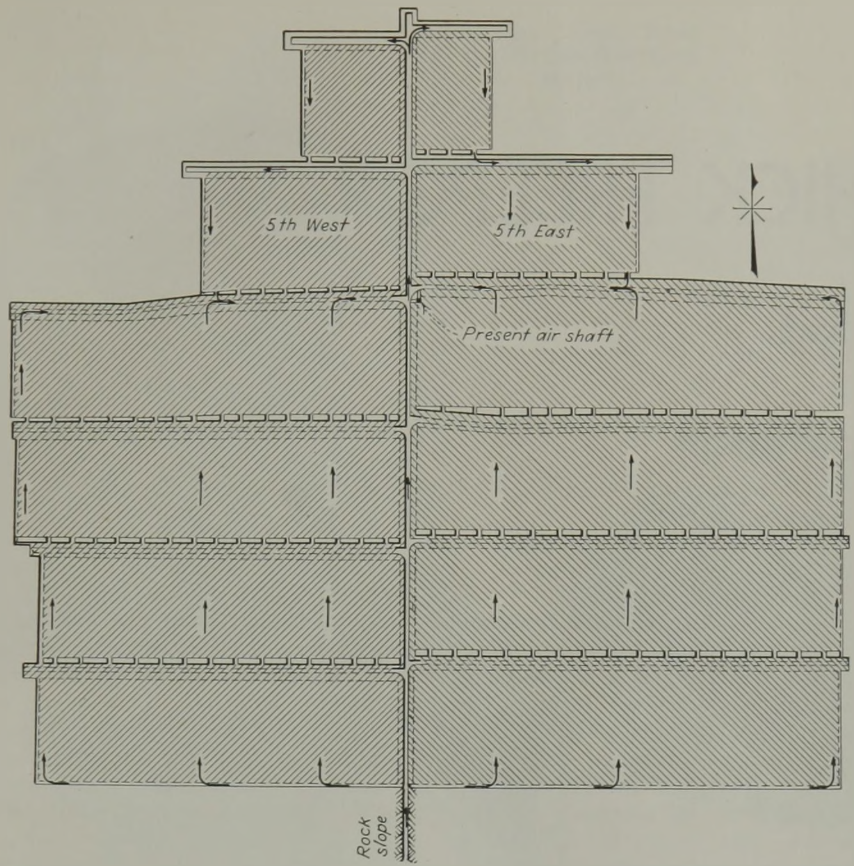


Fig. 3—Development at the Eureka Mine Since Operations Started in 1926.

the weight pitches onto the face, although no walls have ever been lost for this or other reasons. Action usually ceases and the roof becomes quiet about 30 to 60 days after the coal has been mined out. Maximum depth of cover at the No. 6 headings is 180 to 190 ft., against 75 ft. at the foot of the rock slope.

Heading crews consist of three men, who load both the coal from the 50-ft. face and the rock from the 8- to 9-ft. roadway, extend timber and crib lines and drill the bottom in the roadway at the end of the shift. Pneumatic drills are used in the rock and are supplied from compressed-air lines laid in each heading. Two drillers and shooters shoot the roadways with dynamite on second shift and in addition drill and shoot breakthroughs and tight corners on the upper ends of the walls. A portable electric drill is employed for such coal drilling as is necessary.

Cars are handled from the surface to the loading stations in trips of five, and electric hoists are employed exclusively. The main hoist on the surface handles loads and empties between the dump and the No. 3 entries. Below the No. 3 entries, trips are handled by a relay hoist, which was installed because the decrease in gradient made gravity lowering in one stage impossible, due to the fact that the empty cars could not pull the necessary length of rope.

Trips are dropped into the mouths of the working headings by the relay hoist, where they are taken in charge by the Sullivan single-drum heading hoists. Depending upon whether the gradient is in favor of or against trip movement, the heading hoist acts either as a puller or retarder, both in moving the trips to the loading station and in spotting indivdual cars under the conveyor discharge. Due to the fact that the heading is kept 50 to 60 ft. in advance of the wall, the entire trip can be spotted back of the loading station. Actual loading is placed in the hands of chunkers, who direct the lumps to the proper places in the car. Cars for the use of the heading crew are detached from the trip and pushed to the face for loading, after which they are again coupled to the trip before it is pulled. The slope is laid with 30-lb. and the headings with 20-lb. steel on wood ties. Track gage is 42 in. and 3-ton solid-end cars with a height of 36 in. over the rail are employed. An average of 128 cars of coal are dumped per day, in addition to 32 cars of rock—largely from headings.

The underground power supply is exclusively 220 volts, a.c. The main power circuit on the slope is a jute-wrapped armored cable suspended from the roof. Heading circuits and trailing cables for machines and drills are of the three-conductor rubber-covered type.

The Eureka operating organization is headed by George F. Campbell, Chicago, vice-president, Old Ben Coal Corporation. Operations at Paris are in charge of Fred K. Wood, general manager. A. J. Blanschett is foreman at the mine, and William James is chief electrician and machine boss.

Fig. 4—View of Roadway Ahead of Wall Showing Timbering and Hoist Tail Block.

PREPARING THICK FREEPORT

+ For Meticulous Market

At Union Collieries Operation

THE two liveliest problems of the coal industry are the cleaning of the mine product and the disposal of mine refuse. How the Union Collieries Co., of Pittsburgh, Pa., has solved these problems at its No. 3 colliery, Renton, Allegheny County, Pennsylvania, is indicative of the way in which they may be met with economy and satisfaction. The coal, though recognized as a difficult one to treat, is being enabled to enter successfully the most meticulous of all markets, and the unusual output of boney refuse is being transferred from bin to refuse bank by the labor of only one man standing at the levers of his machine.

A little over a year ago additions were made to the plant providing for the washing of all coal below 4-in. This coal, known locally as the thick Freeport, consists of two beds separated by 8 to 10 in. of boney coal. The coal lying immediately above and below that layer is extremely difficult to clean, much of it lying on the borderline between clean coal and reject, requiring an accurate gravimetric separation and a close control of the depth of the refuse bed in the jigs. These desiderata have been provided and a good and reliable product consequently obtained.

Coal from the mine and boney from the parting described (with any rock that may fall and have to be sent out) are hoisted in separate cars from the mine bottom to the landing, a distance of 550 ft. There they are dumped automatically. By flygates in the chute onto which the content of the cars is discharged the refuse and rock are diverted to the rock bin. The boney refuse mentioned runs about 33 per cent ash and has no commercial value.

With the flygates closed, the coal flows down the chute to a 20-ton bin where it is sprayed to eliminate dust and whence it is removed by two feeders to the raw run-of-mine flight conveyor which elevates it to the primary screen. Here the minus 2-in. coal is removed at the top end of the screening table, caught by a shake-back chute and delivered to vibratory screens which pass all coal over $\frac{5}{16}$ in. to the raw-coal conveyor. What passes through the vibratory screens mixes with the other coal on the slack conveyor.

At the lower end of the primary screen is a 4-in. lip section. All that passes over this screen is delivered to the lump-coal picking table, 5 ft. wide, where pickers remove all coal having visible impurities. All the minus 4-in. coal passes by a shake-back chute to the raw-coal conveyor, already described. This conveyor handles 4x$\frac{5}{16}$-in. raw coal, but if the vibrating screens are bypassed, the coal is 4x0 in.

If desired, the primary screen can be entirely blanked off at its lower end or a 6-in. section can be opened, admitting 6x4-in. coal to the egg-coal picking table. A patented rescreening loading boom delivers the coal from the lump-coal picking table to the lump track. As has been noted, this coal may be plus 4-in. or plus 6-in. coal.

The 4x0-in. or 4x$\frac{5}{16}$-in. coal screened out on the primary screen and delivered to the raw-coal conveyor passes to a 50-ton two-compartment surge bin, into which, to prevent degradation, it is delivered by two spirals, one to each compartment, whence it is removed severally by means of variable-speed reciprocating feeders to the wash boxes of two Link-Belt Simon-Carves washers, each of which is now handling 130 tons per hour. The method of operation of these units has been fully described in *Coal Age*, Vol. 26, pp. 177-181. However, this particular installation has been furnished with floats with electric-eye control. The stem of each float runs on two roller bearings and on these stems are flags which interpose barriers to the passage of light and thus regulate the speed at which the refuse is ejected from the jig. This delicate adjustment and the variable speed at which the reciprocating feeders can be made to operate have done much to give this equipment its certainty in operation at any desired gravity of separation.

After cleaning, coal passes from each washer by a separate flume to the head of a classifying screen, which is hung on flexible hangers. This screen separates the product into 4x2-, 2x1$\frac{1}{8}$- and 1$\frac{1}{8}$x0-in. sizes which are delivered to the cars on the several tracks under the tipple, also $\frac{1}{2}$x0-in. or $\frac{1}{4}$x0-in., which goes to dewatering screens. An apron conveyor is used for the loading boom by which the 4x2-in. egg is delivered. The other two sizes are delivered by chutes.

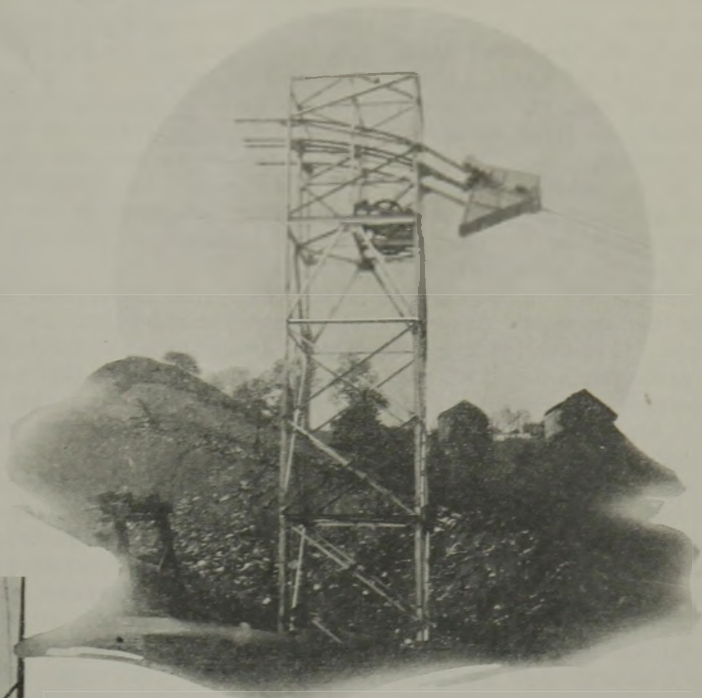
The size of the coal removed by the vibratory screens designated in the earlier part of the article as $\frac{5}{16}$-in. varies in practice from $\frac{1}{4}$ to $\frac{5}{8}$ in. As, after washing, the finer sizes retain much water which in winter would freeze and make much trouble, it is thought best to remove the extremely fine coal before washing. As has been seen, this fine coal is loaded into the slack conveyor.

When large coal is not in demand, all the plus 4-in. coal is trapped after hand-cleaning by a gate at the lower end of the lump picking table and is carried by a scraper conveyor to a double-toothed Link-Belt roll crusher which can be arranged to break the coal to any desired size, delivering it to the head of the secondary screens for resizing. In this secondary screen, arrangements are provided so that combinations can be made of the various sizes, and dividers are introduced so that percentages of any of these sizes can be mixed with appropriate percentages of other sizes and any size or combination of sizes can be delivered to any track for loading.

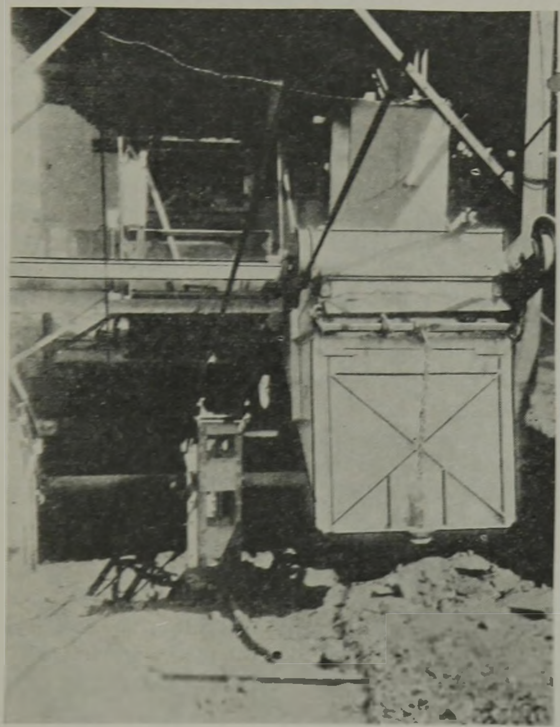
All eccentrics are lubricated with pressure grease cups. Most of the equipment is driven through Link-Belt speed reducers. A small Sturtevant automatic sampler and crusher, an Iler pulverizer and a dryer constructed at the plant enable samples to be taken and checked without delay in the preparation plant.

Water from the tank below the

Settling Tank From Which Overflow Goes to Jigs.

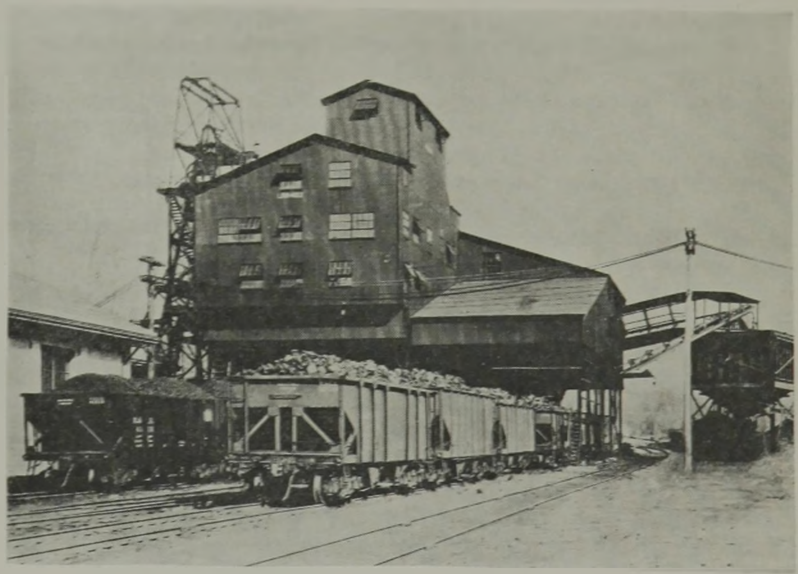


Break-Over Trestle With Car From Loading Terminal.

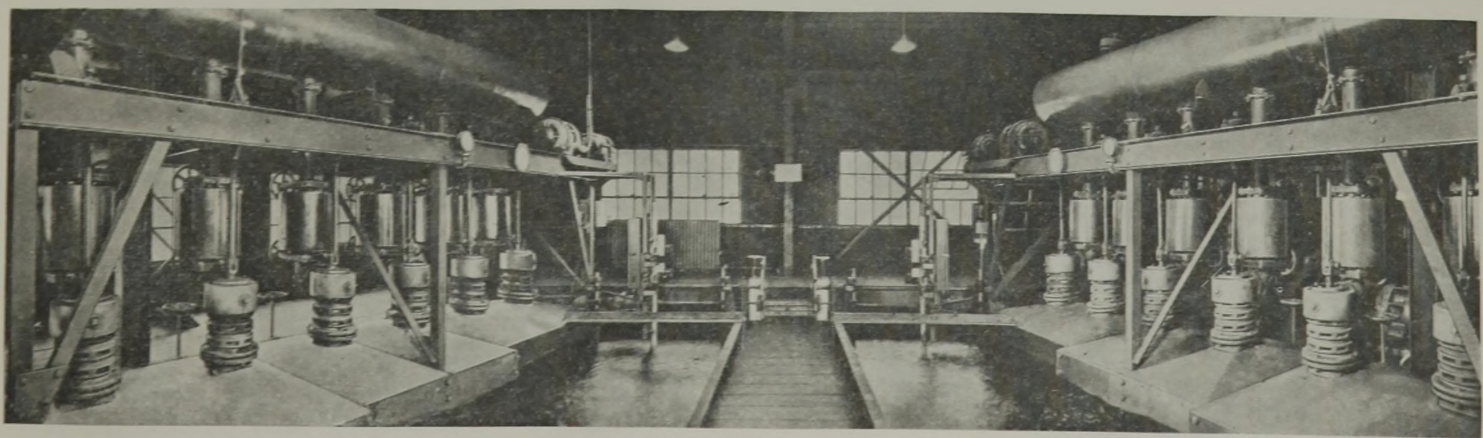


Aluminum Car Leaving Loading Terminal.

Washing and Sizing Plant.



Boxes in Which Coal Is Washed.



screens and from the dewatering wedge-wire screens is lifted by an 8-in. Gould pump of 3,600-gal.-per-minute capacity to a settling tank just outside the building. Overflow from this tank supplies the jigs. The water supply is from a branch of Plum Creek, the water being brought in by a 2-in. pipe line. Some mine water is used, and, as this is not acid and is mixed with fresh water, no corrosion has resulted.

The tipple is an all-steel structure with four loading tracks and one track used as a run-around by the engines of the Unity Railways, on which line the mine is located. All windows have steel sash, and the generous skylights are of wire glass. Roofs and siding are of Robertson protected metal. All the equipment, except as otherwise stated, below the 20-ft. bin into which run-of-mine coal is delivered was constructed and designed by the Link-Belt Co.

Disposal of the parting boney has always given much trouble at this operation. Wherever possible, this waste is left in the mine, but about 300 tons, or a twelfth of the entire tonnage hoisted, is waste material which must be dumped somewhere in a valley, none too wide for operation and for its reception. The top of the hill is preempted by the trim little town, and the company is naturally anxious not to destroy this favorable town site. Consequently, above the tipple and beyond most of the houses, dumps were run up the hillside.

Dumping uphill requires much power and with hand-dumping much labor. Two men always were employed and, for about a third of the time, three, for the dumps, though long and steep, were necessarily shallow. In addition, several men had frequently to be employed to grade the roads on the dump when they had slidden sidewise or slumped down the hill. As the dumps grew longer and also shallower by reason of the steepening of the slopes near the crest of the hill and facilities for further waste disposal promised soon to be exhausted entirely, something evidently had to be done.

Moreover, the boney was subject to spontaneous combustion, and when it caught fire it burned so freely that there was not that assurance that usually can be felt with a rock dump that no great amount of interference with operations probably will result. A dump available one month might not be operable the next, and even other dumps, if not actually on fire, might be rendered inoperable by reason of smoke. At No. 6 mine of the same company, mining the same seam and parting, all the dumps have been reduced to ashes.

Consequently, it was decided to erect an aerial tramway on a 45-deg. slant to the hill in a place that was still vacant and available, passing over a section of the old but still burning dump, and now one man can take care of the entire operation. It has been calculated that enough space is provided between the two towers of this aerial to hold the waste of all kinds which will come out of the mine within about eight years. Burning of this material will lessen its bulk materially and consolidate it, and this burning is quite prompt because the boney is exposed in small piles to which the air has always abundant access. When a load from the bucket drops on the fiery mass below, it does not distill gases and fumes but promptly burns with a minimum of smoke, whereas if the boney were in a well-formed, well-consolidated bank and were after some years to catch fire, it would smolder and fume with unfavorable effect. Moreover, the combustion being rapid, the heated air carries the gases upward, so that they rarely hang over the valley.

The near-by tower is 140 ft. from the loading point and is 60 ft. high; the other 235-ft. tower is on the top of the hill. Loading point and towers are all three in line, so the only angle is at the lower, or "break-over," tower, and that is a vertical angle. Here the buckets pass over curved rails below which the ropes are supported by a series of short saddles (see p. 11). Distance between towers is approximately 1,600 ft., and the length from loading point to tail tower 1,740 ft. The foundation of the tail tower at the top of the hill is approximately 100 ft. above the loading point, which makes the total climb for the cars about 335 ft. As the greatest heights are at the far end, most of the dumping is being done near the far tower.

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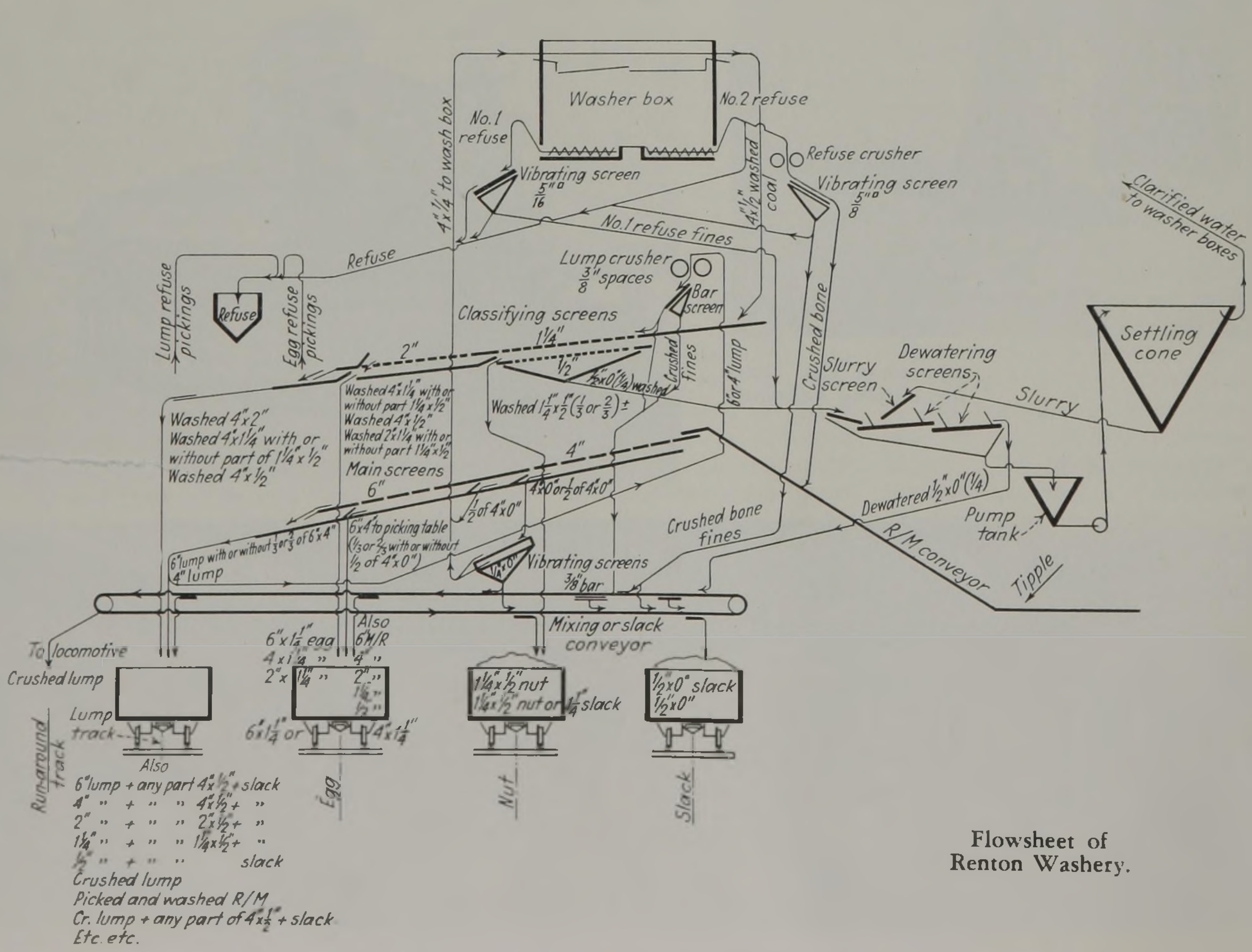


Flowsheet of
Renton Washery.

ANTHRACITE MINE

+ Finds That Safety Lies

In Safety-Minded Men

SAFETY continues to be a major concern of the anthracite companies. With increasing depth, the aging of long-standing pillars and their extraction come dangers that make mining more hazardous year by year, but anthracite operators are meeting these hazards by greater caution and more careful planning. In particular, the St. Clair Coal Co., St. Clair, Schuylkill County, Pennsylvania, has managed to establish a good record in a mine wholly devoted today to the second mining of coal, some of which was first-mined in a period beginning with the year 1827, 108 years ago, since which time the mine has been working and shipping continuously, except in the three years 1835-37 inclusive.

The management of this mine gives most of the credit to the first line of defense, the mine foremen and the firebosses, who act as section foremen, and to the loyalty and safety sense of the men, who mostly are old employees who have learned for years that nothing in life concerns a man more than safety. Operated, as the mine has been, by the deceased William H. Taylor, his wife, Mrs. Nellie G. Taylor, who succeeded him as president, and two generations of the Smyth family; the younger son of the former general manager, H. M. Smyth, now controlling the company—all of them always firm believers in safe and sane practice—safety has been elevated into a standing tradition to be practiced by everyone and to be demanded by the older men of all newcomers. The reckless are promptly indoctrinated with the idea that under no condition should chances be taken. Slackness is recognized as folly rather than as an evidence of bravery, smartness or agility.

Thus it is that the St. Clair Coal Co. stands second in a list prepared by the Pennsylvania Department of Mines, which arranges the several coal companies of the anthracite region according to the number of non-fatal lost-time accidents resulting from direct falls of roof, coal and slate. This list covers casualties occurring from January to July inclusive, 1934.

A "direct fall" includes all accidents resulting from falls of roof, coal or slate occurring while the person injured is engaged in shoveling coal, drilling a hole, walking along a road or doing any kind of work not having for its purpose removal of an existing hazard arising from insecure top, rib or face. These accidents are held by the department to indicate lack of supervision.

"Indirect falls" include all injuries resulting from falls of roof, slate or coal where the persons injured are trimming the face, roof or rib, setting timber or doing any other work for the direct purpose of removing danger from a fall, after its detection by proper supervision. "Falling material" includes all injuries resulting from falls of coal, rock or other material in shafts, slopes, chambers or manways or from mine cars, batteries and so forth.

The production record without an accident from a direct fall at the mine of the St. Clair Coal Co. during the first half of 1934 was 387,400 tons. For this record the Pennsylvania Department of Mines gives a rating AAA. A certificate of honor also was given this company by the Joseph A. Holmes Safety Association, March 6, 1933, for the production of 632,553 tons per non-fatal roof-fall casualty, the exposure to accident comprising 1,286,806 man-hours. On March 5, 1934, the same association awarded a further certificate of honor to this company, citing it as having the highest rating in the anthracite region per non-fatal roof-fall accident, the record showing a production of 909,705 tons with 1,804,383 man-hours of exposure without a single lost-time roof-fall accident. Yet, as the record states, approximately 410,000 tons was produced by underground mining, about 96 per cent of it pillar work and coming from five separate beds varying in thickness from 4 to 20 ft. and in pitch from 5 to 90 deg.

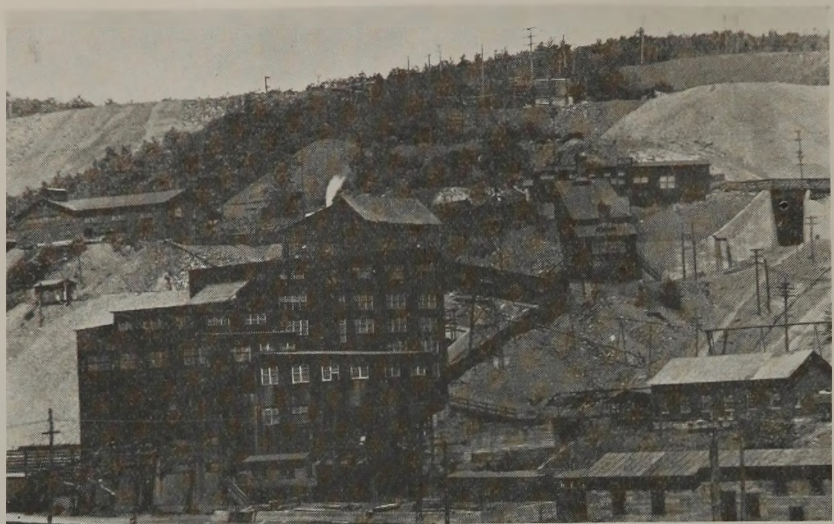
But, to show that roof-fall safety is not the only title of the St. Clair Coal Co. to distinction, the honorable mention given June 2, 1933, by the Committee of Award of the National Safety Competition conducted by the U. S. Bureau of Mines may be cited. This mention was granted because the mine was fifth in rank among anthracite companies during 1932 in the record for safety. During that year, St. Clair men worked 1,103,045 man-hours and their accident severity rating was 1.067.

For this reason, it would seem that the safety record and practices of this company are entitled to examination, but the company declares that its main safety resource lies in men with a background of safe operation, or habit of safety, fostered by the former president, W. H. Taylor, and W. T. Smyth, his general manager, and maintained since by the management, outside bosses, and firebosses—mostly the latter—who all have had the tradition passed on to them by a previous generation and are susceptible to advice and leadership from the management by reason of a long-continued friendly relationship.

No safety committee, no monthly meetings, no general rules, just a common purpose and mutual understanding exist at this mine. Without a body of older men to carry on the old practices and without a code of safety, unwritten but carried forward from year to year by repeated counsel and exemplification, meetings and stirring addresses may be indispensable to overcome the desire for excitement that accompanies breathtaking escapades or work done in the face of danger, but the spirit that would live safely is better if already present. New men are rarely hired, but, when they are, they are given intense observation and the requisite good counsel till they learn the satisfaction of good workmanship that spells safety.

Firebosses have authority, even exercise discipline, but no records are kept of their disciplinary measures. Even the accidents of the men they supervise are not kept in such form as to call attention to lapses in their management. And yet safety is attained, for the men have a professional pride in the art of safe mining, and it is an art just as surely as that which a jeweler puts into the regulation of a fine watch.

Sometimes—once or twice a year—there is a banquet, and safety is stressed. Bulletins are posted here and there about the mine. But the interest is not so much in managerial thinking and regulation as in what the fireboss and the miner are thinking about the practices their work involves. Some time back, the U. S. Bureau of Mines was invited to train the men in first aid. Being busy elsewhere, these officials delayed their visit until a day in July, when days and nights were hot and sultry, but the men attended the meetings regularly, and one and all took the instruction. Some had to be fetched in automobiles to the early session, but come they did and took most kindly to the classes.


St. Clair Breaker, St. Clair, Schuylkill County, Pennsylvania.

St. Clair operations employ 350 men inside, 200 men on the surface around the breaker and 165 men in the strippings, or 715 in all. Some may say that stripping labor being included in the record detracts from its outstanding character, and indeed stripping when it was conducted by the company was quite safe, the severity rate being 0.273 in 1929. Since then the stripping has been done by Fred A. Sterner and J. Robert Bazley, Inc., and the care that Messrs. Sterner and Bazley and their men exercise still causes the record of the company to be good, but experience in the region usually is not so favorable, stripping claiming almost as many lives and limbs per man-hours of exposure as underground mining, possibly due to the newness of the methods employed and the inexperience of some of the men. The hazards need not be detailed, but they are many. Most of the men at the mine are of Slavish origin, though many are American-born.

At the St. Clair mine, the measures fail to form a complete basin because one side of the syncline is cut off by a fault. On the unfaulted side, the measures dip at an angle averaging 90 deg., then they fold sharply upward and rise at about 20 deg. to the horizontal and then decrease that rise to 15 deg. upward and are cut off, the lower measures persisting a little longer than the others. The beds are the Top Split (4 ft. thick), the Middle Split (6 ft.) and the Lower Split (20 ft.) of the Mammoth Bed with the Skidmore (4 ft. thick and somewhat spotty) and the Buck Mountain (5 to 14 ft.). All seams but the Skidmore have good roofs and that of the Buck Mountain is exceptional. The Skidmore has a distinctly bad roof, and, because of its lenses of impurity and its partings, is not mined over a large area. Nor is it used, as at many mines in the Southern region, as a means of reaching and remining the thick Lower Split of the Mammoth. Instead, approach to that partially mined split is through the split itself or by way of tunnels and rockholes from the Middle Split. First mining in the Lower Split was by chambers 10 ft. high on the floor of the seam, and the second mining involved driving rooms in the upper half of that bed and removing the pillars from both halves.

Heavy timber work has to be provided in the Lower Split, because of its great thickness. In some of the roads in the St. Clair mine, full sets of timber with legs and collars have to be provided. Where the chambers pitch heavily, they usually are no more than 200 ft. long, and jugglers are used for the manways, coal being thrown down these as mining advances, in order to provide for the excess material in the chamber. Firebosses, of course, travel the innermost crosscuts or "headings" and travel from these to the faces, taking care to warn the miners of their approach so that they will not drop coal down the manways when the firebosses are ascending them. Coal behind the batteries is not removed till the room is finished, and then the batteries are shot, and the coal is discharged by gravity into the chutes. However, as stated, almost all of the coal is now from pillar work. The cover reaches a thickness of 800 ft. and sometimes over but usually the coal does not leave the place in the bed without shooting.

Not much gas is generated by any of the beds, and what gas is formed is readily swept from the workings by ascensional currents of air provided by two fans, one a 16-ft. Guibal and the other a 12-ft. Vulcan. One hundred M.S.A. electric cap lamps are used in the gassy portion of the mine.

Coal is shot by Trojan ammonia cartridges with Crescent fuse and No. 8 exploders, that strength of exploder being needed because of the insensitive character of the explosive chosen. The management prefers an insensitive explosive because it is safer to handle than one which is readily detonated. It is of the opinion that fuse shooting is safer than electric shooting, arguing that if the men use caution in providing sufficient fuse, fuse shooting is less risky than electric. If St. Clair employees were disposed to use short or "skin-'em-quick" fuses the situation would be different, but with care to use long fuse and to charge the holes properly, the risk with such fuse is believed to be less than with electric blasting.

Only boxes containing no more than ten detonators are permitted to be carried into the mine and but one box at a time, unless there is ample reason for providing a larger quantity, in which case permission has to be obtained. No one is allowed to fire more than one shot at a time, for with volley firing no miner

Underground and Aboveground Accidents Combined

(National Safety Competition)

	1933	1932	1931	1930
Hours worked	1,054,795	1,103,045	1,063,006	1,142,166
Fatal accidents	0	0	2	0
Permanent total disabilities	1	0	0	0
Permanent partial disabilities	1	0	1	2
Temporary disabilities (2 days)	55	72	66	87
Total accidents	57	72	69	89
Days Lost				
Fatalities*	0	0	12,000	0
Permanent total disabilities†	6,000	0	0	0
Permanent partial disabilities‡	1,200	0	300	2,400
Temporary disabilities	924	1,177	1,074	1,593
Total accidents	8,124	1,177	13,374	3,993
Frequency	54.039	65.274	64.910	77.922
Severity	7.702	1.607	12.581	3.496

*Standard equivalent for estimation of fatality 6,000 days.
†Standard equivalent for estimation of permanent total disability 6,000 days.
‡Standard equivalent for estimation of permanent partial disability dependent on nature of disability.

can be certain that all his shots have exploded. He may think that two or more of the shots detonated at the same instant and made a single combined report and return to his face to find later that one has failed. If a shot fails, he is not allowed to return for the rest of the shift. In this way, shotfiring accidents have been eliminated.

Safety hats are used everywhere underground. Goggles are used at the face; the company does not insist on their use elsewhere, because they become covered with moisture when the miner first enters the mine in cold weather. Hard-toe shoes are not obligatory and few are worn. The use of gloves also is at the employee's option. Shinguards or creepers are not worn even on the easier pitches.

Haulage is responsible for few accidents. Scotches are used instead of sprags for holding cars. Importance of drags on ascending gradients is emphasized both below ground and on the 5-mile road to the strippings, which in places has 4-per-cent gradients, and safety chains are used on all man trips.

Accident Rate, St. Clair Colliery, 1929-1933 Inclusive

(Underground and Aboveground Accidents Combined—State Schedule)

	1933	1932	1931	1930	1929
Accidents causing seven days of disability	21	42	32	41	41
Accidents causing less than seven days' disability	140	142	127	167	136
Fatal accidents	0	1	2	0	3
Dismemberment accidents	3	0	0	1	0
Total accidents	164	185	161	209	180

No fatal accident has occurred since June 17, 1932, since which time 1,450,000 tons has been produced. A table gives the accident record as compiled for the State and for the National Safety Competition. The two vary, of course, the first being based on the period of seven days, after which compensation commences, and the second on two-day disabilities.

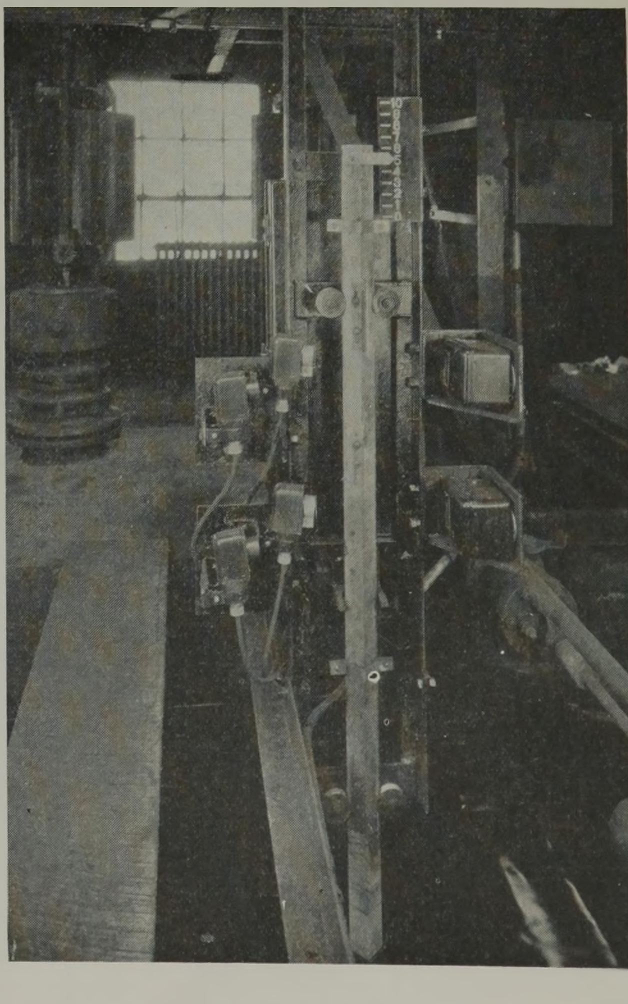
No physical examinations are made in hiring men, though some few anthracite companies have adopted that practice. A long-established company like the St. Clair Coal Co. inevitably has some problems of senescence. Where men are getting too old for safety at work, the company endeavors to have them quit before they get hurt or gives them some easier job, if such is available. Necessarily, such jobs are limited. So long as a man does not become enfeebled or rendered slower to react to danger, it is believed years of experience should breed caution and furnish a knowledge of inherent risk. It has been fairly well established that in older communities chance-takers are frowned on and are less numerous than in more mobile communities, and the St. Clair Coal Co. gives much of the credit for its record to this condition.

Naturally, its record is not entirely consistent. When accidents are few, a single bad accident spoils the record of a whole year. Thus the record of 1933 was not nearly as good as that of 1932, for a single permanent total disability and a single permanent partial disability, both incurred at the same time, marred the record of the former years. One of the two men thus injured has since died, but it is not so recorded, as he died too long after the accident and possibly from other causes. Temporary two-day disabilities declined noticeably in 1933 and have been declining, at least as compared with the record of 1930, but they could not overcome the evil effect of these two more serious accidents, one of which is equated to as many days as a fatality. The moral of the St. Clair colliery record may be briefly summed up in the words, "Given good management, safe men will tend to make a safe mine."

Preparing Thick Freeport For Meticulous Market

(Concluded from page 12)

Two 93-cu.ft. buckets reciprocate between loading point and dump and run each on two $1\frac{3}{8}$-in. diameter special tramway-strand telpher ropes and are driven by an endless plow-steel $\frac{5}{8}$-in. haulage rope. Weight carried by each bucket is about 3 tons. The drive drum around which the $\frac{5}{8}$-in. haulage rope is carried—so as to maintain the necessary tension and provide the required power for moving the buckets—is operated by a motor with a V-belt drive. An automatic tripper is built into each bucket, which can be changed at pleasure, and when the bucket reaches the desired dumping point, the bucket latch is tripped and the waste is dumped automatically. The equipment was furnished by the Interstate Equipment Corporation. When the present location has exhausted its possibilities, the towers can be removed and the installation so aligned that a new location will be available for dumping of refuse. Combustion has ceased to be a bugbear and now does not interfere with dumping or constitute a nuisance to the neighborhood. The system is held well suited to highly combustible refuse and restricted dumping space.



Automatic Refuse Discharge Device With Electric Eye Operation.

PURITAN TIPPLE

✦ Designed and Constructed

For Later Removal to New Mine

By SAMUEL TESCHER
Chief Engineer, National Fuel Co., Denver, Colo.

WHAT shall be done when a new preparation plant must be provided for a mine nearing the end of its productive life? This was the problem which confronted the National Fuel Co. when fire destroyed the tipple of its Puritan mine, 26 miles north of Denver, on Jan. 9, 1934. The mine, which is in the northern Colorado field, had been opened in 1908 and the acreage remaining was only sufficient to insure about four years more of operation at the current annual rate of production. Under these circumstances, new preparation facilities adequate to exacting market demands meant an investment which well might cause any prudent management to hesitate.

Fortunately, however, the company controls extensive acreage to the south of the Puritan operation which it had planned to develop when Puritan was worked out. Study of the problem—including alternative plans and cost estimates—made by the author and Allen & Garcia Co., consulting engineers, revealed that the best and cheapest solution was to design a preparation plant for the proposed new development and adapt this plant for present erection at the Puritan mine. Adopting this solution made it possible to give Puritan a new plant of modern design and facilities at a cost approximately one-half that which would have been necessary for a tipple designed solely for Puritan and which would have been junked at the end of four years. The portion of the cost of the tipple charged to the Puritan mine covers shaft guides, cages, sheaves, hoist rope, foundations, scale pits and corrugated covering plus the cost of dismantling and reerecting.

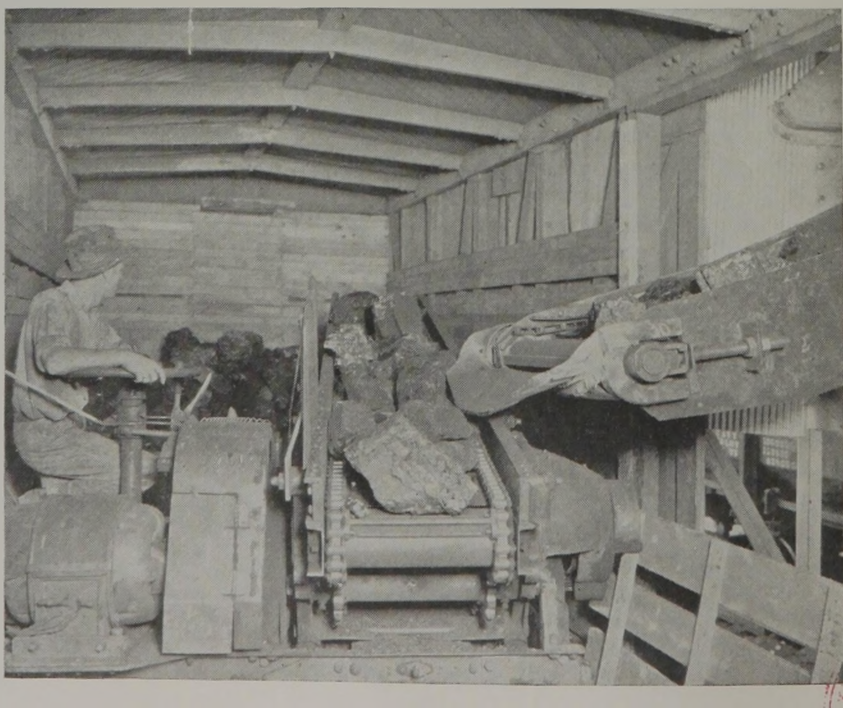
Because the fire had caused the shaft to cave in for a depth of 22 ft., it was inadvisable to carry any weight from the new headframe on the shaft collar. So the headframe was designed in the shape of an A-frame and the members to support the guides were hung from the dump plates. This has the added advantage that the headframe can be adapted easily to the larger shaft at the new location by widening out the dump plates for which provision was incorporated in the design. There are four loading tracks at Puritan, but provision has been made for a fifth track at the new mine.

The long way of the shaft is at right angles to the railroad tracks, so the screening structure was set parallel to the tracks and the loading shed was built over them. Coal is dumped by a pair of Card Iron Works cages into a weighpan large enough to take two dumps. Scales are equipped with a quick reading dial and, after the first dump, the weight is run out onto the beam until the dial returns to zero. The second car is then weighed and the two cars dumped together into a feeder hopper directly below. From there it is fed out by a reciprocating plate feeder to an 8-ft. A. & G. pendulum-hung, center-crank driven double-leaf shaker screen. The upper leaf has 20 ft. of 2½-in. diameter perforations; the lower leaf has 8 ft. of 4-in. and 6 ft. of 6-in. diameter perforations. Veil plates are provided for both the 4- and 6-in. perforations for making either 2½- or 4-in. lump.

By means of a series of vanes in the lower screen, both the lump and the egg coal can be diverted to either the picking tables, the retail coal chutes or a crusher at the end of the screen. These vanes are controlled by hand winches mounted on columns adjacent to the retail coal chutes and can be operated while the screens are running.

Lump and egg coal are hand-picked

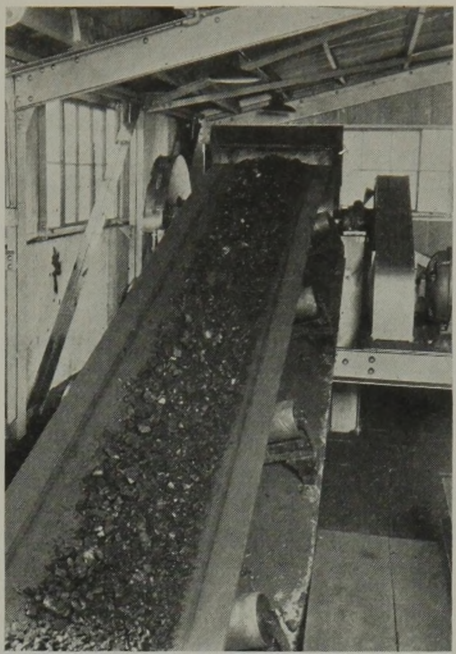
Lump Box-Car Loader in Action.



on two 5-ft. wide shaking picking tables. Each table has a ridge in the center which divides the coal into two distinct streams. The pickings are thrown into chutes and fall into a large bin under the picking floor; they are taken from this bin to the boiler room in a special larry car. After passing the pickers, the coal goes over a section of degradation screen before loading onto the conveyors to the box-car loaders. Lump is loaded with a standard-model Ottumwa loader and egg coal with a 16-in. Type C Manierre loader.

Particular care has been taken to handle the lump and egg with the minimum of breakage. The lump coal discharges from the picking table onto a special 36-in. wide flight conveyor with 1x1½-in. flights mounted on a double strand of 4-in. pitch rivetless chain. This allows the use of very small sprockets at the discharge end, which, together with the use of a short section of curved discharge chute and the elimination of the usual plate attached to the loader, permits the lumps to be placed on the loader with practically no drop. This has resulted in a very decided decrease in the amount of fines per car. As a further precaution, the lumps pass over a 3-ft. section of bar screen before discharging onto the loader and the resultant degradation taken out returns on the bottom run of the conveyor to the slack track.

The entire conveyor moves in and out of the box car, telescoping in under the picking table. It is operated by a rack and pinion, motor-driven, and is controlled by a limit switch and a solenoid brake. If it is desired to load open-top cars, a switch has been provided in the track layout which allows the conveyor to be projected over the side of an open-top car instead of through the door of a box car. The egg coal being loaded on the outside track is carried over the picking table on a 36-in. wide rubber belt conveyor over the lump track and lowered into the box car onto a Manierre loader in much the same way as lump is handled. In this case, however, only the end of the belt conveyor telescopes, the travel being taken up in the vertical take-up. The telescoping member is operated by a drive similar to that for the lump-coal boom and the conveyor also can be elevated over the side of an open-top car if necessary.

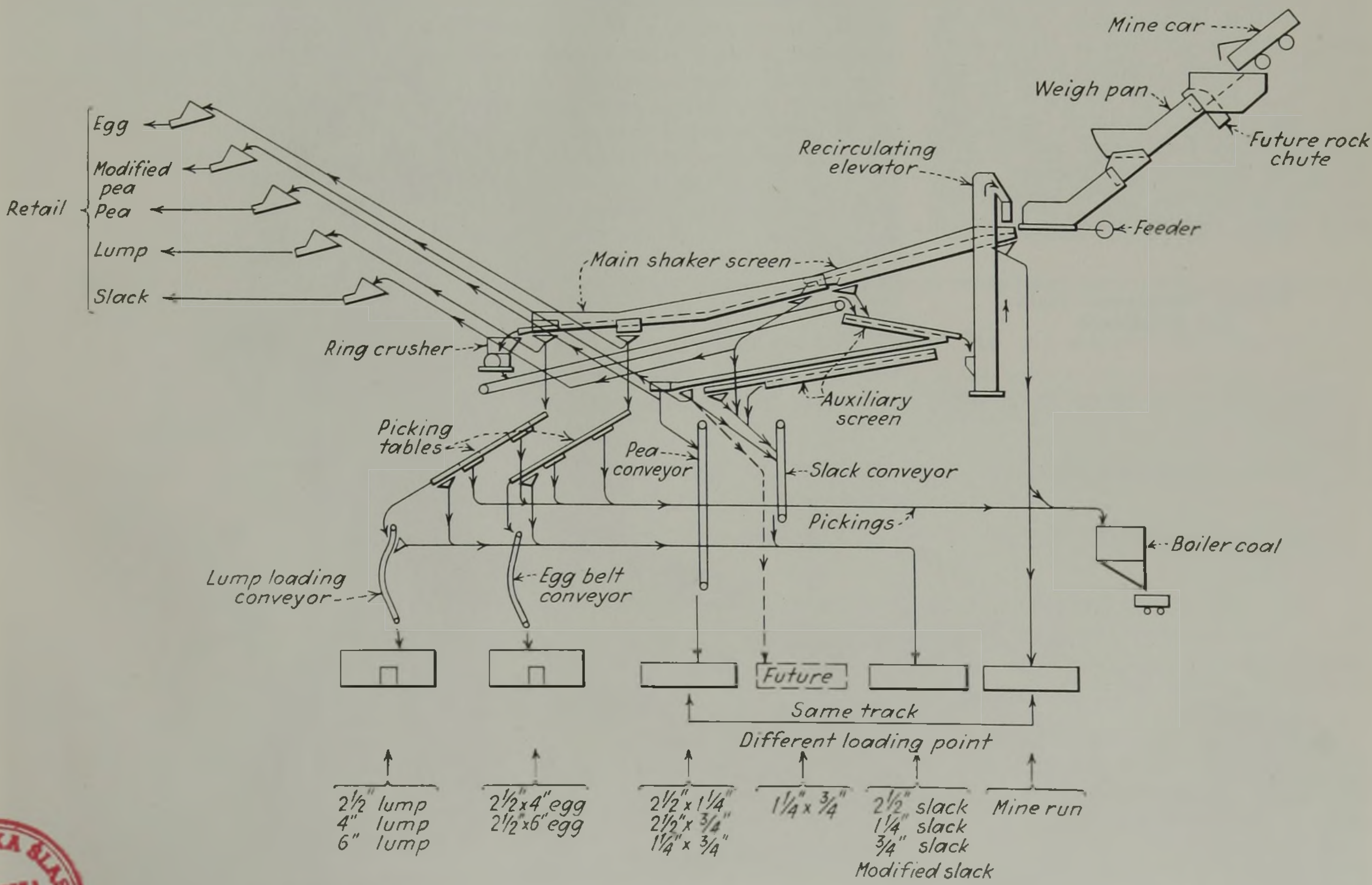


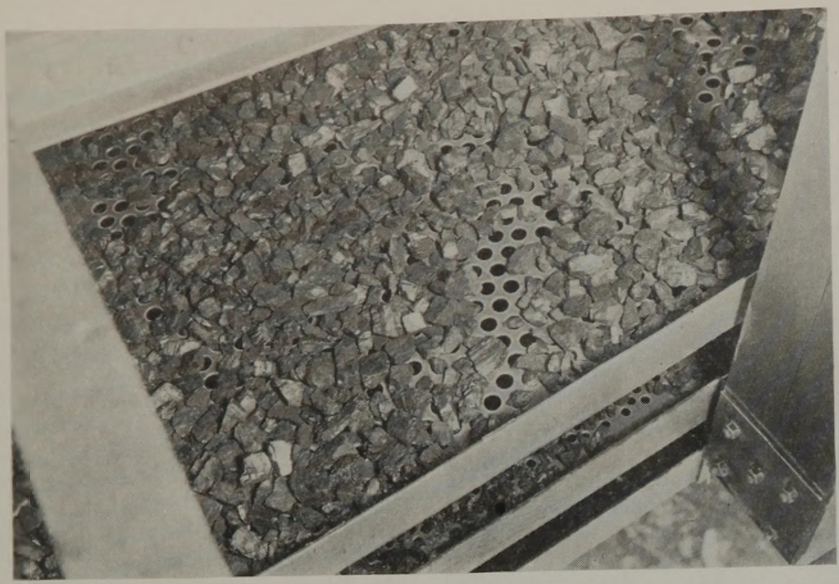
Slack Belt Conveyor.

Slack (2½-in.) from the main shaker screen can be loaded either to a 36-in. belt conveyor and thence through a loading chute into cars or onto the upper deck of an auxiliary screen directly below the main shaker. This auxiliary screen is a double-leaf, triple-deck screen 7 ft. wide, hung on ashboard hangers and driven with a center crank through flexible wood connecting rods. The upper leaf consists of a single deck of 20 ft. with 1¼- or 1½-in. diameter perforations and a short double-deck section superimposed above the upper end with 8 ft. of 2½-in. perforations in its upper deck for rescreening crushed coal. The lower leaf is a double deck with 20 ft. of ¾-in. diameter perforations in its upper deck.

A system of gates in the lower end of the screen allows either the 2½x1¼-in., the 2½x1½-in. or the 1¼x¾-in. coal, or a mixture of two, to be loaded onto a 24-in. belt conveyor and thence into cars through a telescoping loading chute. The remaining product is

Flowsheet, Puritan Tipple.





Double-Leaf, Triple-Deck Slack Screen.

loaded onto the 36-in. slack conveyor either in the form of $1\frac{1}{4}$-in. slack, $\frac{3}{4}$-in. slack or modified slack ($2\frac{1}{2}$-in. slack with the $1\frac{1}{4}$x$\frac{3}{4}$-in. product removed). In the new location with a fifth track added, all three sizes made on the auxiliary screen can be loaded out separately and simultaneously.

As northern Colorado lignite slacks badly in the larger sizes, it is rarely stored and, as a result, there is little or no demand during the summer for anything larger than $2\frac{1}{2}$-in. screenings. To meet this condition, the new tipple has a No. 42 American ring crusher at the lower end of the main shaker screen. By means of the vanes in the shaker, either lump or egg, or both together, can be diverted to the crusher and the resultant crushed product carried on a 36-in. belt conveyor to the upper end of the auxiliary screen and passed over the 8-ft. screen surface with the $2\frac{1}{2}$-in. diameter perforations. The oversize is elevated to the head of the main shaker and recrushed in a closed circuit. The undersize joins the $2\frac{1}{2}$-in. slack from the main shaker and is either sized or loaded out as $2\frac{1}{2}$-in. slack.

The proximity of the mine to Denver and other communities near by creates a large truck demand. The new tipple is equipped to load all sizes in trucks that can be loaded in cars. Lump and egg for the retail trade passes over 4-ft. sections of bar screen to remove degradation.

The tipple is an all-steel structure with wood floors, galvanized steel corrugating and steel window sash. A large skylight is provided over each picking table. In addition, each table is illuminated with five 200-watt lamps in large reflectors equipped with daylight-blue shades to insure perfect picking under all lighting conditions. The inside of the tipple and all outside stairways and landings have ample lighting facilities for night operation. Floodlights illuminate the ground landing of the shaft and the empty and loaded-track yards.

All electrical work, both lighting and power wiring, is in conduit. The incoming power line is divided into three separate circuits on a Westinghouse De-ion no-fuse panel board equipped with De-ion circuit breakers for each circuit. Each motor is controlled by a magnetic-type linestarter and the entire plant is operated by pushbuttons from one central control station located midway between the two box-car loaders. The structure and all equipment are covered with aluminum paint.

Allen & Garcia Co. designed the plant and superintended its erection. Erection of the steel structure was by contract; all other installation work was done by the coal company's own men under the direction of Roy Williams, general superintendent.

Puritan Preparation Plant and Headframe.

CONVEYOR SYSTEM

+ At Barnesboro Mines

Lowers Loading and Other Costs*

By RICHARD T. TODHUNTER

General Manager, Barnes & Tucker Co. Barnesboro, Pa.

A SYSTEM of belt conveying that replaces gathering units and assembles the coal from 22½ acres at one loading point was installed in September, 1931, by the Barnes Coal Co. at its No. 15 mine, Barr Township, Cambria County, Pennsylvania. A 1,400-ft. main gathering belt conveyor of the trough type, 26 in. wide, running at a speed of 100 ft. per minute and having a capacity of about 90 net tons per hour, has been installed in the main *C* section. This 52-B belt, which is of Jeffrey construction, as also is the entire conveyor and cutting equipment, including the controller, is in sections 90 ft. long. These sections can be added readily when headings are being advanced or can be taken out when headings are on retreat; the belt is driven by a 20-hp. open-type motor, the entire belt system being kept in careful alignment at all times. At present, it operates on an adverse gradient averaging 1.69 per cent, with 75 ft. of it on a maximum adverse gradient of 5 per cent. To minimize the severity of its fall and thus prevent breakage, coal at loading points is loaded on the main conveyor in the direction of travel. By reversing this belt, all timber and other necessary supplies loaded on it can be delivered to the entrances of the producing rooms, where they are loaded again onto the room conveyors, which carry them to the working face.

A complete signal and control system is maintained at all times, the signal system being by telephone and bell and the control by a series of switches which are installed at advantageous points. The attendant at the main loading station can start or stop the entire layout; miners at working faces control the face units. The room-conveyor control switch is installed near the room entrance. Various types of room conveyors—namely, flat belts, trough belts, and shakers—have been used with varying degrees of success. A.M. scraper flight conveyors are being used. These, with H.G. face conveyors, give excellent results.

In planning the electrical installations, safety was given first consideration, all face equipment being of permissible type. At *A* in the illustration, which is the loading point of the main conveyor, a conveyor panel heading was started off the main *C* entry; here a No. 21 controller connects with a 250-volt d.c. 4/0 trolley wire. From this controller three main cables pass: (1) the conveyor circuit, which is a positive No. 2 cable, fused for 100 amp.: (2) the conveyor negative cable, which is of 2/0 wire; and (3) the machine cable, which is of the same size. All cables are rubber-covered and installed upon suitable insulators. Main cables are equipped with quick-break cable connections and are readily extended when necessary.

Power for the room equipment is brought to the drive mechanisms of the room conveyors by a two-conductor No. 7 cable, securely soldered to the main cables. At near-by points on the mains, a three-conductor cable with soldered connections is installed; this cable extends into the producing rooms and terminates in Ohio Brass junction boxes mounted upon movable panels. From this panel a No. 3 rubber-covered machine cable, fused for 200 amp., extends inbye; also a joined cable, fused for 30 amp. and supplying power to the face conveyor and to an electric drill, this equipment being duplicated in each room. All junction boxes are kept locked, and face ends of cables are fitted with strain insulators. Inspections of this equipment are made weekly by a

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Conveyor mining as installed at No. 15 mine of the Barnes Coal Co., says Mr. Todhunter, gives safer, more economical and more successful extraction than with ordinary methods, because—

(1) Workings are concentrated and rapid extraction eliminates the possibility of squeeze or creep.

(2) Increased supervision can be and is provided, assuring greater safety.

(3) Heading and room yardage, ranging from 65c. per yard in rooms to $2.05 in headings, is saved.

(4) All trackwork, including cost of materials and maintenance, is eliminated.

(5) Ventilation is under better control.

(6) For any given production, fewer transportation men are required.

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*Abstract from paper, entitled "The Use of Conveyors in Headings and Rooms," presented at the meeting of the Coal Mining Institute of America, Pittsburgh, Pa., Dec. 6, 1934.

competent person, the results of such inspections being entered in a book provided for that purpose.

The bed mined is the Lower Kittanning *B*, or Miller, seam. It is entered by two drifts from which are extended five main headings into the body of the mine, the middle heading being the main haulage road with a manway on each side and main return airways to right and left of these manways.

Producing mains on the three-heading system are turned to the right and left of the original mains at distances of 1,400 ft. and panel entries on the two-heading system are turned off the producing mains. Each panel exhausts an area 1,400 ft. long and 700 ft. wide and, with an average recovery of approximately 96 per cent, should produce 95,000 net tons of coal. Rooms are 45 ft. wide and 300 ft. long, with 30-ft. pillars. Crosscuts are driven in these pillars every 75 ft. As soon as the rooms reach the boundary line, open-ended pillar work is begun, and continued until the first fall is obtained; then a cut is made through the pillar 30 ft. wide, leaving a supporting pillar about 6 ft. wide between the broken roof and the active working face.

The average thickness of the coal seam is 38½ in. with 10 in. of bone above it which adheres closely to the overlying stratum and furnishes a reasonably good roof for this system of mining. The coal is cut immediately under the bone by a No. 41-A shortwall machine specially designed for conveyor mining. As the bone coal is not disturbed, a clean product is assured. Rooms are advanced by a four-man crew which usually loads out two cuts of coal per day, or an average of 60 net tons in 7 hours. The roof in rooms is supported by a systematic method of timbering with posts of not less than 4-in. diameter at the small end, set in lines parallel with and perpendicular to the working face on 4½-ft. centers with a cap-piece 1½ in. thick and 14 in. long symmetrically placed over the head of each post. An extra line of posts on 4-ft. centers is set along the gob rib, 12 in. from the coal. These posts are undisturbed by the subsidence of the roof and provide much needed protection to the miners when the next outbye pillar is being drawn. The room conveyor is laid 7 ft. from the rib in each room.

The mine is ventilated on the exhaust system, each panel being provided with a separate 12,000-cu.ft. split of air, so conducted that it sweeps all working faces, for the seam and also the overlying and underlying strata emit methane in quantities making such ventilation imperative. All stoppings between headings are of fireproof construction; stoppings in room crosscuts are of canvas, line brattice being carried from the last crosscut to within a few feet of the working face. A Wolf magnetically locked flame safety lamp is hung on a post near the face in such position that miners can readily observe any elongation of the flame. Permissible explosives, fired by an electric battery, break down the coal. Only four working places are in operation at any one time, and an assistant mine foreman is employed to supervise and enforce all safety rules and regulations.

Method of Mechanical Mining at Barnes Coal Co.'s No. 15 Mine Near Barnesboro, Pa.

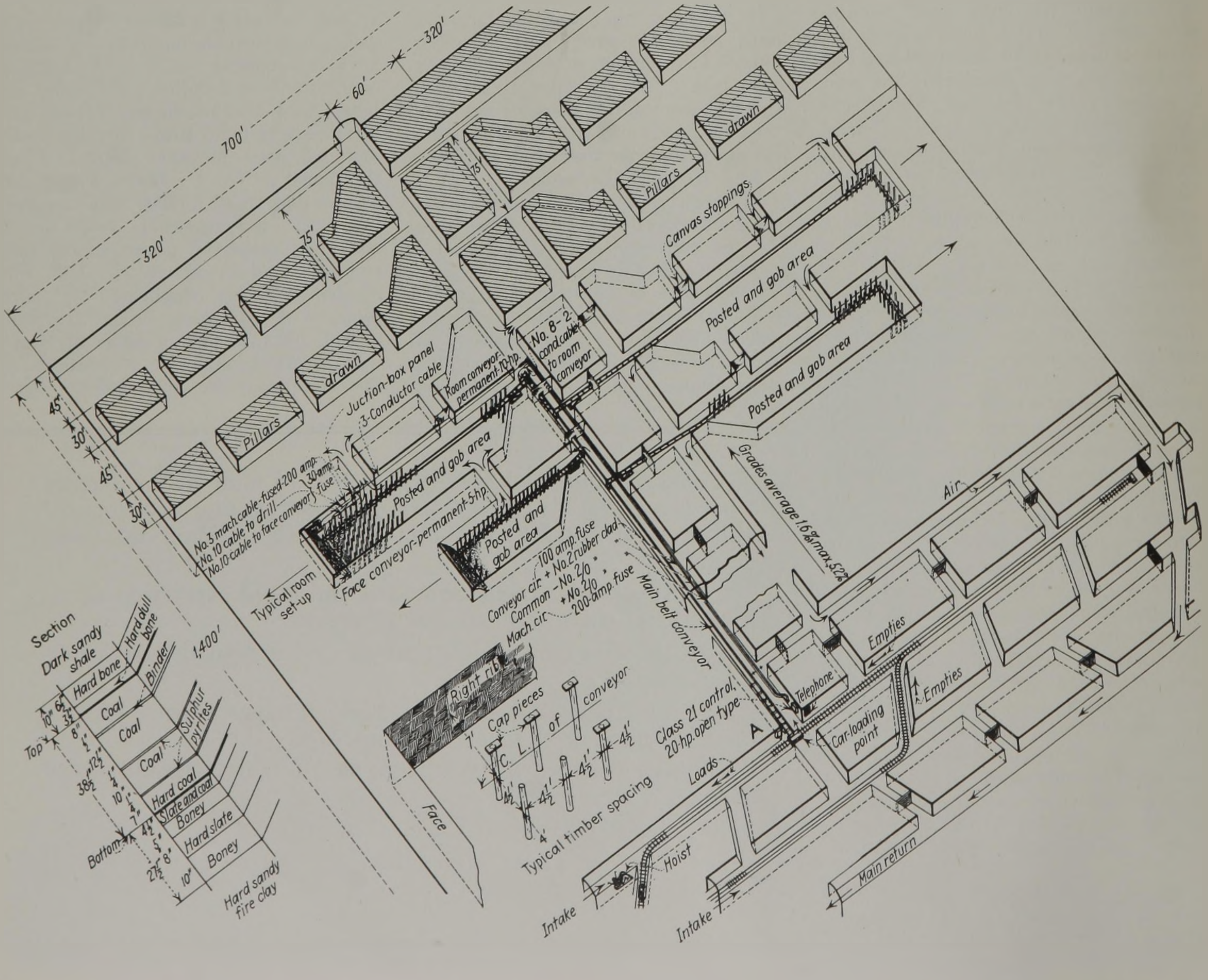


Fig. 1—Pyramid Strip Pit, Showing Stripping and Loading Units (Photograph Taken After the Loading Units Had Stopped for the Day).

"CIRCLE HAULAGE"

+ Increases Effective Operating Time Of Loading Units at Strip Mine

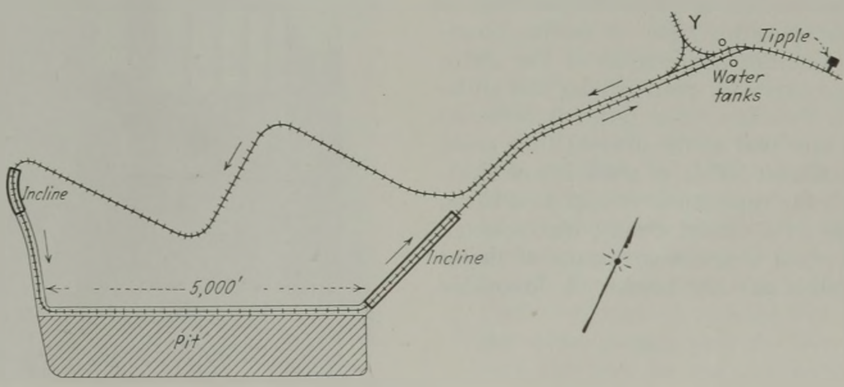
"CIRCLE HAULAGE" has been adopted at the Pyramid strip mine of the Pyramid Coal Corporation, Pinckneyville, Ill., to increase the effective operating time of the coal-loading units. By hauling in a closed circuit, the trips enter at one end of the pit and leave at the other, thus eliminating waiting time at passing tracks, as well as the expense of installing switches with the attendant possibilities of derailments. On the debit side must be entered the cost of the additional trackage, in part offset by the elimination of passing tracks and more than compensated for, in the opinion of the mine officials, by the increased tonnage secured.

Average output of the Pyramid operation is 4,400 tons per day, which is loaded by one 50B Bucyrus-Erie steam shovel with a $2\frac{1}{4}$-cu.yd. dipper and one 75B electric shovel with a $3\frac{1}{4}$-cu.yd. dipper. Haulage equipment consists of four Porter 33-ton, two Baldwin 30-ton and two Vulcan 21-ton steam locomotives, and 94 Western side-dump cars—66 with a capacity of 8 tons and the remainder with a capacity of 5 tons. Track gage is 36 in.

Overburden on the present location averages 30 ft. in thickness, but ranges up to 50 ft. in the territory yet to be worked. Directly over the coal is an average of 15 ft. of shale and rock, topped off by clay to the surface. Length of the pit, which is characterized by a relatively straight face, is approximately one mile, and the first step in the stripping operation, shown diagrammatically in Fig. 3, consists of removing all but 2 or 3 ft. of the clay. A 375B Bucyrus-Erie electric dragline with an 8-cu.yd. bucket and a 150-ft. boom is used for this purpose. Width of the cut made by the dragline, which deposits the clay on the spoil left by the 750B Bucyrus-Erie electric stripping shovel equipped with a 12-cu.yd. dipper, is 45 to 50 ft.

While the function of the dragline is to clear away the clay in front of the shovel and thus enable it to perform more efficiently, it normally occupies a position just behind until the end of a

Fig. 2—Diagrammatic Sketch of "Circle Haulage" Layout at Pyramid (Certain Details Are Not to Scale).



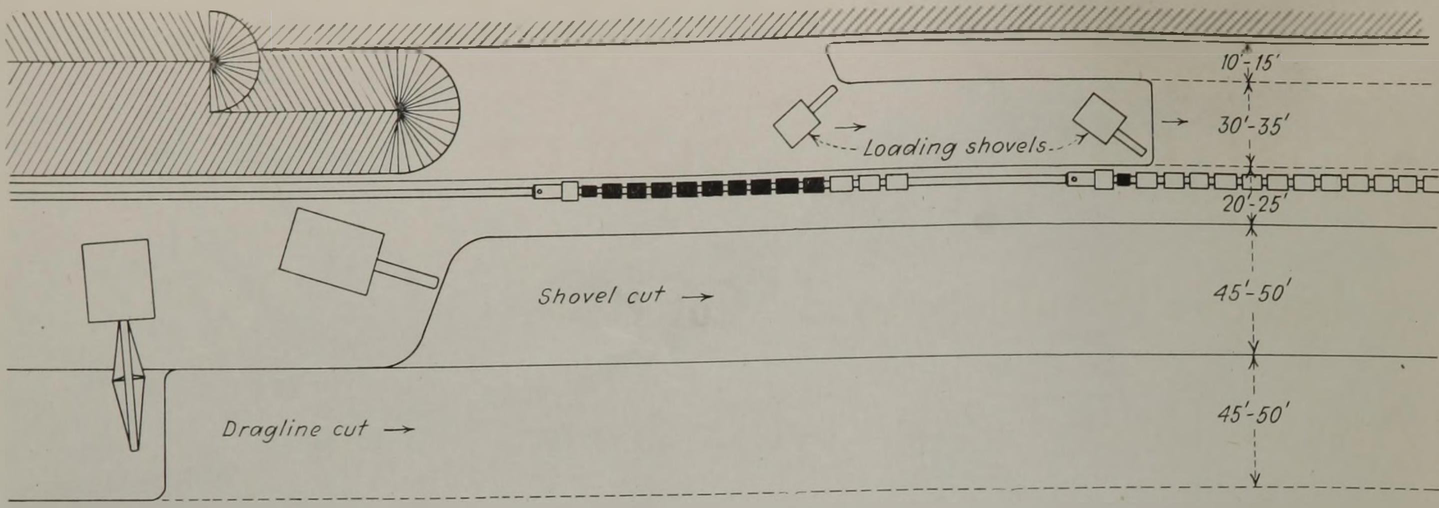


Fig. 3—Stripping Plan at Pyramid, Showing Method of Removing Overburden, Loading Coal and Transportation.

cut is reached, whereupon the shovel digs out wide to allow the dragline to pass, both units then returning along the wall. Both Loomis electrically driven well drills and Sullivan Stripborers are used in drilling the overburden, the choice between the two types of equipment depending upon the thickness of shale and rock. After drilling, the overburden is shot with L.O.X.

The coal (No. 6 seam, 6 ft. thick) is drilled with pneumatic drills and is shot with Atlas "Blakstix." In loading, the 3¼-yd. shovel leads off with a 30- to 35-ft. cut next to the berm on which the track is laid, and is followed up by the 2¼-yd. steamer, which cleans up the remaining 10 to 15 ft. next to the spoil bank. Cleaning prior to loading is done with a bulldozer, followed up by hand-shoveling and air.

Prior to the adoption of circle haulage, first installed in the present pit about the middle of 1933, transportation was based on the establishment of passing tracks approximately 800 ft. apart in the pit. Empty trips were backed into place at the loading shovels, and usually the closest passing point was approximately 500 ft. away. As a preliminary to revision of the system to increase the loading opportunity, time studies were made covering the haulage scheme originally in use. These demonstrated that by reducing delays due to waiting at the passing tracks and wrecks at the switches, operation of the loading shovels, for all practical purposes, could be made continuous, against the then record of 75 to 80 per cent of possible operating time. A further possibility was the elimination of the extra labor required for maintaining and shifting the switches. The latter is reflected in the fact that at the present time eight men can shift 500 ft. of track in one shift.

With the time-study results as a basis, haulage in a closed circuit was selected as the most practicable means of doing away with passing tracks. A favorable factor was the comparatively level nature of the surface. Total length of the circuit (Fig. 2) at the time this article was prepared was 6⅝ miles, requiring an average of 40 minutes per trip to negotiate. After dumping, empty trips are backed to the Y, from which they pull ahead to the back end of the pit, entering it down an incline on a gradient of 4½ per cent, which levels off into a cut made by a shovel.

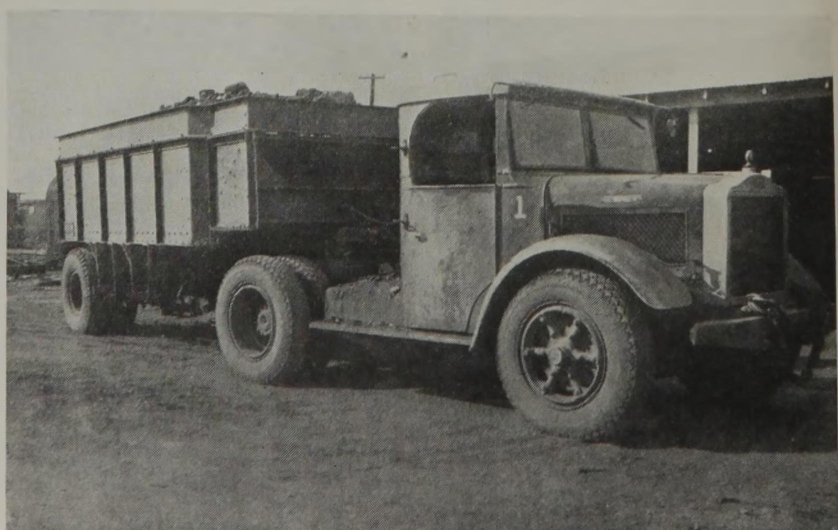
Twelve cars make up the average trip and as a rule nine are loaded by the 3¼-yd. shovel, after which the locomotive pulls up to allow the 2¼-yd. machine to load the remaining three. On the way out of the pit, the loaded trips travel up an incline laid on a gradient of 1.3 per cent. A single track is installed from the dump to a point near the Y where the water tanks are located to allow the locomotives to take on water while waiting for the empty trip to come out.

Changing conditions also have dictated a revision in transportation methods at the neighboring Coal Strip operation of the Coal Stripping Corporation. Both Pyramid and Coal Strip, as well as the Universal washer, are operated from the same office, and seam and overburden conditions are approximately the same over both mines.. Coal Strip began the development of new territories, consisting of several fairly large but isolated acreages, early in 1934 to replace an older pit that had been nearly worked out. Because of their isolation, one from another, investigation showed that the cost of track for steam-locomotive haulage would be excessive. Consequently, it was decided to adopt trailer haulage.

Stripping equipment at Coal Strip consists of a 320B Bucyrus-Erie steam shovel, which makes 45- to 50-ft. cuts, taking both the shale and the clay. The coal is then loaded by a 50B steam shovel with a 2¼-cu.yd. dipper. As the bottom consists of a fairly thick layer of fireclay unsuitable for haulage, a 15- to 20-ft. coal berm is left to provide a firm roadbed for the trucks and trailers.

The trailer units went into service in May, 1934, and consist of five 7½-ton White tractors, each with a 16-cu.yd. Sanford-Day bottom-dumping trailer. Only four of the units were in use at the time this article was prepared, the other being held as a spare, and were hauling an average of 1,700 tons in seven hours over a round-trip distance of 1½ miles.

Fig. 4—Truck and Trailer on Way to the Dump at Coal Strip.



NEW FAN AND SHAFT

+ Improve Ventilation and Cut Power At Two Union Pacific Coal Co. Mines

By C. E. SWANN
*Chief Engineer, Union Pacific Coal Co.
Rock Springs, Wyo.*

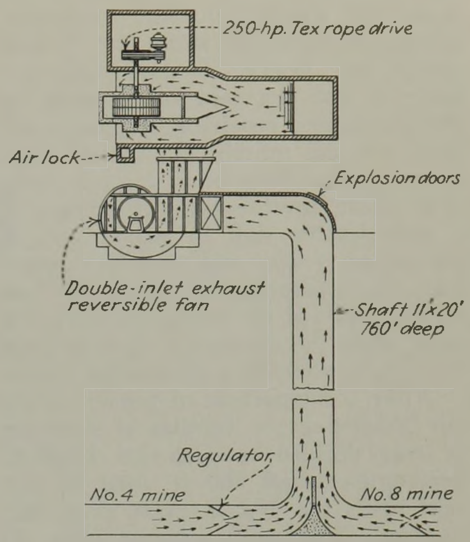


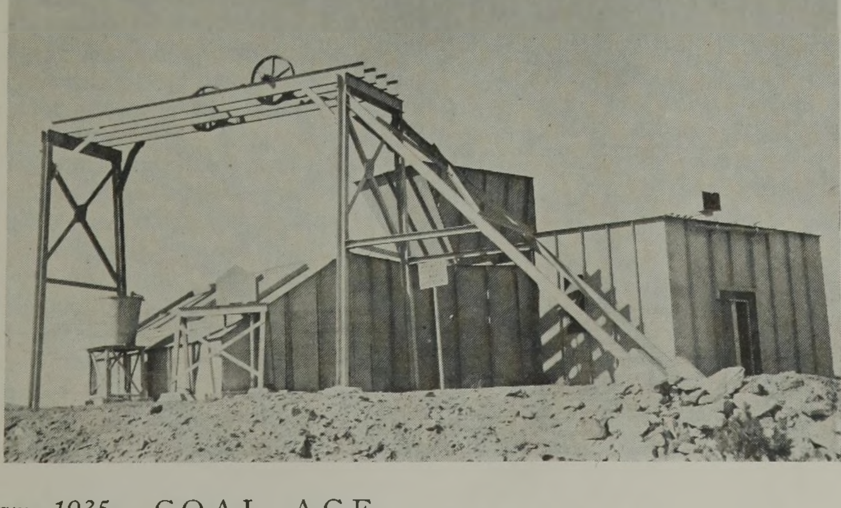
Fig. 2—Profile Showing Construction at Top and Bottom of Shaft.

CAREFUL investigation, in view of conditions now existing in the coal industry, naturally preceded authorization of an expenditure of $110,000 for a new fan and air shaft as the major step in a program of ventilation improvements at the Rock Springs Nos. 4 and 8 mines of the Union Pacific Coal Co., Rock Springs, Wyo. This item, it was estimated, would add 1½c. per ton to cost of recovering the remaining coal at these mines, which, however, would be less than the cost of maintaining and enlarging the old ventilating system during the life of the operations. A desire to provide underground men with the safest possible working conditions was the controlling factor in the decision in favor of the new fan installation, which circulates a slightly greater quantity of air at a higher water gage with only two-thirds the original horsepower.

Rock Springs Nos. 4 and 8 mines are essentially slope operations, although the main slope in No. 8 is reached by means of an underground tramway 7,200 ft. long. Normally, each slope consists of three separate headings, one of which is used as a traveling way for men and animals, as well as for intake air; another for transporting coal, supplying additional intake, or fresh, air to the live workings and handling materials and supplies used in the operation of the mine; while the third heading is used exclusively as the main return aircourse. A second main return aircourse has been added at the lower end of the slopes to improve the ventilation. Both mines operate the No. 1 coal seam, which dips to the northwest under the surrounding hills at a rate varying from 16 to 25 per cent and has attained a depth of 1,200 ft. under the Kilpatrick Valley 10,000 ft. from the No. 4 slope opening.

At these mines, no doors are used along the main ventilating course to divert the air. Substantial stoppings and well located concrete overcasts at each level make doors unnecessary, increase safety, speed up haulage, make inspecting the mine easier and assure a positive circulation of air at all times. No doors are placed in the end walls of an overcast. Each level has a separate air split and the company's Code of Standards prescribes that 65 per cent of the air in each split must pass through the crosscut nearest the face of the level.

Fig. 1—Fan Installation at Top of Shaft.



The ventilating problem during the early life of both mines was comparatively simple, requiring merely the installation of mechanical fans at the three surface openings to the main return air courses and the construction of concrete overcasts to conduct the used air over each working level leading away from the main slopes. After several years of operation, however, providing adequate ventilation at the working faces of the lower levels became increasingly difficult because of the increased friction of the air current due to length of travel and inability to keep the return aircourses free of falling roof rock, which decreased the original cross sectional area and multiplied many times the work to be done by the fans. Mines Nos. 4 and 8 were operated and ventilated as individual units and the ventilating problem at No. 4 neared a critical stage in 1926.

In that year, the company started an improvement program at No. 4 involving a general clean-up of return aircourses plus the lining of several hundred feet of the main return aircourse with tile and concrete to stop the leakage of air through broken rock strata near the mouth of the mine. These corrective measures greatly improved the situation, but it was apparent that with increased development to the dip, a more permanent solution of the ventilation problem must be found.

As a result of an intensive study of this problem by the engineering and operating departments of the company, in collaboration with fan-company engineers, it was found that the air must travel between two and three miles from the time it entered the mouth of the mine, passed over the live workings and returned to the ventilating fan at the surface, and that along this route losses by leakage through stoppings, cracks in the coal seam and broken strata was heavy. It also was discovered that the cost of cleaning up the aircourses, repairing stoppings and overcasts and retimbering where necessary to place them in first class condition would involve the expenditure of a considerable sum of money over a period of years, and that the power cost for operating the existing fans as the depth of the workings increased, even when the aircourses were in good condition, would be a controlling factor.

After a comparison of possible plans for improving the ventilation situation, it was decided to sink an 11x20-ft. rectangular shaft 760 ft. deep to connect with the No. 8 main slope aircourses. The point selected (Fig. 3) appeared to be the approximate center of operations at the Nos. 4 and 8 mine workings for the next ten years and unquestionably would be good for the estimated life of these mines. Possible use of the old main return aircourses from the surface to the new fan installation as auxiliary intakes was another factor entering into the selection of the site. The shaft is lined with box timbering of 3-in. redwood planks 12 in. wide, reinforced at 25-ft. intervals by 6x12-in. redwood tie sets extended into the side and end walls. The only obstruction in the shaft is a line of buntons in the center made of 8x8-in. redwood timbers set 3 ft. apart with headers between. Considerable water was encountered in the No. 5 coal seam sandstones and therefore it was decided to install a concrete water ring about 175 ft. down the shaft to trap this flow for later use in the sprinkling system lines in No. 8 mine. A reinforced concrete structure (Fig. 2) was built at the foot to facilitate the flow of air from both mines up the shaft, and to permanently support the rock strata above the aircourse in the immediate vicinity. Above and below the shaft for some distance the aircourse roof was timbered with steel sets covered with asphalt paint.

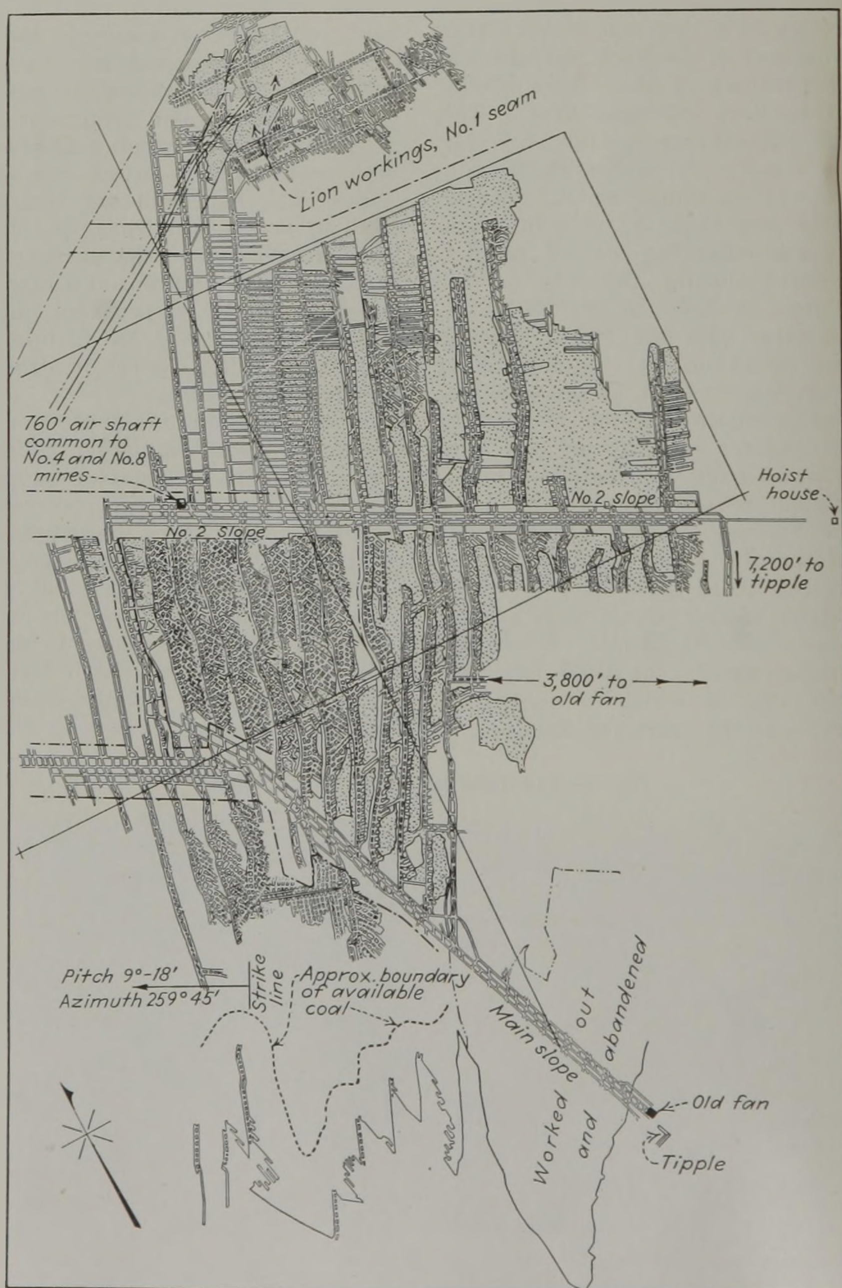
A steel headframe was built over the shaft so that buckets or cages (stored on the outside) can be operated in the shaft compartments for placing pump discharge lines and electrical power cables, repairing shaft timbers and equipment, lowering mine material, if desired, or—most important—hoisting men in case of a mine accident. A 75-hp. electric hoist is set in the permanent hoist building near the shaft, and will always be ready to operate.

At the time the air shaft was sunk in 1930, the combined output of the fans at Nos. 4 and 8 mines was 196,000 c.f.m. against a 2.2-in. water gage. Power requirements totaled 120 hp. Even then there was insufficient air at the faces of the workings. After the new fan and air shaft were completed, 200,000 c.f.m. was circulated against a 2.35-in. water gage. Energy consumption was reduced to only 80 hp., while air was distributed in large volume to the working faces.

The ventilating unit constitutes the largest single installation in the West, and consists of a 6x12-ft. double-inlet reversible-type Jeffrey fan (set 40 ft. north of the shaft) driven by a 200-hp., 3-phase, General Electric slip-ring motor. Fan and motor are connected by a Texrope drive. The fan, fan housing, fan approach and motor house (15x24 ft., with steel window sash and fireproof door) are all built of steel. The unobstructed area of the fan shaft totals 200 sq.ft., and each fan inlet, measuring 6½x11 ft., is equipped with reversing doors. The fan and fan building are floored throughout with concrete. All steel work was painted with an asphalt paint before installation to minimize rusting in the very moist air.

Safety features include: steel railing at the top of the incline from shaft; explosion doors in the fan housing; fan and motor bearings equipped with thermostatic relays with cut-offs set at 106 deg. C. to prevent overheating; and a standard mercury-switch signal system, which rings a bell and turns on a red light in the central power station three miles distant in case the fan stops. The switchboard is equipped with automatic starting equipment. Rated capacity of the fan is 300,000 c.f.m. against a 3-in. water gage, and it is built to withstand a 5-in. water gage. A recording water gage is provided and charts are changed every 24 hours. Every fan stoppage or change of pressure indicated on a chart must be explained on the back by the mine foreman and approved by the mine superintendent before it is passed on to the general manager's desk. Changes of charts and a few minutes' oiling is the only attention necessary at the fan during a 24-hour period.

Fig. 3—Location of New Air Shaft in Relation to Nos. 4 and 8 Mines.



DRAGLINE EXCAVATORS

+ Widen Casting Opportunities

In Anthracite Strippings

By R. DAWSON HALL
Engineering Editor, Coal Age

COAL strippers in the anthracite region are beginning to realize the advantage of casting methods in which the overburden, or spoil, is lifted off the coal and cast on one side instead of being loaded into cars and hauled by locomotives to a dump at some distance. When the bed pitches heavily, overburden may be cast on either side. Dragline excavators can be built with a long reach without excessive weight and power. Shovels with a long swing radius must have both. The change to dragline excavators has been rapid, mainly because they dispense with need for transporting the spoil to distant points.

Tracks, railroad cars and locomotives are being used in smaller numbers, but trucks, tractors and trailers are being employed in their place, and even purchased as rapidly or more rapidly than ever, but usually for the transportation of coal to breakers, or dumps, or in one case to a specially constructed preliminary preparation plant. The leader in this development has been the Rhoads Contracting Co., with offices and shops at Ashland, Pa., and H. R. Randall, its president. Since this company introduced its first dragline excavator it has installed several similar though larger equipments, as have other strippers in the anthracite region. Casting will soon be as general in the hard-coal region as in the bituminous, though shovels will not be used, and methods in the two classes of stripping will continue to be quite different.

With a dragline excavator, the stripper can keep his machine further from the high wall of his excavation than with a shovel if he is stripping along the strip pit, or he may even place it on the top of the low wall if he is stripping across the strip pit. The scraper bucket can be dropped at such a distance from the body of the machine that only the bucket and the ropes are likely to be buried if the sides of the cut fall, and this is true even if the scraper bucket is well below the level of the berm on which the machine rests. Surface scraping—pardon the term—or draglining, like underground scraper loading, has this recommendation, that the only part of the equipment that is in imminent danger from a slide is the scraper bucket and ropes, the former so stoutly constructed that a rock fall will not demolish or even seriously damage it.

In many cases, a dragline excavator has to remove only about half as much spoil as a shovel in uncovering the coal and will recover more coal with that excavation, for the latter must dig a place for itself near the level of the coal and to one side of it or the coal cannot be obtained, and room must be left for a railroad track or for trucking equipment at the same or but little higher level; thus the excavated cross-section must be much larger with shovels than with dragline excavators. This feature is the more striking with thin and steeply pitching beds than with thick and flat beds (note the conditions in Fig. 1). Where excavation has been made wide enough to prevent loose overburden from falling, if the bed is vertical or nearly vertical, the coal usually can be removed by a dragline excavator as far as the point where the extension of chambers inside the mine was discontinued; see Fig. 2, which shows the strippings at the Maryd colliery, the work on which has been completed.

In a trip around the eleven strippings and three culm-bank reclaiming operations of the Rhoads Contracting Co., at only two were shovels encountered, and both of these, while loading out both dividing rock and coal, were not called upon to handle overburden, for in both instances the overburden had been removed already by dragline excavators. This shows how complete and rapid the change has been from shovels to excavators.

One of the two shovels mentioned was located at the Richards colliery stripping on the property of the Susquehanna Collieries Co. Here a Marion-490 shovel was located at the bottom of an excavation 130 ft. deep, awaiting

Fig. 1—Railroad Shovel vs. Dragline Excavator; Both Removing 28 Ft. of Cover.

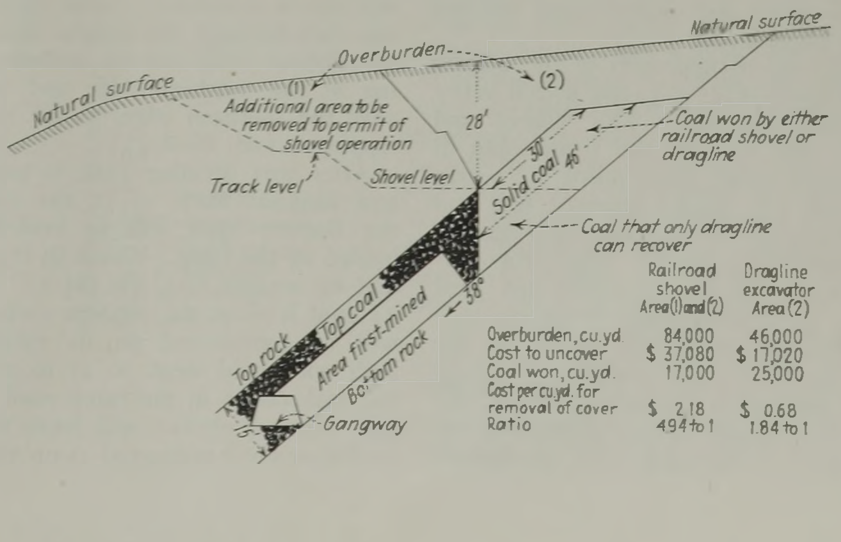


Fig. 2 — Stripping at Maryd Colliery Showing Coal Being Removed From a Sharp Fold by a Dragline Working Along the Length of the Pit.

its opportunity to go to the western face to lower that end of the excavation to its final depth of 184 ft. (see Fig. 3). The eastern end had been excavated still deeper. The coal basin dips about 14 per cent toward the west. The excavation had been completed at the eastern end, and a detour road had been made across it, for an old stripping to the east made it impossible to build a road around the end of the Richards stripping. Much dividing rock from the western end of the stripping has already been dumped at the eastern end.

The present approach to the bottom of the excavation is a road with a heavy ramplike gradient. This enters and crosses the western end from south to north and turns, going down the northern side for several hundred feet and curving again to the south till it reaches the bottom of the pit. The cross-section shown in Fig. 4 shows this road in the northwest corner of the pit, also the dividing rock and seams in the west end of the pit, as they will appear when the pit is deepened at that end to its final depth. It also shows how the thickness of the coal was determined at that point with one vertical hole and two holes at an inclination of 45 deg.

At the eastern end of the pit, a road is to be built from a point on the bottom of the pit, to travel to the northern side of the excavation and turn around and come out on the southern end by a heavy gradient, like that at the western end. This will be made by building up a pile of dividing rock from the western end. When this is completed the dragline will be able to attack the earlier road at the latter end and salvage its coal values. But even then the work will not be finished, for an old road formerly crossed the site of the excavation, and this will have to be replaced with 120,000 cu.yd. of material, some of which will be dividing rock loaded from the western end of the pit and dumped at this point, and some material to be dragged from the piles of overburden spoil placed by a dragline excavator on the two sides of the pit when the pit was first opened.

The drill at the west end is sinking holes of 6-in. diameter and 28 ft. deep in the center of the basin. These holes will be shot and the dividing rock loaded out and hauled to a desired point toward the east end of the pit. Then the Middle Split coal thus exposed will be loaded and hauled, doubtless still by the western ramp road, for the other will not be completed. Later, the dividing rock between the Middle Split and the Bottom Split will be drilled, starting at the northern edge and ending near the southern edge, as the rock is dipping about 45 deg.

After this dividing rock is removed and disposal made of it, the coal in the Bottom Split will be loaded and hauled up the ramp. When, in this way and by several lifts, the pit will reach its final level at the western end, work will be commenced on its extension, both north and west, so as to recover the coal values in the ramp road. The coal then, or earlier, will leave the pit by the newly constructed ramp road at the eastern end. In the cross-section the first bed shown at the bottom is known as the Bottom Split, the third bed as the Middle Split, and the fourth and fifth combine to form the Upper Split.

The coal is hauled in trucks to a dump where it is discharged into coal cars, by which it is hauled to the Pennsylvania breaker, which now handles all the coal that the Richards colliery and its strip pit produces.

Removing seams of coal with intermingled dividing rock is as slow and exasperating a job as describing the operation. It keeps equipment idle too much of the time, and it is questionable whether rock and coal should not be loaded and hauled together *en masse* to a breaker, or to a specially provided picking table where the larger rock could be removed and sent to the dump and the coal and smaller rock sent to the breaker for cleaning.

At the Williamstown colliery of the same company, the Mammoth bed has long been worked by underground methods, and on the upper levels of the northern dip, now being stripped, has been regarded as completely exhausted. It can be stripped along the outcrop, however, for a distance of 8,000 ft. and, barring a fault in one place, is quite regular. Thus its stripping involves no unusual difficulties.

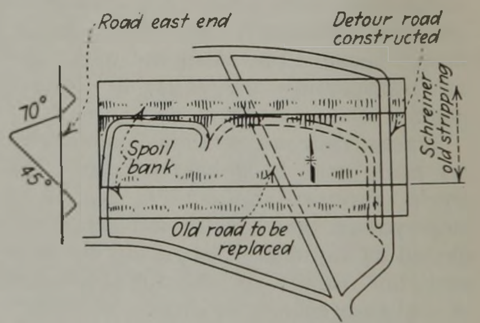


Fig. 3—Sketch Plan of Richards Stripping.

The coal is about 9 ft. thick without dividing rock and is dipping at 70 deg.

Here a Marion dragline, with an 85-ft. boom and a 3-cu.yd. bucket, is master of the situation, not only removing the loose overburden, as in Fig. 6, and the rock roof but also loading the coal into trucks, as in Fig. 5. These trucks transport the coal a short distance to a tipping point, where it falls into mine cars and is taken to the Williamstown breaker through a tunnel, described in *Coal Age*, Vol. 37, p. 356.

During one shift, the dragline advances in the loose overburden 30 ft. and in another shift removes the roof rock back for an equal distance, and in a third shift excavates the coal for an equal length of pit and places it in trucks, all of which seems quite simple but is the result of close figuring, for the capacity of the bucket and dragline must match the conditions, or the right balance between these three operations will not be maintained. In this case, the dragline stands at the end of that part of the pit from which the type of material being severally dragged has already been removed. It stands, in Fig. 5, directly on top of the coal at the end of that section of the pit from which all loose overburden, rock and coal have been lifted, and drags its burden along the pit.

Here the material under the heavily pitching Mammoth bed is a soft fireclay which tends to break away readily and slide down the pitch, as also does the coal. If the coal did not have a marked tendency to slide, the opposite side of the pit could be shot so heavily that it would drop into the workings of the mine, making rock removal easier and filling up the old breasts, as shown in Fig. 7. This would make rock removal easier. This filling material falling into the old breasts would also abut on the lower end of the coal being removed and would hold it in place while it was being scraped up by the dragline. With the coal so disposed to slide, the breaking of the top coal at the face of the breast would remove the support by which the coal to be mined is held in position, and the coal it is planned to recover would slide down the breast beyond hope of recovery. So at this stripping this method of disposing of rock, unfortunately, is not available.

Boreholes of 6-in. diameter are sunk in the low wall of the strip pit for the shooting of rock, but these frequently penetrate into the old workings, so that unless they are stemmed at both ends they are useless. The method of closing the lower or mine end before charging is to drop into the hole a short piece of the trunk of a tree of about 5-in. diameter, or a railroad tie, and fill the space tightly around it and immediately above it with surface material. At the time of the visit about 4,000 ft. of stripping had been completed, about 2,000 more feet were ahead and 2,000 more were beyond the fault, but other seams on this and the opposing dip afford further stripping opportunity.

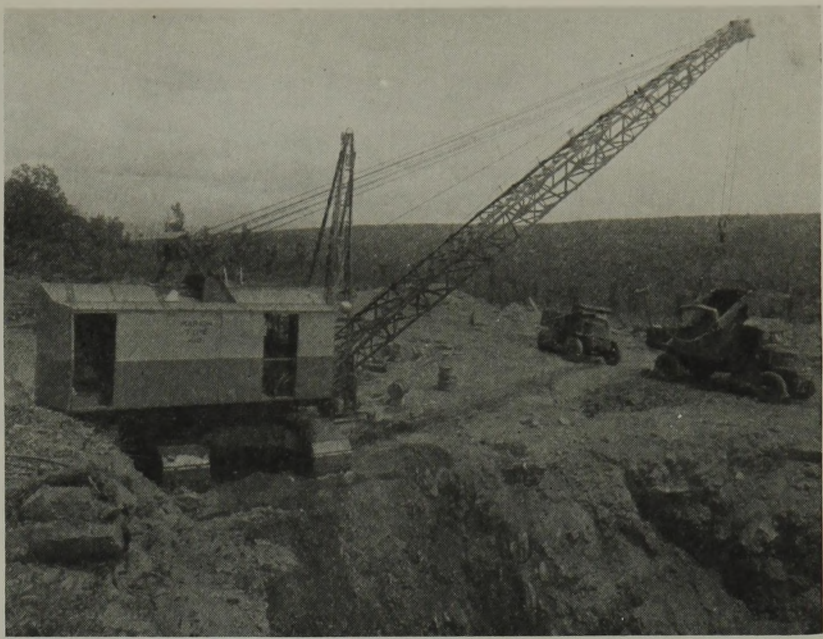
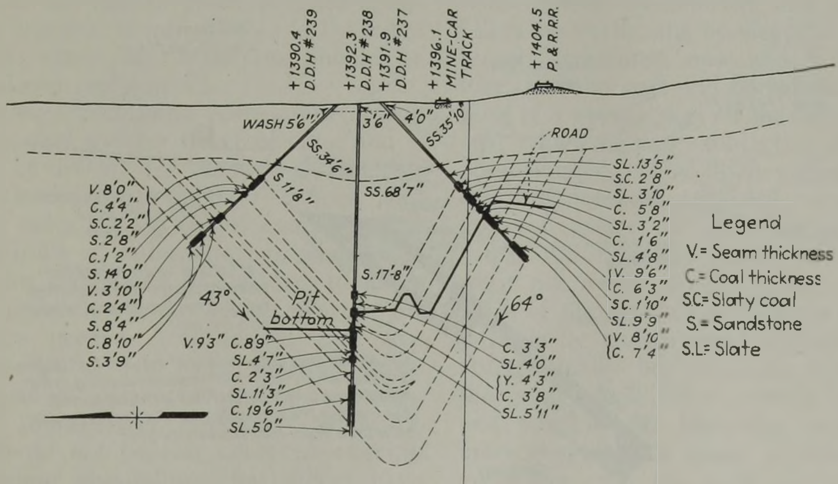


Fig. 5—Dragline Removing Coal, Williamstown Stripping.

Another stripping is that of the William Penn colliery, also of the Susquehanna Collieries Co., near Shenandoah, Pa. Here the Mammoth bed is split in two, the Top and Bottom Split. On the west end the splits are 160 ft. apart and a few hundred feet east of that point they are 180 ft. apart and, where they strike, to the east, the recess in the line of the hill in which the breaker stands, the dividing rock is only 40 ft. thick. As the coal has its sharp basin in the Mahanoy Creek valley to the north of the William Penn property, the Bottom Split outcrops well up on the hill and the Top Split outcrops far below it, but not so far but that stripping the Bottom Split and casting the rock down the hill would cover up the Top Split and render its later recovery expensive, if not impossible. Where the splits were far apart (160 ft.), some of the Bottom Split well up on the hill was uncovered, some of the cover being draglined up the hill and some down it by an excavator working across the pit and stationed part of the time on the high wall and part on the low wall.

Fig. 4—Cross-Section of the Coal Measures in Richards Stripping.



But this stripping work has been abandoned temporarily and will be made a part of a larger scheme now under way. The Top Split, which is 14½ ft. thick and is low down in the valley, will be stripped and its coal loaded, both stripping and loading being effected by a 50-B Bucyrus-Erie dragline with a 2-cu.yd. drag bucket which will work across the pit, the machine being located on the top of the low wall and delivering its spoil on the lower side of the pit. This stripping will be kept a little ahead of the pit in the Bottom Split on the brow of the hill (Fig. 8).

A machine of equal size and capacity will strip the outcrop of this split, which is 17½ ft. thick. This dragline will be stationed mostly on the low wall and cast its spoil partly on the side hill between the two strippings and partly still further down the hill, with the end of its talus, or its "toe," in the strip pit below, from which the Top Split of the Mammoth by that time will have been removed. In some places, some overburden may have to be placed above and beyond the high wall by a machine stationed on that wall. This will not be done to protect the Top Split stripping, because that will be valueless, as the coal will have been extracted, but because the overburden from the Bottom Split will not run down the hill far enough to prevent the dragline from being "landlocked." These two draglines were originally shovels and had 28-ft. booms and 2-cu.yd. buckets, but conversion from shovel to dragline is not difficult. Practically only a new boom, bucket and electric control are needed to change the shovel of today into the dragline of tomorrow.

Just outside Mahanoy City, the Lehigh Valley Coal Co. has a large, highly strippable area lying between that city and the village of Delano, a piece of land that at one time is said to have

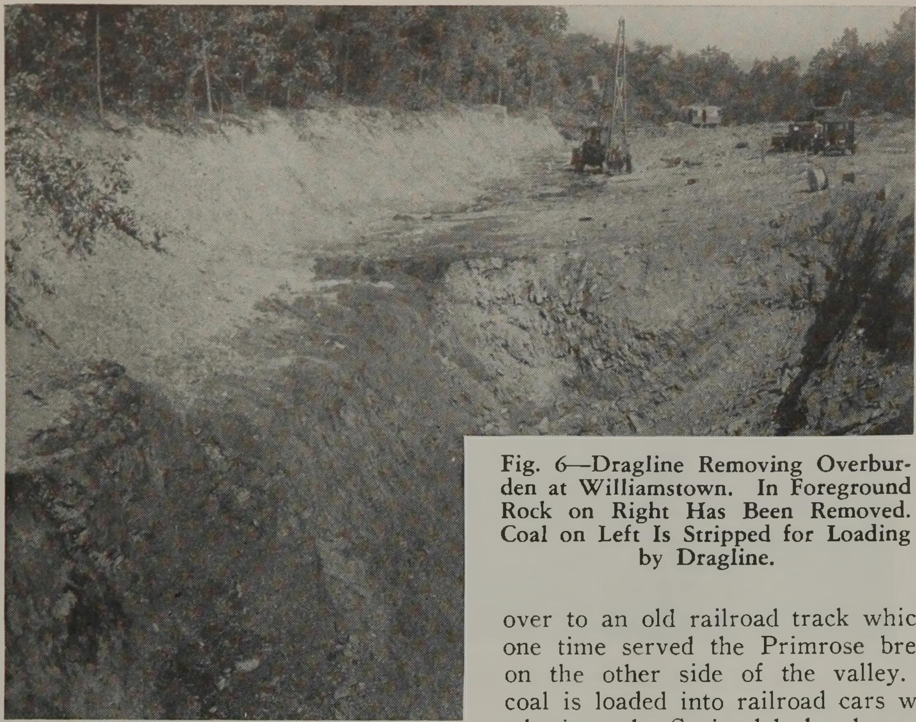


Fig. 6—Dragline Removing Overburden at Williamstown. In Foreground Rock on Right Has Been Removed. Coal on Left Is Stripped for Loading by Dragline.

belonged to the ancestors of President Roosevelt and to have passed through Delano & Jones, the Lentz interests and the Mill Creek Coal Co. to the Lehigh Valley. Two strippings recently have been started on this property, one on the Buck Mountain bed on the south dip and the other of the Primrose bed on the north dip, both casting jobs, but this by no means exhausts the possibilities, for the Mammoth bed also is present, sometimes with three splits and sometimes with but one. Where the Mammoth is in a single bed it is 15 ft. thick. Noted thicknesses of the other beds are shown in Fig. 9, but the thicknesses of the coal seams and dividing rocks vary greatly, as also do the pitches of the beds. The seam being washed off at the top before being covered with débris is thinner than normal toward the high wall, and only 9 ft. thick, but this, of course, is not the true seam thickness.

By underground mining, much of the coal was long ago removed. In fact, in the stripping many of the old breasts are uncovered. They approach the surface quite closely, the working places being driven on the bottom rock, leaving some feet of coal as a roof. Thus the miners were enabled to advance further than if the working place had been driven full height with the rotten rock and, in places, loose overburden as mine roof. The desire to keep this dangerous cover in place and the disadvantage of letting loose material in among the coal caused the earlier operations to keep up coal for roof and to avoid advancing the breast too far.

This loose material and the coal are being separately removed by a Pawling & Harnischfeger dragline excavator standing on the low wall and working across the pit. It carries this material over to an old railroad track which at one time served the Primrose breaker on the other side of the valley. All coal is loaded into railroad cars which take it to the Springdale breaker. The dragline has a $2\frac{1}{2}$-cu.yd. bucket, a 70-ft. boom and a Fairbanks-Morse diesel engine. Usually it works for two shifts, taking overburden during one shift and coal during the other, but sometimes three shifts are necessary, the third being in overburden. No rock is found in this operation, the loose material grading into smut and smut into coal. Where the dragline encounters old breasts, it dumps, on the edge of the low wall, the dirt which has fallen into the breast and puts the coal it finds into the railroad car.

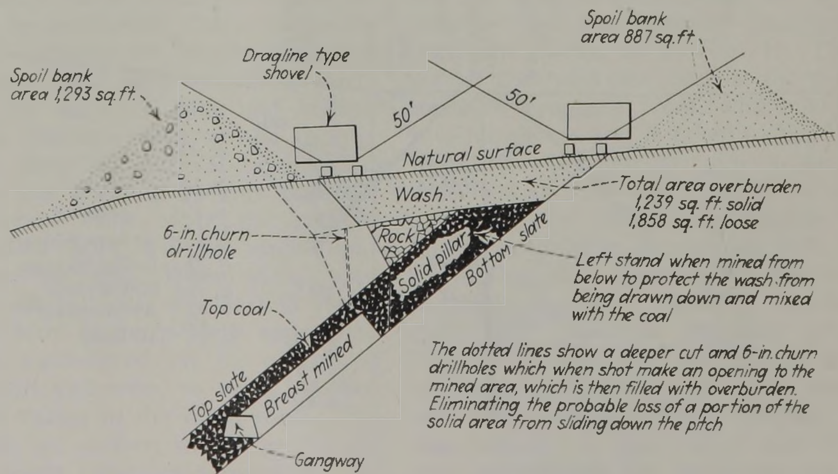
Primrose stripping is about a mile away and has been commenced near the edge of a highway. Here the dragline is working on the edge of the stripping near the high road toward which temporarily it has been working back. The cover varies from 19 ft. at the high wall to 33 ft. on the low-wall side. Here the Primrose coal is strong and resists disintegration.

Later, the dragline will be placed not on the end of the stripping but on the low wall and will work across instead of along the pit. The coal is dumped in railroad cars on the track already described as having been constructed in the distant past to the Primrose breaker adjacent, the operation of which has been abandoned. This coal also will go to the Springdale breaker for preparation. The excavator is a Marion No. 5120 with 100-ft. boom and $3\frac{1}{2}$-cu.yd. bucket, electrically driven. It has regenerative braking, which feature has been found to result in the saving of much power. Eight thousand feet or more of Primrose outcrop has to be stripped. The bed pitches here at an angle of 22 deg.

Another operation is that at the Righter culm bank near Mt. Carmel. This bank is owned by the Lehigh Valley Coal Co. and is leased to the Stevens Coal Co., which operates the Cameron breaker, formerly belonging to the Susquehanna Collieries Co. The material in this high-grade culm bank runs 38 per cent coal. The bank is 75 ft. high and contains about 1,200,000 tons of culm. Here a Lima Locomotive Works No. 701 dragline excavator, with a 60-ft. boom and a 2-cu.yd. bucket, is removing the culm at the foot of the bank and dumping it into a movable conveyor with a 24-in. belt. The conveyor is 100 ft. long and travels at a speed of 300 ft. per minute, delivering the culm to railroad cars.

Here a shovel formerly was used, but it stood so close to the work that slides rendered its operation too hazardous, and shooting the bank down to the shovel also was dangerous work. Sinking holes in such loose material was not without hazard and sometimes difficult. The introduction of the dragline excavator renders shooting unnecessary and permits masses of culm to slide down without shooting, as the bank can be cut so nearly vertical that the culm will slide, yet without danger to those employed below. The use of the conveyor greatly expedites matters, especially as culm does not gum on the belt as clayey materials would. It ap-

Fig. 7—Method of Disposing of Rock and Loose Overburden Where Coal Is Not Too Much Disposed to Slide on Bottom Rock.



pears likely to more than one contractor that belts have a place not only in culm loading but also in stripping, because material often has to be removed further than even a dragline excavator will permit, without going to sizes too large to be economical.

The coal bank being stripped was accumulated from the T. M. Righter breaker and was deposited perhaps 40 years ago. It is very warm—even hot—though it is far from reaching a temperature threatening spontaneous combustion. In winter one can note hot-air currents ascending from the conveyor on which the culm is passing. The heat is so great that the coal under the culm bank in the Skidmore and Mammoth beds could not be mined by underground methods. These seams have been mined by stripping all around the culm bank, and, after its removal, all coal beneath it will be removed in that manner.

When a stripping is to be opened, the coal is drilled, the contours are cross-sectioned and the tracing is put on a desk lighted through a glass panel below. Under the tracing are placed, one by one, the tracings showing the loading characteristics of several different equipments, with their varied angles of operation and reaches duly plotted. From these the most available equipment, and the best location for it, is determined. If land-locking is inevitable in places, double handling is provided, but this adds greatly to cost. However, if it is necessary, the best relocation for rehandling is found by use of the lighted panel, and the dragline operator is informed as to the exact place where his excavator should be be placed (see Fig. 7).

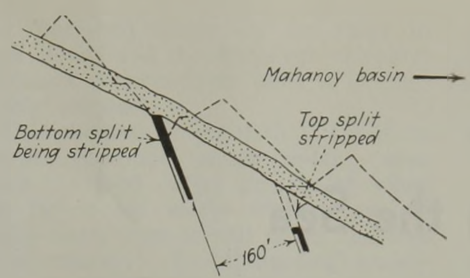


Fig. 8—William Penn Stripping—Cross-Sectional Sketch.

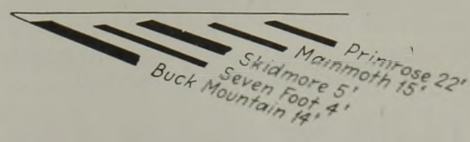


Fig. 9—Sketch Showing Coal Seams in Stripping Near Mahanoy City. Buck Mountain Seam Is Being Stripped.

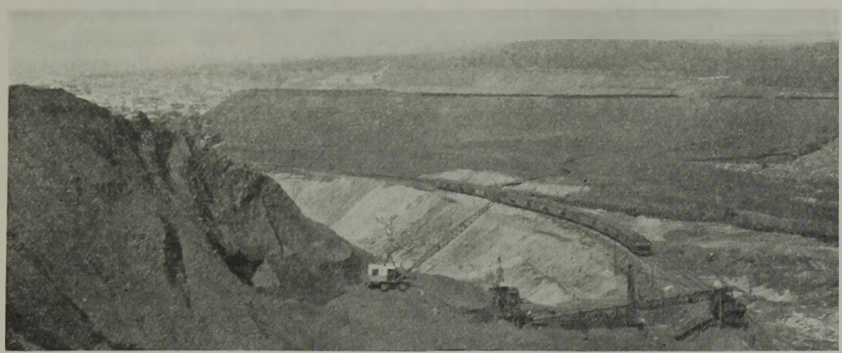


Fig. 10—Righter Culm Bank Loading Near Mt. Carmel.

Many anthracite companies today have only meager developments, and it will be difficult for them to correct this deficiency, for gangways, tunnels and rock holes are but slowly extended. The low price of anthracite has made most of the companies ill-disposed to drive the necessary gangways to provide for future needs. Accordingly, they are compelled to strip more coal, that being a form of development that is speedy and immediately effective. Some of them do not possess acreages offering stripping possibilities, but others have large resources of this kind. By aggressively developing what they have, they will gain time and money for needed underground development.

By removing stripped coal as fast as it is uncovered and working double shift, "bootleggers" can be prevented from availing themselves of uncovered coal. With the indifference of the civil authorities to bootlegging, it is becoming a serious menace not only to the finances of the companies, who lose both coal and markets, but to the lives and limbs of the bootleggers themselves. Shallow coal also is in danger of fire, and this may spread to virgin coal. With the use of a dragline excavator that will remove overburden and coal in following shifts, the bootleggers will be largely frustrated, now and in the future, and the coal will be saved. Stripping is a speedy way of marketing that coal which is most subject to bootlegging activity. This illicit mining hitherto has not been regarded with active disfavor where not too extensive, because the coal companies themselves were not awake to the value of such parts of the coal seams as were not obtainable by underground mining. They are gradually beginning to appreciate the great possibilities of such deposits, and stripping is becoming more and more general as a means of getting inexpensive coal, the high cost of labor offering greater inducements for such operation.

Meanwhile, the work of the bootleggers is uncovering the outcrops of many seams that might have been overlooked and drawing attention to stripping possibilities. Better machinery is making such opportunities more general. However, coal companies to date have not realized fully the importance of letting binding contracts that will permit strippers to recover all the coal available. With larger schemes and assured opportunity of continuity of operation, larger machinery can be purchased and the work can be more cheaply done as a whole if such large machinery is used.

To leave a portion of the coal at the bottom of a stripping affords an opportunity, however dangerous, for bootleggers, especially if the coal is stripped by a shovel and is excavated only a few feet below the level of the excavator, and it makes the final recovery more difficult, because for such recovery bigger machines must be used, and how can they be financed if the coal left for recovery is too small to justify their purchase?

When a contract is offered, the price obtained depends on certainty of operation, and that is a matter which usually is left to the stripper to assess from his knowledge of conditions and the past record of the company. That is not so true now perhaps as in earlier years, for the mechanisms being used today are more portable than in the past, when planes, hoists, railroad tracks—all more or less non-portable—were used in place of trucks, trailers and tractors. But in those days companies provided their own equipment and in many cases did their own stripping.

Nevertheless, no one desires to buy a big dragline or shovel that a decision to close down, temporarily or over a longer period, may deprive of work. The use of central breakers and the great appeal of low-cost strip coal have made such decisions less likely, but still they occur only too frequently. When a mine is shut down today, it often happens that the stripping continues to work, for the breaker which received the product of that mine is dependent partly on the production of other mines that continue to operate. But for each job, a special size of equipment is best suited, and, if the stripping is to be abandoned, opportunity for such equipment may not be immediately available.

Many companies today realize the danger that workings to the crop may bring in large quantities of surface gravel, or glacial drift, that will fill the working places, and they find that in stripping these places with sloping sides this loose material can be largely excluded and that the workings underground can be brought nearer the surface without danger to the miners, more effort being made today than before to recover all available coal.

NOTES

. . . from Across the Sea

AT car-dumping points in our mines, concreted steel is quite generally used, for what reason is not usually stated, but probably most usually because of a desire for permanence, order, light and ventilation efficiency, though such material for construction is preeminently desirable also if a deposit of coal dust is to be avoided.

At the Baddesley colliery, in Warwickshire, England, even the headings at the delivery ends of gate belt loaders are being encased with steel and concrete. In consequence, dust can fall only on the floor, where it can be wetted down and removed. Even the floor is concreted. W. E. T. Hartley, inspector, Midland and Southern Division, in recording this fact, recommends that all rock dust which cannot be blown in a cloud by a vigorous puff of the breath be replaced with new dust. Some dusts cake after a short time to such an extent that they would be doubtful protection in case of an explosion.

THE same authority recounts the suffocation of a miner at the edge of an old road into which a hole had recently been made from his workings. The coal had been crushing under roof pressure and evidently liberating a large quantity of gas, into which the man stepped and was suffocated. His fellow-worker did not miss him for about 15 minutes. The men who dragged him out applied artificial respiration, and he rapidly recovered, but became extremely violent and ultimately died at the hospital from heart failure, induced by an acute mania apparently "due to breathing an atmosphere deficient in oxygen." Was this mania due merely to such a deficiency or to the action of methane, or whatever other gas may have been present? It would be interesting to learn if anyone has heard of a similar case of mania from the breathing of gas.

In the early days, ill-ventilated mines were believed to be tenanted by demons, and mania was believed to be due to demoniacal possession. Could it have been that the prevalent reference to demons in early writings about mines originated in the occurrence of mania which, in turn, had its origin in the breathing of concentrations of mine gas of certain types? But this seems unlikely, for, if it were so, cases of mania would even today be not infrequently reported. Gas from coal may have a variant physiological and psychological effect on those exposed to it, and some gas may be provocative of mania, but it would seem far more likely that the miner under discussion was readily susceptible to mania. This propensity may have been dormant in him and have been released by the shock or excitement which his temporary suffocation induced.

IN THE operation of jigs, Europe has introduced methods of regulation that render them automatic. One or more of these have been transferred to this country and others have been devised here. Among these European devices is that of the Preparation Industrielle des Combustibles, or PIC, which has found place in France and the Saar, notably at the Gayant washery of the Mines d'Aniche, at the Hostenbach washery of the Saar Collieries, and at the Volklingen washery of the mines of Rochlingsche Eisen und Stahlwerke. Instead of using the deepening and thinning of the refuse bed on the screen of the jig to regulate the removal of refuse, the resistance of the jig bed to the rise of the water in the jig is made the means of regulation.

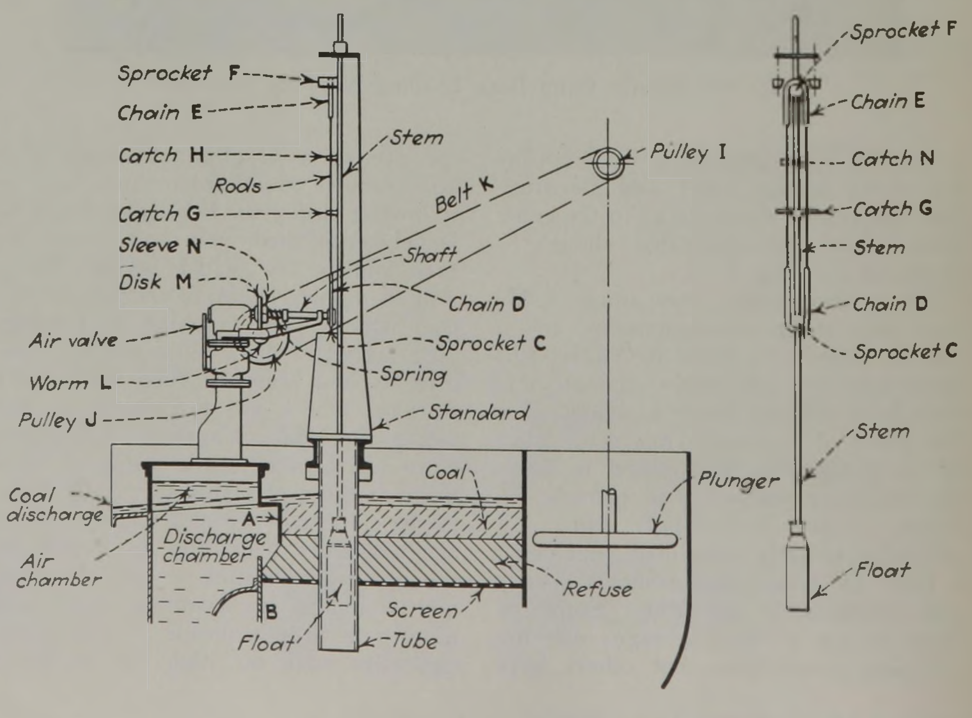
In the left section of the illustration, the plunger of the jig is shown on the right, and on the left appears the jig bed with the refuse on the screen and the coal above it as separated by the upward and downward movement of the water. The reject passes into a discharge chamber on the left which extends for the full length of the wash box. Above this chamber is an air space, the communication of which with the atmosphere is regulated by the opening and closing of the air valve above it.

After passing on either side of the air chamber, coal is discharged over the lip, as indicated in the drawing. When the valve is wide open, the water set in motion by the plunger goes freely up and down in the air chamber and at each pulsation some refuse from the jig bed is carried through the wide throat between the two plates *A* and *B*, which are so located that the refuse makes a slope between them and cannot spill out by gravity but must stay in the wash box except as driven out by the water. When the air valve is shut, the resistance of the air keeps the water motionless, and refuse builds up on the screen. For every position of the air valve a definite quantity of refuse per stroke will be evacuated.

Even when large coal is being washed, it is said that the action of the jig is absolutely selective, for the valve operates in the open where it can readily be inspected and oiled and because nothing passes through it but air; hence there can be no clogging.

Regulation is obtained by a float located in a vertical tube or well which passes through the coal, refuse and screen. This tube is open at its upper end to the atmosphere so that the float within it follows every movement of the water in which it is immersed. The float is supported by a rod or stem guided by two bearings above the water which are fastened to a rigid standard. When the depth of the refuse bed increases, the resistance of the jig bed also increases, and the water tends to pass through the tube, raising the float abnormally. On the other hand, if the refuse bed becomes thin, the water has less tendency to pass through the tube and the amplitude of its movement decreases below normal.

Method of Regulating Discharge of Refuse From Jig.



By means of a mechanical device, the degree to which the air valve is opened is automatically regulated, for it is placed at the end of a small shaft which carries at its opposite end a sprocket, *C*. This engages a chain, *D*, which is fastened at both ends to steel rods, the opposing ends of which are fastened in turn to another chain, *E*, which engages a sprocket, *F*. A catch on the stem of the float in its upward movement impinges on another catch, *H*, fastened on one of the rods mentioned. This opens the air valve whenever the upward movement of the water is excessive, which is only when the refuse bed is deeper than normal. On the other hand, the pulleys *I* and *J*, the former on the main operating shaft of the jig, a belt, *K*, and an endless worm, *L*, revolve a toothed loose disk, *M*, which bears against a sleeve, *N*, keyed on the shaft, when that sleeve is pushed against the disk *M*. This closes the air valve very slowly.

When the catch *G* raises the catch *H*, the disk *M* slides on the sleeve *N*, thus allowing the air valve to open. When the depth of the refuse bed decreases, the movements of the float also decrease and the two catches no longer meet. In this event the friction device just described causes the air valve to close slowly and the discharge of refuse decreases progressively until it is completely stopped.

This method of regulation is said to operate without an attendant even when the feed varies greatly or when the jig is fed solely with refuse, in which latter case it will reject the feed in its entirety. By eliminating attendance, it makes the jig operate with certainty, for attendants are likely to err in the direction of making a perfect coal entirely without regard to losses of coal in the reject.

Regularity in the product, increase in washed-coal yield, decrease in ash content of coal, increase in ash content in bone and other refuse with elimination of coal in refuse, increase of volume of coal treated, reduction of water used, less degradation, less solids in waste water, with more rapid sedimentation in settling tanks, and reduction in installation, operation and maintenance costs are claimed for jigs with this regulating device, which is about to be introduced at a plant in this country.

R. Dawson Hall

On the ENGINEER'S BOOK SHELF

Requests for U. S. Bureau of Mines publications should be sent to Superintendent of Documents, Government Printing Office, Washington, D. C., accompanied by cash or money order; stamps and personal checks not accepted. Orders for other books and pamphlets reviewed in this department should be addressed to the individual publishers, as shown, whose name and address in each case is in the review notice.

Progress in Safety in Coal Mining in the United States, by D. Harrington. Information Circular No. 6810, U. S. Bureau of Mines, Washington, D. C. 8 pp.

If the gas and dust explosion fatality rate of 1.059 per million tons of coal during the period 1906-10 inclusive had continued to the first of January, 1934, instead of the 6,378 deaths which actually occurred due to gas and dust explosions there would have been 13,480 deaths. Hence, during the 23 years of existence of the Bureau of Mines there apparently has been a saving of about 7,102 probable deaths, or an average of more than 300 per year, declares the author.

Mr. Harrington undoubtedly makes a strong presentation of his two major premises: (1) That accidents can be reduced 75 per cent, and (2) that the Bureau of Mines' expenditures have been of great financial assistance to the miner and his employer, and this despite the fact that a distinction should be made between the gross and net earnings of the miner. It is not correct to multiply the gross earnings by the increase in life expectancy. The multiplier should be the net earnings after cost of living is deducted, for all the rest is human maintenance. However, in regard to the miner, it may be truly said, What shall not a man give in return for his life? The author gives eighteen ways in which mines could be made safer.—R. Dawson Hall.

Value of the Cooperative Method in First-Aid Training, by J. J. Forbes. U. S. Bureau of Mines Information Circular 6803; 21 pp.

In the mining industry first aid is an essential part of safety programs, says this bulletin, which shows the various certificates issued by the Bureau of Mines, the equipment needed for each first-aid class to be instructed, an instructor's outline in the standard first-aid course and a list of the seven fundamentals of first aid. This is followed by a recital of the advantages of first aid, with emphasis on training by the cooperative method in which instructors receive fifteen hours of training from U. S. Bureau of Mines' instructors in the practice of first aid, and another fifteen hours of training in teaching what they have learned. By cooperative methods (1) competent instructors are provided, (2) classes are small enough for individual attention, (3) instruction is quickly completed, (4) cooperation and fellowship are developed, (5) plant has employees at mine at close of instruction competent to instruct new men and maintain training and interest, (6) trained men are safe men themselves, and (7) can relieve the accidents of others; (8) reduction in compensation cost and in insurance premiums usually follows first-aid training.

Table Cleaning of Fine Coal From the Thompson and Woodstock Beds of the Cahaba Field, Alabama, by A. C. Richardson, B. W. Gandrud and W. D. Musgrove. Report of Investigations No. 3234, U. S. Bureau of Mines, Washington, D. C. 19 pp.

The finer sizes of Cahaba coal contain much rash or boney coal. In this lies its principal trouble. It is not only dirty but flaky. Most of the mines have washing plants in which jigs are the favorite type of equipment, though at some mines tables are used for cleaning the slack sizes. The washing characteristics of the coal from the Cahaba field are very uniform and differ from those in the near-by Warrior field in that the coarser sizes contain much less bone than the finer sizes.

To ascertain flakiness, the float-and-sink fractions to be tested are first screened on a series of standard sieves with square-mesh openings varying as the square root of 2. After each square-mesh product has been weighed, it is screened on three sieves with rectangular openings, the width of which is about 100, 75 and 50 per cent, respectively, of the openings in the square-mesh screen upon which the product was retained. In the selection of these sieves the aim is to get meshes with lengths at least as great as the diagonal of the opening of the square mesh through which the product previously was screened. Of the raw coal from the Woodstock bed that went through a 4-mesh screen and was held on a 6-mesh screen, 34.7 per cent was held on a 100-per cent screen, 35.9 per cent was held on a 75-per cent screen, 14.3 per cent was held on a 50-per cent screen and 5.1 per cent would go through none of them.

When a table was operated properly the rash was readily eliminated, but high table efficiency at low ash contents was made difficult, chiefly because of the boney impurities found in the material finer than 100-mesh; but these impurities cannot be removed efficiently in ordinary table practice, regardless of their flaky or non-flaky character.

OPERATING IDEAS

From Production, Electrical and Mechanical Men

Advantages of Heat-Treated Bits Proved In Two-Year Trial at Dresser Mine

BIT PERFORMANCE, particularly where cutting is hard, is one of the most perplexing questions connected with the operation of cutting machines, declared James Hyslop, assistant superintendent, in presenting at the annual meeting of the Indiana Coal Mining Institute (p. 43 of this issue) the savings in bit steel and power, reduction in sharpening cost and improved performance of machines growing out of the installation of heat-treating facilities at the Dresser mine of Walter Bledsoe & Co., Terre Haute, Ind.

"It is not surprising," said Mr. Hyslop, "in view of the great variety of conditions encountered in cutting throughout the country, that the question of how to produce a better bit should bring numerous and varied answers, and in giving an outline of our own particular solution, it will be necessary, among other things, to critically discuss some of these other methods. Before adopting our present procedure in sharpening and resharpening bits, we conducted several experiments, and the views presented here are the result of several years' study of the problem in general."

The severity of the service to which a bit is subjected will, of course, depend on the nature of the cutting. Cutting conditions may be classified as: clean (coal only); abrasive (abrasive materials encountered); rocky (hard, irregular sulphur balls or other foreign bodies encountered, subjecting the bits to severe shocks); a combination of the last two. This explains why a bit satisfactory at one mine may be a total failure at another. The ideal bit would successfully meet any of these conditions.

The most commonly used bit stock is a special grade, 70- to 90-point carbon, open-hearth steel, which will develop excellent physical properties when given the correct heat treatment. The heat treatment of any metal requires care to secure satisfactory results, and this is the reason that the haphazard methods of treating machine bits usually employed produce even more haphazard results. The common practice is to heat the bit to forging temperature, forge to the desired shape and then quench in a water or oil solution. Such a method can never produce a satisfactory bit, as a careful examination of the product of the average mine blacksmith shop will quickly reveal. Bits will be found to vary widely in quality. None of them will be good, for the following reasons: variation in bit temperature at the time of quenching; variation in the temperature of the quenching solution; and incomplete operation, for even if the quench had successfully hardened the bit (the only thing it could do), tempering by drawing to the proper state of toughness is necessary to prepare the bit for service.

"Disregarding the first objection, a consideration of the other two will make it clear that good bits cannot be made this way. Water usually is the quenching medium employed. Cold water has the highest quenching speed of any common solution, whereas hot and impure water will not cool a piece of steel much faster than air. . . . It is a popular idea that the mystic virtues of soap or some other doctoring agent added to the bath will cause the bit to develop a skin you love to touch or some equally intangible excellence. The truth is that any such addition to a water quench simply aggravates its inherent shortcomings." The most serious drawback to this treatment is seldom recognized; i.e.: some of the bits, particularly those quenched before the water is hot, are glass hard. Consequently, they break readily, but, what is more serious, they soon ruin every cutter-chain setscrew in the mine. No setscrew can be made which will bite into the hardened shank of a cutter bit. Incidentally, ruined setscrews are practically the only cause of losing bits while cutting. Many a coal salesman's headache over tramp iron in the screenings is directly traceable to the mine blacksmith shop.

"The third objection—that the operation is incomplete—deserves comment. A piece of carbon steel that has been properly hardened is brittle and must be tempered before it is fit for service. . . . Therefore, if the quench did harden the bit effectively, which it does not do, it would be necessary to properly temper it. Our experience indicates that it usually is better to allow the bits to air cool rather than to adopt such a method as the one just discussed."

"As stated before, ordinary bit steel, where properly heat treated, will develop excellent qualities, and it was after extensive tests had shown that these qualities would result in a good bit that we came to the conclusion that the most promising field for bit improvement lay in working out a practical system of heat treatment for ordinary steel," investigation having convinced officials that other metals and methods for increasing bit life were unsuitable and too costly under prevailing conditions. "In attacking the problem from this angle, however, several difficulties are encountered. In the first place, any heat-treating process designed to handle steel in quantities met in bit sharpening calls for an elaborate outlay of equipment, and the use of such equipment requires specialized operating skill. Then it is soon evident that heat treating a machine bit is not an ordinary job. If it were simply a problem of placing a batch of bits into a furnace, bringing them to the desired temperature, and then quenching, it would be comparatively simple. The objection to this method lies in the fact that in order to protect the setscrew the shank of the bit must be left unhardened. In other words, only the point can be heated.

"The bits we had treated to our specifications for test purposes were heated by immersing the points in a lead bath, a procedure we considered as impractical for the mine shop. It was after considerable investigation along this line that we finally dropped back to the old idea of hardening the bit from the forging heat, which led to the adoption of the successful system we now use.

"We heat our bits in an oil-fired Sullivan furnace and forge them in a Sullivan roller. The forging heat is considerably above the proper hardening temperature, and if a bit is quenched at this high temperature it will be very brittle due to its coarse structure. After the bit has been rolled, however, the temperature, particularly at the point, is reduced considerably, sometimes below the critical range, and we discovered that if a little time were allowed between rolling and quenching in oil, a bit of surprising merit resulted. What actually happens is that the forging and cooling action of the roller tends to refine the grain structure of the steel, which has been enlarged by the high temperature. The point of the bit, due to its smaller section, is cooled, often below the critical range, and if time is given the heat in the body of the bit will run out to the point, tending to equalize the temperature. If the proper time is given and the bit then quenched in oil of suitable quality, the bit will be found to be quite satisfactorily hardened. However, it still is unfit for use, due to its brittleness, and requires to be drawn to the proper state of toughness. The method we finally adopted is as follows:

"As the forged bit is discharged from the roller it falls on to a steel chain conveyor, which carries the bit to the quenching tank. This conveyor is timed to allow the bit to reach its most satisfactory quenching temperature. We have set this time at about 14 seconds. The quenching bath consists of a 50-gal. tank of quenching oil, equipped with suitable cooling facilities. The bits are caught in a basket inside the tank and when about 600 have accumulated the basket is lifted out by a chain hoist. The bits are dumped from the basket onto a drip pan to allow the oil to drain off. At this stage of the process the bits are hardened and, of course, are not at all suitable for use due to their brittle condition.

"Tempering is accomplished by placing the hardened bits in a bath of fusible salt at the correct temperature. This bath consists of a steel tank 16 in. wide, 26 in. long and 12 in. deep. The salt used becomes fluid at about 275 deg. F. Heat is supplied by an oil furnace. Another basket to fit this salt tank holds about 500 bits, which are dumped in after the oil has drained off. When the cold bits are immersed in the tank, the temperature of the salt drops about 150 degrees. The bits are allowed to "soak" in the solution until the temperature comes up to the required value, usually about 15 minutes. Temperature readings are taken from a thermometer immersed in the salt. As soon as the bits are hot enough (we draw them to 575 deg. F.) they are lifted out of the bath and allowed to air cool.

"The temperature to which the bits are drawn governs the hardness. It is of course desirable to leave the bits as hard as possible and yet keep down breakage of the points. The nature of the cutting determines the maximum allowable hardness. By drawing to 575 deg. we experience practically no breakage, although our cutting is very rocky, and the bits are called upon to withstand terrific shocks. We can take these bits and drive them through a ¼-in. steel plate without appreciable damage.

"The first thought that will occur to anyone experienced in metallurgy is that there will be a deplorable lack of uniformity in bits treated this way, due to the variation in the quenching temperature. While there is some variation in the condition of the bits, the poorest of them are far above the quality of the best we were making heretofore. Close examination of the finished bits reveals that the cutting points are nearly all very close grained. Farther back, the structure is coarser, due to excessive temperature at the time of quenching, but the bit section is heavier in this area and there is ample strength to support the point. While the process is crude when judged by fine-haired heat-treating theories (for which I have the utmost respect), it is practicable at the mine and produces results which are quite gratifying."

A trial of the system for over two years at the Dresser mine has been sufficient to give a definite check on results Mr. Hyslop pointed out. The bit machine is equipped with a counter to show the number of bits used, and all other necessary data for the calculation of the relative merits of the processed bits have been recorded. "We mine 1,500 tons of coal per day from a 4-ft. Indiana No. 5 seam. Formerly we used two untreated bits per ton of coal mined. Since inaugurating the heat-treated bits we have been using 1.06 bits per ton, a reduction of about 50 per cent. Our sharpening cost for untreated bits was $3.08 per thousand, while for the finished treated bit our cost per thousand is $3.63. The increase in cost per bit represents the cost of quenching oil, fuel oil and salt, which totals 35c. per thousand bits. Heat treating does not increase the labor cost per bit. Our bit-sharpening cost per thousand tons mined has dropped from $6.16 to $3.84, a saving of $2.32, or 38 per cent. Our consumption of bit steel fell off about 40 per cent. These figures were collected after about 250,000 bits had been made by the new method.

"The saving in sharpening cost per ton is a minor item compared to the other economies effected, which include 50 per cent less time for bit setting by the machineman, improved quality of screenings, greater life of the cutter chains and other parts of the machine and lowered power cost.

"The fact that the labor cost of sharpening is not increased by heat treating probably deserves some explanation. We use two men in making bits. One runs the machine while the other feeds the bit furnace, the men alternating at these jobs. Two men can roll an average of 500 bits per hour in this way. The man feeding the furnace has ample time to attend to the drawing furnace without neglecting his other duties. Formerly, we had an average of 300 bits per day which were so badly bent that they would not go into the bit machine without being straightened. This number has been reduced to not more than two bits per day. The treated bits do not require as much forging as did the others due to the fact that they are not dulled so badly. In fact, it would be quite practical to simply regrind a large percentage of the dull bits and put them back in service and still have a much better shaped bit than most reground hard-surfaced bits. It is therefore evident that the bit consumption has been decreased more than 50 per cent when the improved condition of the dulled bits is considered.

"In regard to the skill required in operating such an outfit, it is evident that some measure of intelligence is required of the blacksmith, as the forging temperature must be kept within a reasonable range, cold bits must be kept out of the system and a thermometer must be watched and read.

"Our experience has shown that the nature of the quenching oil is of considerable importance. Most oils lose their quenching speed after the temperature reaches a certain value. Some oils will thicken and sludge. In any case some means must be provided for dissipating the heat from the oil."

What's Yours?

Mining men, of necessity, must be familiar in some degree with a wide range of subjects, but most, no doubt, are particularly interested in some phase of operation, equipment or safety. Items in this department are designed not only for general use but also to answer particular problems confronting operating, electrical, mechanical and safety men charged with the duty of keeping mine activities running on an even keel. Your solutions to problems encountered in your own operation belong in these pages. Send them in. Include a sketch or photograph if it will help to make the item clearer. Coal Age will pay $5 or more each for each acceptable idea.

Leather Boxes Cut Bit Loss

Leather bit boxes have been adopted at the American Nos. 1 and 2 mines of the Knox Consolidated Coal Corporation, Bicknell, Ind., to prevent loss of bits and promote convenience in handling. These boxes are circular in shape, and are made of pieces of old leather belts riveted together as shown in the accompanying illustration. Advantages, as compared with metal containers, such as tin pails, are resistance to punctures,

These Leather Boxes Reduce Bit Loss at Knox Consolidated Mines.

ability to resume original shape after being crushed and resistance to overturning, due to the generous area of the bottom. All these factors combine to reduce the possibility of bit loss, and the type of bail, in addition, facilitates handling by the machine men.

Electric Shifter Moves Cars In Kathleen Yard

An electric locomotive has been employed to shift both loaded and empty railroad cars at the Kathleen mine of the Union Colliery Co., Dowell, Ill., since 1927. Prior to that time, two steam locomotives (one 31- and one 25-ton) were employed for this service and also for refuse-disposal. The latter is now taken care of by an aerial tramway. Bad water was the primary reason for adoption of the electric locomotive, which operates off an overhead trolley system.

The electric locomotive, furnished by the Goodman Mfg. Co., is equipped with two 120-hp. motors and weighs 25 tons. Railroad cars are handled under the tipple by gravity, but the level nature of the country made the construction of elevated roadbeds compulsory unless locomotives were employed. The present machine handles approximately 100 cars per day, working on both the empty and loaded side of the tipple, and has moved as high as fourteen loaded cars at one time. Maximum travel to the end of the loaded or empty tracks is about 1,800 ft., and the machine runs on a separate narrow-gage track.

Locomotive and Crew on the Loaded Side of the Tipple.

Interpoles Are Adjusted by Meter of 5-Volt Scale

Proper adjustment of commutating field strength of interpole generators, such as used in mine substations and direct-current power plants, was shown to be a relatively simple and easy job by L. W. Scott, electrical engineer, General Electric Co., speaking before a recent meeting of the New River & Winding Gulf Electrical & Mechanical Institute, Mt. Hope, W. Va.

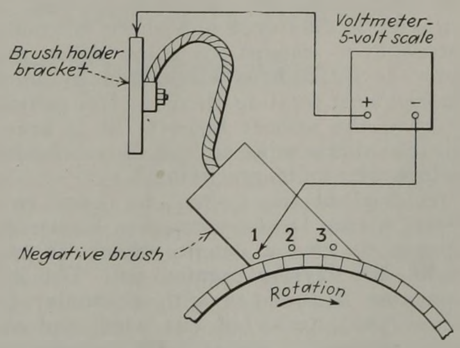


Fig. 1—Commutating Field Test at Full Load.

With brushes equally spaced around the commutator, the first step is to set the brushes on the no-load neutral. The generator may be of a type which carries tram markings—for instance, certain armature coils may be painted red and certain bars marked *T* and *B*. With the armature turned with red coils centered under commutating poles, the brushes should be shifted so the center is exactly over the

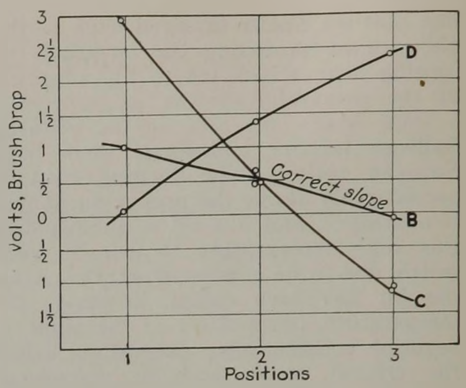


Fig. 2—Position Scale Refers to Contact Points Designated in Fig. 1.

center of the letters. Otherwise, with the machine operating at no load, the terminals of a milli-voltmeter should be placed on the commutator at the front and back edges of a brush and the brushes shifted until the lowest reading is obtained on the voltmeter. That is the no-load neutral point.

A water barrel rheostat, or other means of adjusting the machine current to full load, is necessary for checking the commutating field strength. To prevent boiling and undue current fluctuations the load per barrel should be limited to 200 amp. Salt water is used and the terminal plates should be of large size.

With the generator operating at full load the positive terminal of a voltmeter with 5-volt scale is connected to a negative brush-holder bracket, and the negative terminal of the meter then connected at the edge of the brush (Point No. 1, Fig. 1) close to the commutator and on the leading side of the brush.

The voltage reading at Point No. 1 is plotted roughly as in Fig. 2. If it is necessary to reverse the voltmeter leads for any reading, that reading is considered negative and the point is to be located below the zero line of the voltage scale of the graph. Next, voltage readings should be taken at Points 2 and 3 on the brush edge and these plotted also. The slope of the line through the three points indicates the degree of approach to a correct commutating field strength.

The line should slope slightly downward from Point 1 to Point 3, as does *B* in the figure. If the line slopes upward from Point 1 to Point 3 (line D) the commutating field is too weak and shims should be placed under the commutating pole pieces until a curve sloping slightly downward is obtained. If the line slopes rapidly downward from Point 1 to Point 3, as does *C* in the figure, the commutating field is too strong and shims should be removed from under the commutating pole pieces until the curve sloping slightly downward is obtained.

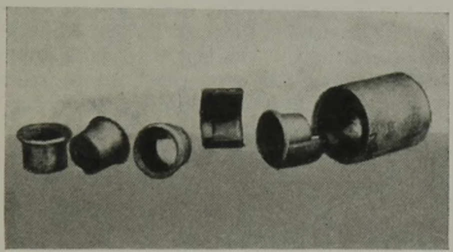
Mr. Scott said it is much better to add or remove shims to secure the correct field strength than to use a shunt across the field. Unless the shunt is wound on a core of iron and its inductance is in proper relation to that of the field winding, the proper division of current will not take place with sudden changes of load. The result would be exceedingly bad commutation and possibly a flashover.

Steel Ferrules Prolong Life Of Locomotive Flues

Little is heard in coal-mining circles about the maintenance of steam locomotives, primarily because these methods have changed but little during the past 25 to 50 years. Improvements are possible, however, as indicated by the experience of W. R. Talbot, who handles steam-locomotive maintenance at the mines of the Leckie Smokeless Coal Co., Anjean, W. Va.

Eight years ago Mr. Talbot developed a special ferrule for prolonging the life of locomotive flues, and since that time has never found it necessary to make a renewal due to thinning at the firebox end, which is where the ferrules are applied. Four steam locomotives are used on a six-mile haul from the mine portals to the headhouse, as follows: Vulcan rod type, two 20- and one 30-ton; Shay geared, one 35-ton. The Shay has $2\frac{1}{4}$- and the Vulcans 2-in. flues. Consequently, it is necessary to provide two sizes of ferrules.

The ferrule is a beaded nipple which fits inside the flue at the firebox end. It is



Four Ferrules and the Three Parts of a Beading Holder

not applied until after a flue has become thinned or its bead burned. After being pushed or driven into place with the bead firmly against the sheet, the ferrule is expanded in the same fashion as a flue end. When, after long use, a ferrule has become thin, due to being expanded a number of times, and the bead is partially or totally burned away, it is removed with a beaver-tail chisel and "cork-devil," and a new ferrule installed in the same manner as the original. The end of the flue suffers very little further damage in service after being protected with a ferrule.

Three ferrules are arranged in different positions at the left of the accompanying illustration to show their shape. The illustration also includes the special tool to hold the ferrule in a vise while it is being beaded. Either new flue stock or good sections of old flues are used in making ferrules. The first operation consists of heating the tube and swaging it down to the proper outside diameter to allow turning or grinding to final dimensions. For 2-in. flues in various states of wear, three sizes are made in the following finished diameters, $1\frac{11}{16}$ in., $1\frac{3}{4}$ in. and $1\frac{25}{32}$ in. All have an inside diameter of $1\frac{5}{8}$ in.

The holder used in beading consists of a heavy steel collar (extreme right in the illustration) and a split collar (also shown) that fits inside. The fitting surfaces are Morse tapers, and the diameters are such that the split collar goes in almost flush. This collar, which clamps around the ferrule, is made with a bottoming shoulder $1\frac{1}{2}$ in. from the top. The ferrule, which has been cut to a length of $1\frac{11}{16}$ in., is therefore held so that $\frac{3}{16}$ in. of its length projects above the split collar. This projection is then beaded over with an ordinary beading tool while the collar is held securely in a vise.

Another beading holder of different dimensions was made for holding the ferrules for $2\frac{1}{4}$-in. flues, as well as a special-sized expander to fit the inside of the ferrules, although it was possible that one could have been purchased on special order. Approximately one year is the life of a ferrule in the Anjean locomotives, and a few of each size are kept in stock for immediate application.

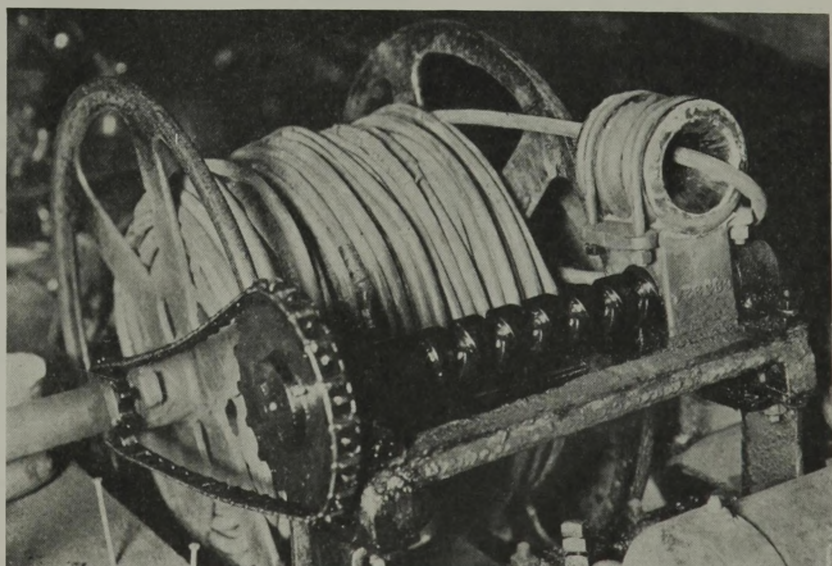
Automatic Spooler on Reel Truck Promotes Safety

Danger attends the used of a mining machine where the reel truck is not equipped with a level-winding automatic spooling device, particularly in low coal, where the helper's task of walking or running ahead of the machine to guide the cable onto the reel as the machine backs out of a room is both difficult and accompanied by the danger of being run over in case of a fall. For this reason, the trucks of the seven Type 12AA shortwall machines used by the Gauley Mountain Coal Co., Ansted, W. Va., recently were equipped with automatic spooling equipment devised by J. E. Morran, mine electrician.

The first effort to improve the truck was based on the use of a hand-operated device equipped with a lever which the operator worked with one hand while he kept the other on the controller. This was discarded, however, when a man was injured due to the cable tightening suddenly on a curve and jerking the lever against his side.

Now all of the machines are fitted with the new equipment shown in the accompanying illustration, which has proved its worth in several months' service. Most of the parts are from standard Jeffrey locomotive cable-reel equipment, supplemented by the purchase of the following items: two sprockets, chain, thread bar, nut and porcelain guide. The thread-bar bearings, ways for the traveling nut and brackets were made in the mine shop.

Mining-Machine Reel and Locomotive Spooler.

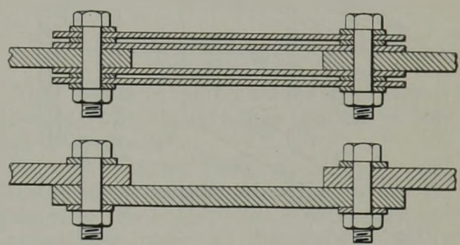


Fuse Burnouts

As an outgrowth of considerable grief from a series of fuse burnouts which recently occurred at his mine, W. G. Hageter, Meadowlands, Pa., makes the following observations:

"It had been the custom at this mine to replace a single 400-amp. filler with four 100-amp. fillers, using washers as spacers between fillers. An inquiry as to 'Why not a single filler instead of four of lower current-carrying capacity?' brought out the fact that none of that size were in stock. Furthermore, no particular person was charged with the duty of filling fuses, practically anybody undertaking this task who had a mind to.

"The writer then explained that four



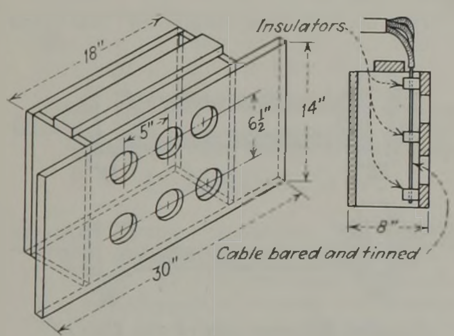
Graphic Comparison of the Use of Four Fillers or One Large Filler.

100-amp. fillers were not always equivalent to the current-carrying capacity of a single 400-amp. filler. This is due to the fact that a series-parallel circuit is formed, the current in each circuit (or filler) of which is proportional to the resistance opposing its flow. Because of the shorter and thus lower resistance through the fuse links adjacent to the copper terminals and because of the unequal resistance through the washers, bolts and contact surfaces, an unequal division of the load current between the four fillers in the fuses would be the natural result. Thus, while the load may have been well within the burnout value of the original 400-amp. filler, one or two of the fillers of this 'multiple' fuse circuit very probably carried the greatest share of it and, as a result, burned out, the others soon following.

"The writer at once perceived the necessity of either enlarging the fuse filler on the side that burned out most frequently or inserting a single 400-amp. filler. The first was considered too risky, so he chose the second. A supply of 400-amp. fillers was accordingly ordered, and he now feels that his troubles from that source will be eliminated permanently."

Nip Box Promotes Safety

To minimize the possibility of electrical shock or burns in attaching trailing cables, the safety nip box shown in the accompanying illustrations has been



Design of Nip Box.

adopted at the American Nos. 1 and 2 mines of the Knox Consolidated Coal Corporation, Bicknell, Ind. At these operations, all major equipment except locomotives operates on 240-volt alternating current supplied from portable transformer stations (see p. 3 of this issue) installed to assure adequate voltage in the various mechanical-loading sections. Three-conductor cables are installed for distribution.

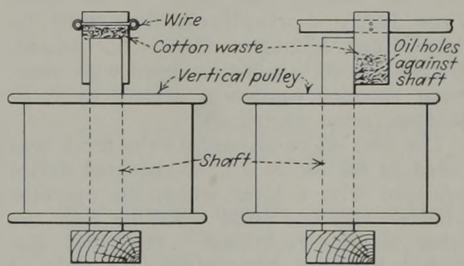
Nip Box Mounted on Posts Ready for Service.

The nip boxes are made of wood, as shown in the accompanying detailed sketch, and are fitted with insulators in which the three conductors, previously bared and tinned, are fastened. Jaw-type clamps are used on the trailing cables, and are inserted in the holes in the front of the box and clamped on the conductors. The boxes are nailed securely to posts at convenient points in rooms and on entries. An average of 25 nip boxes are used in a typical mechanical-loading section containing the following major equipment: one loading machine, one shortwall cutter, one post-mounted portable electric drill and one serving locomotive (d.c.).

Oiling Shafts of Vertical Pulleys

Tin cans after having served their original purpose may be employed in the construction of low-cost oilers for the shafts of vertical pulleys on rope haulage roads, writes Charles W. Watkins, Kingston, Pa. Two methods of using cans proposed by Mr. Watkins are shown in the accompanying illustration.

Where the cans are fitted over the shaft, the first step is to cut out completely one end and then punch a hole in the other for the introduction of the oil. A wire is run through the can about ¼ or ½ in. from the



Two Methods of Oiling Shafts of Vertical Rope-Haulage Pulleys

punched end. Before slipping the can over the shaft, a small wad of cotton waste is placed against the wire as shown, leaving a small chamber just under the oil hole. The hole facilitates oiling, it is pointed out, and the cotton waste insures a slow and even flow down the shaft.

In the other case illustrated, a number of small holes are punched in the bottom of the can, which is nailed to a supporting strip so that the side with the holes presses lightly against the shaft. Cotton waste is inserted to hold the oil. In addition, the can may be mounted above the shaft in cases where it does not protrude above the hub, the oil dropping into the hub.

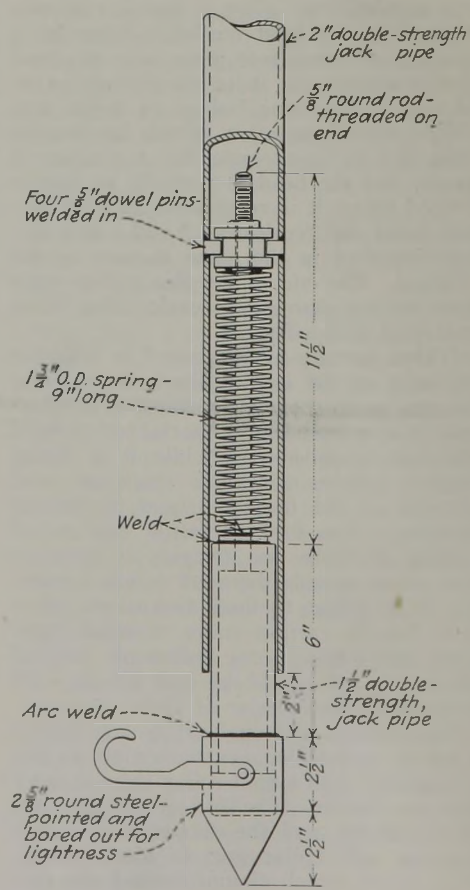
Safety Jack Pipe

Prevention of injuries due to falling jack pipes—many quite serious—was the principal reason behind an attempt to develop a spring-type safety jack pipe at the Zeigler (Ill.) No. 2 mine of the Bell & Zoller Coal & Mining Co. In addition to other lesser causes, a study of the reasons why jack pipes fall showed the following to be the major ones: incorrect length, condition of top, improper setting, and dropping of the point out of the hole when the rope is released. Working on the theory that some type of spring mechanism offered the best possibilities, Hector Hall, chief electrician, and the shop staff at No. 2 developed a spring-type pipe. Construction details of the latest model are shown in the accompanying figure.

The principal feature of the pipe is use of a plunger and hook on the lower end. This plunger works inside the main pipe against a coil spring and is free to turn entirely around, thus facilitating detachment of the rope and making it possible to get a straight pull from the cable eye. The latter prevents breaking the strands of the cable. When the pipe is set in place, a pull on the rope causes the plunger to slide up into the pipe against the pressure of the spring. Movement of the plunger is limited to 2 in., and when this limit is reached the pipe is to all intents and purposes solid, but with the additional feature that the spring is holding the top into the roof and the bottom into the floor. This prevents falling when the rope is released.

One feature—inherent in the safety characteristics of this type of jack pipe—is the increased time required to take it down, which is accomplished by digging out either the top or bottom point. Actually, however, removal requires less than one minute, tests have shown, and the danger of a blow on the head or back is eliminated.

Construction Details, Spring-Type Safety Jack Pipe



WORD from the FIELD

Business Maps Recovery Plans At White Sulphur Springs

Enactment of new emergency legislation to become effective upon the expiration of NIRA was recommended by the Joint Conference on Business Recovery, which met at White Sulphur Springs, W. Va., Dec. 17-19. The proposed law would be administered by a board of at least five members with power to approve or disapprove codes of fair competition in or affecting interstate competition voluntarily submitted by an association or group truly representative of a given trade or industry. This is in line with the recommendations made at the Congress of American Industry early last month (*Coal Age*, December, 1934, p. 505).

The life of the new law would be limited to one year. Continuance of present NRA codes or adoption of new ones would be conditioned upon the voluntary action of the respective trades or industries. Suitable code provisions covering maximum hours and minimum wages, prohibiting child labor and protecting both employer and employee by giving labor the right to deal either individually or collectively directly or through representatives of their own free choice would be mandatory. Either the administrative agency or the industry would have the right to terminate codes.

"In some natural-resource industries," said the conference, "conservation is a matter of great public concern and may require special treatment. These industries should be able to utilize such provisions of general legislation as outlined herein; but, since these provisions may not be sufficient to meet the needs of the industries and for the protection of the public interest, specific legislation should be considered to meet their requirements. Such legislation should follow the general principle that the further the actions thus approved extend into fields otherwise restricted or prohibited by law the greater the governmental supervision necessary to protect the public interest."

Permanent solution of the problem of unemployment, declared the conference, lies in the creation of confidence which will stimulate greater industrial activity. Balancing the federal budget ranks first in the list of confidence restoratives. The conference also recommended a thorough and sympathetic study of unemployment insurance and old-age pensions by business men so that action on social security measures could be taken on the basis of definite knowledge "and not merely upon a commendable desire. Unsound legislation at this time would prejudice the possibility of securing a satisfactory solution in the future." No plan of unemployment reserves, it pointed out, can be of immediate help in relieving the present situation, since there must be a considerable period for the accumulation of the necessary reserves.

Arbitrary labor legislation was condemned. Sympathetic strikes or walkouts, blacklists and boycotts, said the conference, should be prohibited. Modification of the Securities Exchange act to increase the flow of capital into legitimate private business enterprise also was recommended. This plus a sound real estate mortgage market and low construction costs to encourage rehabilitation and rebuilding would aid in the revival of the durable goods industries, which now account for 60 per cent of the unemployed. Government competition with private business was condemned.

The conference was called by the Chamber of Commerce of the United States and the National Association of Manufacturers. About 100 industrialists participated in the meetings, which had their climax in the statement of what business felt was necessary to promote sound and early recovery issued on the closing day of the conference. The subcommittee on NIRA was headed by Malcolm Muir, president, McGraw-Hill Publishing Co. C. E. Bockus, president, Clinchfield Coal Corporation, represented the mining industry on this subcommittee. J. D. A. Morrow, president, Pittsburgh Coal Co., also was a delegate to the conference and was made a member of the subcommittee on social security and relief which is studying the problems of old-age pensions and unemployment insurance.

As a result of the White Sulphur meeting, it was decided to make the conference a continuing body, with C. B. Ames, Texas Co., chairman.

COAL AGE was founded in 1911 by the Hill Publishing Co. In 1915 *Colliery Engineer*, with which *Mines and Minerals* previously had been consolidated, was absorbed by COAL AGE.

When, in 1917, the Hill Publishing Co. and the McGraw Publishing Co. were consolidated to form the present McGraw-Hill Publishing Co., COAL AGE became a member of this larger publishing enterprise. On July 1, 1927, the journal was changed from a weekly to a monthly.

During twenty-three years the editorship has been held successively by Floyd W. Parsons, R. Dawson Hall, C. E. Lesher, John M. Carmody and Sydney A. Hale. The editorial staff of COAL AGE consists of: Sydney A. Hale, R. Dawson Hall, Louis C. McCarthy, Ivan A. Given and J. H. Edwards.

Bituminous Legislation Still in Committee

While details were not released, the long-awaited report of the special legislative committee of the National Coal Association was submitted to the board of directors at a two-day session Dec. 6 and 7. Action was postponed to allow directors to study the proposals offered. At a second meeting, on Dec. 17, the board referred the proposals back to the committee with suggestions for changes to meet the sentiment of various members. Among the reported changes were elimination of a tonnage tax. On the other hand, the board is understood to have approved the general principle of compulsory correlation of prices, and to have favored strict price regulation while opposing allocation of production.

New Preparation Facilities

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

BELL & ZOLLER COAL & MINING CO., Chicago, Ill.; contract closed with Robins Conveying Belt Co. for construction of coal-washing plant at the Zeigler (Ill.) mines to cost approximately $600,000. Capacity of the new plant, to be equipped with Chance cones for all coal under 6 in., is 1,000 tons per hour. Construction will start immediately, and the plant will be in operation in July, 1935.

DOMINION STEEL & COAL CORPORATION, LTD.; extensive improvements now under way at Springhill, Nova Scotia, to handle coal from two existing parallel slopes, each serving a different seam. This coal will be brought to a preparation plant consisting of a rotary dump station, conveyor gallery to a four-track tipple and retail coal pockets. The tipple, with a capacity of 400 tons per hour, will be equipped with shaker screens, picking tables, mixing facilities and a box-car loader. Allen & Garcia Co. is in charge of design and the work is being handled by K. H. Marsh, chief engineer for the Dominion company.

NEW BYRNE COAL CO., Fairmont, W. Va.; contract closed with McNally-Pittsburg Mfg. Corporation for screening, picking and breaking equipment, including a shaker screen for separating 2x0-in. coal from 300 tons per hour of mine-run, a picking table for picking the 2-in. lump before breaking, 5-ft. Norton vertical-pick breaker for reducing the lump to 6-in. cubes or smaller and an auxiliary picking table for cleaning the coal after breaking. The equipment is arranged for bypassing the mine-run around the breaker.

PEABODY COAL CO., Chicago; contract closed with Link-Belt Co. for Link-Belt Simon-Carves washer for installation at the Taylorville (Ill.) operations of the company; capacity, 100 tons per hour.

National Resources Board Submits Program For Mineral Conservation and Use

PROPOSALS for the formulation of national policies and long-range planning for the conservation and effective utilization of the natural resources of the United States are embodied in a report of the National Resources Board submitted to the President last month. The report of the board, headed by Secretary Ickes, of the Department of the Interior, covers land, water and mineral-policy planning. Six major recommendations are made with respect to mineral policy:

1. That the federal government assist the mineral industries to attain economic stability in order that they may minimize waste of natural resources, maintain reasonable wage standards and protect investments.

2. As a means toward that end, the board recommends careful consideration of collective organization and action by these industries; industry control, under government supervision, of capacity, production, stocks and sometimes of prices; as guides toward the type of control adapted to different mineral industries, experience under NRA codes should be analyzed with care.

3. Before any type of control is authorized for any industry that industry should be required to accept whatever safeguards are required to protect the interests of consumers, wage earners and the nation's long-run interest in the conservation of its natural resources.

4. Since each industry presents problems peculiar to itself, an effort should be made to adjust whatever controls are authorized to these peculiar needs and opportunities.

5. The situation of stranded populations dependent on mines now closed calls for prompt attention.

6. To make its efforts increasingly effective, the government should promote scientific research relating to minerals, foster mineral technology and provide a permanent planning agency to consider problems of policy.

These recommendations are based upon a detailed report of the planning committee for mineral policy of the board. This report, a document of over 60 pages, has not yet been released for publication, but its conclusions are summarized in the report of the board itself. Special consideration and a unified policy for the guidance of the mineral industries, says the committee, are warranted because: (1) Minerals are exhaustible and non-reproducible; (2) the nation lacks an adequate supply of some minerals necessary for the national welfare, and (3) struggles with a surplus of certain others; (4) nature has settled the question of geographic distribution; (5) there are special hazards, both physical and economic, in mining; (6) closing a mine may result in losses far more serious than in closing a factory. "Laws that forbid collective action between competitors have promoted waste."

While complete exhaustion of the country's mineral resources is too remote to cause immediate concern, "the depletion of reserves to the point at which costs begin to mount rapidly is not far distant in some minerals and will handicap an industrial life that has been built upon an abundance of cheap mineral raw materials. Waste must be reduced and technology improved. Forecasts of consumption are necessary to prevent overexpansion of capacity—one of the major causes of instability and waste. The forecasting agency should be a government body, probably the Bureau of Mines, acting in cooperation with representatives of producers and consumers.

If production or price control is to be permanently effective, control of capacity also will be necessary. Among the suggestions which have been made to bring this about are: (1) guarantees of minimum employment to the miners by the operators: (2) that the Federal Securities Commission require promoters of new mines to publish full information on the economic condition of the industry; (3) Interstate Commerce Commission disapproval of the extension of railroads until public necessity has been demonstrated; (4) purchase and closure of marginal mines by the government with the cost to be defrayed by a tonnage tax, and (5) purchase of reserve coal lands along existing railroads to be set aside as a national coal reserve and to be financed by a tonnage tax. "These proposals are not specifically indorsed by the minerals committee, but are recommended as worthy of further study and consideration. If the coal industry really desires to check the expansion of capacity, the committee is convinced that the problem can be solved."

In dealing with those mineral industries which are burdened with a surplus plant capacity, the committee recommends: "(1) That the emergency provisions of the NRA codes for production control be continued in some form; (2) that in some cases, such as bituminous coal, provision for maximum and minimum prices also may be needed; (3) that action by Congress be considered establishing an agency to authorize control of production and capacity and, in special circumstances, of prices, where uncontrolled competition is found to result in serious resource waste, with all necessary safeguards for the protection of the mine workers and consumers. Such control, however, should not be permitted to "create monopoly profits or to subsidize inefficiency."

Federal work in the field of safety should be maintained and strengthened, says the committee, which also calls attention to the disparity between funds allotted to agricultural services and mineral services. Scientific, technical and statistical services should remain in, and some of the fact-finding services in other departments should be transferred to, the Department of the Interior. Fact-finding services, however, should be under separate direction from the administration of production control or mineral codes. Mineral-code supervision ultimately should be grouped under one agency to facilitate treatment of urgent problems of inter-industry competition, such as competition between coal and oil. An advisory coordinating committee made up of representatives of all federal agencies of mineral administration should be continued and a representative of this committee should sit on any general committee for natural-resource planning.

Supervision of plans for production control should be lodged either under a separate mineral division of a permanent NRA or under a separate mineral industry division of the Interior Department. "In the case of oil and coal, separate acts may be necessary to provide for special problems, such as crude oil quotas or purchase of marginal mines, but supervision should be placed under the same general auspices as other mineral codes. The important point, in the board's view, is to recognize that the special problems raised by the waste of irreplaceable resources necessitate separate consideration."

The program of the board also calls for "the systematic development of our water resources for purposes of sanitation, power, industrial uses, transportation, recreation, domestic consumption and other collateral uses on a far higher level than ever before." Seventeen specific projects are proposed for early study by the water planning committee. The goal of the board is "continuous long-range planning of land, water and mineral resources in relation to each other and to the larger background of the social and economic life in which they are set."

Who's Who in Planning

The National Resources Board is headed by Harold L. Ickes, Secretary of the Department of the Interior, with Frederick A. Delano, vice-chairman, and George Dern, Secretary of War; Henry A. Wallace, Secretary of Agriculture; Daniel C. Roper, Secretary of Commerce; Frances Perkins, Secretary of Labor; Harry L. Hopkins, Federal Emergency Relief Administrator; Charles E. Merriam and Wesley C. Mitchell as fellow members.

Secretary Ickes also is chairman of the planning committee on mineral policy, with C. K. Leith, chairman of the department of geology, University of Wisconsin, as vice-chairman. Other members of the committee are: Herbert Feis, economic adviser to the Department of State; J. W. Furness, chief of the minerals division, Department of Commerce; Lt. Col. C. T. Harris, Jr., ordnance department, U. S. A.; Leon Henderson, director, division of research and planning, NRA; W. C. Mendenhall, director, U. S. Geological Survey; F. A. Silcox, chief forester, Forest Service; Wayne C. Taylor, special assistant to the special adviser to the President on foreign trade; W. L. Thorp, director, consumers' division, National Emergency Council; J. W. Finch, director, U. S. Bureau of Mines. W. P. Rawles is technical secretary.

Coal Mining Institute of America Finds New Ways of Promoting Safety

VENTILATION ECONOMIES running into thousands of dollars, the work of the U. S. Bureau of Mines, the menace of government hydro-electric projects, conveyor mining, air shooting and safety in mechanized operations featured the 48th annual convention of the Coal Mining Institute of America, Fort Pitt Hotel, Pittsburgh, Pa., Dec. 5-6. Defining the percentage of the air sent into the mine by the fan that reaches the entrance of the splits just outbye the area to be ventilated as the quantity efficiency of the ventilating current, S. J. Craighead, State mine inspector, Johnstown, Pa., declared that at some mines this efficiency was as low as 10 and in some as high as 70 per cent.

The rest of the air is lost through doors, stoppings, curtain walls of shafts and outcrop holes. This loss imposes a burden on the fan, increases the quantity of air to be moved and, by requiring increased velocities, demands higher ventilation pressure and excessive power cost. The rule that pressure will vary as the square of the quantity delivered by the fan, Mr. Craighead explained, will not hold true between two mines of equal length of equally resistant roadway if one has several leaks and the other few, because air that leaks travels a shorter distance and causes less resistance. Table I, therefore, is not based on this rule, but the speaker, nevertheless, believed the figures used representative.

Stoppings soon deteriorate and give trouble. In one thin-coal mine in Pennsylvania, said Mr. Craighead, there are 917 brick stoppings along the main haulway and 492 in room entries, 32 brick overcasts and 65 brick door wing walls. In another mine where care has been taken to eliminate the need for crosscuts between intake and return, there are only seven stoppings in two miles of roadway. Surface breaks sometimes cause such a loss of air that recovery under shallow cover may well be delayed until later in the life of the mine.

How small airways and high velocities add to ventilation costs is shown in Tables II and III. Figures in these tables are based on a fan 65 per cent efficient, a 1c. per kw.-hr. cost and a friction coefficient of 0.000,000,01.

Where large barrier pillars are left, it is sometimes cheaper to drive new headings in them than to clean old ones. In the anthracite region, said Mr. Craighead, an effort is being made to put inlets and outlets for ventilating air currents at equal elevations so that the fan will have work more nearly equal in all seasons. On reversal of the fan in the correct direction, however, natural draft will aid ventilation.

Air, remarked R. Dawson Hall, engineering editor, *Coal Age*, need not be circulated but can merely be passed through a mine, splitting it as it goes and directing it to areas needing ventilation, but moving largely in one direction. This one-way, or "unidirectional," ventilation reduces resistance, eliminates many stoppings, shortens travel and makes it possible to use all airways in the direct path as intake. Where there is more than one point of exit or intake, the fan may be placed nearer the center of the immediate working area and the main road ventilated by a split from the main current.

Table II—Pressures, Velocities and Yearly Cost of Moving 30,000 Cu.Ft. of Air per Minute Through a 10,000-Ft. Heading

Size of Airway, Ft.	Velocity, Ft. per Min.	Pressure, In.	Yearly Cost, Dollars
14x7	306	0.77	367
13x6.5	355	1.12	532
12x6	417	1.67	793
11x5.5	496	2.59	1,230
10x5	600	4.16	1,976
9x4.5	741	7.02	3,336
8x4	938	12.63	6 002

Table III — Pressure and Yearly Cost of Moving Quantities of Air Through a 100,000-Ft. Airway of 60 Sq.Ft. Cross-Sectional Area

Velocity, Ft. per Min.	Quantity, Cu.Ft. per Min.	Pressure Water Gage, In.	Yearly Cost, Dollars
100	6,000	0.109	10.30
200	12,000	0.436	82.80
300	18,000	0.978	278.00
400	24,000	1.745	663.00
600	36,000	3.92	2,236.00
800	48,000	6.97	5,299.00
1,000	60,000	10.90	10,358.00
1,200	72,000	15.70	17,904.00

Leakage around fan drifts and shafts, he pointed out, may cause an immediate recirculation and prevent some of the air delivered or withdrawn by the fan from assisting in ventilation. These leaks often are larger than those near the heart of the mine.

The suggestion of E. A. Holbrook, University of Pittsburgh, that laws should specify the quality of air received rather than the quantity delivered was challenged by G. E. McElroy and Francis Feehan, U. S. Bureau of Mines, and by George Steinheiser and J. F. Bell, Pennsylvania mine inspectors, and Richard Maize, deputy Secretary of Mines, Pennsylvania. At present, contended Mr. McElroy, such laws would be unworkable because the industry lacks a rapid analytical method. Analysis varies greatly, added Mr. Steinheiser; for example, there is excessive contamination after shooting and the air cannot be adjusted accordingly. Volume, declared Mr. Maize, is the more dependable guarantee. Mr. Feehan felt that volume minima should be stepped up and suggested 200 cu.ft. per minute per man in non-gassy mines and 400 cu.ft. in gassy operations.

All breaks to the surface are not harmful, said Mr. Maize; if they are at the opposite end of the property, they may be of immense assistance. Mr. Hall agreed that, if the outflow is controlled in case of a force fan, they may be helpful at any point where workings to be ventilated lie in the course of the air to the opening. Pillars should be drawn, remarked Mr. Bell, so that the pillar lines will recede from the fan and not approach it.

Perhaps 95 per cent of the mines, stated W. L. Affelder, vice-president, Hillman Coal & Coke Co., are ventilated with fans installed for operation when the mine was at or near the largest development. Today, by changing gear and belt ratios, using smaller motors, or by resort to electrical resistance, these fans have been slowed down to suit the smaller volume of air now required. A large fan at a small mine involves great waste of power and should not be kept running to the bitter end. He had recently changed five fans to cater to declining mines and outputs and is saving their cost in less than a year while getting a volume as large as with the big fans.

Coal is a coming, not a waning, industry, asserted J. W. Finch, director, U. S. Bureau of Mines. Oil is but a brief incident in the history of the human race; Mark Requa had placed the life of the developed petroleum resources of the United States at thirteen years. In time, coal will invade the field of hydro-electric power, and diesel oil, which can be made from coal, will replace gasoline.

A symposium on the relation of the coal industry to the U. S. Bureau of Mines found P. T. Fagan, president, district 5, United Mine Workers, in a critical mood, while R. C. Beerbower, Goodman Manufacturing Co.; W. H. Glasgow, Secretary, Pennsylvania Department of Mines; J. V. Berry, supervisor of safety and compensation, Bethlehem Mines Corporation; W. R. Chedsey, State College, and Mr. Affelder praised the work highly. Mr. Fagan felt that too much of the Bureau's activity had been diverted from safety to industrial investigations. He took exception to accident statistics based upon production because such statistics ignored the fact that the tonnage per worker was increasing and thereby presented a false picture of improvement in safety.

Mr. Beerbower declared that the Bureau had done much to improve the safety of equipment in the presence of gas. A similar view was expressed by Mr. Affelder, who said it was impossible to estimate how many accidents have been prevented by the work of the Bureau. Preventive work was emphasized also by Mr. Glasgow, who asserted that the Bureau had been of great assistance to State inspection service in

Table I—Effect of Leakage on Yearly Power Cost

	Quantity Efficiency of System, Per Cent 40	50	60	70
Air at entrance of splits, cu.ft. per min	80,000	80,000	80,000	80,000
Air at fan, cu.ft. per min	200,000	160,000	133,000	114,300
Water gage, in	4.0	2.84	2.19	1.78
Horsepower required (fan efficiency, 65 per cent)	194.0	110.1	71.0	49.2
Kilowatt demand	144.8	82.2	53.0	36.7
Annual power cost at 1c. per kw.-hr	$12,680	$7,190	$4,640	$3,220

Table IV—Two Conveyor Installations

	First Instal-lation	Second Instal-lation
Seam thickness, in.	44	40
Room length, ft.	350	270
Room width, ft.	40	40
Pillar width, ft.	25	25
Average production per man-day, tons	12	9
Percentage of coal handled by conveyor	60	80
Props set between face and face conveyors	3	3
Rows of props in room	7	5

Table V—Screen Tests of Coal Broken Down by Explosives and by Air

Royalton, Ill.	Dislodged by Explosives	Dislodged by Air
6-in. lump	14.60	24.00
6x3-in. furnace	18.25	21.50
3x2 in.	11.45	8.65
	44.30	54.15
2x1¼ in.	7.75	9.40
1¼x¾ in.	9.80	10.35
¾x3/16 in.	15.75	8.60
3/16 in. and under	22.40	17.50
	55.70	45.85
	100.00	100.00
Little Betty, Linton, Ind.		
6-in. lump	9.3	19.9
4x6 in.	11.9	11.7
	21.2	31.6
1¼x4 in	43.8	39.4
1¼ screenings	35.0	29.0
	78.8	68.4
	100.0	100.0

outlining opportunities for greater safety.

American engineers, said L. E. Young, vice-president, Pittsburgh Coal Co., at the annual banquet, would do well to study the following aspects of European mining practice: (1) multiple shifting and the scheduling of work which provides for men arriving individually as need for their labor occurs; (2) concentration of production on long or stepped faces; (3) use of conveyors; (4) employment of diesel locomotives even in gassy mines; (5) use of alternating current in underground operations; (6) qualitative control of ventilation in the workings; (7) use of steel pipes to conduct air to the face; (8) use of steel for roof support; (9) analysis of roof movement along break lines, and (10) methods of training boys for underground employment.

The government hydro-electric program raises a real economic issue, declared Prof. Holbrook at the second day's session. Muscle Shoals cost $57,000,000 and, if a private investment, would be saddled with an annual interest charge of $3,400,000. A coal plant of equal capacity could be built at a cost which would involve $1,500,000 less interest and would put 1,000 more men to work in the coal fields. Completion of the Tennessee Valley program will require $1,000,000,000. Estimates on the St. Lawrence River project involve the expenditure of $350,000,000 or more to produce 6,500,000 hp., displacing 58,000,000 tons of coal annually.

During a question-box discussion on underground conveyors, Alexander Jack, State mine inspector, Pittsburgh, Pa., described two installations operating in a double-room system with reciprocating main conveyors. Flight conveyors in adjoining room and face deliver the coal to the main conveyor. Basic data on the installations are set forth in Table IV. In the first installation, rooms are driven and pillars drawn in 21 working days. The coal is clean, free of parting and not hard; the roof is generally good. Caving chambers and aircourses are driven by conveyors and advance 25 ft. per day. Entries are advanced by hand-loading directly into mine cars.

The second installation has seven men in a crew. The coal has a 1-in. binder, or mining slate, and quite frequently 4 in. of drawslate must be taken down. An extra conveyor is ready for operation when a place is finished. By keeping cutting equipment in one place, falls off flitting machines are eliminated. Electrocutions, however, sometimes occur when machines are trolleyed from place to place. During July, August and September, there were eighteen lost-time accidents at the first operation; four of these were on conveyors. At the second operation there were five lost-time accidents in three months; three of these were on conveyors.

Use of draglines, shaker and belt conveyors on development work at the Clearfield Bituminous Coal Corporation, said A. R. Long, mechanical engineer, has shown the following results: Number of cuts per 7-hour shift (two places), 4 to 6; actual heading advance per shift, 11 ft.; tons per man-shift, 12; tons per man-shift, installing conveyor, 75; tons per man-shift, maintenance, 75; man-hours for drilling, shooting and loading one linear yard of rock 33 in. thick, 3; advance per man-shift exclusive of superintendence and haulage, 1.10 ft. The work is in 3-ft. coal, driving an 18-ft. back heading and a 12-ft. main heading on 60-ft. centers with room necks every 50 ft. and crosscuts every 100 ft. Top rock is drilled with jackhammers and loaded with a duckbill.

Conveyors are essential in low places, for speedy development, and are highly advantageous in selective mining, according to L. H. Schnerr, division manager, Pennsylvania district, Consolidation Coal Co. Because of the speed of extraction, conveyors eliminate ties and frequently make timbering in butt headings unnecessary. Longer cars can be used because they do not have to enter rooms; room switches and room-neck timbering are eliminated; trouble with bonding the return is avoided; tonnage of gathering locomotives is increased and excessive gradients are eliminated.

Conveyor mining at Barnesboro was described in a paper by Richard T. Todhunter, general manager, Barnes & Tucker & Co., presented by Patrick Nairn, State mine inspector. Discussing the paper, abstracted on p. 19 of this issue, Mr. Nairn said that a line of props is set between the face and the conveyor before loading. Two faces will produce 240 tons in a 7-hour shift; 450 tons with double shifting. The system is operated in full retreat, because, if worked on advance, the floor clay will lift the conveyor. Falls are obtained after the first 60 ft. of the pillar is removed.

Eight lines of props are placed in drawing the pillar and, when a fall impends, more are set. Pillar work proceeds on the butt, room work on the face, although the pillar is drawn back on the face until trouble supervenes. The second room pillar is kept 30 ft. behind the first room pillar. Three days suffice for pillar extraction. No coal has to be double shoveled. A conveyor installation will cost $27,000 and save 14c. per ton.

Chain-type conveyors, said Mr. Schnerr, have been used for seven years at Consolidation mines. Such conveyors

Officers elected by the Coal Mining Institute of America for the ensuing year are:

G. W. Riggs, mine safety engineer, Uniontown, Pa., president.

G. S. McCaa, Pennsylvania State mine inspector, Pittsburgh, first vice-president; W. R. Chedsey, professor of mining, Pennsylvania State College, State College, Pa.; second vice-president; C. W. Pollock, general manager, Ford Collieries Co., Curtisville, Pa., third vice-president.

Directors for two years: F. B. Dunbar, general manager, Mather Collieries, Mather, Pa.; E. A. Holbrook, dean, school of engineering, University of Pittsburgh; J. J. Forbes, supervising engineer, safety division, U. S. Bureau of Mines, Pittsburgh; C. L. Lutton, safety director, H. C. Frick Coke Co., Scottdale, Pa.; M. L. Coulter, safety director, Clearfield Bituminous Coal Corporation, Indiana, Pa.

Director to replace L. W. Cooper, deceased, for one year, C. F. Keck, safety director, Jamison Coal & Coke Co., Greensburg, Pa. Other directors carried over from 1933 are: Newell G. Alford, J. V. Berry, Richard Maize and J. W. Paul.

Table VI—Accident Record at Wildwood Mine

	1930	1931	1932	1933	1934 to Date	1934 Over 1930 Improvement, Per Cent
Accidents reported	283	109	80	60	66	— 76.7
Lost-time accidents	237	62	23	17	24	— 89.9
Compensable accidents	117	37	12	13	18	— 84.6
Over-60-day accidents	20	9	6	4	4	— 80.0
Permanent partial disabilities	3	1	0	0	0	....
Permanent total disabilities	4	0	0	0	0	....
Fatalities	3	0	1	0	0	....
Frequency	329.22	81.55	35.54	26.22	32.65	— 90.1
Severity	61.16	8.64	10.99	1.72	1.38	....
Tons of coal per lost-time accident	3,226	11,653	26,818	31,335	21,563	+568
Tons of coal per compensable accident	6,535	19,527	51,401	40,977	28,750	+340
Hospitalization cost	$2,211.65	$984.00	$697.50	$682.75	$453.25	— 79.5
Medical cost	4,412.68	2,405.00	1,816.00	1,182.00	1,412.50	— 68.0
Compensation cost	54,946.15	8,338.33	9,794.00	2,003.62	1,903.17	— 96.5
Total cost	61,570.48	11,727.33	12,307.63	3,868.37	3,768.86	— 93.9
Cost per ton	0.08	0.016	0.019	0.007	0.007	— 91.0

get thin and cannot be repaired. Ten to twenty pans may have to be replaced monthly in the operation of 35 conveyors and the cost of these replacements may be slightly higher than would be the cost for room ties, but conveyors mean the elimination of deadwork. Some conveyors, remarked Mr. Long, will not last seven years. Accident frequency is less with conveyor than with hand loading, added Mr. Jack.

Compressed-air shooting was described by C. A. Herbert, U. S. Bureau of Mines, who gave credit for the first development in this field to the "Energy Air Miner" (see *Coal Age,* July, 1934, p. 281). This system uses a shell of seamless tubing 33¼ in. long and $\frac{6}{64}$ to $\frac{7}{64}$ in. thick. The pressure usually was from 6,500 to 7,000 lb. per square inch. Compressed air is delivered to the shell by a copper pipe. "Shots" are stemmed. With the new "Airdox" shell (see *Coal Age,* June, 1934, p. 241), holes are not stemmed. The standard shell is 51⅞ in. long and 3 in. in diameter, although larger shells are being made. This shell is fitted with a piston with an outlet port so curved that the air passing through it exerts an inward pressure which prevents the shell from coming out of the hole. Firing cost with these two systems is somewhat higher than with explosives, but the decreases in the percentages of small sizes affords a profit. This is illustrated in Table V. About ten shots are fired in 16 minutes.

Shells, continued Mr. Herbert, are inert till air is pumped into them, and no one is near when pressure is applied. Time is saved through the elimination of tamping. A 5-in. hole is drilled for a 3-in. shell. Because the coal is not greatly shattered, it cannot be readily loaded unless a machine that will dig the coal is used.

Danger from electrostatic sparks was suggested by S. P. Howell, U. S. Bureau of Mines, as likely to occur from the escape of compressed air. E. H. Johnson, Sullivan Machinery Co., said that the air tube might fail, but that it would not burst. The tube has a tensile strength of 30,000 lb. per square inch and the pipe is tested to withstand an air pressure of 20,000 lb. per square inch. As soon as the pipe gets stiff, it is annealed. Cost of shooting is about 33 per cent higher than with explosives. There are now seven air installations in Illinois and Indiana and one at the Philadelphia & Reading Coal & Iron Co.

Mechanized mining can be made safe, declared G. N. McLellan, safety engineer, Butler Consolidated Coal Co., in a paper covering much the same ground as an article by the same author appearing in *Coal Age* some time ago (May, 1931, p. 243). The statistical record was brought down to date in the figures summarized in Table VI. Up to April, 1932, no month went by without one or more disabling accidents, but Wildwood had four months during the rest of that year without such accidents and operated 184 days in 1933 without a disabling injury.

C. L. Lutton, safety director, H. C. Frick Coke Co., and retiring president of the institute, presided. Thomas Moses, president, H. C. Frick Coke Co., acted as toastmaster at the annual banquet.

Mining Congress Proposes Broad Program For Revival of Mineral Industries

A BROAD PROGRAM covering the steps and policies which the mineral industries believe are necessary for national stability and industrial revival was outlined in resolutions unanimously adopted at the 37th annual meeting of the American Mining Congress, Mayflower Hotel, Washington, D. C., Dec. 13-14. The major planks in this program are:

(1) Cooperation with the federal government in national recovery and national defense;

(2) Self-government for the mineral industries, with relaxation of the anti-trust laws to the extent necessary to make that self-government effective;

(3) Opposition to a 30-hour week and to the establishment of wage rates by government fiat;

(4) Indorsement of the right of workers to bargain collectively through representatives of their own choosing free from the imposition of the authority of any organization over all workmen in an industry and subject to the protection of employers and employees from mob law;

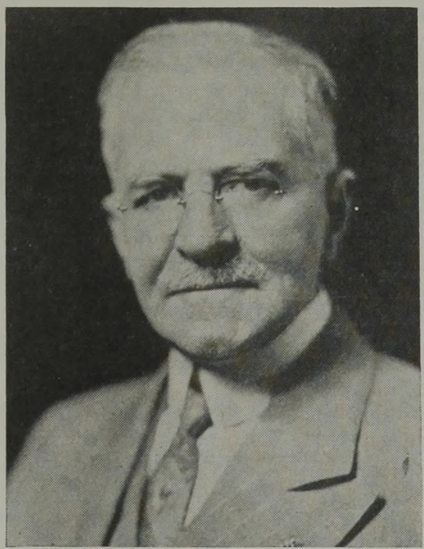
(5) Taxation for revenue only and not for a redistribution of wealth.

(6) Easing of debt burdens without cancellation of debts;

(7) Adequate government financial support for the U. S. Bureau of Mines and the U. S. Geological Survey;

(8) Elimination of government competition with private enterprise.

The resolutions also reaffirmed the conviction of the members that the country should hold fast to proved policies and constitutional government. Sec. 7(a) of the NIRA, it was stated, had added to the cost of mineral production. Expanding further its declarations on labor policies, the Congress held that maintenance of an 8-hour day was desirable and that imposition of a 30-hour week would be oppressive because of the seasonal character of some groups in the mineral industries.



James F. Callbreath

Who becomes secretary-emeritus of the American Mining Congress after serving as the mainspring of the organization since his first election as secretary in the summer of 1904. Mr. Callbreath, who will act in an advisory capacity to the Congress, gave up active duties because of ill health.

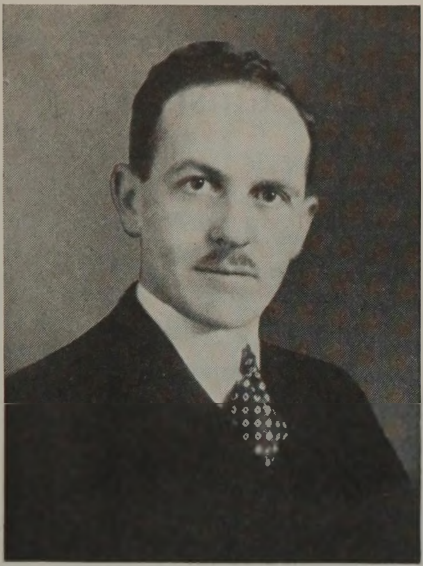
Mining industries, exclusive of gold and silver, with $12,000,000,000 capital, said Howard I. Young, president of the American Mining Congress and of the American Zinc, Lead & Smelting Co., at the opening session, are working only 15 to 60 per cent of capacity. Half of the 10,000,000 men reported idle are in the durable goods industries. Of the many proposals for putting these men back to work, the 30-hour week, asserted Mr. Young, is perhaps the most dangerous.

Production and consumption balanced in 1929 and 1930, said James F. Callbreath, secretary. In those years, the average work week was 48.4 hours. Had the hours been cut to 30, production would have been only about 65 per cent of consumptive demand. Such a shortage would mean not only hunger and inadequate clothing but also a runaway market. A four-day week of eight hours per day, declared J. G. Puterbaugh, president, McAlester Fuel Co., would be preferable to five six-hour days because of the loss of time in going underground.

At a luncheon to J. W. Finch, director, U. S. Bureau of Mines, Eugene McAuliffe, president, Union Pacific Coal Co., who acted as toastmaster, urged that Dr. Finch's appointment be confirmed by the Senate because the Bureau should be headed by a man with technical training. The director stated that the recent inactivity of the mineral industry had left an aching void in the country and had convinced the public that in large sections of the United States the miner is the backbone of prosperity.

"Business," said A. L. Deane, vice-president, General Motors Co., at the afternoon session, "has been busily engaged in laying off each other's customers." He outlined a plan for preventing depressions, recommending that whenever the monthly average of employment is below the long-term average, the pay of every eligible would be supplemented out of a national reserve fund by an amount equal to 1 per cent of each hour per week that the short-term average was below the long-term average. Thus, if the long-time average proves to be 40 hours per week and the monthly average is 36 hours and the employee receives $25 per week, the national reserve fund would add 4 per cent to the wage, making the compensation $26, thus increasing the employee's purchasing power.

Every employer would pay a payroll tax into this fund when an employee was employed in any six months' period (January to June, July to December) more average weekly hours than the long-term average, that tax being 1¼ per cent of the total pay of such employee for each excess hour above the long-term average. Thus, if he worked 43 hours a tax of 3¾ per cent would be paid. All eligibles unable to find private employment would be furnished preplanned work through government employment offices after a wait of 30 days. Payment of tax would make employers keep their hours of labor below the long-term average. This would tend to smooth off peaks which presage unemployment. Payment of supplementary compensation and work given to men laid idle would restore



Julian D. Conover

Who has been made secretary of the American Mining Congress. Mr. Conover resigned the secretaryship of the American Zinc Institute to accept his new post.

confidence and increase the velocity of money. In Mr. Deane's opinion, depressions should not be anticipated in calculating cost of meeting unemployment, because they will be averted if the action is automatic and immediate. His plan leaves wages and employee relations unaffected.

NRA is not perfect, admitted J. P. Williams, Jr., president, Koppers Coal & Transportation Co. and president of the National Coal Association, but it has done some good, because fair prices and wages and relief from the Sherman Act are imperative needs of the coal industry. Until the last century, remarked J. B. Putnam, Pickands, Mather & Co., at the third session of the convention, presided over by W. J. Jenkins, president, Consolidated Coal Co. of St. Louis, initiative lay with government. With the transfer of that initiative, the lot of the workman was vastly improved. Now government retakes the initiative and business is paralyzed. Both political parties have tried to squander the nation into prosperity; the public can endure no more major operations whether good or bad.

Improvement of the workers' status under our constitutional form of government also was emphasized by C. L. Bardo, president, National Association of Manufacturers, in presenting the recovery program of the recent Congress of American Business at the closing session of the convention. Mr. Williams, in an address read in his absence by John Battle, executive secretary, National Coal Association, stressed the freedom from strikes in the coal industry under the NRA régime. Appalachian Coals, Inc., he pointed out, was older than NRA and was approaching a solution of the problems of the industry when the government recovery program was launched. The National Coal Association battled not only for itself but also for the railroads and the taxpayers when it opposed the TVA and similar projects.

Mr. Young was reelected president. D. D. Moffat, vice-president, Utah Copper Co., becomes first vice-president; J. B. Putnam, Pickands, Mather Co., second vice-president; and D. A. Callahan, president, Callahan Zinc-Lead Co., third vice-president. J. R. Hobbins, vice-president, Anaconda Copper Mining Co., succeeds R. E. Tally, vice-president, United Verde Copper Co., as director. Other directors are Mr. Moffat, Mr. Putnam, Mr. Callahan, W. J. Jenkins, president, Consolidated Coal Co. of St. Louis; Paul Weir, vice-president, Bell & Zoller Coal & Mining Co.; D. B. Gillies, vice-president, McKinney Steel Co.; C. H. Crane, president, St. Joseph Lead Co.; A. B. Jessup, vice-president and general manager, Jeddo-Highland Coal Co.; A. E. Bendelari, president, Eagle Picher Lead Co.; C. H. Segerstrom, president, Carson Hill Mining Co., and Eugene McAuliffe, president, Union Pacific Coal Co.

Coal Proposes Electrification of Farms As Substitute for Hydro Program

CURTAILMENT of federal expenditures for hydro-electric development and substitution of a nation-wide program to electrify 6,000,000 farms was the bituminous industry's answer to increased agitation for extension of TVA and its blood relatives in December. The proposal for farm electrification was addressed to Secretary of the Interior Ickes on Dec. 10 by George J. Leahy, chairman of the Job Saving and Investment Protection Bureau for the Coal Industry. Adoption of the plan, declared Mr. Leahy, will take a million people off the welfare lists throughout the country and give permanent employment to several hundred thousand men.

"The government's present hydro-electric program of building unnecessary facilities will eventually cost more than $4,000,000,000, put more than 200,000 persons out of work and electrify only a few hundred thousand farms over along period of years," Mr. Leahy said. "The coal industry's program of widespread electricity from present sources of supply would put nearly 600,000 men to work instead of eliminating 200,000 persons and would electrify 6,000,000 farms instead of a small number. We have recommended to Mr. Ickes that a committee be appointed from representatives of the coal industry, railroads, utilities and the federal Public Works Administration to discuss the possibilities of such a gigantic program."

Data marshaled by Mr. Leahy to support his proposal include the following: only 710,299 farms, or 11.3 per cent, are electrified; 43,000,000 people are now living on unelectrified farms; capital investment in transmission lines, $445 per farm, or a total of $2,000,000,000; cost of wiring homes and barns, $292 per farm, or a total of $1,628,000,000; cost of appliances (washing machines, refrigerators, vacuum cleaners, toasters, milking machines, etc.), $1,000 per farm, or approximately $4,500,000,000; total expenditure for completing rural electrification without additional generating facilities, approximately $8,128,000,000; labor required—construction of transmission lines, 200,000 man-years; wiring houses and barns, 370,000 man-years; manufacturing appliances, 6,222 man-years; total, 576,222 man-years.

Completion of the present hydro plan might provide the benefits of electrification to approximately 2,000,000 people, whereas the general distribution plan would provide benefits to twenty times that number. Complete electrification also would make it possible to reduce present rural rates possibly 50 per cent and provide rates equal to if not below TVA yardstick rates. While rural income in TVA territory averages approximately $100 per year, average income of farms throughout the United States is several times greater. Considering this fact, it still would be necessary to develop a financing program to assist appliance purchases. A broader distribution of income, particularly in the lower brackets, is necessary for recovery. General farm electrification would be of greater value in reaching this objective than the present policy of developing huge hydro-electric projects without market for the power produced and with appended irrigation projects having capital charges per acre sufficient to work hardship on farm settlers in competition with farmers on natural farm land.

Energy consumption by farms not now served with electricity would aggregate 5,000,000,000 kw.-hr. annually, Mr. Leahy pointed out. This load could be absorbed at the present time by surplus generating capacity without extra equipment, but if additional generating capacity should be required to handle increased industrial and urban loads resulting from expansion in general business activity, construction of additional low-cost steam plants or addition of boilers and turbo-generators to present plants would be simple.

Should all of this additional electricity be generated from coal, it would require the consumption of 188,000,000 tons additional annually. Approximately 70 per cent of the electricity today is generated from coal. Assuming only 50 per cent of the additional farm load is produced by coal, 94,000,000 tons per year additional would be required, giving steady employment to 117,500 miners, in addition to thousands of men in allied and service industries. Railroads, at an average freight rate of $1.50 per ton, would receive $141,000,000 per year for transporting this tonnage, of which $78,960,000 would go to 52,600 additional employees. Present hydro-electric projects actually give only temporary work to 50,000 people, and these and probably 200,000 coal miners, railroad men and others would be unemployed upon their completion. In contrast, the general electrification program would provide permanent employment for 200,000 men, taking from 750,000 to 1,000,000 persons off the relief rolls.

TVA, as in past months, held the center of the stage in the conflict over the government's hydro program. Following a series of reverses in legal tests, TVA on Dec. 14 urged three municipalities in northern Alabama to build their own distribution systems as a result of delays in the authority's attempt to purchase facilities of the Alabama Power Co. serving fourteen communities in the region. The mayors of the three cities in question—Sheffield, Tuscumbia and Florence—immediately announced their intention of completing at once PWA loans for construction of distribution systems. The cities had previously voted construction of plants, but had held plans in abeyance while TVA conducted negotiations for purchase of Alabama Power facilities.

Legal operations against TVA largely marked time until late in December, when Federal Judge Grubb, Birmingham, Ala., who denied a TVA motion to dismiss a stockholders' suit for an injunction against the sale of the northern Alabama properties of the Alabama Power Co. on Nov. 28, set the date for final hearing for Jan. 28. In addition, Alabama coal and ice companies prepared to take a recent decision of the Alabama Public Service Commission approving the sale to the State courts.

Entrance of the public-utility industry of the country into the fight against TVA through the medium of the Edison Electric Institute brought that organization a sharp rebuff from government officials in December. Contending that a joint conference between the power industry and the administration would go farther toward solving the problems of the industry than "governmental competition and strangulation," T. N. McCarter, president of the Institute, in a memorial presented to the President on Dec. 17, requested that the government cooperate in a friendly test of the constitutionality of the government's power program, as exemplified by TVA, before the Supreme Court. This request was tartly rejected in a statement issued by the Federal Power Commission, to which the memorial was referred by the President.

Bureau of Mines Value Stressed In A.M.C. Pamphlet

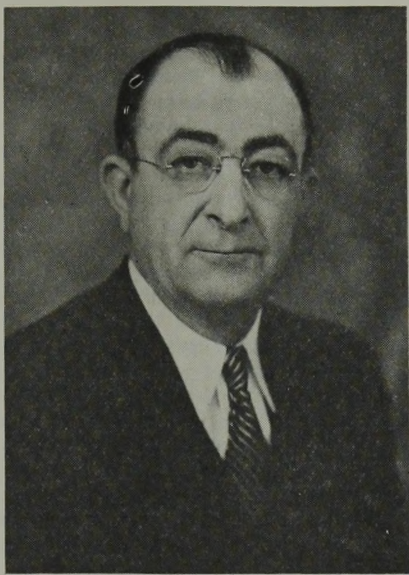
To bring home to the general public the value of the mining industry and the U. S. Bureau of Mines, the American Mining Congress brought out last month "The Unseen Empire," a pamphlet prepared by the National Committee on the Rehabilitation of the U. S. Bureau of Mines. The committee is headed by Eugene McAuliffe, president, Union Pacific Coal Co. Pointing out that minerals are the source of half the nation's wealth, the booklet estimates the book value of the capital investment in the mineral industries at twelve to fifteen billion dollars. Taxes on mines (1924-28, inclusive) were $800,064,024; agriculture, $151,251,405. The mining appropriation, on the other hand, was $10,627,887, while agriculture got $509,322,580. Coal mining alone gives employment to more men than any single manufacturing industry, and two out of every three counties in the United States produce minerals.

Turning to the safety work of the Bureau, the pamphlet points out that from 1906 to 1910 there were 84 mine disasters claiming 2,484 lives; between 1931 and 1934, the number of disasters was cut to 15 and the loss of life to 230. But in spite of this record, the Department of Agriculture was allotted $49,123,282 for the present fiscal year, while the Bureau of Mines received only $1,197,926. Moreover, the Bureau of Mines has been saddled with the tasks of other federal agencies which are covered by this appropriation, yet have crowded out mining work of the most vital importance. Figures for the current fiscal year show that 119 federal units, including both regular and "emergency" agencies, have appropriations larger than the Bureau; only six have smaller.

Safety the Underlying Theme of Proceedings At Indiana Institute Meeting

HEAT treatment of machine bits, the use of the hitch drill from the standpoint of safety and efficiency in timbering and the place of the electric cap lamp and protective clothing in the prevention of injuries were the major topics discussed by Indiana operating men and delegates from other States at the annual meeting of the Indiana Coal Mining Institute, held at the Hotel Deming, Terre Haute, Ind., Dec. 15.

Comparative costs before and after installing heat-treating equipment for machine bits were offered by William Sharp, supply clerk, No. 48 mine, Peabody Coal Co., Cass, Ind., in opening the discussion on a paper on heat-treated machine bits by James Hyslop, assistant superintendent, Dresser mine, Walter Bledsoe & Co., Terre Haute, abstracted on pp. 32-33 of this issue. These costs are summarized in Table I, and the saving in bit steel alone, said Mr. Sharp, was sufficient to pay for the installation of the heat-treating equipment.



P. L. Donie
President-Elect,
Indiana Coal Mining Institute

The Taylorville district offers the hardest cutting in Illinois, declared J. W. Starks, superintendent, Langley No. 9 mine, Peabody Coal Co., with the result that the number of sharpenings for four mines is 2,500,000 per year. Low-carbon steel heated in a Miller furnace, forged in a Sullivan sharpener and water-quenched, he felt, is most economical in the long run. When starting operations in the morning, the chill should first be taken off the quenching water to prevent undue hardness and subsequent breakage of the first bits sharpened.

Until 1929, crossbars at the No. 8 mine of the Binkley Mining Co., Clinton, Ind., were supported either on wooden legs or in holes hitched into the ribs with picks, said F. M. Schull, general superintendent, in discussing the hitch drill. Maximum depth of pick-cut hitches was 6 in., and, in addition to the cost, the hitches were unsafe because they were too shallow. As for legs as a means of supporting crossbars, a number of bad falls were experienced as an aftermath of wrecks. Also, wooden legs could not be counted as permanent timbering, due to susceptibility to rot.

Casting about for a better system of timbering, two types of hitch drills were considered, but were rejected because of high first cost and inability to stand up under ordinary mine service. Consequently, it was decided to build a machine at the mine, which later was patented. Essentially, the drill consists of a truck carrying a turntable mounted on a baseplate which can be slid crosswise to extend the reach of the drill. The turntable carries the drill proper, which is mounted on the end of a boom and is driven through a sprocket and chain from a gear-and-pinion reduction connected to a 25-hp. motor.

The boom is raised and lowered manually, and is supported in the desired position by a screw jack. A 7-hp. tramming motor is installed for moving the machine. Average speed of the drill is 120 r.p.m. Drill steel 1¼ in. square is attached to the 2½-in. splined threadbar by a heavy socket sleeve, and one or more intermediate sections may be similarly added to extend drill reach. The boring end of the drill consists of a pilot auger forged on the end of the drill steel and an 8-in., or longer, rectangular block, depending upon the size of hole desired. The block is attached to the drill steel by a setscrew. Ordinary cutting-machine bits are inserted in the block, and the drill is held in position by a horizontal telescopic jack.

Two holes, one on each side of the entry, can be drilled without changing the position of the machine, Mr. Schull pointed out. When the first hole is completed, the drill is placed on the free end of the threadbar, the boom is moved to the opposite side of the place, the horizontal jack is set, rotation of the drill is reversed and the second hole is started. This way, "no time is lost feeding out the threadbar or swinging the drill through a 180-deg. arc, which is necessary when drilling can be done on only one end of the threadbar." Only in moving is the turntable revolved.

Timbering after the hitch drill can be done in several ways. One is to drill a 36-in. hole on one side of the place and an 18-in. hole on the other. The crossbar is inserted in the deeper hole, raised to position and pulled back until it strikes the bottom of the 18-in. hole. In timbering across room necks on breakthroughs, the collar bar rests on pegs or pins of 90-lb. rail concreted or braced in holes approxi-

Table I—Comparison of Ordinary and Heat-Treated Machine Bits

Bit Steel:	August, 1933–March, 1934, No Heat Treatment	March, 1934–Nov., 1934, Bits Heat Treated
Cost of bit steel, cents per pound	3.85	2.75
Pounds used	15,000	5,292
Total cost of steel	$577.50	$145.53
Sharpening and machine repairs:		
Cost of sharpening labor	$651.40	$450.62
Cost of mining machine repairs	$4,140.71	$1,504.44
Total cost of sharpening and repairs	$4,792.11	$1,955.06
Tons produced	224,810.60	166,622.95
Cost per ton	$0.0213	$0.0113

mately 5 ft. deep. About 12 in. of the rail protrudes.

"I am of the opinion," Mr. Schull stated, "that it would be more economical to do all timbering with pegs, allowing the long bar which parallels the entry to rest on two or more pegs and placing the crossbars on top of these bars flush with the roof. Especially would this be true in rooming entries, or short-lived entries, where these bars would all be of uniform length and could be recovered easily and safely. For those who still prefer the wooden crossbar, the hitch holes can be drilled any size desired. Also, in timbering bottoms with large I-beams, hitch holes of corresponding size could be drilled to receive the ends of the beams. The possibilities of this machine are not limited to timbering, as it has drilled a 24-in. hole through a chain pillar 20 ft. thick. I am of the opinion that holes drilled at short intervals, especially in the chain pillar in main headings, would give you a firmer chain pillar and eventually make for greatly improved ventilation with resultant economy.

"At present, we have two machines at our No. 8 mine and one at No. 10 mine. We have timbered approximately 8 miles of entry with these machines at approximately one-third the cost of timbering under the old method. Not only has it proved more economical and safer to timber in this manner, but we have been able after a shutdown of six months' duration to run a haulage locomotive to a parting two miles from the bottom in 30 minutes. This is something that could not have been accomplished under the old method of timbering."

In using the hitch drill in a rock tunnel, drilling had to be done in sandstone, which forced a redesign of the cutter head to obtain more cutter points in a smaller space, said Wright Gaston, mine manager, Walter Bledsoe & Co., Terre Haute. This was accomplished by forging out a star-shaped head having four points and the pilot bit, but drilling a hole only 6 in. in diameter. The smaller bit, however, is better in any kind of drilling, but difficulty was encountered in getting the cuttings out of the hole. Therefore, augers were constructed of 2-in. double-strength pipe with 2-in. strap iron welded on spirally, which proved satisfactory. The cutter head is welded to the auger, which is made in 3- and 6-ft. lengths. The pin system of timbering has been found better, Mr. Gaston declared, because bars are more easily replaced or recovered.

A hitch drill was installed two or three years ago at the mines of the Templeton Coal Co., reported H. A. Keenan, general superintendent, Sullivan, Ind. Both hand-hitching and legs had been tried at these operations. With the former, it was difficult to get a satisfactory hitch, while the legs quickly rotted out. With the hitch drill, four to five times as much timbering can be done as by hand, and the hitches give no trouble. One mine hitched by hand is now being gone over and pins installed in the ribs. No further work, it is expected, will be necessary during the life of this mine.

Detailing experience at a Pennsylvania mine, Jack Patterson, Binkley Mining Co., Clinton, declared that very bad roof conditions forced the erection of 1½ miles of brick wall along a double-track haulage road to support crossbars. In laying a 228-ft. turnout, bricks required totalled 15,000 to 16,000, the laying of which cost $18 per thousand. With the drill, the same turnout could be drilled in two days. Chippers, he reported, were used in places where the drill could not be employed. Average per chipper was four hitches per shift; with the drill, 30 to 36 per shift. Entries were crooked, requiring slabbing, and with the drill the holes could be drilled to the proper depth and the crossbars set in place before slabbing. Cost with the hitch drill is much less, he stated, but even if it were equal, use of the drill would still be an advantage from the safety standpoint.

Mr. Schull also pointed out that the drill could be used to advantage in installing bulkheads or seals by lowering the head and drilling a series of holes, each one breaking into the next.

Citing the recommendation of the U. S. Bureau of Mines that portable cap lamps for illumination should be of the permissible electric type because of freedom from danger of igniting explosive gas and dust, Henry Thies, Portable Lamp & Equipment Co., Dugger, Ind., also called attention to the greater light intensities available. The brightest electric lamp of today, he pointed out, has an average intensity of 9 mean candlepower over a distribution of 130 deg., a beam candlepower of 45 and a light flux of 32 lumens, all at the 6th hour of burning in a 12-hour discharge cycle. Since the NRA, the Bureau of Mines has given manufacturers and operators the option of using a 10-hour bulb, which increases the light flux to about 40 lumens at the 6th hour. These figures Mr. Thies compared with 18 lumens for the average carbide lamp; 4½ cp., or 18 lumens, for the early electric lamp: and ⅜ cp., or 3½ lumens, for the flame safety lamp.

Study under actual operating conditions, said Mr. Thies, indicates that the improved electric lamp will likely bring about fewer and less severe injuries than open lights, due to the steady and controlled light of the electric lamp. In support of this conclusion, he offered the following results of an individual study: carbide lamps, 400,000 man-hours of exposure, severity rate 43½; electric lamps, 474,000 man-hours of exposure, severity rate 4⅛. "It is believed that these figures are fairly representative of the relative safety of open and closed lights in mines, in so far as the ordinary types of accidents are concerned, and in addition no mine fires or explosions have ever been caused by permissible electric cap lamps."

Turning to protective headgear, shoes and goggles, Mr. Thies cited reports of the West Virginia Department of Mines for the period January to August, 1934, showing the number of injuries that could have been prevented had protective equipment been worn to be as follows: preventable eye injuries, 334; head injuries, 105; toe injuries, 163. These figures, he contended, show the value of protective clothing, not only in the prevention of suffering but in savings in compensation.

Protective clothing was one of the first subjects considered by the Knox Consolidated Coal Corporation, Bicknell, when it started its safety program, said Peb G. Conrad, superintendent. Now, No. 2 mine is 98 per cent safety hats and 80 per cent shoes; No. 1, 85 per cent hats and 65 per cent shoes. One result has been a reduction of more than 75 per cent in head injuries. Hats and shoes are sold to employees at cost on a deferred payment plan which gives the men as long as desired to pay. Introduction of goggles still is in the preliminary stages, largely because of difficulty in finding a satisfactory type. The company is now experimenting with the spectacle type, but has found the closed goggles to be desirable under certain conditions. When nailed safety shoes are purchased, an insulating insole is recommended.

With present-day electric lamps giving around 55 beam candlepower and a light flux of 32 lumens, it is not surprising "that these types are being used for efficiency when they originally were developed for safety," declared N. L. Muir, junior safety instructor, U. S. Bureau of Mines, Vincennes, Ind. "It is a well-known fact," he continued, "that lack of illumination is a contributing factor to mine accidents, and it is reasonable to assume that the modern electric cap lamp, which gives a uniform light of twice the illuminating power of the carbide lamp, should be a factor in accident reduction."

The protective hat, said Mr. Muir, offers not only protection against head injuries, but also against electric shocks. Serviceable, comfortable shoes are now available for prevention of foot injuries due not only to falling coal and rock but also to tools and materials being handled. Shoes with insulating soles also protect against shock. Eye injuries from flying materials have been a great problem. Danger comes not only from the original injury but also from the possibility of a spread of infection from amateur attempts to remove foreign bodies. Mesh or screen goggles first used were never entirely satisfactory, which condition resulted in the introduction of the shatterproof glass at a reasonable figure. This offers the possibility of corrective lenses at a slight increase in cost.

The type of lighting is a question which affects the safety of every man in the mine as a group, while hats, shoes, etc., affect, in general, the safety of the individual only,

Officers and executive board members were elected as follows at the annual meeting of the Indiana Coal Mining Institute in December:

President—P. L. Donie, vice-president, Little Betty Mining Corporation, Vincennes.

Vice-presidents — B. H. Schull, general manager, Binkley Mining Co., Clinton; H. P. Smith, vice-president, Princeton Mining Co., Terre Haute; and C. A. Herbert, supervising engineer, U. S. Bureau of Mines, Vincennes.

Secretary-treasurer — Harvey Cartwright, commissioner, Indiana Coal Operators' Association, Terre Haute.

Executive board—H. G. Conrad, general superintendent, Knox Consolidated Coal Corporation, Bicknell; R. A. Templeton, vice-president, Templeton Coal Co., Sullivan; Thomas W. Faulds, superintendent, Jackson Hill Coal & Coke Co., Terre Haute; H. A. Cross, superintendent, Dresser mine, Walter Bledsoe & Co., Terre Haute; Paul Carey, Hercules Powder Co., Terre Haute; S. M. Cassidy, superintendent, Saxton Coal Mining Co., Terre Haute; and James White, superintendent, Peabody Coal Co., Sullivan.

declared John Hessler, Terre Haute. Mr. Hessler introduced the electric light into Indiana. In addition to the safety in gas feature, he offered the following additional advantages for the electric light: releases no poisonous or explosive gases; insures the miner a light when he needs it—important not only from the standpoint of safety but also efficiency; requires no attention, thus enabling the man to devote all his time to his duties; and offers a measure of protection from contact with live wires.

Installation of electric lamps must be accompanied by improvements in ventilation, said Wesley Harris, president, Bicknell Coal Co. Electric cap lamps are being used in a new mine opened in April, and have resulted in a noticeable increase in safety, efficiency and cleaning of coal.

"Not so much pressure on the miner and more on the condition of the mine" was the theme of an appeal for a variation in the usual approach to safety by John A. Garcia, president, Allen & Garcia Co., Chicago. Instead of placing the most of the responsibility on the miner, management might better spend money to put its property in such condition that it will be practically impossible for a man to get injured in the normal course of events, supplementing this with a revision in supervisory methods directed toward the same end.

Research Officers Elected

John C. Cosgrove, Johnstown, Pa., president, West Virginia Coal & Coke Corporation, was elected president of Bituminous Coal Research, Inc., at an organization meeting in December. Other officers were chosen as follows: vice-presidents, L. W. Householder, vice-president, Rochester & Pittsburgh Coal Co.; R. H. Sherwood, president, Central Indiana Coal Co., Indianapolis, Ind.; and J. W. Carter, president, Carter Coal Co., Washington, D. C.; treasurer, Col. W. D. Ord, Alexandria, Va., president, Empire Coal & Coke Co.; assistant treasurer, C. C. Crowe, National Coal Association, Washington, D. C.; secretary, Oliver J. Grimes, Washington, D. C.; assistant secretary, V. V. Wade. The executive committee is composed of Mr. Cosgrove; Douglas Gorman, president, Cumberland Coal Co., Baltimore, Md.; and Charles G. Berwind, vice-president, Berwind-White Coal Mining Co., Philadelphia, Pa.

A subscription of $3,000 to the organization was announced by the Eastern Bituminous Coal Association early in the month. Payment was to be made in monthly instalments of $250 each, beginning with December.

Pierce to Manage Kingston

Management of the Kingston Coal Co., Kingston, Pa., one of the oldest and largest independent operators in the northern anthracite field, was taken over by James H. Pierce & Co., Scranton, Pa., early in December. The company operates two collieries, one of which, Kingston No. 4, will be continued in operation with 800 men. Gaylord colliery, Plymouth, employing 220 men, will be closed because of market conditions.

Ask Code Amendment to Halt Price Cutting; Pittsburgh Discards Adams Plan

ANNOUNCEMENT of public hearings on proposed amendments to the bituminous code to check price cutting, which John L. Lewis, president, United Mine Workers, charged was endangering maintenance of code provisions, continued assurances that the natural-resource industries in general and bituminous coal in particular would receive special treatment in proposed code revisions now under consideration by the NRA and notice that western Pennsylvania producers were abandoning the "Adams plan" of price correlation Dec. 31 were highlights in bituminous code developments in December. Retail developments were characterized by continuation of the flood of approvals of cost determinations by a special NRA committee, which a minor number of disapprovals. Attention in the wholesale trade was centered largely on the long-standing question of allowances for commissions.

With the president of the United Mine Workers calling on the NRA for action to forestall a breakdown in the bituminous price structure and consequent encroachment on wages and hinting at direct measures by the union itself in the absence of satisfaction, the ensuing flurry of activity resulted in the proposal of amendments by both the NRA and the industry. Arguing that the breakdown of the price structure was a violation of the understanding between the operators and the government, and that this virtually resulted in the operators tearing up their contract with the union, Mr. Lewis charged various illegal practices were being indulged in to sell coal below minimum prices. One practice which he particularly singled out in his letter to Division Administrator Wayne P. Ellis was the dating of contracts beyond the present coal year at greatly reduced prices, ranging from cuts of 30c. to $1 on slack to $1.50 to $2 on steam and gas sizes.

The amendment proposed by the operators is directly addressed to the question of contracting at reduced prices, and was submitted in behalf of the following code authorities: Division I—Northern West Virginia Panhandle, eastern Pennsylvania, northern West Virginia, Southern No. 1, Southern No. 2, Ohio and Michigan subdivisions; Division II; Division III; and the Arkansas-Oklahoma subdivision of Division IV. The text of the amendment, proposed to replace Sec. 1, Art. VI, is as follows:

Sec. 1. The making of a contract to sell, whether for immediate or future delivery (regardless of the dates specified for the making of deliveries), or the sale of coal under the fair market price thereof, determined as hereinafter provided, is hereby declared to be an unfair competitive practice and in violation of this Code. In order to determine such fair market prices, agencies shall be established as hereinafter provided. It shall be proper in determining such fair market prices to take into consideration the purposes of the National Industrial Recovery Act, the minimum rates of pay herein established, the furnishing of employment for labor, and also competition with other coals, fuels, and forms of energy or heat production.

The NRA proposal, designed to replace Secs. 1, 2, 3, 4 and 5 of Art. VI, has substantially the same purpose, but also includes provisions for determination of minimum prices by agencies of NIRB. The text of the amendment is as follows:

Sec. 1. No producer shall sell, or offer to sell, or make any contract to sell, coal at any price less than the fair market price thereof, determined as hereinafter provided, at the date of the offer, sale or contract to sell, as the case may be, provided that any violation of this Sec. 1 shall be an unfair competitive practice and a violation of this Code.

Sec. 2. An emergency has arisen within the industry adversely affecting small enterprises, wages and labor conditions, tending toward monopoly and other acute conditions which tend to defeat the purposes of the Act. The determination of stated minimum prices for coal until and including June 16, 1935, is necessary to mitigate the conditions instituting such emergency and to effectuate the purposes of the Act.

The National Industrial Recovery Board, through such agencies as it may designate, shall investigate costs and thereafter shall proceed to determine and publish such stated minimum prices.

Both amendments were scheduled for discussion at a hearing on Jan. 4 at the Commerce Building, Washington, D. C.

Abandonment of the Adams plan by western Pennsylvania, with its possibility of competitive price cutting, was held in many quarters to have been a major factor in the emergency action on price provisions in December. Declaring that "operation of the present plan under which prices proposed by various subdivisions and protested by other subdivisions are considered by the Board of Review . . . does not satisfactorily carry out the policies and purposes of the bituminous coal code," the western Pennsylvania subdivisional code authority gave notice in a resolution approved Dec. 12 that the plan would be abandoned on Dec. 31.

As a substitute, the western Pennsylvania group proposed that on or before the 20th of the month minimum prices and regulations for the succeeding month be drawn up by the subdivision and copies mailed to the presidential member and code authority and marketing committee chairman of every other subdivision in Division I, and to the deputy NRA administrator, the same procedure to be followed for changes in prices and regulations for publication on other than the first day of the month. Protests by other subdivisions would be made direct to the issuing subdivision, whereupon it would be the duty of the presidential members of the subdivisions to arrange promptly for a conference of the representatives of both sides to compose their differences, "where practicable. In the event of failure to compose such differences, if any, the prices shall become effective on the date proposed for their publication.

"There is expressly reserved to each subdivision," the resolution continued, "the right to publish on the same effective date prices deemed necessary to meet schedules of prices proposed by any other subdivision. Nothing herein contained shall be construed to limit or impair the right of each subdivision to establish schedules of minimum fair market prices for all markets in conformity with the provisions of the Code of Fair Competition for the Bituminous Coal Industry and the National Industrial Recovery Act, and the right to review such prices and regulations shall be exercised by the NRA only for the purpose of giving effect to the policies and principles expressed in said code and act."

Long-standing speculation as to the future of NRA is expected to be replaced by concrete proposals of fundamental new policies from both industry and influential recovery officials at a series of hearings on the operation of major code provisions and advisability of amendment and continuation starting at Washington on Jan. 9. The hearings were announced by S. Clay Williams, NIRB chairman, on Dec. 17, and the Jan. 9 session will be devoted to price control and price fixing. While the subjects to be considered will be selected by the NIRB, the hearings will be limited to the general aspects only "and there shall be no consideration . . . of the advisability of amending or modifying any particular code."

In announcing the subject for the first hearing, the board declared that its present position with respect to price fixing is "that in the usual case it is inconsistent with the most effective functioning of our industrial system to have in or under codes of fair competition price fixing in the form of permanent schedules of minimum prices, with or without mandatory costing systems for the purpose of establishing minimum prices," but "that the board recognizes the value of permissive cost systems, emergency price provisions and the dangers to the economic structure or destructive price cutting. It also recognizes that minimum prices may be proper for the normal operations of certain types of industries, but, in such cases, government supervision and control would naturally tend to be increased."

Further reassurance to coal men is contained in a statement by W. A. Harriman, NRA Administrative Officer, that the NIRB opposition to price regulation does not extend to the natural-resource industries. Specifically, coal need not fear that its detailed price schedules will be dropped, said Mr. Harriman.

Climaxing a long dispute over the questions of statistical forms, statistical information, including copies of contracts, invoices, orders, etc., is being filed by all subdivisions in Division I, western Pennsylvania excepted, according to word given out last month. The latter was directed to begin gathering this statistical material at once by NRA representatives. Regarding material for use in the Adams plan of price correlation, it was agreed that statistical information regarding production will be furnished by all subdivisions but that the question of percentages for each subdivision, as well as captive-tonnage rulings, will be clarified.

Enforcement activities in December were featured by the entrance of a number of consent decrees against operating companies and by a conference between representatives of Southern Subdivision No. 2 of Division I and federal authorities in an effort to initiate legal action against a number of code violators, particularly in eastern Kentucky. With the consent of the defendants, permanent injunctions restraining the Leckie Coal Co., Columbus, Ohio; Buchanan County Coal Corporation, Big Rock, Va.; and the Panther Coal Co., Hurley, Va., from violation of the price provisions of the bituminous code and from the issuance of misleading advertisements were entered in the U. S. Court for the Western District of Virginia on Nov. 28. On Dec. 20, criminal information charging violations of the price provisions of the wholesale code was filed in the U. S. Court for the Eastern District of Kentucky against the Kentucky Home Coal Co., a wholesaler.

In Illinois, the Morgan Coal Co., operating two strip mines near Belleville, depicted the bituminous code as unconstitutional, tyrannical and favoring racketeering and monopoly in an answer to charges that it had cut prices on sales to truckers filed in the federal court at East St. Louis. The same court early in December dismissed charges that the Illinois Coal Co., Belleville, had cut prices upon agreement of company officials to consent to an injunction restraining them from selling below established prices.

Enforcement activities in Colorado were given a fillip by an announcement that the decision in favor of Ballard Gearhart, Palisades, would be appealed to the U. S. District Court. The lower court had previously refused to convict on charges of sales in interstate commerce at prices under those established by the bituminous code. A general meeting of the Division V code authority on enforcement was held in Salt Lake City, Utah, in December, after which representatives departed for Washington to discuss the question with federal officials. This meeting also brought about a clarification of the question of relative authority over price approvals, the Utah subdivision yielding to the divisional authority on its contention its schedules were not subject to review by the divisional authority.

New Mines Enter Lists

A marked quickening in activity in opening new mines and revising old operations to increase production was noticeable in December. In northern West Virginia, the newly organized Monongahela Rail & River Coal Corporation, of which H. W. Showalter, Fairmont, W. Va., is president, started preparations to open up 1,500 acres of Pittsburgh coal through the old Eureka mine, rechristened Emily, on the Monongahela River. Equipment already has been purchased and production will start Feb. 15. Contemplated capacity is 600,000 tons per year. About 400 men will be employed. The preparation plant includes shaking screens and picking tables for preparing any size desired. The Continental Coal Co., Pittsburgh, Pa., is expected to handle the output of the mine, which can be shipped over the Monongahela, Baltimore & Ohio, New York Central or Pennsylvania railroad or on the Monongahela River. The mine is located at the head of deep water and will be served by the largest barges on the river.

Presaging eventual development of 12,000 acres of coal land in Greene County, Pennsylvania, on the Pennsylvania-West Virginia border, the St. Paul Coal Co., Pittsburgh, Pa., a part of the estate of the late H. C. Frick, is reported to have purchased the old Har-Mar mine of the Warner Collieries Co., in Cass district, West Virginia, and 600 to 650 acres of coal from various owners. This move, it is reported, will furnish the company with a connection between its Pennsylvania acreage and the Monongahela R.R. and River.

H. C. Frick Coke Co. is reported to have exchanged 233 acres of coal in Washington County, Pennsylvania, for an equal acreage in Fayette County, between Uniontown and Brownsville, belonging to the Connellsville Central Coke Co. This exchange gives the Frick company an outlet to the Allegheny River, and the tract obtained from the Connellsville Central company will be worked out through the Filbert and Footedale mines and loaded over the Palmer Dock. The Hillman Coal & Coke Co., with which the Connellsville Central company is affiliated, will work the acreage obtained from the Frick company through its Gibson mine.

The H. E. Harman Coal Corporation expects to begin shipments from a 12,000-acre tract in Buchanan County, Virginia, in the near future, according to reports current last month. Annual capacity is expected to be 1,000,000 tons. Preparation facilities are nearly completed and housing facilities for employees have been provided.

Additional developments in the Buchanan field (*Coal Age*, August, 1934, p. 302) are forecast by the application of the Norfolk & Western Ry. for permission to build 38 miles of new track east of Grundy. The application has been indorsed by the State of Virginia and little opposition is expected from the I.C.C.

Other new operations reported in December include: Boggs Run Coal Co., new shaft mine employing 50 men in Marshall County, West Virginia; W. M. Richardson, mine employing 50 men in the Blair seam, Wise County, Virginia; Red Jacket Consolidated Coal & Coke Co., proposed operation at Rittermine, Wyoming County, West Virginia; Green River Valley Coal Co., improvements at the Bowne mine, Spottsville, Ky., to increase output to 2,000 tons per day; Cane Creek Mining Co., Bankhead, Ala., installation of equipment started in Bankhead No. 2 slope in anticipation of production early in 1935.

Personal Notes

W. H. Cooke, electrical superintendent, West Virginia Coal & Coke Corporation, Omar, W. Va., has resigned to become superintendent of power for the Jewell Ridge Coal Corporation, with headquarters at Richlands, Va.

J. P. Peabody, general manager, has been elected president of the Rocky Mountain Fuel Co., Denver, Colo. Mr. Peabody succeeds Miss Josephine Roche, who resigned to accept the post of Assistant Secretary of the Treasury.

William G. Caperton, Charleston, W. Va., vice-president of the Slab Fork Coal Co., was reelected president of the Smokeless Coal Operators' Association of West Virginia at the annual meeting in New York, Dec. 10. Other officers were again chosen as follows: vice-presidents, R. H. Knode, Philadelphia, Pa., president, Stonega Coke & Coal Co., and Capt. E. C. Page, Philadelphia, president, Crozer Coal & Coke Co.; treasurer, H. R. Hawthorne, New York, vice-president, Pocahontas Fuel Co.; secretary, Holly Stover, Washington, D. C.

Edward Graff, general manager, New River Co., Macdonald, W. Va., was chosen president of the New River Coal Operators' Association at the annual meeting in Mt. Hope, W. Va., last month. WILLIAM G. CAPERTON, Charleston, W. Va., vice-president, Slab Fork Coal Co., was elected vice-president, and P. M. SNYDER, Mt. Hope, president, C.C.B. Smokeless Coal Co., was reelected treasurer. S. C. HIGGINS, Mt. Hope, was again chosen secretary and traffic manager.

A. W. LAING, Charleston, W. Va., vice-president, Morrison Coal Co., heads the list of officers reelected at the annual meeting of the Winding Gulf Operators' Association, held at Beckley, W. Va., in December. L. T. PUTMAN, general superintendent, Raleigh-Wyoming Mining Co., Beckley, was chosen vice-president. P. C. GRANEY, general manager, C.C.B. Smokeless Coal Co., Mt. Hope, was elected secretary-treasurer, and HAL M. SCOTT, Beckley, was chosen assistant secretary.

Anthracite Club Banquet

The fifth annual banquet of the Anthracite Club of New York will be held at the Hotel Astor, New York, Jan. 17 for members of the club and representatives of producing and selling companies engaged in mining and distributing anthracite. The principal address will be delivered by James J. Farley, Postmaster General, and it is expected that James A. Moffett, FHA head, or a representative of that agency, will discuss the future activities of the organization. Charles Dorrance, president, Penn Anthracite Mining Co., will be toastmaster.

Hart Reorganization Approved

A reorganization plan for the Hart Coal Corporation, operating four mines at Mortons Gap and Madisonville, Ky., was approved by Federal Judge Charles I. Dawson, acting under provisions of the federal bankruptcy act, Dec. 13. Preferred stock, according to the reorganization plan, will take the place of certain bonds and notes of the corporation; common stock aggregating $77,500 is provided for, old common to be retained and canceled; new bonds totaling $458,500 will be issued; and wage claims will be paid in full. Unsecured claimants, according to the plan, will receive preferred stock.

Stoker Manufacturers Elect

J. R. Whitehead, manager, stoker and research divisions, Fairbanks, Morse & Co., Chicago, was elected president of the Stoker Manufacturers' Association at the annual meeting in Cleveland, Ohio, Dec. 10. Other officers were chosen as follows: vice-president, R. B. McClave, president, McClave-Brooks Co., Scranton, Pa.; treasurer, Harry H. Kurtz, Iron Fireman Mfg. Co., Chicago; secretary, Marc G. Bluth, executive secretary, Committee of Ten—Coal and Heating Industries, Chicago. Mr. Kurtz was continued as the association's representative on the Committee of Ten, and the organization unanimously voted to contribute a substantial sum to help support the committee's activities in 1935.

Board Issues "Collective Bargaining" Orders; Sporadic Strikes in Anthracite Field

TWO Southern coal companies received orders from Division I—South Labor Board in December to negotiate collective bargaining agreements with their employees. The Fordson Coal Co. was directed on Dec. 13 to meet with officials of the United Mine Workers "or any other representatives the workers may select" on or before Jan. 1, 1935, for the purpose of "negotiating in good faith a collective bargaining agreement." The board acted on petitions filed by the United Mine Workers. The company operates mines at Hardy, Stone and McVeigh, Ky., where, according to the findings of the board, a potential strike exists. Fordson officials admitted that "a substantial majority of the employees are members of the U.M.W.," but only two brief meetings were granted to employee representatives, neither of which could be construed as an attempt to negotiate a collective bargaining agreement. Failure to comply, the board ruled, violates Sec. 7(a) and 7(b), NRA, and Art. 5(a) of the Bituminous Coal Code. Correspondence with the Fordson company, the board stated, disclosed that it did not wish to sign the Williamson district agreement because the wage scale was lower than Fordson was paying and because it did not wish to be a "collection agency" for union dues.

The McKell Coal & Coke Co., operating in Fayette County, W. Va., received an order from the same board on Dec. 15 instructing it to negotiate an agreement with the United Mine Workers. Evidence submitted to the board disclosed that 401 of the 480 miners employed by the company were members of U.M.W., but it made no effort to bargain with union representatives.

Other labor board decisions included:

Sec. 7 Violation—U.M.W. Local No. 6418 asked Division III Labor Board to order collective bargaining at the Alabama Fuel & Iron Co. mine. Other issues were involved in the original petition, and a charge of violation of Sec. 7(a), NRA, and Art. 5 of the Bituminous Coal Code was added as an amendment. On this ground the company moved that the case be dismissed because of irregular pleading. The board held that the procedure before it was largely informal, that pleadings are not required to meet the standards of court pleading and denied the company's request that a new complaint be prepared. The board ruled that the company had violated Sec. 7(a) and also Art. 5 of the code.

Separate District Denied—Division V held that it had no authority to comply with the request of the Weber Coal Co., Grass Creek Coal Co. and J. H. Roberts that a separate district be established under the Code for the Coalville (Utah) area.

Orders Compliance With Working Provisions—The Weber Coal Co. and Grass Creek Coal Co. were ordered to adopt the wage scale and seven-hour day and five-day week provided in the code.

Hours—Assistant Mine Manager—Employment of an assistant mine manager seven hours a day seven days a week laying track and acting as mine examiner in the Crown mine, Louisville, Colo., was found to be not in violation of the code. It was shown that the mine has a dangerous roof, that the assistant was often ordered to inspect portions of the workings three or four times in a single shift, and that rock falls and other dangerous conditions occurred so often that his activities might be classified as work in prevention of accidents.

Orders Probe of Code Violations—Convinced from evidence submitted that the coal code is being violated in Routt County, Colorado, Division V has empowered James Morgan, a member of the board, to cooperate with Arthur Vail, Presidential member, Divisional Code Authority, in investigating mines in that area with reference to all coal code violations.

Discharge and Reinstatement—A driver discharged by the Bair Collins Coal Co., Roundup, Mont., after an accident in which a mule was killed was ordered to be reemployed and to receive ten days' compensation at driver's rate.

Sunday Night Shift—Employment of a Sunday night shift in the Klein mine of the Republic Coal Co., Roundup, Mont., when it is to be operated the following day was allowed by the board. The company contended that it was necessary for these men to make a thorough inspection of approaches and working places and do such work as may be required in order to start work safely and efficiently the following day, and that they were not engaged in the actual production of coal.

Need Not Sign for Tools—In a controversy between District 27, U.M.W., and the Montana Coal & Iron Co. over a requirement by the company that men employed at day work at the Smith mine, Washoe, Mont., sign for tools they receive from the company, the board held that the employees should not be required to sign for the tools.

Nine-Hour Pay—J. D. Acuff, Presidential member of the Bituminous Coal Labor Board, Division III, and member of the National Bituminous Coal Labor Board, ruled that employees of the power plant of the Union Pacific Coal Co., which furnishes electricity for use in the mine and markets a part of the power commercially, came under the coal code rather than the regulation of utilities. He declined to place an interpretation on the contention of the employees that under the Executive Order of March 31, 1934, which reduced working hours from eight to seven, they should be paid for nine hours' work while employed on one of three shifts of eight hours each.

The Progressive Miners of America won a point in its struggle with the United Electric Coal Cos. in Illinois when Judge Fred L. Wham, in federal court at East St. Louis, on Dec. 21, denied the coal company a restraining order against interference by the Progressives with operation of the company's strip mine at Freeburg, Ill. The company signed a contract with the United Mine Workers, despite the fact that a majority of its men were avowedly favorable to the Progressive union. Judge Wham held that the company, in refusing to deal with the Progressives, violated the public policy clause of the Norris-LaGuardia Act.

A decision on the constitutionality of the

NIRA in the case of the Hart Coal Corporation and 33 other western Kentucky operators will not be forthcoming for 90 days by the Circuit Court of Appeals in Cincinnati, Ohio. The constitutionality of the act was attacked by Judge Dawson, in the U. S. District Court at Louisville, Ky., in an opinion covering his issuance of a temporary injunction against the U. S. Attorney for the Western district of Kentucky, who then took an appeal to the federal court at Cincinnati, which remanded the test case on Dec. 14 to the trial court for completion of the record.

A National Guard unit was called out Dec. 8 to preserve order in Harlan, Ky., where clashes threatened between U.M.W. organizers and an opposition group. William Turnblazer, president of District 19, U.M.W., and other union representatives reported that they were "hemmed in" by armed men at a hotel and that it would not be "healthy" for them to leave. The situation eased when Turnblazer and his aides were escorted out by troops, but the union official said that "Harlan County will be organized."

A strike at the Bevier mine of the Rogers Coal Co., Greenville, Ky., was terminated Dec. 13 after three days' idleness. The men walked out when the company refused to discharge two non-union men employed at the mine, one as a blacksmith and the other as a timber boss. The company contended that its contract with the U.M.W. provided that in case of a dispute between the union and the company the matter be submitted to arbitration, the mine being kept running meanwhile. A clause calls for a penalty of $2 a day for each miner violating this provision. The company plans to invoke the penalty, it is said.

Three strikes—two of them of short duration—were the chief developments in the anthracite labor situation in December. Employees of Jeddo No. 4, Jeddo No. 7 and Ebervale collieries of the Jeddo-Highland Coal Co., at Hazleton, quit work Dec. 11, contending that the company should hire unemployed men instead of working the regular men overtime. The strikers returned to work Dec. 15, after a meeting at which it was decided to submit the grievance to the conciliation board. A walkout involving employees of Nos. 5 and 7 operations of the Susquehanna Collieries Co., at Nanticoke, who quit work Dec. 22 because of alleged unsettled grievances and a powder dispute was settled Dec. 24 and the men returned to work three days later. Two Glen Alden Coal Co. collieries were closed and three others were crippled by a general strike called by the United Anthracite Miners of Pennsylvania on Dec. 27. Alleged rate cuts, discrimination and excessive car topping were charged by the insurgents.

Obituary

Joseph D. Lumaghi, 73, president, Lumaghi Coal Co., operating mines at Collinsville, Ill., died Nov. 27, at his home in St. Louis, Mo., after several months' illness. Born in Collinsville, where his father founded the Lumaghi company in 1871, he joined the organization at the age of 18. He became secretary-treasurer of the company in 1884 and president in 1932. He also was treasurer of the Williamson Coal Co. of Illinois and a director of the Monsanto Chemical Co. and the Laclede-Christy Clay Products Co., both of St. Louis.

Thomas P. McQuade, mechanical engineer of the Ben Franklin Coal Co., Moundsville, W. Va., and a son of M. J. McQuade, Pittsburgh, Pa., president of the company, died Nov. 30 as the result of an explosion in the mine.

Stephen L. Yerkes, 54, president, Grider Coal Sales Agency, Inc., Birmingham, Ala., died Nov. 30 in a Cincinnati (Ohio) hospital, after a long illness caused by an eye injury sustained while on a hunting expedition. Born in Danville, Ky., and educated at Centre College, he joined the engineering department of the Alabama Great Southern R.R., later becoming fuel agent for the Q. & C. route. Shortly after moving to the Birmingham district he became associated with the late Frank Grider in coal sales and distribution, and for a number of years prior to his death was president of the Grider organization, one of the largest coal distributing agencies in the South. He was Assistant Fuel Administrator, in charge of distribution of coal, with headquarters in Washington, during the World War.

Joseph R. Smart, 65, resident engineer at the Docena mine of the Tennessee Coal, Iron & R.R. Co., died at his home in Birmingham, Ala., Dec. 14.

J. Pugh Pearson, president of the Central Alabama Coal Co., operating at Kimberly, Ala., died from an attack of erysipelas Dec. 11 at his home in Birmingham.

Industrial Notes

Worthington Pump & Machinery Corporation has established a Pacific Coast headquarters at Los Angeles, Calif. C. E. Wilson, vice-president, with offices at 510 West Sixth St., is in charge.

Canadian Sullivan Machinery Co., Ltd., Dundas, Ont., has been formed to supersede Sullivan Machinery Co., Ltd., and arrangements have been made with John Bertram & Sons Co., Ltd., to manufacture Canadian Sullivan products at Dundas, Ont.

Wilmot Engineering Co., Hazleton, Pa., has been licensed by the Hydrotator Co. as its representative in the manufacture and sale of the Hydrotator coal-cleaning process and the Hydrotator classifier.

Reading Iron Co., Philadelphia, Pa., announces promotions and additions to its sales force as follows: C. T. Ressler, formerly manager of railroad and marine sales, has been appointed specification engineer. R. I. Fretz, formerly district sales representative at Columbus, Ohio, succeeds Mr. Ressler. C. W. Guthrie succeeds Mr. Fretz. Bryant Myers joins the Pacific Coast sales force with headquarters at Los Angeles, Calif.

Republic Steel Corporation, Youngstown, Ohio, has appointed new warehouse distributors of Enduro stainless steel as follows: Buhl Sons Co., Detroit, Mich.; F. W. Heitman Co., Houston, Texas; Woodward Co., Albany, N. Y. Steel Products Co., McKees Rocks, Pa., has been appointed as warehouse distributor of Toncan iron sheets in the Pittsburgh area.

The Borden Co., Warren, Ohio, manufacturer of pipe tools, announces a change in the corporate name of the company to Beaver Pipe Tools, Inc.

Poole Foundry & Machine Co., Baltimore, Md., has appointed the Nibling Engineering Sales Co., Colonial Building, Philadelphia, Pa., as its representative for the sale of flexible couplings and speed reducers in the Philadelphia district.

Anthracite Independents Scan Sales-Agency Plan

Formation of a sales agency patterned after Appalachian Coals, Inc., is the major plank in a market stabilization plan drawn up by a committee of independent anthracite operators representing producers with aggregate annual capacity of 15,000,000 tons. Organization of the committee was an outgrowth of a meeting of independent operators at Wilkes-Barre, Pa., Dec. 4, at which control of unwieldy stocks and consequent dumping at reduced prices was one of the chief topics of discussion.

Members of the planning committee, which consulted with E. L. Greever, one of the drafters of the Appalachian plan, are as follows: James H. Pierce, president, East Bear Ridge Colliery Co., Scranton (chairman); C. S. Kenney, vice-president, Weston Dodson & Co., Bethlehem; John Kehoe, Kehoe-Berge Coal Co., Pittston; John Gilbert, president, Madeira, Hill & Co., Philadelphia; Frank Passarelli, president, Pompey Coal Co., Jessup; Nat D. Stevens, Stevens Coal Co.; George F. Lee, George F. Lee Coal Co., Wilkes-Barre; and A. B. Jessup, vice-president, Jeddo-Highland Coal Co., Jeddo.

Pocahontas-Tug River Institute Holds First Meeting

Approximately 50 men attended the first meeting of the newly organized Pocahontas-Tug River Mechanical & Electrical Institute, held at the West Virginia Hotel, Bluefield, W. Va., Dec. 22. Officers of the new institute are: president, S. S. Cooper, electrical engineer, American Coal Co. of Allegany County, McComas, W. Va.; vice-president, J. C. Newman, electrician, Houston Collieries Co., Kimball, W. Va.; secretary-treasurer, T. A. Martin, electrical engineer, Peerless Coal & Coke Co., Vivian, W. Va.

Mining Institute Continued

For the eighth successive year, the annual mining institute of the College of Mines, University of Washington, will be held at Seattle, Jan. 21-28. Following the procedure of past years, forenoon hours will be devoted to lectures by members of the mining, metallurgical and ceramics staff of the college, as well as faculty members in related departments and special lecturers from industry. Afternoons will be devoted to laboratory work, and a special field trip is planned for the concluding day. Sessions are open to all persons interested in the mineral industries, and no fees or registration formalities are required.

WHAT'S NEW

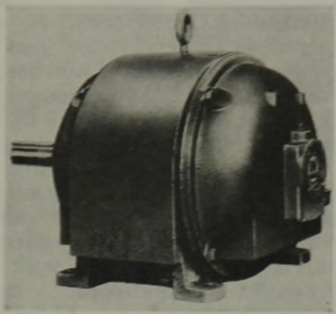
IN COAL-MINING EQUIPMENT

Grease in Cartridges

Greases packed in cartridge form to fit a new-type grease gun are now being sold by the Standard Oil Co. of Indiana, Chicago. To fill the new gun, according to the company, the operator merely slips a factory-loaded cartridge into the barrel of the gun, which is then ready for use. The cartridges are being made in 1-lb. capacity and include several grades of lubricants. The handling method, it is stated, works equally well with fluid gear lubricant or fairly stiff grease. A partially used cartridge can be replaced quickly with another containing a different grade of lubricant, and the lubricant in the used cartridge, being inclosed, is not wasted and does not accumulate dirt.

The new system was perfected by the Lubrication Corporation, Chicago. Each cartridge, it is explained, has a sliding plunger to feed the lubricant into the high-pressure chamber in the nose of the gun. Although the cartridges cannot be refilled, they cost only slightly more than the same quantity of grease packed in an ordinary container, it is stated. Larger-sized cartridges may be offered in the near future.

Weatherproof Motor



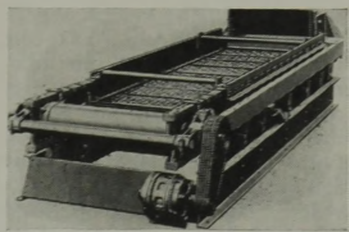
A new splashproof, dripproof and weatherproof motor for use indoors or outdoors, or in any service where dripping or splashing liquids are encountered, is announced by the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. Entirely new design, rather than the adaptation of an open machine by the use of inclosures, is stressed by the company, which points to solid castings in the motor frame and end brackets. The thickness of the case iron and its inherent resistance to rust and corrosion increase the resistance of the motor in this service, and the use of castings has been extended even to the conduit box to eliminate exposed sheet-steel parts, the company points out. A baffle plate cast integrally with the inner side of the motor bracket prevents splashing liquids from reaching the motor windings and enables the motor to be used outdoors the year round without additional protection. Either ball or sealed-sleeve bearings are available, and motors, offered in both the squirrel-cage and wound-rotor types, have a continuous rating of 50 deg.

Vibrating Screen

Nordberg Mfg. Co., Milwaukee, Wis., offers the Symons screen with a combination conveying and screening action which permits the screen to set level, according to the company. Features include full-floating design, all vibrating parts being mounted on flexible supports. Two sets of such supports are attached to the heavy frame channels at an angle of 30 deg. with the horizontal. The lower ends of these supports are fixed. The screening deck is attached to the upper end of one set and the side bars, or balancing deck, to the other.

Four horizontal supports at the discharge end of the screen carry the driving mechanism, which consists of a shaft in anti-friction bearings housed against dust. Two sets of bearings are provided for this shaft, those on the eccentric part being connected to the screen deck and those on the concentric extensions to the side bars. These bars are further supported on the inclined flexible supports. As the shaft is revolved, motion in a horizontal direction is imparted to the deck, but as the deck is held on the inclined supports the material is lifted and carried forward a definite distance with each throw of the eccentrics. Thus, the screen can be set level.

As the screen deck moves in one direction, the reaction is taken by the side bars, causing them to move in the opposite direction. Consequently, the moving parts are counterbalanced, and the screens, the company points out, can operate satisfactorily with a long throw at high speed. The feed hopper is mounted on the side bars, thus providing automatic and uniform feeding. The drive unit is located at the discharge end, out of the way of falling material. Also, in hot or dusty screening, the drive can be located outside of the housing and away from the dust. Screen cloth is applied in readily removable panels, according to the company, and is not stretched, insuring long life. These screens are available in one, two or three decks in lengths up to 20 ft.



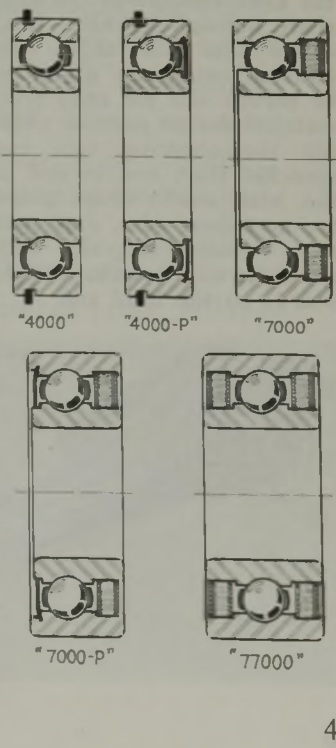
Insulation

United States Rubber Products (wire division), 1790 Broadway, New York, announces "Laytex" flexible insulation for wires, for which it makes the following claims: greatest flexibility (maximum stretch, 750 per cent); greatest tensile strength (5,000 lb. per square inch) and resistance to compression; highest dielectric strength and insulation resistance; and thinner but superior walls which make possible finished conductors lighter in weight and smaller in size. Laytex, according to the company, is derived directly from latex by a process which removes the proteins, sugars and other water-soluble products, and is applied as the conductor is run through a series of baths. Each layer is solidified on a given section before it comes in physical contact with any support, it is pointed out, thus preventing mechanical defects. This method also insures perfect centering and uniform wall thickness, it is stated, and in certain applications outside diameter is reduced 25 per cent and weight 50 per cent. Applications include emergency or portable telephone wire, non-metallic underground cables; portable cords and switchboard, blasting and shotfiring wire.

Bearings

Norma-Hoffmann Bearings Corporation, Stamford, Conn., calls attention to several recent types of bearings designed to reduce the costs of machining and assembly. Among these is the "4000" series of ball bearings, distinguished by a snap ring of steel inserted in a groove in the periphery of the outer race close to one face. This ring, protruding around the outer race, eliminates one shoulder from the housing, according to the company, not only reducing cost of machining but also resulting in a more compact mounting.

Closely related is the "4000-P" series, differing from the "4000" series only in the addition of one side plate, or shield, for the retention of grease. Both of these types are available in a range of metric sizes in both light and



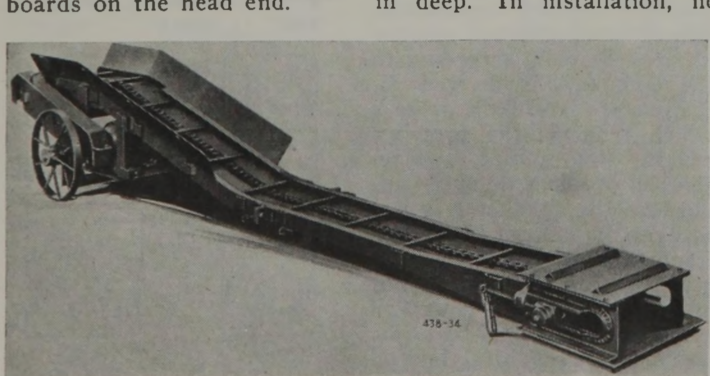
medium series. Three other types offered to designers seeking lower production costs are: "7000" series of felt-protected bearings with a removable felt seal between metal plates; "7000-P" series with a single felt seal and one side plate, or shield, wholly inclosed for retention of lubricant; and the "77000" series of sealed bearings with two removable felt seals. The latter three types, the company points out, not only simplify machining and assembly but also provide within themselves a grease capacity ample for long periods of operation.

Unit Conveyor

A new portable underground unit conveyor, Type 61-L, is announced by the Jeffrey Mfg. Co., Columbus, Ohio. Adaptable to low seams, it is intended primarily, the company points out, for necking rooms and driving breakthroughs, and as an auxiliary unit in driving headings. It also may be used as a face conveyor where the coal is not shot directly onto the machine and where the required length of conveyor does not exceed 30½ ft.

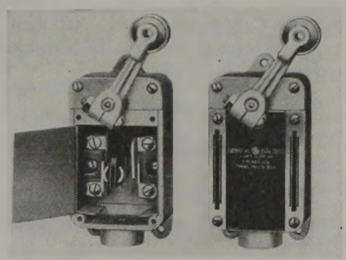
Features noted by the company include: lightness without sacrifice of strength (besides possessing the desirable features of a heavier machine, the conveyor can be moved about the mine without disassembly of any of its parts); removable two-wheel truck on which the head end rides in moving; only two men required to mount the conveyor and move it about, wheelbarrow fashion; geared-head motor built into the frame under the head end drives the head shaft through a chain from either side, removal of four bolts allowing the motor to be turned end for end; symmetrical design permits shifting the shearing hub and sprocket from end to end of the head shaft; chain guard fitting either side; cast-steel flights made integrally with the link; and detachable side boards on the head end.

The conveyor is available in lengths beginning at 12½ and extending up to 30½ ft. in multiples of 3 ft. Its length, it is stated, may be increased or decreased readily by inserting or removing intermediate sections. These features permit the length to be adjusted so that complete units may be moved in and out between posts when conditions compel posting in front of the conveyor. They also allow use of the conveyors in tandem under these same conditions.



New Electrical Controls

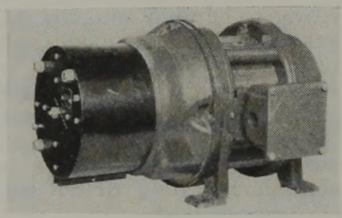
A small track-type spring-return limit switch for use in making or breaking control or indicating circuits at a fixed point in the travel of a part of a machine or mechanism has been introduced by the General Electric Co., Schenectady, N. Y. The switch, designated CR9440-A1A, has one normally open and one normally closed circuit. Its maximum carrying and breaking capacity is 5 amp. at 550 volts a.c.; d.c., 0.4 amp. at 550 volts to 2 amp. at 115 volts. The switch is operated by an 18-deg. movement of its operating arm from the normal position, an overtravel of 54 deg. being possible without damage. A precision



Track-Type Spring-Return Limit Switch.

mechanism, it is said, affords simple and accurate adjustment of the arm to any position around the shaft. The switch, excepting the arm, is inclosed in a die-cast box 4 in. high, $2\frac{7}{16}$ in. wide and $1\frac{23}{32}$ in deep. In installation, no right-angle mounting bracket is required, and the spring-return feature allows mounting at any desired angle without interference with operation.

As an addition to its line of solenoid- and Thrustor-operated brakes, General Electric announces a compact, smooth-acting disk-type electric brake for mounting directly on a number of GE motors. It is intended especially for controlling small hoists, winches, cranes and similar equipment requiring no more than 50 lb.-ft. braking torque continuously or 75 lb.-ft. intermittently. The brake is available completely mounted and wired as a shipped-assembled unit on GE ball-bearing squirrel-cage, wound-rotor or single-phase and d.c. motors in NEMA frames. The motors may be open; splash-



Disk Brake on Totally-Inclosed Squirrel-Cage Motor.

proof; non-ventilated totally inclosed; or non-ventilated explosion-proof with the electrical characteristics designated by GE Types K, KC, KG, KR, M, MR, SCE, SCR and B. The brake also is available separately and, according to the company, may be adapted easily to floor mounting for use with other types of motors already in service. Adjustments for torque and lining wear may be made without removing the cover.

A new method for the dynamic balancing of heavy rotating machinery in the field under normal operating conditions and new portable equipment for obtaining a direct and exact solution of this problem are available from the General Electric Co. The new method, it is stated, deals directly with that component of vibration which occurs at running-speed frequency and is caused by mass unbalance in the rotating member. This is the only component of vibration which may be eliminated by the addition of balance weights. The new system and equipment, however, not only greatly simplify the elimination of this component, it is declared, but also aid markedly in analysis to determine the cause of vibration at other than running frequencies.

Portable Dynamic Balancer in Carrying Case.

Equipment consists of two special generators attached to each bearing pedestal, a contactor coupled to the shaft to rotate with it, and a meter and control box into which both the generators and the contactor are plugged. Only three balancing runs are necessary, it is stated. The first is made with the machine in normally unbalanced condition, the second with any known reasonable weight placed in any position on the near end of the rotor and the third similar to the second but on the far end of the rotor. Phase and magnitude readings for both ends are taken during each run. These, in connection with a standard data sheet, enable the values and positions of the final corrective weights to be calculated.

Motorized Spotter

To increase compactness, the Link-Belt Co., 910 South Michigan Ave., Chicago, announces that hereafter its vertical-capstan electric car spotter will be "motorized," with the motor attached directly to the side of the spotter housing, thus eliminating motor-shaft couplings and separate motor-base plates. This plan, it is stated, assures proper initial and permanent shaft alignment and reduces foundation space to a minimum. Two sizes—giving rope pulls of 5,000 and 10,000 lb., respectively—are available.