COAL AGE

Established 1911—McGraw-Hill Publishing Company, Inc.

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

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August 1938

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Mr. Allen Excepts

"WHY IS nearly all our training lavished on first-aid men who, after all, 'only pick up the pieces' which others, for lack of training, have scattered?" Thomas Allen, Colorado State coal-mine inspector, whose pungent and picturesque comments have enlivened more than one institute meeting, answers this question, posed in an editorial plea for more and better job analysis and job training, with mild rebuke. This method of statement, he told the Rocky Mountain Coal Mining Institute, "is a severe blow at first-aid training." Certainly it was not so intended, and *Coal Age's* long and consistent support of such instruction should be convincing on that point. Since Mr. Allen's own forceful Denver address, abstracted elsewhere in this issue, was itself a strong plea for the job training advocated in the editorial he criticizes, it seems hardly necessary for the editors to grow vehement in its defense.

Steel Points the Way

ALTHOUGH the President surprised most people by vetoing the stream-pollution measure passed in the closing days of Congress, the subject is by no means a closed issue. The veto, it should be emphasized, was framed on jurisdictional objections and was not a condemnation of the desirability of stream-pollution control. Industry must still face the task of finding a sane and economic solution to a complex problem.

Obviously the answer must be found through scientific research. The American Iron and Steel Institute already has taken the first step in that direction by establishing a fellowship at Mellon Institute of Industrial Research to investigate the problem as it relates to stream pollution by waste liquors from metal-pickling plants. Objectives of the investigation include not only treatment which will satisfy health authorities but recovery and utilization of valuable chemical byproducts now wasted in the liquor discharge.

The coal industry may well follow the path steel has set out to blaze. While the problems in the two industries may and do differ in details, fundamentally the objectives are the same. The scientific approach opens the way both to the determination of what can be done economically and to a valid defense against extravagant demands by well-intentioned reformers whose zeal outstrips their knowledge.

United Front

MARK TWAIN once remarked that everybody talked about the weather but nobody seemed to do anything about it. Until recently, a similar observation also might have been made without too violent distortion of the truth in speaking of the bituminous coal industry. Within the past few weeks, however, the National Coal Association has taken vigorous steps to change that situation.

A modest effort to regain tonnages lost to oil in New England (*Coal Age,* May, p. 98) has blossomed into a full-fledged, two-way campaign to check the inroads of natural gas, oil and hydro-electric power in all parts of the country. Reciprocity and the buying power of a prosperous mining industry are emphasized in the appeals to large consumers. Broadsides stressing the relation of production to employment and seeking the cooperation of labor in promoting legislative protection against unfair competition are addressed to the men at the mines.

Last year, the association estimates, consumption of fuel and gas oil, natural gas and hydro-electric power represented the equivalent of approximately 200,000,000 tons of bituminous coal. How much of this competitive business coal can or should hope to win is, of course, debatable. But an increasing rate of loss to rivals—52,000,000 tons more in 1937 than in 1930—is not speculative. And nobody is going to hand coal this tonnage on a silver platter; it must be fought for with all the resources the industry can enlist.

Because it has been popular with a certain school of critics to picture the coal industry as decadent, it is possible that this same group will diagnose the present campaign as the death rattle. Nothing could be further from the truth. Frank recognition of competitive problems and a determined attack upon them constitute the best indications one could ask that coal will continue to hold its place as the major source of heat and power in the United States through generations yet unborn.

Accident Reports

No accident has only a single cause. In the code advocated by the National Safety Council and approved by the American Standards Association, dangerous conditions are listed under unguarded or poorly guarded equipment, defective equipment or material, hazardous arrangement or unsafe process, improper illumination, improper ventilation and unsafe dress or lack of protective equipment.

Perhaps in preparing a questionnaire to determine whether conditions surrounding an accident were dangerous, a coal-mine executive would change the order and wording of these too often overlooked items, but, though rearranged and even revised, they cannot safely be ignored. Reports are made sometimes as if the malice of the machinery or of the mine roof caused the injury, and not a train of causes, any one of which would have effectually disarmed and outwitted all the others. Engineering is the cure for all these dangerous conditions.

Unsafe acts of individuals listed in the code are: (1) Lack of skill or unawareness of safe methods; (2) improper attitude, such as recklessness, nervousness, distraction or willful disregard of instructions; and (3) bodily defects, such as poor eyesight or hearing. Job training will correct the first; supervision, discipline and better home conditions will correct improper attitudes; and proper placement of men will evade the hazards of bodily defects.

Flame Safety Lamps

Though more modern flame safety lamps are safe if rightly used, many accidents are chargeable to those who carry them. Frequently lamps go out for lack of oil or of clean oil, from gumming or tightness of the wick and cotton, in falling or stumbling, or from the concussion of shots; then, if the oil is not volatile enough to create an explosive atmosphere around the wick, the re-igniter cannot relight them. In many such cases, a man using such a lamp will open it if not locked and, if he can, will induce the lamp tender not to lock it. Such an unlocked lamp was believed by the State mine inspector to have been one of the causes of the Mulga explosion.

A big step forward has been made by the U. S. Bureau of Mines in defining the kind of oil needed for flame safety lamps and still more in specifically recommending certain makes of oil for that purpose. One company at least—the Allegheny-Pittsburgh Coal Co.—long ago made tests of its own to determine what oil its lamps required, but henceforth such companies will have the researches of the Bureau to guide them. Operators and their agents should not only enforce the laws but also should eliminate the inconvenience and loss of time that incite their men to law evasion.

GETTING MAXIMUM RECOVERY
+ From Thick Pitching Anthracite Beds At Navigation's Lansford Colliery

By R. DAWSON HALL
Engineering Editor, Coal Age

IN THE LAST few years, the Lehigh Navigation Coal Co. has made many changes in its mining methods. One of the most interesting has been the carefully planned development and extraction method in the 48-ft. Mammoth bed on the Fifth Level of No. 6 mine, Lansford Colliery. In earlier years it was sometimes found desirable to drive gangways and subchutes in the Skidmore bed to tap, through rock chutes, coal in the Mammoth bed, which, after repeated minings, still remained in that seam and otherwise could not be obtained.

This system of gangways and subchutes, instead of being used only for ultimate coal extraction, now is being provided prior to the removal of any coal, and the subchutes under the big bed are now usually being driven in a hard sandy slate lying between the Skidmore and the Mammoth instead of, as heretofore, in the Skidmore bed. Choosing this measure in place of the Skidmore for the location of the subchutes shortens the rock chutes, or "taps," to the Mammoth and reduces maintenance costs. By "subchutes" must be understood steep passageways driven in a plane under the pitching coal bed and paralleling the plane of that bed without at any point intersecting or tapping it.

Slants or Sub-chutes in Rock

A gangway or chute may be driven in the plane of the bed or in a parallel plane in either rock or coal and yet may deviate considerably from a line drawn straight up the pitch. In this event, the place driven is known as a "slant" because it is inclined to a line on the full pitch. To prevent the coal from sliding or rolling too speedily, none of the subchutes is driven straight up the pitch; hence they may also be termed "slants." They are so related and distributed that, through tap chutes driven through the rock, they afford access into every part of the bed being worked.

By the means adopted, most of the development is in rock, not coal, and the coal-chute mining in the seam itself, which, in the more usual parlance, would be termed "first mining," removes only about 5 per cent of the coal, and even that driving is left until just prior to the time when the coal is to be completely removed. Thus, a plan of campaign is laid providing that all parts of the coal section under attack will be extracted promptly as soon as the section is entered, instead of being less completely removed, as heretofore, with difficulty and hazard, in several less well-planned forays made from different points of approach.

Safety thereby is increased, timbering and retimbering of chutes, so necessary in coal, but nearly dispensable in rock, are much reduced, and removal of coal progresses downward and in retreat from the old workings above the operating area, so that all crushes, free runs of coal, falls of rock and other misadventures are so rare and so confined to the area near the working face that they do not disturb production.

- To increase the productive life of future levels, the Lehigh Navigation Coal Co. proposes to increase the distance between them, thus saving the development expense of perhaps one lift. On the fifth level at No. 6 mine, the lift is 385 ft. From the first it was realized that breasts for this distance could not be maintained; also that chutes driven in the coal bed would involve too much timbering and maintenance cost.
- Since operations in the coal of this level have been started, several methods of mining its long lift have been tested, the coal in each instance being mined entirely on retreat. The size of the block of coal to be mined was the first consideration to be settled. This company's long experience with the mining of blocks of coal of various sizes indicates that the most economical results in its thick beds can be obtained by mining a block 40 ft. wide and 96 ft. up the pitch.
- Subdivision of this block of coal for mining is second only in importance, for this largely determines the completeness with which the coal can be extracted. Recovery records at this colliery show that when the block is improperly divided, losses in recovery occur with no reduction of total cost. Part of the article is devoted to the development in the rock for an attack on these several blocks, and the remainder to the mining of the coal itself.

Almost Straight Breakline

Moreover, by confining operation to the coal above one sublevel at any time, an approach is made to a definite breakline which, though not nearly so closely approximated as in the bituminous regions, is much more nearly straight and continuous than in most anthracite operations. Irregularity is permitted only when inherent difficulties make departures from straight-line methods almost inescapable. Output from every working place is so assured that the tonnage is almost definitely predictable, which is not usually the case with heavily pitching coal, especially where it is outstandingly thick and, therefore, treacherous.

The term "first" mining is used

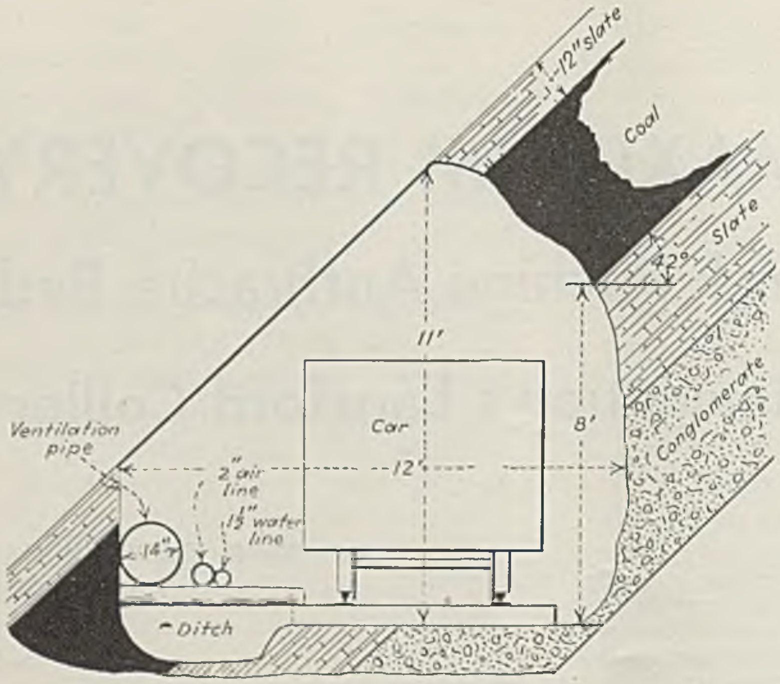


Fig. 1—Cross-section of Skidmore gangway.

here in its usual connotation, but in thick beds like the Mammoth in the Lehigh Navigation mines the expression "a single mining" usually covers the entire work done from each single approach to the coal bed. This may include not only the driving of a breast but the recovery of coal, if possible, above the breast, and even recovery of the pillar as far as the breast has been driven. These recoveries were made in any case with such completeness as was possible and before approach was rendered unsafe or no longer open. Three or more approaches of this character often were made to the same section of the same seam and termed "first," "second" and "third mining," and each of these resulted in a composite extraction of coal in breast, pillar and top.

Skidmore Open for Later Work

The Skidmore bed, a 30- to 50-in. bed below the Mammoth, is of merchantable quality. It is somewhat too thin for profitable operation at present local mining rates, but, should it be mined later, the gangways within it and the subchutes of the Mammoth above it then would be available for its operation.

Skidmore Gangways—Although the subchutes are not excavated in the Skidmore but in a rock nearer the Mammoth and though this is a leading merit of the new system, for obvious reasons it was thought well not to remove the main gangways from the Skidmore, which, being 32 ft. below the Mammoth as measured at right angles to the plane of the beds, is so remote from the big bed that the collapses and movements of the latter will be cushioned and will scarcely affect the main roadways. These are 8 ft. high and measure 12 ft. along a horizontal center line. As the coal dips about 42 deg., the gangway is often 9 ft. wide at the top and 15 ft. wide at the bottom. The rock immediately under the Skidmore resembles slate, merging, as deeper rock is reached, into a rather friable conglomerate, such as is so often found in the anthracite region. In driving the gangways, both kinds of material—slate and conglomerate—are entered; that is, in proceeding west, conglomerate will be found near the floor on the north side of the gangways, for the basins and the gangways run east and west, and Lansford mine is on the north side of the basin or in what is known as the "south dip."

The sloping roof of the gangway is the under side of the sandy slate already mentioned, but this, in the unmined portions of the measure, is underlaid by 12 to 18 in. of slate known as "false top" because, of course, it is the immediate cover of the Skidmore. In mining, it always comes down, which, for gangway and subchute work, is an element in its favor but one that would be highly detrimental if the Skidmore coal were being mined commercially.

In the acute angle of the gangway on the south side bounded by the gangway bottom and the sandy slate roof, a ditch 30 in. wide and 12 in. deep is excavated, for there is an abundance of water to be removed. Across the ditch, at about 10-ft. centers, plank or lagging are placed, bridging the waterway and supporting both the 2-in. compressed-air pipes for running drills and the 1½-in. water pipes for wetting down muck piles after shooting and for supplying drills with dust-allaying water.

On the same side of the gangway in its forward section are the 12- or 14-in. galvanized-steel pipes by which that section, which is never allowed to be over 500 ft. long, is ventilated. When it has been advanced that distance, the blower also is moved up. The steel ventilating pipes are carried forward to within 200 ft. of the face, which is as far as can be done without risking their destruction when shooting. The rest of the distance is ventilated by removable fabric pipe.

Leyner drills are used for all rock driving, and the work is prosecuted in two shifts, one a drilling-and-shooting shift and the other devoted to mucking; the two periods are separated by a 10-hour interval in which the dust made by shooting is allowed to settle. All muck piles are thoroughly drenched before loading. These provisions have been found greatly to improve the health of the men.

Gradients Easy Yet Helpful

Gangway gradients here and elsewhere in Lehigh Navigation mines —except where, for some reason, an irreducible minimum is sought, as in the main drainageway of the Panther Valley mines—are 0.58 per cent, and in this particular section the gangways are laid out at 385-ft. centers as measured on the pitch. Haulage facilities are provided on these gangways, but all the coal which comes to them arrives through a series of slant subchutes on which the coal travels by gravity. Wherever these chutes can be diverted from the full pitch by 35 deg., to give an inclination of 32½ deg. to the horizontal, this is done, thus assuring that the coal will flow without undue degradation yet without stalling so long as the chutes driven in rock are lined in the bottom by plank or when those in coal are bottomed with sheet iron. However, the broken rock sometimes wedges and lodges in the chutes, but, on this inclination, the coal never has to be "bucked"—that is, pushed manually down the chutes.

Coal will run well on a 30-deg.

pitch, but rock moves best on one of 35 deg. In development the first 50 ft. from the face is not planked, and the rock does not run so well on that section. When plank is not used, the rock will "bake" to the bottom if allowed to remain there during an idle spell. The plank also serves to smooth off over irregularities in subchute driving. The pitch could be increased to suit rock, but, if it were, it would be excessive for coal and result in degradation. Furthermore, despite careful engineering, the subchutes sometimes get below the required elevation and have to be given a steeper gradient to provide for tapping the coal at the point desired.

Advantages of Chain-Chute Method—This method has been termed the checkerboard system because the chutes arrange themselves almost in squares. It has no relation, of course, to the system of the same name in bituminous mines. Another name is sublevel mining.

A main idea of the method is to divide the distance between gangways into five parts by the establishment of four equidistant sublevels at 77-ft. centers, or more recently into four parts by three such levels, 96 ft. apart, and to provide that men can pass up to the work from the main gangway in all-rock chutes to the particular sublevel that is being worked without entering the coal seam at any point on the way. Thus, they are protected in traveling, and in working they have a near-by place driven in the solid rock to which they can retreat in safety should coal, roof or sides begin to tumble in or break away.

Rock Chutes Enhance Safety

Safety is further advanced, moreover, because the men reach their sublevel without negotiating the long, excessively steep or vertical pitches up which so many men, working in pitching anthracite breasts, must climb to reach their coal faces. As both the Skidmore and Mammoth are gassy, it is greatly helpful to safety to have the development in gasless rock instead of in either of those gassy seams.

In this particular instance, the lift, or distance between levels, has been made 385 ft., which would be a considerable distance, even with thin and level coal. It is especially difficult to operate in a pitching seam where, because of the thickness of the coal, a single breast would, if mined clean, produce 40,000 tons and last seven or eight years. The number of complete retimberings in that length of time due to excessive pressure can be imagined!

In practice, it has been found difficult, because of runs of coal and falls of roof, to drive breasts more than 125 ft., and the usual distance between levels is 200 ft. vertically or 275 ft. as measured along the pitch. It was obvious therefore that the lift should be divided in some way, and this checkerboard method does this and makes it possible to mine the larger lift with an even greater degree of completeness than under the old methods with the shorter lift. Thus, with this system, levels may be established at longer intervals.

As will be explained later, by having four separate mining units to each tap and four or five taps in the 385 ft. between levels (provided a real sublevel is driven in the Mammoth below the other sublevels) it also is possible to replace the one breast by four to five "mining blocks" or sixteen to twenty separate mining "quarter blocks" respectively with accompanying safety and efficiency. Since the blocks, each having four quarter blocks, are reached by approaches in solid rock not subjected to runs or falls of coal or rock, ventilation is positive. Moreover, as the work of coal getting begins near the old goaf, it soon breaks through into it, after which time a current of air from the surface or from adjacent workings streams from the goaf, which is by no means tightly filled and reinforces the ventilation in the new workings, and this is further increased as soon as a length of goaf is exposed by the falling of undermined coal. This influx of air occurs when and where the coal is being broken down and therefore is generating methane. Thus it affords increased ventilation just when most desired.

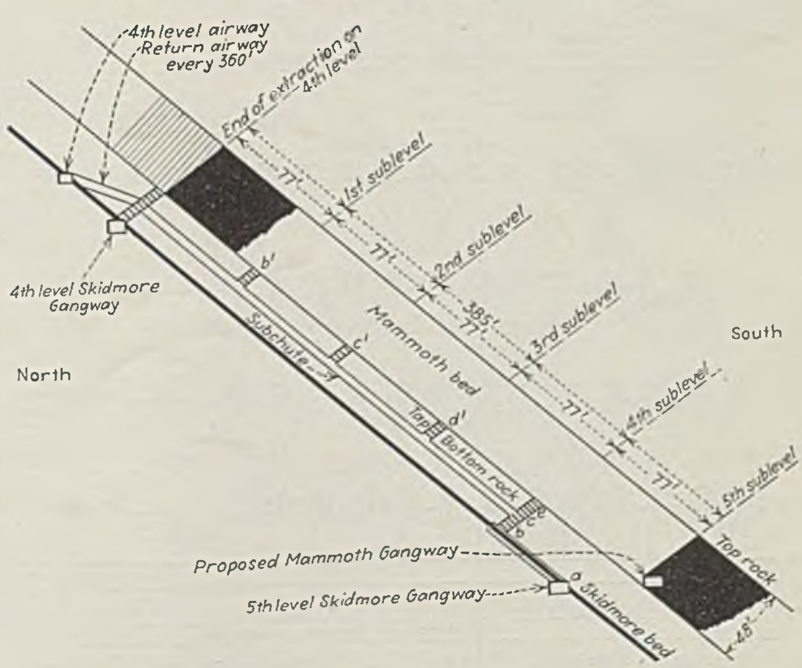
In the description which follows it will be assumed that the sublevels are 77 ft. apart and that accordingly there are four sublevels instead of three, as is now being planned tentatively.

Drive Chutes in Solid Rock

Rock-chute Development — From the main gangway at 120-ft. centers, 6x8-ft. chutes are driven from the Skidmore bed on its full pitch of 42 deg. for a distance of 40 ft. as measured on the slope *ab* in Fig. 3, which shows the plan of "rock-chute development" as viewed when laid down on the pitch of the beds. Each chute then branches at *b* into two slant chutes, *c* and *d*, like the arms in the letter Y or in a sling-shot, one lying 35 deg. to the right of a line straight up the pitch and the other 35 deg. to the left of that line. Thus they rise at an angle at 32½ deg. to the horizontal until they reach sufficient elevation to start the taps for the fourth sublevel, whence by 32-ft. rock taps they are driven to the Mammoth bed at *e* and *e'* respectively.

Special attention should be drawn to the left-hand, or western, prong.

Fig. 2—Rock-chute development as seen in profile (Section A-A, Fig. 3)



At the foot of the rock tap at *e'* a second slant chute, parallel to the bed and only 10 ft. under it, is started in rock. This is one of the main slants and is extended to a point above the first, or top, sublevel at *f* and travels at an inclination of 35 deg. from a line straight up the pitch or up an inclination of 32½ deg. to the horizontal, maintaining in this way the 10 ft. of rock cover between it and the Mammoth bed.

Sublevels Merely Level Lines

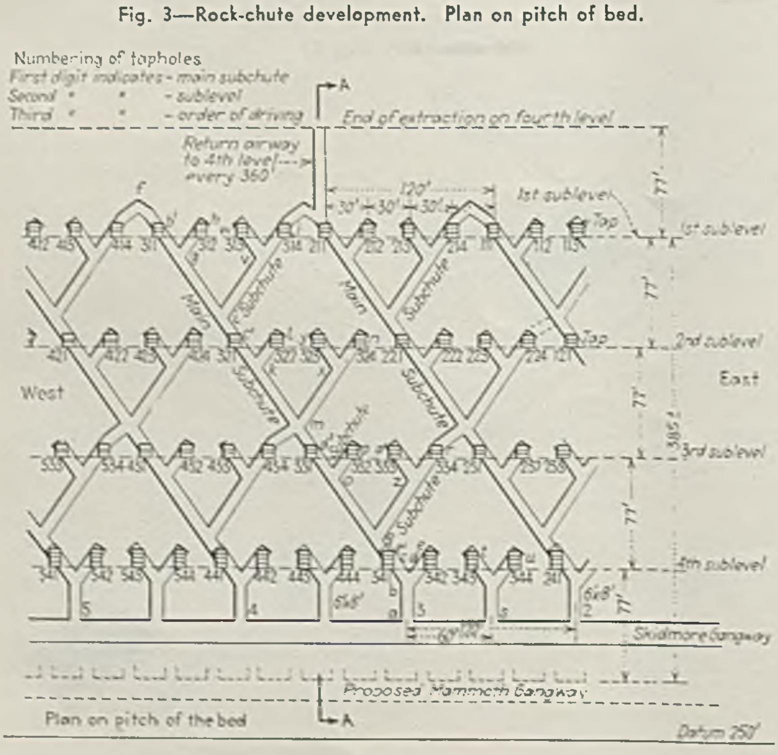
None of the "sublevels" are really "levels" at all in the sense of that term as generally accepted by mining engineers. They are merely level or near-level lines establishing the lower edge of the portion of the coal bed to be removed in a given stage of mining. Thus, the first sublevel marks the lower edge of the first area of coal to be extracted in the fifth level.

From the left prong (the main slant) slant chutes *gh, ij, kl, mn, op* and *qr* at an angle of 70 deg., as will be noted in Fig. 3, are driven at appropriate points to other points whence slant taps can be and are constructed to the bottom of the Mammoth coal bed; two go to each sublevel, except the fourth, which has its needs partly supplied by the right prong, *de,* at the foot of the main slant *cf* and by a separate wye from the Skidmore gangway, *s,* with two slant taps, *t* and *u,* leading to that level. Other shorter slants, *vw, xy* and *za',* break off from the long prongs *ij, mn, qr* respectively to the right of the main slant, *cf,* one for each prong, and terminate in slant taps *w, y* and *a'* respectively, driven up to the bottom of the Mammoth coal bed. Slant taps *b', c'* and *d'* also are provided from the main subchute, *cf,* to the Mammoth bed wherever the main slant crosses a sublevel.

Each main slant ultimately receives coal from each of the four sublevels, but all these are not being worked at the same time; in fact, the custom is to use only two adjacent tapholes concurrently and to work, of course, only the area of the bed adjacent to them. The coal is removed, where possible, in order from east to west, and thus far, one level only has been worked at a time. A line of props is carried in all chutes partly for the support of the roof, but mainly as the basis for division between chuteway and manway, for the rock usually is so strong that it does not need timbering.

Slants are started by mine superintendent and engineer no sooner than will permit them to be completed at the precise time when they will be in demand for ventilation or access to the coal. In this way, the work of development is spread, does not fill mine roads with rock cars to the detriment of production, involve too early an expenditure on expensive development, cause upkeep cost for timber chutes and supports, if the latter should be needed, or permit the rock to deteriorate by lengthy weathering or prolonged stress.

Fig. 3—Rock-chute development. Plan on pitch of bed.



Some important changes are being tested, and if they prove satisfactory will be adopted. With these the main subchutes will be driven straight up the pitch for a portion of their distance at each sublevel and the entire subchute system will be driven in the Skidmore instead of in the rock underlying the Mammoth.

Coal-chute Development and Coal Extraction—All this prior work, except such as is in the Skidmore bed, is by design in permanent and dependable rock; that in the far less dependable coal now has to follow. The purpose of the underlying development is to approach by a separate taphole a single small and manageable "block" of Mammoth coal which thereafter can be mined by a combination of short chutes, breasts and caving. The preferable size of these breasts is still in process of determination. Of the three dimensions, one—the thickness of the seam—of course, is uncontrollable. The other two—width along the strike of the bed and height, or lift, along the pitch of the bed—cannot be changed other than by a change in the spacing of the rock taps and these distances have been varied so as to discover the preferable arrangement. At present the disposition is to question whether an increase in these dimensions might be advisable. They probably lie between 30 and 40 ft. on the strike and between 75 and 95 ft. up the pitch, but will be assumed here to be 30 and 77 ft. respectively.

How Coal Block Is Extracted

In brief, the scheme is to travel on the floor of the seam from the rock tap on a 32½-deg. inclination to the center of the block, to drive a "cut-back" chute at the same inclination to the middle of the seam, thus arriving at the first quarter block, which is a section of coal 24 ft. thick, 30 ft. wide (which is the full block width) and 38½ ft. long (which is the half distance between sublevels). Here comes a parting of ways. First, the cut-back chute is widened like a breast and extended to the top rock of the seam and, second, a wide chute is driven straight up the pitch in the middle of the seam and extended until the coal thus undermined can be made to fall. This coal is then loaded out, thus extracting the first of the four quarter blocks, or sections. Similarly, the section in the lower half of the

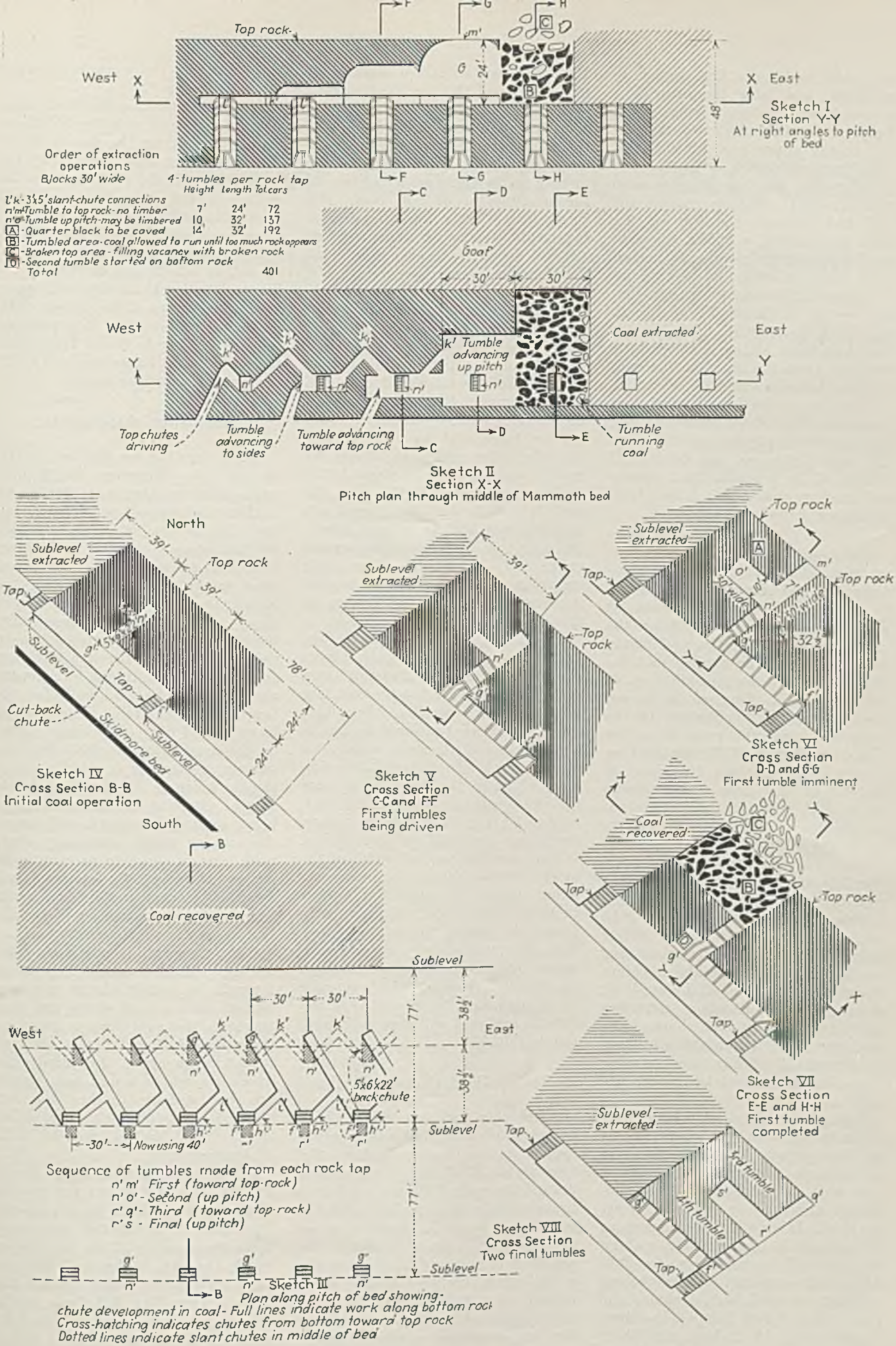


Fig. 4—Coal development.

seam and under the first section is extracted, and later the other two quarter-block sections lying down the pitch from the first two, the section in the upper part of the seam being removed first.

To express the foregoing in more explicit detail: Having reached the coal bed through the tap of the block to be mined, a 5x6-ft. timbered chute is driven sufficiently off the full pitch (about 35 deg.) to give an inclination of 32½ deg. to the horizontal; see *f'g'* in Sketch IV of Fig. 4. This coal chute, which parallels the main subchutes in the rock below, is extended from the tap *f'* to the mid-distance between sublevels, about 46 ft. For its entire length this slant lies on the floor of the Mammoth bed. To aid temporarily in its ventilation, this chute *f'g'* is met (see Sketch III of Fig. 4) by a similar, but shorter and smaller, chute, *h'i'*, driven from the adjacent tap on the west.

Driving Cut-Backs of Top Lift

As the bed slopes at 42 deg. to the horizontal, a chute driven at right angles to one straight up the pitch and directed to the roof of the seam would not be vertical but inclined at 90-42 deg., or 48 deg. to the horizontal. One could travel, however, at any inclination to the horizontal and yet pass from the bottom to the top of the coal bed by choosing a suitable direction of travel. In this case a "cut-back" chute, *g'n'*, is driven not at an inclination to the horizontal of 48 deg. but at the standard slope of 32½ deg. to the horizontal. This cut-back chute parallels the tap chutes driven in the rock between subchutes and coal.

This "cut-back" is timbered only until it reaches the middle of the bed at *n'*. Here, as a final provision for ventilation, 3x5-ft. slants *n'k'* are driven from the top of the cut-back chute to intersect other narrower slants from the cut-back chute of the workings from the neighboring tap. In Sketch II of Fig. 4 all similar chutes in the several blocks are lettered *n'k'*.

Beyond the point *n'*, which itself might be regarded as a tapping point for the quarter block or section, the cut-back chute is turned into a breast 7 ft. high and 30 ft. wide, thus completely undermining the entire quarter block. It is no longer timbered, as its purpose is to afford the coal an unobstructed opportunity to fall. After it is completed to *m'* at the top rock of the coal bed, a chute, *n'o'* (see Sketch VI of Fig. 4), is driven up the pitch, 10 ft. high and 30 ft. wide, the full width of the block. How far it can be driven depends on the strength of the overhanging coal and which may be resting on it as a result of operations at higher levels. Sometimes the distance will be 25 ft., sometimes 32 ft. The chute *n'o'* may or may not be timbered, according to the condition of its coal roof. Its purpose is to cause the ultimate dislodgment by blasting or gravity of the coal above it and also of the coal ahead of it. Both these places, *n'o'* and *n'm'*, are known as "tumbles."

In some cases the coal may fall without the aid of blasting. The men engaged at this tumbling work have had so much experience that they can forecast the likelihood of a fall with accuracy. After the coal has fallen, miners enter the place, break up the large coal by drilling and blasting, after which it travels by gravity down the several slants to the Skidmore gangway. In this way, the coal is not broken by excessively speedy travel nor, as in most mines, by being held in full battery breasts under excessive weight, where it is subject not only to pressure beyond its strength but also to abrasion in movement under that pressure.

This quarter block is known as "the first tumble," for not only places driven to cause the "tumble" are known as "tumbles" but the coal also which falls as a result of their driving. The next coal removed is that in the thickness of the seam under this quarter block. To this end, the timbered chute on the floor of the seam *f'g'* is extended, heightened and widened to 30 ft. with or without timber, depending on roof-coal conditions. It thus occupies the full width of the block. As the chute to the previously mined tumble is only the narrow timbered slant, *g'n'*, already mentioned, it loosens the coal far less than the tumble *n'm'*, which was a breast 30 ft. wide, so this extension or "tumble" from *g'*, which is made 10 ft. high, may be driven 35 ft. before its coal roof will show a disposition to fall.

Taking Third Quarter Block

After this coal has fallen, been broken by drilling and shooting and loaded out, a timbered slant, *f'g'* (see Sketch VIII, Fig. 4), is driven toward the roof of the coal, but it is timbered only to *r'* and the end *r'q'* is widened to 30 ft. to dislodge the third quarter block of coal with the aid of a tumble, *r's'*, driven up the pitch. With this third quarter block drilled, shot and loaded, the chute *f'g'* is widened to 30 ft. to dislodge the fourth coal mass, which likewise falls, is drilled, shot and loaded, writing "finis" on the work to be done through the tap *f'*.

For ventilation, each third main slant is connected with the Skidmore main gangway on the fourth level; thus three main slants are fed by the same split. All the operations in the Mammoth bed have left, and will leave, this and other Skidmore gangways unaffected. As this fourth-level Skidmore gangway is not being extended, or indeed used except for delivery of timber to the first and upper sublevel workings of the present fifth level and for drainage, it is possible to allow the air to travel from west to east direct to the return airway of the main slope of the mine.

Ventilation Ascensional

When once the air has been taken up to the Skidmore fourth-level main gangway—that is, to the top of the live workings—it is not necessary with this layout, as is so generally the practice, to bring it back down to a return airway of the fifth-level main gangway and then carry it back again up the return of the main slope. If it should be necessary for the air in the upper gangway to be used as an intake for live workings further along, the fourth-level return airway would be used both for the fourth and fifth levels. Hence, in this instance, not only is the long S-turn in the ventilation avoided but the passage of the air is wholly ascensional, which is the most desirable way of directing it. Methane resists being carried downward, and unless the air can scour completely every nook, cranny and side passage in its downward travel, the methane will inevitably collect and tend to make trouble; hence descensional ventilation is never entirely effective.

A separate split of air is provided for every twelve men. Air passes through the rock subchutes to a connection with a coal chute and then traverses the coal slants, returning through the last rock tap on the split to the return chute. All blind ends, which are held to a minimum length, are ventilated by line brattices constructed of airtight plank to within 20 ft. of the face, followed by 15 ft. of brattice cloth.

All taps are numbered for identification; the first shows the number of the main slant to which the coal from that tap is directed; the second digit, the number of the sublevel on which the tap is located, and the third the order in which the tap was driven. Thus Tap 323 feeds to the third main slant, or chute, and is located on the second sublevel and is third in order of driving.

NEW CLEANING PROCESS

+ Materially Improves Nut Coal Quality At Knox American No. 2 Mine

By IVAN A. GIVEN
Associate Editor, Coal Age

USING a new type of washer, the Knox Consolidated Coal Corporation materially improves the combustion characteristics of the 2½x1¼-in. nut produced at its American No. 2 mine, Bicknell, Ind., and at the same time also facilitates crushing this product at times when it is desired to make a commercial-stoker coal. The improvement, both from the combustion and crushing standpoints, arises primarily from the elimination of sulphur balls and other sulphur-bearing refuse, although, of course, excess ash also is removed, leaving a highly uniform product. In crushing, Knox also takes advantage of later developments in the design of segments to secure the maximum yield of coarse coal and reduce fines under ⅛ in. to less than 5 per cent.

Another feature of the American No. 2 plant are the provisions incorporated to recover and clean by dry methods coal contained in material thrown off the picking tables. By the use of this auxiliary dry-cleaning installation the hand-picking process is improved and at the same time a substantial volume of material for which a ready market is available is reclaimed, treated to improve its quality, and sold.

Fifth-Vein Coal Mined

American No. 2, a shaft operation, recovers the Indiana Fifth Vein, averaging 7 ft. in thickness and overlaid with a strong slate roof. Fireclay underlies the seam as a rule, although in some places a "rash" appears in the bottom, reaching a maximum thickness of 12 in. Occasionally natural conditions force cutting in this rash and sometimes the machines get down into it by mistake, in which case it finds its way into the screenings, although such inclusion is relatively infrequent.

The seam is without regular partings and in addition to the rash the impurities encountered are pyritic shale bands up to ½ in. in thickness, sulphur balls and sulphur-bearing boulders, granular sulphur, a "dirty band" up to 3 in. in thickness which occurs about 18 in. below the top in some parts of the mine and other shale and slate partings, non-continuous and usually thin. The coal is loaded mechanically and consequently is subject to some variation in impurity content. Still, however, an acceptable screenings product of a good free-burning character is produced, and as yet mechanical cleaning has not been found necessary to move it.

Domestic Trade Secondary

No. 2 mine, as well as American No. 1, produces primarily steam and industrial fuel, with domestic business as a secondary factor. Consequently, the maximum size produced is a large egg. At No. 2, therefore, mine run is run over a grizzly and the large lumps are broken down with sledges before they pass onto the main shaking screens. These screens separate the feed into 6x3-, 3x2½-, 2½x1¼- and minus 1¼-in. sizes. The latter may be loaded as 1¼-in. screenings or may be passed over an auxiliary flexible-arm shaking screen designed to make either a 1¼x¾- or 1¼x⅜-in. domestic-stoker coal, with minus ¾- or ⅜-in. screenings or carbon as a resultant. On its way to the car, the domestic-stoker coal is passed over a Central Electric Repair Co. chute-type magnet to remove tramp iron.

The 6x3- and 3x2½-in. sizes pass from the main shakers onto 60-in.-wide apron-type picking table-loading booms for cleaning. Material removed on the picking-table sections, depending upon its character, either is sent direct to the refuse bin or is re-treated as described below. The 2½x1¼-in. size does not lend itself to hand picking, even though this was attempted at one time. And so, even though the impurity content of this size is relatively low—5 to 6 per cent sink at a specific gravity of 1.50—washing was decided upon because of the nature of the impurities, as well as to assure a greater degree of uniformity.

Objectives of Cleaning

The principal drawback to the raw 2½x1¼-in. coal was the fact that pieces of pyritic material in the fuel bed tended to form nuclei and clinker. And once a clinker formed it tended to spread, with consequent adverse effect on the fuel bed. Installation of the washer stopped complaints from this source. The second factor was the effect of the sulphur-bearing material on crushing results when reducing the 2½x1¼-in. size to make a commercial-stoker product with a nominal size of 1¼x⅜ in. Being hard, the sulphur lumps usually were not reduced in passing through the crusher. By retaining their original size they would cause the crusher to open up, resulting in an excessive production of oversized coal. Attempts to screen out this oversized material and recirculate it resulted in building up a large circulating load, thus magnifying the difficulties originally encountered.

To clean this 2½x1¼-in. coal the Knox management selected a Morrow-Prins "Multi-Flow" washer. One factor in the choice of this equipment was its relatively small size in relation to its rated capacity. To date, one such unit with a capacity of 108 tons per hour has been installed (operation started in August, 1937) with the idea that eventually a second washer would be purchased to permit cleaning the 3x2½-in. fraction in addition to the 2½x1¼. However, while the present machine operates primarily on 2½x1¼, the entire 3x1¼-in. fraction has been put through it, although the load was somewhat excessive. Taking in all the 2½x1¼ and half of the 3x2½, however, the unit has done a satisfactory job.

How System Operates

While later designs differ somewhat in detail, the washing unit at American No. 2 consists of a long, narrow stationary trough passing through the top of a water tank in which is mounted an auxiliary "basket" given a jigging motion by an adjustable-throw eccentric. Speed of the eccentric shaft also may be regulated by means of a Reeves variable-speed drive. The basket curves upward from the feed to the discharge end.

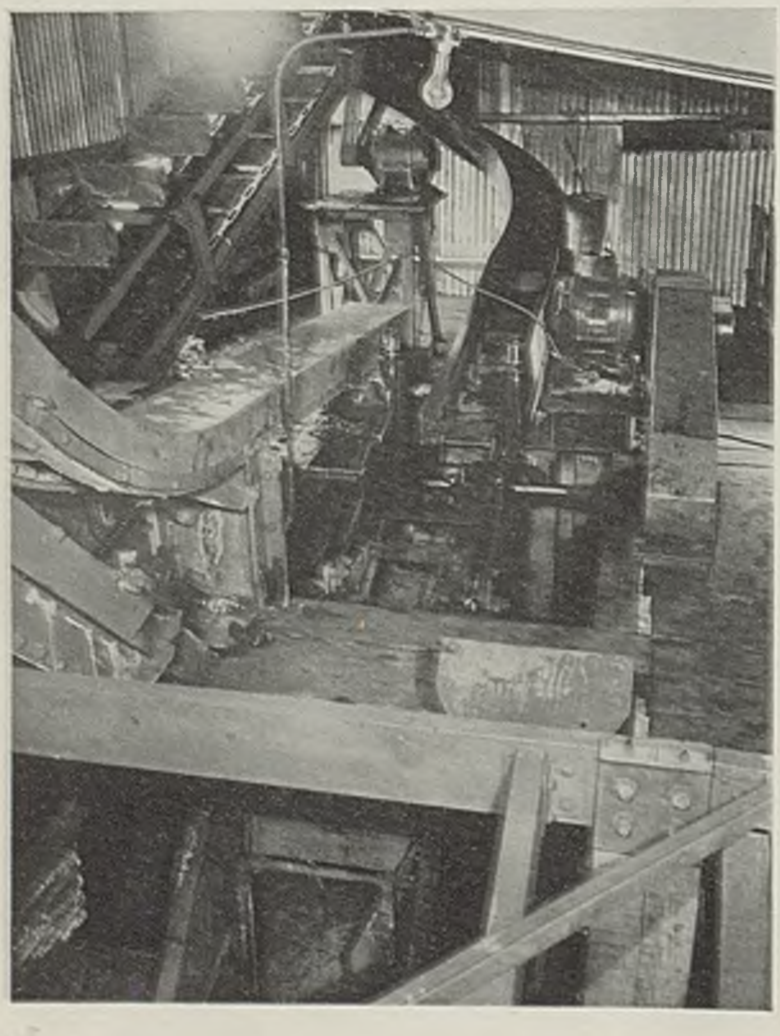
Raw coal is carried down the launder by a stream of water supplied by a pump, and in this operation the feed stratifies, placing the lighter material on top and the heavier material, including the refuse, on the bottom. The first opening in the launder, located about one-third of the way down the tank, is provided with a baffle plate to arrest the movement of the lower layers. This opening permits the heavier material (both coal and refuse) to pass through, while the lighter-gravity pure coal carries over and down the trough to a second opening, where it meets the discharging water currents flowing through the basket beneath, and is carried out as clean coal.

Material through the launder openings, which, in addition to refuse and the heavier coal fraction, includes tramp iron, falls into a stream of water entering from the back of the washer. Most of the remaining coal is removed by this current and carried up to the washer discharge. Refuse and some high-gravity or entrained coal falls through this stream and forms the refuse bed supported by the bottom of the basket. A third, or lower, stream of water also entering from the back of the washer, is used for the purpose of regulating the refuse discharge.

Once the refuse lands on the basket bottom, it is moved back against the inflowing lower current at the back of the washer by the jigging and conveying action of the basket. Perforations in the bottom of the basket, along with the conveying and jigging motion, provide a stratifying movement of this refuse bed to free any remaining coal which is moved upward into the water currents flowing toward the washer outlet.

Adjustment of the speed and throw of the eccentric, as well as the pitch of the short hanger arms on which the basket is suspended, permits regulation of this final jigging and conveying action for the maximum separation of coal and refuse. No separate controls or refuse-trapping equipment is used. The refuse falls into a well from which it is removed by a chain-and-flight conveyor. The same pump that supplies the trough also provides the two water streams in the washing tank proper.

This new-type washing unit cleans 2½x1¼-in. nut at American No. 2 mine.



Housed in Separate Structure

Washer, dewatering screen and auxiliary equipment are housed in a separate small structure built into the original tipple. Coal to be washed is taken off the back chute from the lower shaker screen which discharged onto the original picking table-loading boom. This coal falls through a gate into a chain-and-flight conveyor which takes it back in the opposite direction from the original and elevates it to the head of the washer trough. Clean coal discharged from the washer flows onto a 5x20-ft. dewatering screen fitted with screen jackets having ¼x½-in. diagonal slots. Dewatered coal falls off the end of the screen directly onto the end of the above-noted picking table-loading boom. Washer refuse is discharged onto the top strand of the feed conveyor, which takes it back to a cross conveyor in turn leading to the main refuse conveyor.

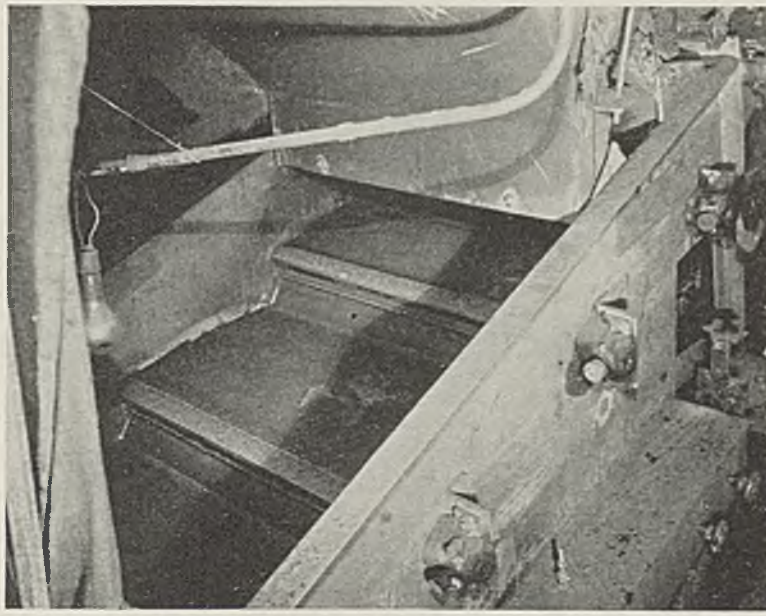
Water and fines through the dewatering screen is recirculated for one shift, with, of course, the addition of the necessary fresh water for make-up, and then is run to waste. Fresh water for make-up is pumped up from behind seals in the mine. Two 14,000-gal. cylindrical oil-storage tanks set on a slant are used as circulating-water sumps. One tank is used for one day and the other the next, and the tank in use is drained after each shift and filled with fresh water to start the next shift. Setting the tanks on a slant facilitates drawing off the slurry and flushing them out. Wash water is circulated by a Weinman centrifugal pump with a capacity of 3,000 g.p.m., although it is believed that the operating rate is not over 2,000 g.p.m. This pump is driven by a 25-hp. motor. Other motors in the plant are: feed conveyor, 7½ hp.; washer, 10 hp.; dewatering screen, 7½ hp.

As noted above, sink in the 2½x1¼-in. size at 1.50 specific gravity ranges from 5 to 6 per cent. As shown by the sink-and-float analyses for 2½x1¼-in. coal given in Table I, the most of this sink is concentrated in the 1.60 and higher gravity range, while most of the coal floats at 1.45. Sink-and-float analyses of the washed 2½x1¼-in. coal (Table II) show monthly sink averages in the period February-May, 1938, inclusive, ranging from 1.36 to 1.79 per cent at 1.50. Monthly float averages in the refuse during the same period ranged from 5.9 to 9.4 per cent.

Preparation officials at Knox keep close tab on the heavier sink in the coal and the lighter float in the refuse as an indication of the efficiency of the process. In April, for example, the sink at 1.60 in the washed coal averaged 0.59 per cent, while the float in the refuse at 1.40 averaged 3 per cent.

Knox Crushing Practice

In crushing the 2½x1¼-in. size to make commercial-stoker coal, increase in the yield of coarse material and reduction in the extreme fines, along with a minimum of oversize, as noted above, was accomplished by reequipping the Series "N" Jeffrey crusher (30x30 in., single roll) originally placed in service in 1929. This reequipping was done in 1937 and consisted of adding new manganese-steel segments with short pyramidal teeth, restricting the maw and installing an extended shoe to bring the unit in line with the latest Jeffrey design for stoker-coal sizing. A test made June 6, 1938, showed the following results: plus 1¼ in., 1.4 per cent; 1¼x1, 28.6 per cent; 1x⅜, 52.3 per cent; ⅜x3/16, 7.3 per cent; ⅜x⅛, 4.6 per cent; minus ⅛, 5.8 per cent. This indicates that both the major aims—a high percentage of medium-size coal and a low percentage of minus ⅛-in. and oversize material—has been attained to a satisfactory degree. Other tests have shown the minus ⅛-in. fraction



Coal recovered from pickings is cleaned in this three-cell dry unit.

as low as 3.9 per cent, and the plus 1¼-in. as high as 4.3 per cent.

Hand picking at American No. 2 is arranged to separate the pure refuse, which goes directly to the rock bin, from material containing recoverable coal. The latter is conveyed to a 7x14-ft. Bradford breaker with 1½-in. perforations. Material through the perforations drops into a 40-ton hopper, from which a 9-in. Redler elevator elevates it to the top of an air-sand cleaning plant in a separate structure. Material out of the end of the breaker (refuse) goes to the bank.

Table I—Sink and Float Analysis of Raw 2½ x 1¼-in. Coal From American No. 2 Mine

Specific Gravity Sink at	Specific Gravity Float at	Per Cent
....	1.45	93.6
1.45	1.50	1.3
1.50	1.60	1.7
1.60	....	3.4
		100.0

Table II—Sink in Washed 2½ x 1¼-In. Coal and Float in the Refuse, Separating at a Gravity of 1.50.

	No. of samples*	Avg. Sink in Coal, per cent	Avg. Float in Refuse, per cent
February, 1938	21	1.69	9.2
March	16	1.52	9.4
April	8	1.30†	7.1†
May	7	1.79	5.9

* One sample, as a rule, of both coal and refuse is taken each shift for sink-and-float analysis.

† In this month, sink in the cleaned coal at 1.60 averaged 0.59 per cent; float in the refuse at 1.40 averaged 3.00 per cent.

And while the breaker product normally is re-treated, provision is made for loading it without any further preparation for certain customers who desire it that way.

Air-Sand Plant Recovery

Rated capacity of the air-sand plant is 15 tons per hour. At the present time, the plant treats about 135 tons of material per shift of 7 hours, recovering about 80 tons of coal, which is shipped separately to a certain class of users. The Redler unit discharges the coal into a 3-ton surge bin, from which it is fed out onto a 4x10-ft. mechanically vibrated screen (450 r.p.m., ⅜-in. throw) supported by board hangers at the feed end. The screen is equipped with a Ty-rod cloth with a clear opening of 1/10 in. between the wires. Material through the cloth, which naturally is high in ash and sulphur, goes to the refuse.

Coal over the screen is fed into a 4 ft. air-sand separator, which is followed by clean coal and refuse desanding screens and a sand-return elevator. The plant also is equipped with a dust-collecting system made up of hoods, ducts, an exhaust fan and a cyclone separator. Arrangements also have been provided for cleaning pickings from American No. 1 mine, but as a rule part of these are burned in the power plant at that operation and the remainder are shipped in the natural state. As at No. 2, pickings are prepared at No. 1 in a Bradford breaker.

CONVEYOR-MINING EFFICIENCY

+ Increased by Hand Room Driving And Tracks for Supply Deliveries

By J. H. EDWARDS
Associate Editor, Coal Age

PROGRESS toward improved mine layout, more workable methods, better equipment arrangement and higher production efficiency has marked the two and one-half years of experience with conveyors in No. 5 section of the Red Parrot mine of the Red Parrot Coal Co., at Prenter, Boone County, W. Va. From a cautious start with one conveyor unit purchased in November, 1935, the complement of equipment was increased to two units in July, 1936, and to three units in April, 1937. Of the 701,000 tons shipped from Red Parrot last year, 131,551 tons (18.8 per cent) was conveyor-mined. In January of this year the average production per man-shift, excluding gathering-locomotive crews and supply men, was 15 tons. The working plan now being followed is the fourth in the line of improvement by study and trials.

The seam, which is the No. 5 block but locally is termed the Red Parrot, lies practically level, outcrops high above the valley and has comparatively light cover. The seam contains a stratum of 30 to 48 in. of clean coal below which is 4 to 6 in. of laminated material, and under that 8 in. of bottom coal. The primary roof over the seam is 30 to 40 ft. of strong sandstone. As a rule, 4 in. of bone lies between the coal and the sandstone top. In some sections of the mine the bone is missing and in others a drawslate occurs, sometimes with the bone. Thus it is evident that details of the work must be varied to suit the different conditions encountered.

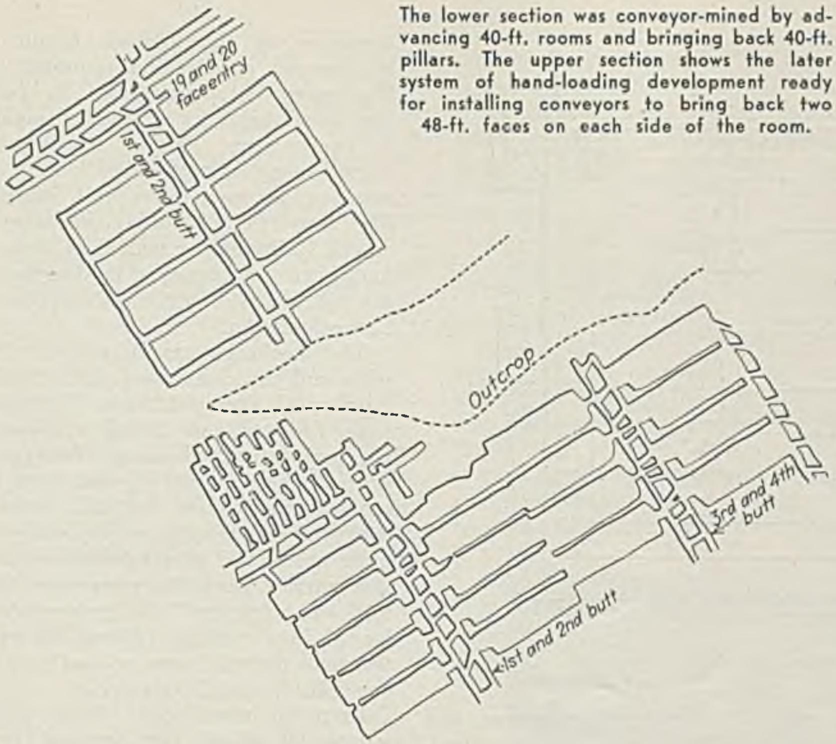
As a rule, the conveyor mining has been confined to the 30- to 48-in. stratum of clean coal; in some of this work, however, the undercutting has been done in the bottom coal and the lamination above it thrown back into the gob. In certain areas that were mined in the early days of the conveyors, the clean-coal stratum ran as low as 30 in. and the top and bottom materials thrown over the conveyor into the gob practically filled the area to the roof. In other sections mined later, the waste material handled has been negligible. The January, 1938, average of 15 tons per man-shift was made under the favorable condition.

Equipment of the first unit consisted of the following: two Jeffrey 61AM 10-hp. 300-ft. chain-flight room conveyors with 6-ft. pans, two Jeffrey 61HG 5-hp. chain-flight face conveyors with 6-ft. pans, two Jeffrey 1½-hp. blowers, two Little Giant electric coal drills and one Brown-Fayro 50-hp. trip hoist. The second and third units are duplicates of the first. All motors are 275-volt d.c.; those on the conveyors and blowers were made by Westinghouse and those on the hoist by Crocker-Wheeler.

The mine cars into which the room conveyors discharge average 3.2 tons and are the same cars as are used in hand-loading sections. These are solid-body, all-steel cars 26 in. high. Undercutters are Goodman 12AA shortwalls with 7-ft. bars, which have been the standard equipment of the mine for some years. Cincinnati chains and bits are used and have materially improved cutting performance.

Driving a 40-ft. room 300 ft. deep,

Conveyor mining is carried on in the No. 5 section, the headhouse of which appears at the upper left. In the foreground is the No. 4 section headhouse, which feeds to the same tipple.



The lower section was conveyor-mined by advancing 40-ft. rooms and bringing back 40-ft. pillars. The upper section shows the later system of hand-loading development ready for installing conveyors to bring back two 48-ft. faces on each side of the room.

bringing back a 40-ft. pillar open ended and having but one room conveyor discharging into a car at the loading point was the initial layout. Material was delivered to the face by reversing the conveyor and this material delivery and all conveyor and pan moving were done by the regular conveyor unit crew. This supply and moving practice gave way to an entirely different system in the fourth and present layout. Trials with the initial system indicated possibilities of worth-while cost reduction but showed that obtaining efficient crews would be no easy matter.

The second step was to increase man-shift production by arranging for the conveyors from two rooms to discharge into one car. Two adjacent rooms on the same side—that is, turning off the haulage heading—were conveyor-mined simultaneously. A short chain-flight conveyor on the haulage heading and paralleled to the track carried coal from the inby room to the common loading point at the adjacent outby room. The rooms were driven 40 ft. wide with a 10-ft. pillar between and no return mining was done.

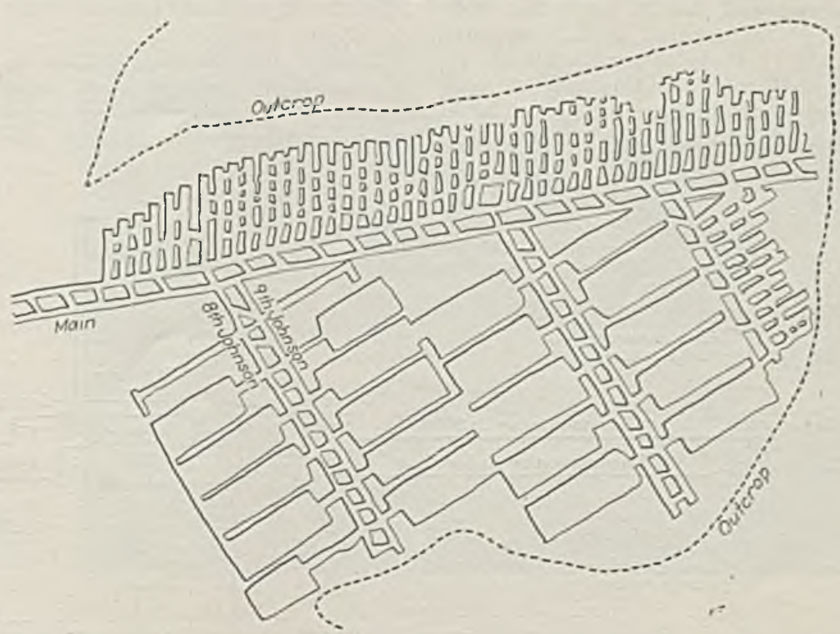
In the third plan driving 40-ft. rooms and bringing back 40-ft. pillars was resumed and the common loading point for two conveyors was continued. However, this step was accompanied by the important change of driving the two rooms on opposite sides of the entry—that is, one from the haulage heading and one from the aircourse heading. This requires that the entry chain pillar have a crosscut straight across from opposite room necks so that the room conveyor from the room off the aircourse can extend over to the haulage entry. The two-room conveyors thus discharge into one car from opposite sides. This car-loading plan has been continued in the fourth and latest layout.

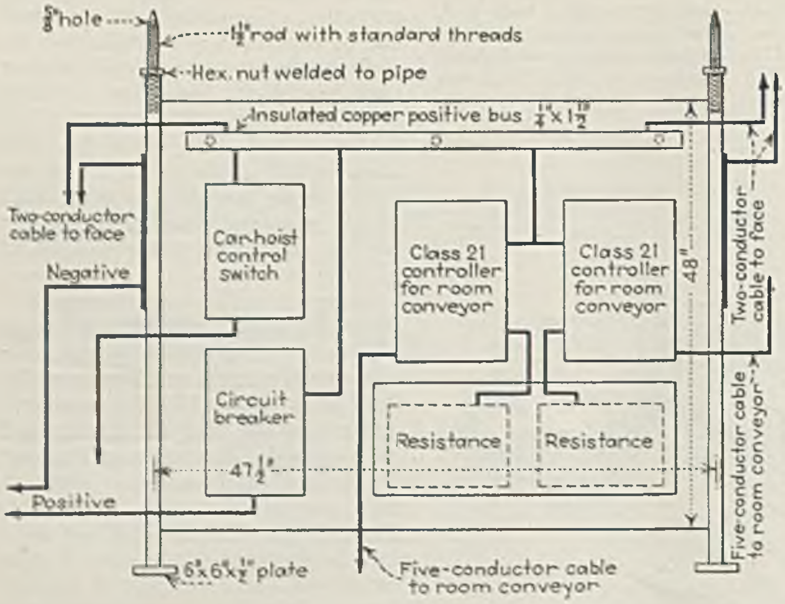
In this most recent and most successful working method hand loading into cars has been reverted to in driving 14-ft. rooms 300 ft. deep on 125-ft. centers and also in driving butt-offs, or crosscuts, at the back end of each room preparatory to installing the conveyors and mining back two 48-ft. faces, one on each side, in a T-square arrangement of the room and face conveyors. The track is left in the room and serves for bringing supplies in mine cars to the conveyor face and also for moving pans and other equipment in and out.

Conveyor sections are worked two shifts. As a complement to the supply-track arrangement a special two-man supply crew working on the third shift brings into the mine and delivers to the face all timber and supplies and disassembles and moves the finished room-conveyor pans to their new position in the next room. Thus the pans are handled but once and the conveyor-mining crew is concerned with moving only to the extent of skidding the face conveyor ahead after loading each cut and the final transferring of drives to the next room. Use of tracks, cars and locomotives and doing the work on the off-shift reduces materially the man-hours required for this supply and equipment handling. This two-man supply crew services all three of the conveyor units and in addition performs other duties. Confining the conveyors and their crews to the primary job of mining and loading coal further raises the general efficiency.

Longer faces are now being tried and when the accompanying photographs were made one face of the tee was 80 ft. long and the other was 40 ft. There has appeared no

The section below the main is nearing completion by conveyor recovery of pillars after hand-driving of narrow rooms.





Showing arrangement of controls on steel panel.

reason why, so far as roof control is concerned, two 100-ft. faces cannot be brought back, thus mining a space 200x300 ft. at each setup. That arrangement likely would require larger than 5-hp. motors on the face conveyors and the heavier drive units would constitute an appreciable disadvantage in moving. On the 48-ft. faces the whole length of the cut is shot down and the conveyor restarted without, usually, any difficulty. On the 80- to 100-ft. faces it is necessary to operate the face conveyor between shots, thus requiring slightly more time.

The order of work at the face is as follows: cutting, raking out the cuttings, drilling and loading shotholes, moving face conveyors 6 ft. ahead and, finally, firing the shots. Holes are spaced 8 ft. apart and only 1½ sticks of permissible are required per hole. One row of wood props spaced 5 to 6 ft. apart is set per cut and not often are any props required between the conveyor and the face. No props are recovered. Wood cribs have been used in a few instances where roof action indicated the need. Since the start of the work one face conveyor has been lost in a fall. Its value was recovered through special insurance against all types of accidents except fire, which the company carries on all its mining equipment.

Ten- to 20-ft. pillars are left between conveyor-mined rooms. The top over a whole room area, 100x300 ft. and up to 200x300 ft., stays in place long enough to mine the area by two-shift work and move out the equipment. At times four to five adjacent rooms have been mined before an extensive roof break occurs. No shooting of props has been necessary to produce a cave.

Driving double-heading entries by a chain-flight conveyor unit, using one conveyor in each heading and a third conveyor crossing from the aircourse to the haulage heading, has proved speedy and economical. The entry is advanced 30 ft. per day (one shift) by a crew of eight to twelve men. During April this narrow-work conveyor crew put in a total of 97 man-shifts and loaded 385 cars (1,232 tons), an average of 12.7 tons per man-shift. Locomotive men employed in hauling cars are not included in the crew-production calculation.

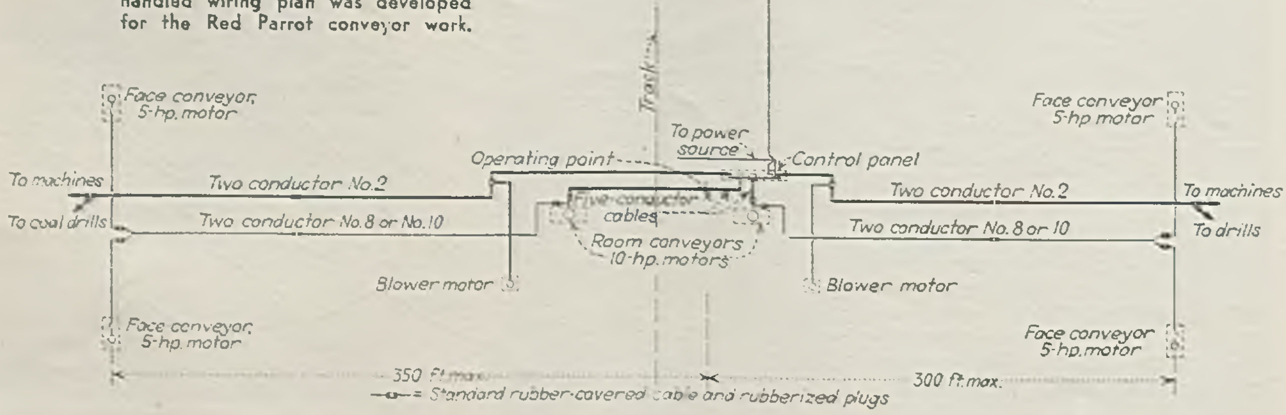
The headings are driven 16 ft. wide and the coal taken during this April work averaged 36 in. in thickness. Blowers and tubing are used for ventilation. Heading conveyors are extended to 300 ft. and then a crosscut is driven and the cross-conveyor and heading-conveyor drive units are moved to a new set-up. In this narrow work the crew does its own "panning up." No refuse was loaded into cars but instead the extraneous material was gobbed along one rib.

Prepared sizes above 2 in. constitute 60 to 65 per cent of the production from conveyor mining. The comparative figure for hand loading into cars is 58 to 60 per cent. The increase means a higher realization because a large part of the mine output goes to the domestic trade.

As in most other mines where part of the production is hand loaded, it was not easy to obtain efficient workers for conveyor crews. Older and experienced miners prefer to work under the old independent system. Generally speaking, the conveyor crews have been built up from the younger inexperienced men. Willingness to work steadily is the primary requirement.

Losses in mines that have both hand loading and mechanized sections may amount to a considerable figure through the placing of hand-loader checks on conveyor-loaded cars. To remove this temptation

An adequate, safe and easily handled wiring plan was developed for the Red Parrot conveyor work.



and to eliminate doubt among mine officials a handful of slacked lime is scattered over the top of each conveyor-mined car as it leaves the loading station. Thus, a whitish cast plainly proclaims a conveyor-mined car.

Electrical controls and connections for a two-room set-up, as designed by W. H. Cooke, electrical engineer, are assembled on a steel panel with screw-jack-type posts welded to each end. Short connection cables are permanently attached to the control panel and are coiled up and moved as a unit with the assembly. Standard equipment on a control panel consists of a General Electric line circuit breaker, a Trumbull 60-amp. safety switch to control the hoist, two Jeffrey reversing starters for the room conveyors and a ventilated box containing the two resistors for the room conveyors.

Special Cables Used

Miller rubber-sheathed connectors are used for all cable connections. A five-conductor type made especially for the duty is used between the control board and the room conveyors. This number of conductors is necessary for reversing-type control. Originally, portable reels were used for the No. 2 room cables feeding the cutting machines and coal drills. The difficulties of handling such a reel when wound with 300 ft. of cable and the greater heating of such a cable when coiled on a reel caused abandonment in favor of two 150-ft. lengths of cable equipped with Miller connectors. These lengths are handled by dragging and coiling into a car for moving. Use of 150 ft. of No. 2 cable instead of 300 ft. for working the inby half of the retreat has an appreciable effect in better voltage and reduced power loss for that portion of the mining.

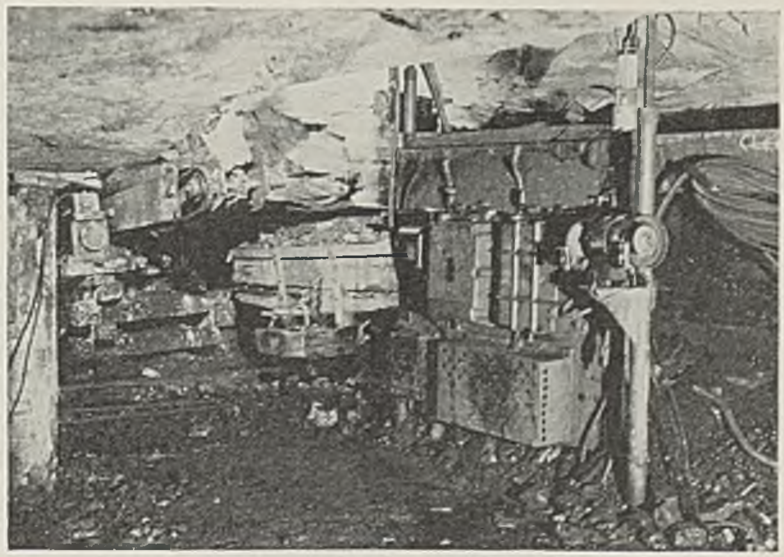
An electric grinder with its supporting bracket welded to a steel roof jack and mounted near the control board serves for sharpening coal augers and for miscellaneous grinding.

A power test last January by the West Virginia Engineering Co. made on a shift cut one hour short due to a transportation difficulty showed a 44-kw. 15-minute maximum demand peak for the equipment in a two-room set-up, consisting of one trip hoist, two room conveyors, four face conveyors, four mining machines, two blowers and four coal drills.

During this six hours of work, the seventeen-man crew mined and loaded 68 cars (221 tons) and the power consumption was 174 kw.-hr., equal 0.79 kw.-hr. per ton. Other test findings were: Actual time power was used, 5.16 hours; average kilowatts of total shift, 35; load factor, total shift, 81 per cent; average power consumption for coal cutting, 0.165 kw.-hr. per ton. Average thickness of the coal in the territory where this wide-work test was made was 39 in. Cutting machines (Goodman 12 AA shortwalls) involved in this test were fitted with Cincinnati "Duplex" chains and C-11 "Duplex" bits. This type of chain is now used exclusively in both the hand-loading and conveyor-mining sections of the mine.

That an unusually favorable condition must have prevailed when the test was made is indicated by the fact that a previous test showed 0.81 kw.-hr. per ton consumed by conveyors alone when the room length was 257 ft. Haulage equipment used in this No. 5 section of Red Parrot mine consists of two 10-ton Westinghouse and one 8-ton Atlas main-line locomotives, and two 8-ton Jeffrey and four General Electric 6-ton cable-reel gathering units.

Paul Sabok is foreman in No. 5 section. J. T. Sydnor was superintendent until his recent acceptance of the position of general manager for the West Virginia Coal & Coke Corporation. He was succeeded at Red Parrot by H. B. Morgan. J. A. Kelly, Huntington, W. Va., is general manager of the Red Parrot Coal Co.



Two room conveyors discharging from opposite sides into one car is the present system. Electrical controls, wiring and short connection leads are permanently assembled on a steel panel complete with roof jacks. The electric grinder at the right is on a separate jack.

Narrow rooms are driven by hand, after which conveyors are installed and two wide pillars brought back open ended.

WHAT ARE WE DOING

+ To Meet Demands of Modern Mining

For Better Trained Personnel?*

By THOMAS ALLEN
Colorado State Coal Mine Inspector

LIKE OTHER major industries, coal mining within the past two decades has revolutionized its practices and methods. In the early days, very little thought was given to the possibility that training and educating miners and officials might reduce accidents throughout the industry. Mining was not the complicated occupation it is today. A boy might enter a mine at the age of ten years; he worked under the close supervision of some older person for a period of years. Gradually, if nothing else was accomplished, he became acclimated to life in the mine and, as he grew physically, at 18 and possibly up to 21 he was a skilled and instinctively, through these years of apprenticeship, a real miner.

Today boys may not be taken into the mines until they are at least 16; the average age is about 18 years, and in many instances they are closer to 20 or 21 years before they even see a shaft top. He is taken into the mine under no system of apprenticeship or training and the only factor taken into account is that he is physically strong enough to perform any manual labor. He represents a hazard from every viewpoint. Should he be fatally injured, the compensation demand is very heavy if he has a wife and children.

Vocational Instruction Needed

Some arrangement could be made whereby these young men could be trained by vocational instruction before they enter the mine, and that training continued for a period of years after such entrance. Practically all grade and high schools in farming areas have instruction in agriculture —why not some instruction in coal mining to prepare these youngsters who must be our future labor supply? Vocational lectures could be given on branches of coal mining; moving pictures showing actual underground conditions exhibited; visits made to different coal mines; first-aid work taught.

Vocational schools or parts of schools set apart for vocational training of proposed miners and employed miners can be established. For those actually employed in mines, timbering, trackwork, electricity, mechanics, construction of machinery used in mines, etc., could be taught. The program could be enlarged to include an experimental mine (centrally located) for demonstrations and training.

First-Aid Training Essential

Every mine employee should be trained in first aid. The excellent training given by the U. S. Bureau of Mines in first-aid work could be materially increased by adopting its more recent system of training instructors. These instructors in turn train the mine employees. And every miner and mine official should hear the Bureau's excellent course in accident-prevention work. Vocational training, combined with the programs of the U. S. Bureau of Mines, could be carried on steadily at very little cost to mine operators, who undoubtedly would be repaid many times over for their efforts in lower operating costs and fewer accidents when using trained men in their mines.

The common practice today in appointing mining officials is a haphazard selection of men employed in the mines. In many cases they are picked simply because they happen to be good workers; the term "good worker" means a man who will attempt to do more physical work than others in an average group. No thought is given to the fact that a man in charge of a mine needs special training, and no attempt is made to give anyone with ambition any real assistance in gaining the training necessary for such advancement.

No Guide for Ambitious

There is no guide for the ambitious miner unless he is fortunate enough to contact someone who will give him some idea of what to study and where to procure the literature, etc., necessary to study. Consequently many men of very high natural intelligence present themselves for examination as mine officials when they are totally unprepared. The results of this situation are illustrated by the following quotations, showing the attempts of practical mining men to answer technical questions submitted to them:

1. Name the chief dangerous gases met with in coal mines and describe them?

   Answer: Highdrogen and lowdrogen; highdrogen is found in high places, lowdrogen is found in low places.

2. I breathe slowly into the inlet of a safety lamp; the light goes out; why?

   Because your breath is bad.

3. What steps would you take if you found a district full of explosive gas?

   Darned long ones to get out of there.

4. What is air?

   Air is the stuff birds and aeroplanes fly around in; sometimes some of this stuff gets into the working faces in a mine.

* Abstract of an address, entitled "Education of the Miner," delivered at the 36th regular meeting of the Rocky Mountain Coal Mining Institute, Denver, Colo., June 24, 1938.

5. What is a barometer?

A thing for measuring wheelbarrows.

6. What is the law regarding visiting working places?

No visiting allowed.

7. What is electricity?

Electricity is something you get from motors and sometimes from the air.

8. What is a dynamo?

A machine to make dynamite.

9. What is the meaning of KVA or KW or EMF?

Radio stations.

10 How would you change from a.c. to d.c. current?

Hire a good electrician.

11. What is an armature?

A "guy" that sings on Major Bowes' program.

This may sound like comedy, but it is more of a tragedy that the leading mining companies should not help to develop men eager to become more valuable in the profession. In every instance, these apparently absurd answers show that the man being questioned was thinking.

Why No Answers?

The following questions were sent to mine foremen in Colorado; every mine foreman should know answers to such questions if he has prepared for his job, but not a single answer was received:

1. What is a No. 2 frog?
2. How long is a switch on a 3-ft. track gage, using a No. 2 or No. 3 frog?
3. How would you roughly figure the strength of any rope or cable by just knowing its diameter?
4. What size of sheave or wheel would you put in, knowing the size of the rope?
5. How would you figure the pull on the rope, knowing the weight of the trip and the inclination of the haulage road?
6. What is meant by one degree pitch and one per cent pitch?
7. How much track would a ton of 30-lb. rails lay; a ton of 20-lb. rails; a ton of 45-lb. rails?
8. How big is an average mine tie and how would you want to lay the tracks on a 1,000-ft. straight entry?
9. Can you give the approximate cost per ton for the labor on your coal production for today?
10. What is the average crushing strength of a mine post or prop?

Where men are selected without any known previous training they must learn the duties of their position and many scientific facts after they become officials. Companies employing such untrained men as foremen no doubt pay very heavily for mistakes made by them.

Present methods of examinations for mine foremen and other officials have been carried on for a long time. Standard questions are asked repeatedly. Books of questions and answers are available. Any candidate with some natural intelligence can be trained to answer the questions given in a short period of time. In many cases men studying for these examinations simply learn a certain form of answer to these questions, without understanding what half of the answers mean.

Most examining boards take into consideration the practical experience of a candidate. Written and oral quizzes readily reveal the history of the student and his ability in a practical way. But the written questions

with instruction in the hands of specialists in every branch of the industry.

Proof of having taken such courses could be offered to any board of examiners. Proper credits could be included for the completion of certain studies in grading the student in examination for any certificate of competency.

Coal-mining problems involve every known practical science—but they are distinct and far removed from metal-mining problems. Yet, there is no special effort made for the proper training of coal-mining engineers. The time is here now when engineers should be trained especially for our coal mines.

"Yes, sir, if I was President, I'd simply do th' best I knew how."

on calculations and technical problems do not reveal any training the candidates may have had. In most cases the candidate has had no actual instruction on the duties of a foreman and the problems he must face in such a position.

Some States have well-developed plans of vocational training; in the Rocky Mountain region, however, vocational training has received scant encouragement. This condition should and can be remedied if coal-mining men would cooperate with State boards. It is possible to set up a well-defined course of instruction, built into a program over a period of years. Lectures and studies of all phases of a foreman's or supervisor's work, as well as the technical aspects, can be woven into such a program,

Modernized coal mines with their complications demand more than simple and practical experience for those who would really direct the methods of working and preparation of coal. The practical man with a little vocational training will be necessary for a semi-official position as face foreman or mine foreman. These men should be simply supervisors to see that the work is carried out as per adopted plans; planning itself needs the services of trained engineers.

The day should be gone when entries and haulageways are driven haphazardly and surveyed after the work is completed. The heavy losses due to operating on badly aligned and badly graded haulage roads are the result of letting the work be done without any real previous planning or scientific control in development. Another loss from what appears to be a small part of a mining program is caused by driving irregular rooms. This irregularity leaves pillars of varying sizes and thickness. The loss in extraction of irregular pillars is much more than operators will admit; moreover, these irregular pillars represent one of our extreme hazards in coal mines.

Hope in Newer Methods

Newer methods of mining and supervision will eliminate many of our dangerous, inefficient and wasteful conditions. Haulageways will be driven on proper alignment and grades; excavations for the purpose of major excavations will be carried on in a regular form. This means that we must have in our mines men trained to use surveying instruments underground.

Such conditions would offer an opening both to young men taking coal-mining-engineering courses and to young men of ambition unable to take a complete mining-engineering course because of lack of finances. Night-school courses in the mathematics necessary for mine surveying and the use of instruments could be readily arranged through vocational training boards, and from this effort we may secure men well enough trained to do all the necessary mine surveying in individual mines.

With well-devised plans projected for the operation, and such plans properly directed and supervised, it is a bet to say that our accident rate and production costs can be reduced materially. But if we continue our grandfather tactics of mining neither accidents nor production costs will be reduced.

That vocational training for mine employees is a method of reducing accidents is evidenced by the following quotations from a bulletin issued by the Maryland Bureau of Mines (April, 1938) covering the 11-year period ended Dec. 31, 1935: "The percentage of untrained employees injured as compared to the total number injured each year, 89 per cent; percentage of students injured as compared to the total number of injured each year, 11 per cent; proportion of injuries to trained members as compared to injuries to nontrained employees per year, one to eight."

As an argument for continuous training for miners and officials by vocational schools or other similar institutions, a British item quoted in part in an editorial in *Coal Age* (May, 1938) may be given. This statement in an abbreviated form follows: "A Scottish divisional inspector examined a group of shotfirers and asked each individually to demonstrate exactly how he would proceed to fire a shot in a coal face. Not one of the men examined made a score of 65 per cent of the total calculation marks and one man fell below 32 per cent; yet this same inspector says all these men tested were intelligent and capable men."

This same editorial criticizes our more or less extensive programs of training first-aid men as not being all the training necessary for miners. "Job analysis and job training," it says, "are as essential as first-aid training and more fundamental." *Coal Age* is a little drastic when it states that trained "first-aid men, after all, only 'pick up the pieces' which others, for lack of training, have scattered."

Coal Age on the Pan

The method of statement by *Coal Age* is a severe blow at first-aid training, when it is known and freely acknowledged that first-aid training, in addition to preparation of those trained to "pick up the pieces," also creates a safety consciousness in the minds of these trained men, and this safety consciousness is known to be a factor in the reduction of accidents in coal mines. However, *Coal Age* is to be commended for bringing out the fact that other training than first aid alone is necessary among coal-mine employees.

There has yet to be made a statement by anyone that training of coal miners in any shape or form has an ill effect on such men, and that such training does not decrease accidents, and that such training does not make for better conditions in every way, shape or form. Why, then, should this important part of the scheme in coal mining be neglected, and in many cases shunned, and in many cases deliberately retarded by many who should know better?

There is no answer to this question, but the fact remains that in all other industries those not keeping up with modern progress have been lost in the struggle for continued existence, and this same condition will prevail in the coal-mining industry. It would seem that educating and training of coal miners is an essential requirement to keep pace with the rapid-fire changes for improvement being made in coal-mining operation, and that those engaged in the industry would see the necessity for solidified action, whereby advantage can be taken of the opportunities offered by the programs of institutions prepared to include vocational training in their educational work.

"I was neat even as a child."

KANSAS FIELDS

+ Use Largest of Shovels To Strip Thinnest of Seams

MAJOR SEAMS only 18 to 36 in. thick have not prevented operators in the Pittsburg (Kan.) field from working them—and sometimes an upper and even thinner seam—by stripping despite the hard overburden. Such operations require shovels which during the development of the stripping art usually have been larger and heavier than any others employed in this work. Ratio of cover to thickness of seam mined has ranged from 18 to 20. Because continuous progress is a real watchword in modern stripping, recent years have witnessed many changes in equipment and operating practices.[1]

At the No. 17 operation of the Pittsburg & Midway Coal Mining Co., the 22-in. Mineral (Lightning Creek) bed is stripped by a Bucyrus 750-B shovel with a 62-ft. dipper stick, 87-ft. boom and 24-cu.yd. bucket. The Huntsinger seam, which is 12 to 18 in. thick, sometimes occurs about 12 ft. above the Mineral bed. As the Huntsinger covers a sizable area, it has seemed undesirable to dump it to waste when the thicker seam is being stripped, provided recovery of the Huntsinger does not interfere too much with the schedule of operations.

When the overburden is shot from a point above the lower seam by explosives confined in horizontally drilled holes, the upper seam is lifted so gently that it retains its continuity and can be stripped without difficulty. Moreover, the lower part of the "high wall" below the Huntsinger seam is still so strong even after shooting that it will bear the weight of the heavy shovel. Holes are drilled a few feet above the lower seam by a Sullivan horizontal Stripborer with molefoot auger tipped with Borod. The shovel works itself to the top of the seam wherever the Huntsinger bed occurs in workable thickness by traveling up a gradual incline which it digs in the high wall to the full width of the pit.

On reaching the desired level on top of the Huntsinger seam, the shovel strips the overburden from that seam, dumping the material in the usual manner into the pit below, which has been divested by the coal-loading unit of its lower seam. After the Huntsinger seam has been removed, the shovel then uncovers the lower, or Mineral, seam, placing the spoil on top of that removed from the upper bed. Before this lower coal is removed, its overburden is drilled for the next lift; this drilling ends the cycle of operation. The Mineral coal is then ready for removal.

Coal in the upper bed, it is believed, is protected by its hard cover of black slate from the disruptive action of the explosives, which merely crevice and lift the coal so that it settles back almost as if it had not been shot. A little rock, for a depth perhaps of a foot and 6 to 8 in. wide, may dribble down from the face of the high wall where the shot is placed; the bank, however, stands sheer and, to the uncritical eye, would appear unaffected by the blasting. Holes are drilled about 30 ft. apart and are made 65 ft. long, sometimes of 4-in., but usually of 6-in. diameter.

Reclaiming Worked-Out Strip Pits

At Frontenac, Kan., a completed and abandoned stripping has been converted into a park, and after only about three years since stripping was completed a thrifty tree and grass growth has developed. It seems as if the rotted shale proves more fertile soil than the clay which it displaces and contains minerals more favorable than alumina for plant growth, for alumina does not enter in any quantity into plant life. Clay appears to be the prevailing top soil in this country.

Every stripping on completion leaves one long trenchlike open pit which, if dammed, is filled by rains and surface flows, and in this region forms a pool of pellucid water. As these strippings are all below surface level, these pits are never drained. The water covering the pyrite in the coal floor and in the spoil banks and walls of the pits prevents oxidation and maintains the natural alkalinity of the materials.

Such a lake is found in the Frontenac park, with water 18 to 20 ft. deep. It is not deeper because the coal was at that shallower depth. In those days it was not thought feasible or possible to mine a thin seam under what is now regarded as reasonable cover. In this lake the fish are multiplying. At another abandoned stripping fish are found, though it is said that the pool, formed since completion of the stripping, has not been stocked.

[1] For details of earlier developments at operations described in this article see *Coal Age*, September, 1930, p. 524, and May, 1931, p. 227.

No springing or chambering of the holes is necessary. Gelatin dynamite, 250 to 400 lb. to the hole, is used as explosive.

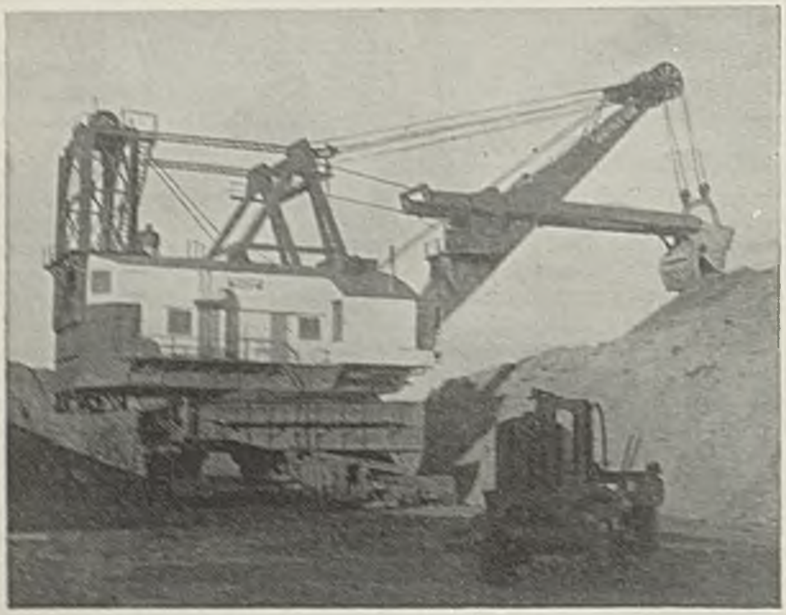
The hardness of the rock above the lower coal bed depends on the percentage of lime it contains. When not too hard, it is drilled 18 in. above the coal; at this level the explosives operate without injury to the bed. Sometimes, however, so much caprock is present that only by drilling about 3 ft. above the coal can rock unimpregnated with lime be found in which to place the holes.

In this case, the caprock is so hard that it is not broken by the shot, cannot be budged by the shovel; it is necessary, therefore, to take jackhammers and drill it with 2-in. vertical holes 8 ft. apart as soon as it has been stripped half way across the pit at the point where the shovel is stripping. Black powder (size F) is used for shooting these holes. The shovel then lifts the rock thus loosened while holes are being drilled and fired on the other side of the pit.

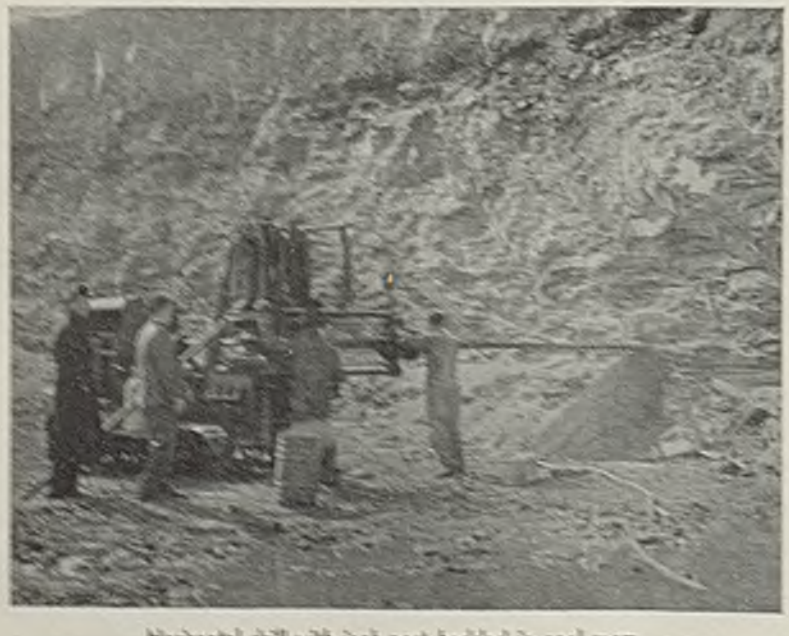
At this operation, horizontal holes have replaced vertical so that springing or chambering of holes in preparation for blasting may be avoided. As a result also the force of the shot is upward, not outward, and extends over the full length of the hole. Eliminating springing also eliminates the risk that the walls of the holes still hot from chambering will ignite the final charge in the hole prematurely. No water is needed in drilling; hence, a dry hole is provided for the charge, and the expense of piping, the mess from wet drilling and the difficulties from freezing in cold weather all are eliminated.

While these holes could be drilled after the lower coal seam has been removed, the aim is to make this unnecessary because the coal affords much more resistance than clay wherever jack posts are needed to force in the drill. Nine or ten holes can be drilled daily when the drill rests on the coal, but when the drilling machine rests on the clay floor only two-thirds as many holes can be drilled in the same time.

Pit width averages 75 ft. The coal is lifted by powder shots dug by a 5-cu.yd. 75-B horizontal-thrust loader, emptied into a 10-ton aluminum skip which is lifted by a caterpillar-mounted 80-B "bank machine," or hoisting derrick, to such a height the coal can be dropped into trips of cars along the high wall of the pit. Depth of overburden rarely exceeds 40 ft., although in some places where conditions are favorable 46 ft. is excavated.



Uncovering 22 in. of coal at No. 17 mine of Pittsburg & Midway Coal Mining Co.



Horizontal drill with jack post bedded in coal seam.

Partial Undermining No Bar

On the surface is a soft, yellow clay, about 4 ft. thick, underlaid by 4 ft. of blue shale. Except for the small, somewhat erratic Huntsinger seam with its few inches of clay and limey material, the rest of the cover over the Mineral bed is a freely weathering blue shale. Shaft-mine operations in the Weir-Pittsburg seam have partially undermined the entire area now being stripped, but as the coal was nowhere over 36 in. thick—it may have been less—and as probably not more than 50 per cent of the seam was extracted, the underground workings have not caved in or in any way interfered with shovel operation.[3]

Another two-seam operation is that of the Pioneer Coal Co. at Croweburg, Kan. Here the Mineral seam is only 18 in. thick, but the Huntsinger is everywhere 12 in. thick and more regular than at the No. 17 mine of the Pittsburg & Midway. The thinner seam at Pioneer is stripped with a 3-cu.yd. Marion 125 shovel ahead of a 12-cu.yd. Marion which uncovers the Mineral bed. The smaller shovel casts the overburden from the Huntsinger bed into the pit and, after the coal has been loaded into

[3] Since field work on this article was completed, the No. 15 mine of the Pittsburg & Midway has been equipped with a 34-cu.yd. Bucyrus shovel with 105-ft. boom and 68-ft. tubular dipper stick.

trucks by a 1¼-cu.yd. Bucyrus-Erie shovel loader, the larger shovel follows along and dumps its spoil behind and over the back of the first spoil dump. The Mineral-seam coal is loaded into trucks by a 2-cu.yd. Marion 37 shovel which has been converted into a horizontal-thrust loader. These thrust-loaders do not make a lifting cut but push their way into the coal in the direction of the bedding and thus split the coal with less resistance along natural breakage planes.

Haulage equipment at Pioneer consists of two White trucks each pulling 14-cu.yd. trailers; three White trucks, each hauling 8 tons "on their backs," and three hydraulic-dump 6-ton Mack trucks. The average round-haul is 4½ miles. No coal berm is left for the trucks, which run on the clay of the coal seam and leave the pit by traveling up roadways on an inclination carefully graded so as not to exceed 6 per cent at any point. Burnt shale and some concrete have been used in the construction of these roads.

At the No. 22 mine of the Clemens Coal Co., the Weir-Pittsburg seam is 36 in. thick and lies under about 46 ft. of cover. The stripping shovel is a 23-cu.yd. Marion 5560 with 96-ft. boom and 56-ft. dipper stick. At the No. 23 mine of the same company, working the Mineral seam, a 15-cu.yd. Marion 350 shovel with 90-ft. boom and 50-ft. dipper stick, and a 14-cu.yd. Marion 5323 unit with 92-ft. boom and 54-ft. dipper stick are used. The seam is 18 in. thick and the cover from 42 to 43 ft. At both Clemens pits United Iron Works horizontal drills with Borod-faced molefoot bits drill the overburden above the caprock, which is about 3 ft. thick over the Mineral and may run to 5 ft. over the Weir-Pittsburg seam.

Because the Weir-Pittsburg coal is soft and requires careful handling, drills must be placed higher above this seam than above the Mineral bed. The shots rarely break the caprock and jackhammer holes have to be made in them. The coal is lifted by a Bucyrus 75 shovel with 4½-cu.yd. bucket at Mine 22 and by two Bucyrus 50 shovels with 3½-cu.yd. buckets at Mine 23. Coal is loaded on a train of six 17-ton cars at each mine by an aluminum skip and is hauled to the preparation plant by a 21-ton steam locomotive.

The Commercial Fuel Co. has further modernized its equipment at its Cherokee mine by installing a 32-cu.yd. Marion 5560 shovel with 110-ft. boom and 68-ft. dipper stick so that the 22-in. Weir-Pittsburg seam can be exposed by the removal of 30 to 50 ft. of overburden. Coal is loaded with a 3-cu.yd. shovel into a 4-cu.yd. aluminum skip which is lifted to the surface by a Marion derrick. Two bucketloads are placed into the skip before it is hoisted, the skip being filled greatly in excess of capacity.

Here, too, hard caprock is encountered. United Iron Works horizontal drills with Borod-tipped molefoot augers drill 4-in. holes 2 to 6 ft. above the coal; then jackhammers are used to drill the caprock with 2¼-in. holes at 8-ft. centers. Even when drillholes are 2 ft above the coal, however, the rock is not broken to a degree that it can be shoveled. Dynamite is used in the jackhammer holes and FF black powder in shooting the coal.

HOW MANY CARS PER TRIP?

+ Tonnage Locomotive Can Handle Safely Determined by Motor Heating*

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HOW MANY cars should be hauled per trip? The usual answer is, as many as possible without excessive wheel slippage. Generally, this number is determined by the simple process of adding cars until the locomotive is no longer able to start the trip and keep it going. In some cases this method of "analysis" is entirely correct, as it results in no harmful overloads on the electrical equipment or mechanical parts. In others, it is good economy to haul all the cars a locomotive can start and keep going, even though the resulting overloads are destructive of mechanical and electrical parts. There are still other conditions in which the size of the trip should be limited to improve production and reduce repair bills.

The maximum number of cars a locomotive can start, accelerate and haul is limited by the wheel slippage and therefore is a function of the locomotive weight. It is not at all uncommon to obtain a drawbar pull as great as 33 per cent of the locomotive weight, and on this basis the maximum loads that a locomotive can haul are shown in Fig. 1. It will be noted that the ratio of the trailing load weight to locomotive weight may be as great as 14:1 on a level track, decreasing to 2½:1 on an 8-per-cent grade. At a very slow rate of acceleration and with good sand-

*Abstract of a paper presented at the 36th regular meeting of the Rocky Mountain Coal Mining Institute, Denver, Colo., June 24, 1938.

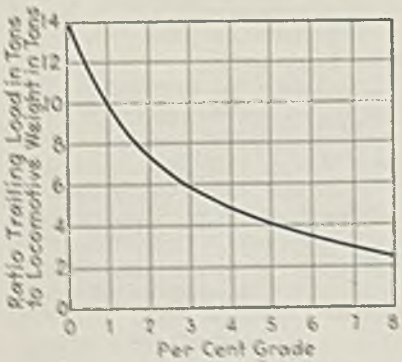


Fig. 1—Ratio of tons of trailing load to tons of locomotive weight, assuming car resistance at 20 lb. per ton and acceleration at 0.5 mile per hour per second.

ing, these ratios may be appreciably increased.

When a locomotive hauls these maximum loads, the motors are, of course, overloaded. In some types of service it is entirely practicable to work up to the slipping point of the wheels and thus overload the motors, while in others such overloads surely will result in trouble. It is entirely safe to operate up toward the slipping point of the wheels (1) on a short haul, not frequently repeated, and (2) on a long haul which includes a short section of maximum grade much steeper than the average. If the haul is short, a single period of overload will not cause excessive motor temperature and if there is a long rest period after each trip, the motors will have time to cool before the next load period starts.

Limitations on Long Hauls

On a long haul which includes a short, relatively steep grade the size of trip will be limited by this steep section. The complete trip, therefore, will include a short period of high overload combined with a much longer period of normal load; the result is an average load within the capacity of the equipment. Incidentally, this is almost the only "foolproof" haulage profile. As ordinarily built, a mine locomotive can, within wheel-slippage limits, haul loads which are beyond the rated capacity of the electrical equipment. If there is a bad grade in the line and this grade is only a small part of the total length it will not be necessary to fight with even the worst motorman to prevent abuse of the equipment.

For example, assume a haulage line consisting of 300 ft. of 5-per-cent and 5,000 ft. of 2-per-cent grades. The maximum load which can be started on the 5-per-cent grade is four to five times the locomotive weight and the motors draw about 50 per cent over current for this short section of the run. On the 2-per-cent grade, this trailing load will require appreciably less than the rated current of the motors and for the total run the load on the motors will be within normal limits.

In contrast, let us consider the type of haul on which a "mistake" most frequently is made. Assume a 10-ton locomotive, cars weighing 5 tons loaded and a haul of 10,000 ft. up a constant 2½-per-cent grade. As cars are added to the trip an ammeter indicates a proportionate increase in load. However, if our meter indicated motor heating instead of amperes, we would see that each added car causes a larger heating effect than any preceding car.

Just what this effect is can be illustrated if we imagine each car to be of a size in proportion to the heating effect its addition to the trip produces. Fig. 2 shows just how big a car seems to the locomotive motor. If the locomotive is hauling only one 5-ton car, that car looks very small. But if we add nineteen more cars of the same size, the last car looks six times as large as the first and the complete trip is not just twenty times as large as one car but about 29 times. This conception is based on the heating effect of the current required to haul the added cars.

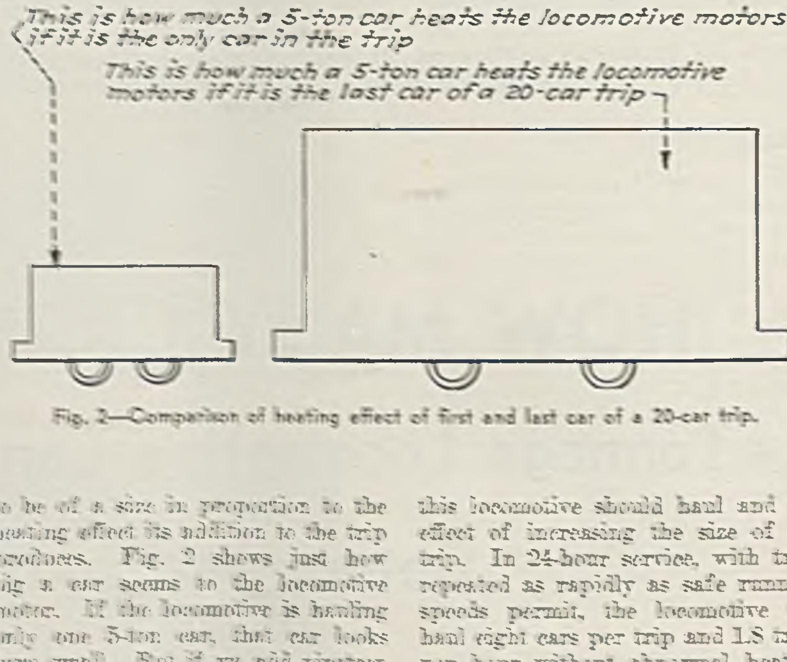


Fig. 2—Comparison of heating effect of first and last car of a 20-car trip.

Effect of Overheating

While the amperes taken by a given locomotive are almost directly proportional to the total weight of the trip, the motor heating is roughly proportional to the square of the weight. In addition to an increase in current, a larger trip increases the time for the run because locomotive motors are series wound and lose speed as the load increases. Thus the heating effect of a trip of ten cars is shown by the curve (Fig. 3) to be about 1½ and for twenty cars to be slightly more than 5.

Now let us consider how many cars this locomotive should haul and the effect of increasing the size of the trip. In 24-hour service, with trips repeated as rapidly as safe running speeds permit, the locomotive can haul eight cars per trip and 1.8 trips per hour without abnormal heating of the motors. Under actual operating conditions, in single-shift work, 10-car trips and eleven trips in seven hours would result in a normal safe motor temperature at the end of the shift.

If we increase the number of cars to twelve and still make eleven trips, the motors will be up to rated maximum temperature after four hours' work and at the end of seven hours may be in trouble. Now let us try fifteen cars and eleven trips. At this rate, any work done after the first two hours will endanger the motor insulation. At the rate of ten trips in seven hours and twenty cars per trip, the motors will need

Table 1—Tonnage Per Day With Various Sizes of Trips

Within Haulage Capacity of Motors

Cars Per Trip	Actual Running and Turn-Around Time Per Trip	Proper Elapsed Time, Including Cooling Time	Tons per Trip (3.5 Tons Net Per Car)	Trips in Seven Hours	Tons in Seven Hours
7	28.5	30	24.5	14	343
8	30.0	32	28.0	13	364
9	30.5	35	31.5	12	378
10	31.0	38	35.0	11	385
12	32.0	52	42.0	8	336
15	33.5	84	52.5	5	262
20	36.0	140	70.0	3	210

a rest after two trips, and if they don't get it probably will quit before the end of the shift.

How many cars, then, should make up a trip for maximum production within the safe capacity of the motors? With good conditions of track and voltage, the locomotive probably can handle twenty cars per trip. Is this the proper trip size? Table I indicates the answer. If we reduce the number of cars to seven we can haul only fourteen trips, or 343 tons, in seven hours because there is not time for more trips. If we haul eight cars per trip, there is time for fourteen trips but not quite enough motor capacity. Without overheating the motors, we can haul thirteen trips, or 364 tons, in seven hours. With ten cars per trip we can safely handle eleven trips for a net tonnage of 385.

This is the maximum tonnage that can be delivered by the particular locomotive on the specified profile because as we increase the number of cars per trip we must allow more idle time for motor cooling and the net result is less tonnage. For example, with twenty cars per trip the motors are operating at lower efficiency and the cumulative heating effect of the large number of cars is such that we are inviting motor trouble if we repeat trips at a shorter interval than 2 hours and 20 minutes. Further, it is not good practice to permit such large trips because the motorman will think that if he can do it once he can do it repeatedly.

Voltage Drop Greater

There is an additional effect which has not been considered in the table but is important in some mines. The current for a 20-car trip is roughly double the current for a 10-car trip. Therefore, the voltage drop in the trolley and ground will be greater for the larger trip. Where the feeder system is inadequate, the voltage drop for the large trip may so reduce the speed as to make the comparison even more unfavorable to the heavy trips.

What can be done if it is necessary to haul 500 or 600 tons in a shift? The most obvious answer is to increase the number or size of trips or to increase both size and number until the tonnage is obtained. This may necessitate rewinding motors every six or twelve months, and repair bills may be high, but this may be more economical than putting on an additional locomotive or purchasing a larger machine. In general, it is better to increase the number of trips as much as possible and thus keep the size of trip to a minimum, as this will heat the motors less than a smaller number of larger trips.

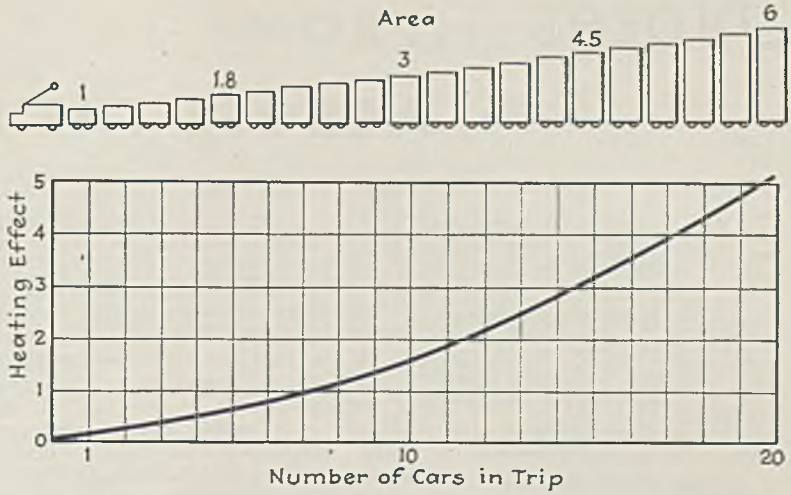


Fig. 3—Each added car increases the locomotive current approximately 20 amp. but increases the heating of the locomotive motors in proportion to the area shown for that car. The total heating effect of a trip with any number of cars up to twenty is shown by the curve.

Needless Motor Abuse

This suggests an abuse to which mine-haulage motors frequently and uselessly are subjected. We have all seen motormen wait at the tipple for a few more empties or at the parting for a few more loads. This loses time, which finally drops the haulage system behind schedule toward the end of the shift. Then, to make up for lost time, the last two or three trips are loaded up with everything the locomotive will start. These few big trips may have more effect on motor temperature than hours of normal load and should be avoided. It is better to make an extra trip with as many cars as are ready than to waste time and make oversized trips.

In some cases it will be possible to rewind motors for higher speed and greater capacity. This is a rather expensive procedure, however, and is possible only in special cases. But it may provide an adequate solution where conditions are favorable. The most effective and economical method of increasing locomotive capacity is by forced ventilation. For a few hundred dollars blower equipment can be installed on practically any locomotive to increase the tonnage capacity 50 to 100 per cent. For example, forced ventilation on the locomotive considered here would permit safely twelve trips of fourteen cars each in seven hours for a net tonnage of 588. This is an increase of 53 per cent over the maximum tonnage from a non-ventilated locomotive.

Summing Up the Case

To summarize:

1. It is generally bad practice to operate a locomotive up to the slipping point of the wheels.
2. On short hauls, not frequently repeated, or on long hauls with a short section much steeper than the average, the locomotive may work up to the slipping point without harmful overload on the motors.
3. On long, frequently repeated hauls with fairly constant grade conditions the loads should be adjusted to the motor capacity.
4. Where it is necessary to deliver a greater tonnage than the equipment can haul without overloads, it is best to make as many trips as time permits, each trip being as small as possible for the required tonnage.
5. Motor may be abused even when delivering a normal daily tonnage if the total is concentrated in a few large instead of several smaller trips.
6. Relief from overload conditions usually can be obtained by installing blowers to cool the motors.

Notes . . . FROM ACROSS THE SEA

CAMBER arches are rolled-steel I-beams of suitable cross-section, 6x4½-, 5x4½- or 5x3-in., bent to a circular arc of 18- to 27-ft. diameter, which curvature usually is expressed by reference to the length of the beam and its rise or spring in the center. Thus, a 10-ft. camber arch rising 1 ft. 3 in. above the springing line may be specified, and its inner curvature will then be that of a circle of 21 ft. 3 in. radius. The most suitable rise for a camber arch must be determined by experiment, declares E. H. Frazer, in the report of the Scotland Division to the British Mines Department for 1936.

Camber arches should be erected just outby the point to which the roof has been brushed, and should rest directly on either side on carefully cut abutments. No spaces should be left for wood shims, cap pieces or stringers between the ends of cambers and their seats or between the tops of girders and the roof they support. With cambers 10 ft. long, five or seven struts should be placed inby and outby each beam, between it and its neighbors. Cambers should never be set on props of any kind, yielding or rigid.

Such cambers, declares Mr. Frazer, not only support the roof but prevent the ribs, at least near the ends of the camber, from moving inward; thus they support not only roof but the sides. As they rest on notches or grooves cut in the roof rock at the sides of the roadway, posts are not used to support them; hence, horizontal clearance is not reduced. They maintain the width of the roadway more effectually and for a longer period than either straight girders or arches. However, where the sides of the passageway are weak, the lower part may move in, while the upper part restrained by the pressure of the end of the camber, remains in place, and it may be necessary to shear the lower part of the sides later to restore the original width. If the brushing is high, the lower part of the side of the road may burst into the roadway, especially if the arch is well cambered, for in such a case the vertical component of the thrust on the abutments is so great and so near the roadside as to cause the extrusion.

A single shot in the center of the roadway will prepare the roof for the reception of a cambered beam, whereas, to shoot the roof for a semicircular arch, side shots are needed. Unlike semicircular arches, they have no bolts or fishplates that may be lost or mislaid. The abutments must be cut and not blasted out, and the work must be done so that no packing material will have to be used to make the ends of the camber fit the rock. Though cambers are best suited for a roadway which is still within the zone where the roof is subsiding they should be replaced by semicircular arches where the roof has ceased to subside and permanent support is desired.

Excessive floor creep in return airways is controlled (Fig. 1) by inverted 4x2½x2-in. girders, 12 ft. long, bent with a 12-in. camber, at the Haworth mine of Barber, Walker & Co., Bawtry, Nottinghamshire, England. These abut at each end against 12-ft. wood stringers, each of which, in turn, is held in place by three props which are abutted against cap pieces resting against continuous slanting footings cut on the underside of the solid mine roof. The floor of the coal seam is a soft clay. More than 3,000 ft. of roadway is supported effectively in this manner, according to J. R. Felton, divisional inspector of the North Midland Division, in his 1936 report.

Here the Barnsley seam, which is being worked, has a good roof, but at the Kirkby mine, of the Butterley Co., Kirkby, in the same county, where the Top Hard seam is mined, the roof, instead of being hard, has 18 in. of soft material known as "clod." Here it has been necessary at longwall faces to forepole the roof (Fig. 2) and this has been done by making 2x6-in. rectangular slots, 5½ ft. deep, in the coal at 3-ft. centers close to or touching the roof, and placing corrugated steel crossbars in the holes, which are supported at one end on a post in front of the face and which rest at the other end on the bottom of the 6- to 9-in. length of slot which extends beyond the coal that is to be undercut. To sink these slots a 2¼-in. center hole is made by an ordinary drill and this is followed by a special slotter that enlarges the hole to the required size.

A PORTABLE apparatus that without human intervention not only makes a continuous and permanent record of the methane percentage in the air of a main roadway but can be arranged also to operate an audible or visible warning or even cut off the electrical supply and so to act either at the place or at a distance even of miles was described at the meeting of the Midland Institute of Mining Engineers, at Sheffield, England.

When and if this can be done reliably, it will be possible to control conditions in the mine with less reliance on exam-

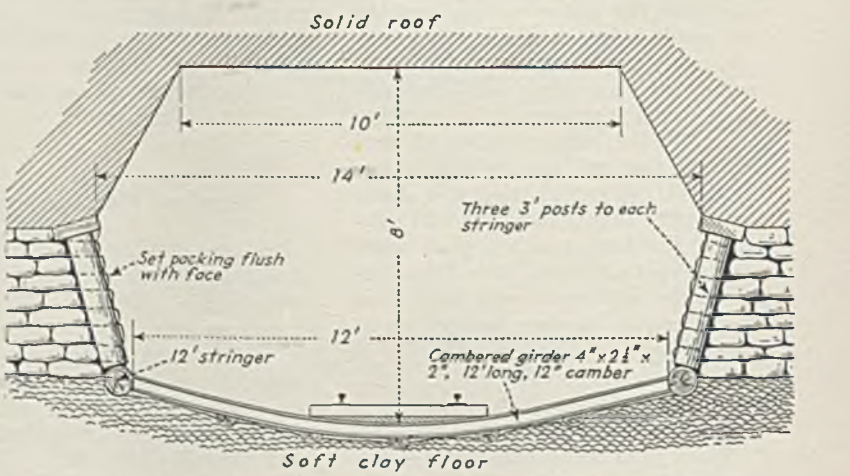


Fig. 1—Holding down a heavy clay floor at Haworth mine

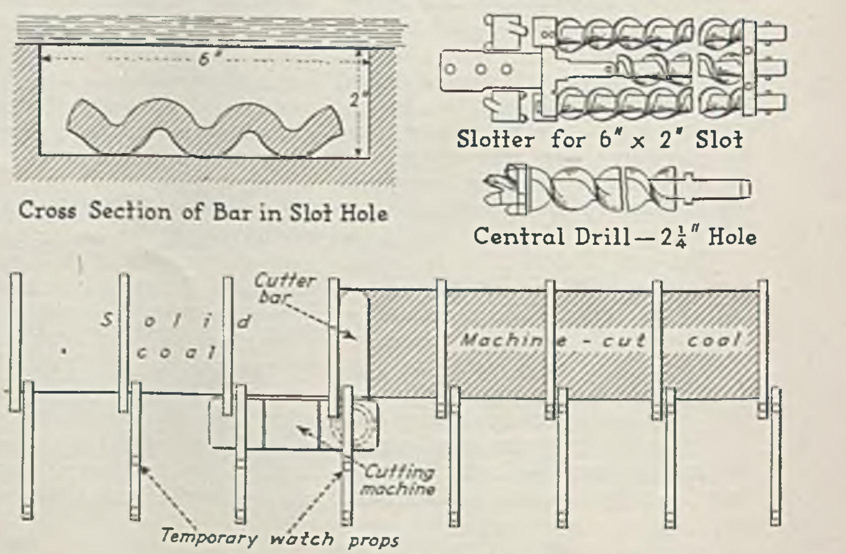


Fig. 2—Forepoling methods at Kirkby mine

iners and shotfirers. With such equipment, major explosions can be made much less frequent, though minor disasters of that type will continue to be dependent on the vigilance of underground personnel. Continuous and permanent recorders of methane percentage have been made available in this country since May, 1926, and the transmission of such indications should not be difficult, though it might be expensive.

R. Dawson Hall

On the ENGINEER'S BOOK SHELF

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

Geology and Mineral Resources of the Western Part of the Arkansas Coal Field, by T. A. Hendricks and Bryan Parks, U. S. Geological Survey. Bulletin 847-E; 38 pp.; one pocket map; paper. Price, 25c.

This bulletin covers about 1,100 square miles in Scott, Sebastian, Crawford, Franklin and Logan counties in the Arkansas Valley. It excludes Johnson County just to the north, a small coal area in Pope County a short distance to the east, and the Ouachita lignite field in the south central area. The exposed rocks and coal beds are wholly of Pennsylvania age and in the Pottsville and Allegheny formations, judging by the classification given in Bulletin 874-B. They total about 10,000 ft. in thickness.

Written mention of this coal showing appeared in 1818, but up until 1870 the coal merely was stripped and used for blacksmithing. Then the old Spadra mine was opened. The beds from oldest to youngest are the Lower Hartshorne, Charleston and Paris, which have produced 88.4, 3.9 and 7.7 per cent of coal respectively. A thin bed is found below the Lower Hartshorne.

Analyses are given for Franklin, Johnson, Pope and Sebastian counties, some of which do not figure in the body of the report. Ash in the Lower Hartshorne varies from 2.4 to 11.7 per cent, and in the Paris, from 8.1 to 10.4 per cent. Sulphur in the former ranges from 0.6 to 3.9 per cent and in the latter from 2.0 to 3.1 per cent. All the coal is low-volatile bituminous, with volatile matter percentages from 10.3 to 17.9, and with the lowest values in Johnson and Pope counties to the east.

The Importance of Adequate Voltage for Distribution Systems in Coal Mines, by E. J. Gleim. U. S. Bureau of Mines. R. I. 3347; 12 pp.; mimeograph.

As shunt motors are used in conveyor drives, a rise or fall in voltage will cause corresponding speed changes and thus seriously affect conveyor efficiency, according to the author. Relays, contactors and other devices function improperly when voltage is variable and inadequate. Push-button-controlled starters employ magnetic contactors which close at a certain potential. With low voltage the accelerating contactors will not function, and the starting resistor, remaining in the circuit longer than intended, may burn out. If the voltage of a machine is below the designed figure, the amperage must be increased with a still greater increase in the heating of the motors and a decreased efficiency. A certain motor delivering less than full load because of decreased voltage was subjected, because of the latter, to a heating effect twice that which it would have experienced had the voltage been normal.

Electric locomotive and machine runners, annoyed by low voltage and desiring to accelerate their machines quickly, will throw the handles of their controllers too rapidly to the running position, and then, if fuses and circuit breakers fail to protect, brushes, armatures and field coils will heat, making repair costs high.

When a motor, because of low voltage, does not develop the torque needed to start the load, the motorman will leave the controller too long in the "on" position, causing heating, roasting insulation, developing short circuits and grounds, and burning holes in housings of controllers, rheostats and other electrical parts. In a gassy atmosphere, gas ignition probably would result. Where the circuit is grounded, persons in contact with the metal parts would be subject to shock. Manufacturers and the Bureau have asserted that voltage often is so inadequate as to render the use of permissible equipment hazardous. The report shows the findings of studies made in eight mines and describes remedies for low voltage.

Design of Welded Piping. Linde Air Products Co., New York. 197 pp., 6x9 in.; paper.

"Welded joints properly made are satisfactory for any pressure and service for which the pipe itself is suitable," declares this handy booklet on welded-pipe design. Welding requires: (1) sufficient controlled heat, (2) elimination of oxide, (3) a metal-to-metal union to be established by metal deposited in molten form.

In fusion welding the pipe metal is melted with metal of a rod of suitable composition. Any oxide that may be on the pipe metal fuses at a lower temperature than steel and thus melts off and rises to the top of the welding puddle, so that it can do harm. In fusion welding of aluminum or brass, the oxides will not melt till above the melting point of those metals, so a flux is needed to unite with the oxide, thus enabling the compound formed to melt.

Bronze welding is used principally for cast-iron, copper and brass pipe. Only the welding rod and the oxides are melted; not the pipe itself. The molten bronze "wets" the heated surface of the metal and makes a strong joint.

How to design welds for steel and wrought-iron piping; how to weld cast-iron, galvanized, iron, stainless-steel and non-ferrous piping; and how to make piping layouts constitute, with drawings and specifications and piping tables, the subjects covered by this handy compilation derived from intimate experience.

The Pneumonokonioses (Silicosis) Literature and Laws, Book III, by G. G. Davis, E. M. Salmonsen and J. L. Earlywine. Chicago Medical Press, Chicago. 1033 pp., 6x9¼ in.; cloth. Price $8.50.

International abstracts, extracts and reviews of publications regarding the pneumonokonioses and their associated diseases and subjects are covered in this book at some length—701 in all. The laws of the several States and of Canada, Alberta, British Columbia, Manitoba, New Brunswick, Nova Scotia, Ontario, Prince Edward Island, Quebec, Saskatchewan, England and Germany follow. It covers many diseases other than silicosis, as tar melanosis, corneal scar, carcinoma, and diseases of silica dust in various parts of the human body.

Grindability of Alabama Coals, by E. S. Hertzog and J. R. Cudworth, U. S. Bureau of Mines. R. I. 3382, 8 pp.; mimeograph.

Most difficult of all to grind of the samples tested in the Southern Experiment Station, the results of which are recorded in this report, was a 1½x0-in. washed coal from the Black Creek bed in Marion County, which contained 37.6 per cent of volatile matter and 3.4 per cent of ash; it had a grindability index of 31.3. Easiest to grind was a 3½x0-in. washed Mary Lee coal with 26.2 per cent of volatile matter and 14.9 per cent of ash and a grindability index of 67.4. The first coal had to be revolved 1,598 times to be brought to the same fineness as the second coal after the latter had been revolved only 741.4 times. After grinding, 80 per cent of both would pass a 200-mesh screen.

Control of Dust From Blasting by a Spray of Water Mist, by C. E. Brown and H. H. Schrenk, U. S. Bureau of Mines. R. I. 3388, 13 pp.; paper; mimeograph.

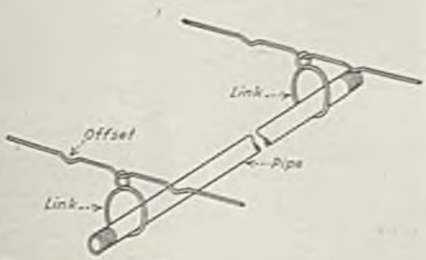
Water-mist sprays reduce dust suspensions after blasting by 99 per cent and those during mucking are decreased materially. They also remove some of the explosive fumes, smoke, odors and colors. Muck when sprinkled emits odor but not when a water-mist spray has been used.

OPERATING IDEAS

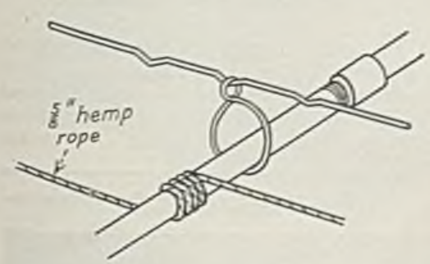
From Production, Electrical and Mechanical Men

Safe Handling of Pipe Aided by Links

To facilitate carrying heavy pipe from 3 in. in diameter up and to reduce the possibility of injury in handling it, Anthony Shacikoski, superintendent, Cochran Coal Co., Salina, Pa., has had the safety links shown in the accompanying sketch constructed. These links are made of ¾-in. or larger round iron, depending upon the size of the material to be handled, and are constructed in one piece with a half twist at the top through which a carrying bar is passed. Special bars with offsets are used, these offsets permitting changes in position to pass timbers and also preventing the links from sliding around on the bar while the pipe is being transported.



Showing use of links and bars in carrying a length of heavy pipe



How the links and bars are used with a ⅝-in. hemp rope in screwing on a length of pipe

Four men, says Mr. Shacikoski, easily can carry a length of pipe with these links and bars without danger of the pipe rolling out and pinching someone. Again, the pipe is not very high off the floor and if it should be dropped it does not have far to fall. When pipe smaller than 3 in. is being handled, several lengths can be carried at a time in the links. The links also may be used to carry other heavy material, such as timbers, etc., with safety.

But aside from the carrying aspect, one of the biggest advantages of the links, Mr. Shacikoski points out, is in laying the pipe. This arises from the fact that four men easily can hold the pipe in position while two others start it in the collar and screw it up, using a ⅝-in. hemp rope to start the pipe. The hemp rope is wound around the pipe about four times. Then it is tightened sufficiently to make it grip the pipe and is pulled from one end, thus rapidly screwing the pipe into the collar. When the rope is pulled as far as it will go, it is slacked off and pulled back to position for another screwing operation. When the pipe is screwed down tight, the chain tongs are applied to finish the job. The same system, in reverse, also may be used in reclaiming pipe, and in either laying or reclaiming long lines of pipe is said to double the speed.

Underground Ambulance at Knox Mine Fitted With Springs and Rubber Tires

SAFETY WORK at the mines of the Knox Consolidated Coal Corporation, Bicknell, Ind., has been accompanied by stress on prompt and competent first-aid treatment for injured employees. Consequently, first-aid stations have been constructed at convenient points in the mines where a supply of bandages, splints, antiseptics, compresses, blankets and stretchers are housed. Walls, cabinet and table are painted white and the stations are kept clean and well lighted. Most of the Knox Consolidated mine employees have been given first-aid training with assistance from the U. S. Bureau of Mines, and certificates of competency have been awarded those completing the prescribed course of instruction.

While these steps were distinct advances over the unsystematic practices of the past, there still remained the problem of transporting men who might be seriously injured out of the mine. Heretofore, this could be accomplished only by placing the injured man in a mine car and, as carefully as possible, to avoid jolting and jostling, hauling him to the shaft bottom. This crude means of conveyance was at best unsatisfactory and often caused the injured much pain and discomfort, if not increasing the seriousness of the injury.

No. 1 mine of the Knox Consolidated Coal Corporation is 24 years old and the active workings are about 2¼ miles from the shaft. Ninety per cent of the employees are concentrated at this point, and consequently it was decided to build an ambulance car and station it near this section so that it would be immediately available when required. This car is shown in the accompanying illustrations, and details as to its construction and use were supplied by Peb G. Conrad, superintendent, Nos. 1 and 2 mines, and Harley W. Fielder, shop foreman, No. 2.

The ambulance was constructed in part of used automobile chassis parts, such as wheels, axles, tires, springs, etc. The frame (Fig. 1) was made of 2x4's with mortised joints and a lumber flooring. Sides were constructed of shiplap joined by corrugated fasteners and covered with light sheet iron. Parts of the leaves were taken out of the old auto springs on which the body is carried for maximum flexibility. Rubber pads are placed on the sills over the axles to cushion the shock in case the body should come down on the axle. The drawbar bracket was made of ¾-in. plate and the drawbars themselves, one on each end, are stiff hitching with snugly fitting pins to eliminate jerking. In operating position, drawbars extend 1 ft. beyond the ends of the car. Hooks are provided to hold them under the end when they are not in use. Stretcher legs rest on short lengths of rubber hose held in rectangular boxes by pins. These boxes also are provided with pins on the bottoms which fit into holes

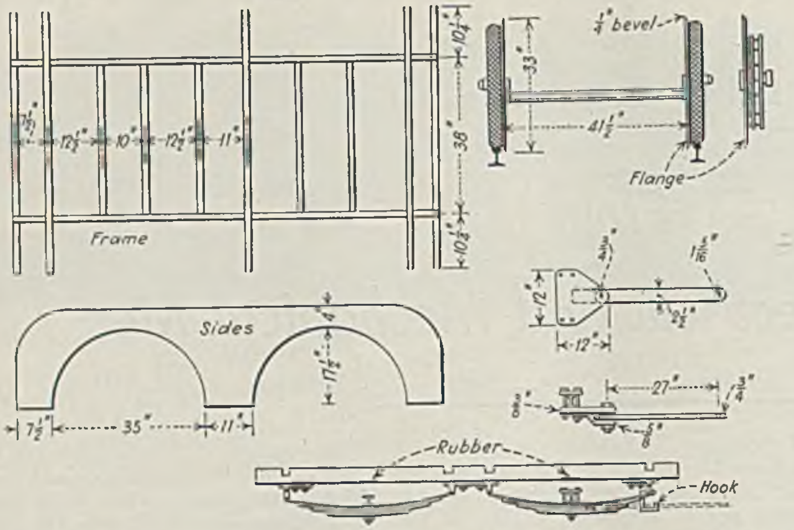


Fig. 1—Details of some of the major parts of the Knox Consolidated ambulance.

in the car floor and thus are easily removed.

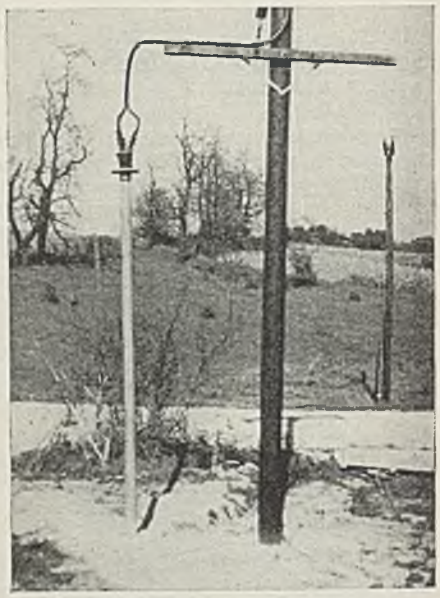
Old Ford wheels with standard 30x3½-in. casings are used on the ambulance. The axles were cut off and spindles were welded on to make the gage nominally 42 in. Disks of sheet iron ¼ in. thick and 33 in. in diameter were bolted to the wheels with eight bolts to form a flange and thus permit the car to operate on the mine track. Four of the bolts hold the rim and the other four the flange. The valve-stem hole was cut to the outside of the rim to make it easy to install and remove the tire. Half-inch-diameter pipe in ⅝-in. lengths was slipped over each bolt to properly space the flange from the wheel. The disks were turned to a bevel of ¼ in. to provide a smooth curved flange and thus prevent derailments. Fenders over the wheels were cut from steel barrels and form seats for as many as four men to ride with the injured person. Compartments between the fenders accommodate blankets and other supplies necessary in case of serious injury.

The ambulance may be pulled by a locomotive or a mule or pushed by a man, as its light weight and ball-bearing wheels make it easy to move. The car is stationed in a room near the active workings. This room, cut in a pillar, is 11 ft. wide and 12 ft. deep. Ribs are sheared smooth and whitewashed and a concrete floor was built so that one man can push the ambulance out of the room and onto the track ready to be taken to the injured person.

"The labor and material cost of the ambulance," comments Mr. Conrad, "was less than $60, and we consider this cost indeed small in view of the good which it is possible to accomplish with it. We are, of course, hopeful that the ambulance seldom will be required. Fortunately, we had only one ambulance injury in 1937 before we built our special equipment, but that was enough to convince us of the desirability of a more practical and humane conveyance. Passing the well-lighted white-painted rooms which house the ambulance and first-aid equipment, the men are silently reminded of their purpose and significance as they go into their working places. A ride in an ambulance, however comfortable, certainly is to be avoided, and the silent message conveyed by the neat-looking car may be more eloquent than the most cleverly worded safety slogan."

Use of Pothead Suspension Saves on A.C. Borehole Job

Installation cost was held to a minimum by using a new type of alternating-current borehole cable at Dun Glen No. 11 mine of the Hanna Coal Co., Jefferson County, Ohio. Instead of a metallic armored cable



A new borehole method used to feed a new type of underground substation.

the armor wires of which would support the weight the new cable has a nonmetallic covering and the entire weight is supported by the three copper conductors the terminals of which rest on the

Fig. 2—Side view of the ambulance.

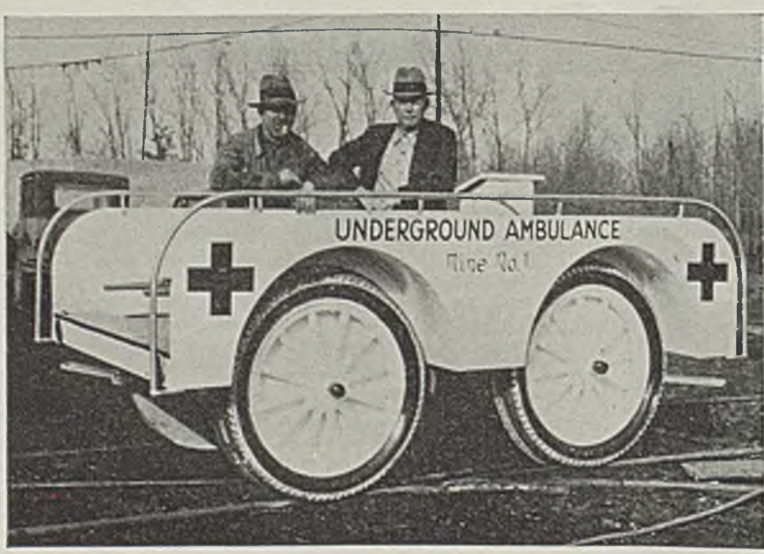
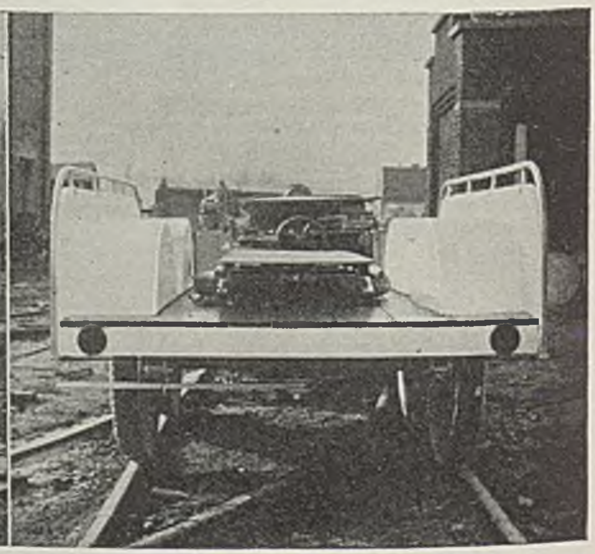


Fig. 3—End view of the ambulance.



insulators of the pothead. A. F. Griffith, electrical engineer of the coal company, supplied the photograph and data relating to this installation.

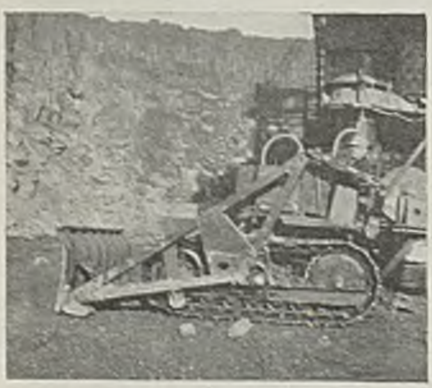
This cable, which is a size No. 1/0 insulated for 5,000 volts, conducts 4,000-volt three-phase 60-cycle power through a 248-ft. borehole to a 300-kw. Ignitron portable substation. The pothead rests directly on the end of a 4-in. pipe which is the casing of the borehole and extends 12 ft. above the ground to position the terminals and exposed wiring above reach. The hole was drilled 6 in. in diameter and the 4-in. pipe grouted therein. Both the cable and the pothead were supplied by the Anaconda Wire & Cable Co., of New York.

Hume-Sinclair Electrifies Strip-Pit Tractor

Following out its principle of electrifying, as far as possible, all pit equipment, the Hume-Sinclair Coal Mining Co., Hume, Mo., has installed an electric motor and cable reel on its pit tractor. This tractor, a Model K Allis-Chalmers unit equipped with a LaPlante-Choate bulldozer, was modified by removing the original engine and clutch and installing in its place a 30-hp. General Electric motor operated by a controller similar to a street-car controller. A cable reel also was added for bringing current to the motor.

Under this arrangement, power is consumed only when the machine is in operation. Gears never are changed in operating the tractor, as it is kept in the original second gear, with changes in speed either forward or backward being made by the controller on the motor.

Two views of the electrified Hume-Sinclair tractor.



Wood Lathe Improved By Drilling Center

Turning wood rollers and other round shapes in a wood lathe in the mine shop is attended by the difficulty of oiling the tail center to prevent heating. In the Mount Hope (W. Va.) shop of the New River Co. this was solved by drilling oil holes in the tail center to provide semi-automatic oiling.

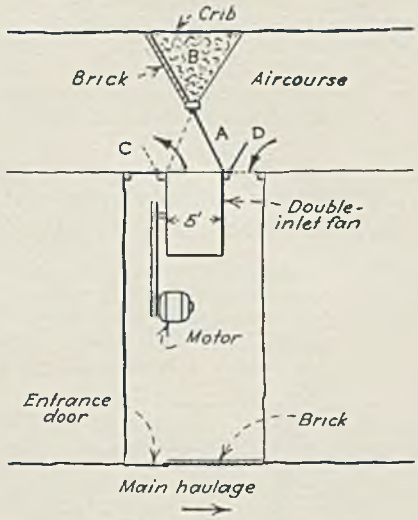
Use of a drilled tail center and an oil can prevents heating.

The illustration shows the turning of a rope-haulage roller in a lathe. The oil can gradually drips lubricant into a vertical hole in which the spout is inserted. Another hole drilled lengthwise and communicating with the vertical hole carries the oil to the wood or to a centered tail plate if one is used. If any indication of too little oil or of heating appears, then the oil-can bottom is pressed occasionally to force an extra flow.

Double-Acting Door Permits Reversing Air Current

The problem of reversing air circulation to keep the shaft free of ice was one which confronted John Simpson, Pana, Ill., now inspector for the Bituminous Casualty Corporation, when he was manager of one of the mines of the Pana Coal Co. several years ago. "The shafts here," points out Mr. Simpson, "are 728 ft. deep. The mines are very old and, as they have no escape shafts, one mining company is dependent entirely on the shaft of the other company for an escapeway. The mines are non-gaseous and are worked with open lights.

"To ventilate the mine, therefore, each shaft has an air compartment to one side of the hoisting compartment 3½ ft. wide and 9 ft. long. The aircourse at the mine in question then being three miles long, a booster fan had been installed in said aircourse about a mile from the bottom. The air compartment of the

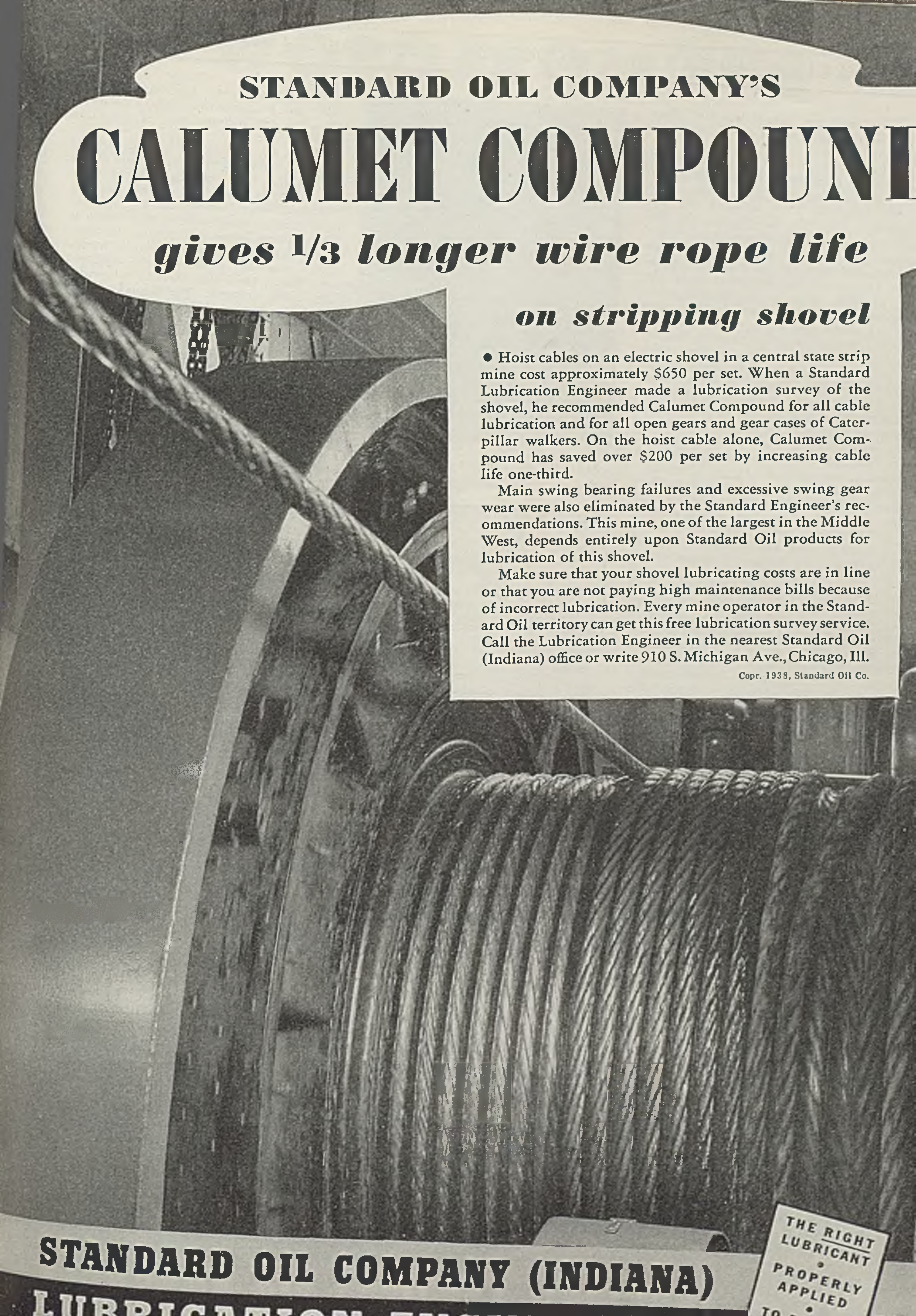


With the booster in the crosscut, three doors permit reversing the direction of the air current. Solid lines show doors in one position; dotted lines the other.

shaft then was being used as the upcast with the big fan exhausting.

"Under this condition, the hoisting compartment became the downcast and in the winter ice in this compartment had to be cut three to four nights a week in severe weather. This was rather expensive, as the ice had to be cut, loaded and then hauled inside and unloaded. Also, it was a rather cold job, especially in the shaft. As the booster fan was necessary to ventilate the mine properly, it became my job to figure out a way to eliminate this ice cutting by making the air current from the booster reversible in conjunction with operating the large fan either blowing or exhausting, thereby permitting me to reverse the fan in cold weather to make the air compartment the downcast and preheat the air with steam from the fan-engine exhaust. This steam went into the aircourse and did not bother the bottom workmen. At the same time the main compartment became the upcast and thus gave me warm air currents in both upcast and downcast to eliminate entirely ice cutting.

"To accomplish this result, I pulled the booster out of the aircourse and set it in a crosscut, as shown in the accompanying sketch, with the discharge flush with the intersection of the crosscut and aircourse ribs and the fan itself properly centered in the crosscut. The next step was to swing Door *A* (6x6 ft.) on hinges attached to an 8x10 post centered so that the door would swing perfectly to either side of the fan discharge. The door swings inside a double frame and is tight all around either way it is set. Next, the part of the aircourse between the door post and the rib was sealed with a triangular crib (*B*) of timber filled solid with dirt, with a wall one brick thick on one side, as indicated in the sketch, to make an airtight seal. The next step was to put up the two side doors, *C* and *D*, each 3x6 ft. These must open toward the fan


STANDARD OIL COMPANY'S
CALUMET COMPOUN
gives 1/3 longer wire rope life
on stripping shovel
● Hoist cables on an electric shovel in a central state strip mine cost approximately $650 per set. When a Standard Lubrication Engineer made a lubrication survey of the shovel, he recommended Calumet Compound for all cable lubrication and for all open gears and gear cases of Caterpillar walkers. On the hoist cable alone, Calumet Compound has saved over $200 per set by increasing cable life one-third.
Main swing bearing failures and excessive swing gear wear were also eliminated by the Standard Engineer's recommendations. This mine, one of the largest in the Middle West, depends entirely upon Standard Oil products for lubrication of this shovel.
Make sure that your shovel lubricating costs are in line or that you are not paying high maintenance bills because of incorrect lubrication. Every mine operator in the Standard Oil territory can get this free lubrication survey service. Call the Lubrication Engineer in the nearest Standard Oil (Indiana) office or write 910 S. Michigan Ave., Chicago, Ill.
Copr. 1938, Standard Oil Co.
STANDARD OIL COMPANY (INDIANA)
THE RIGHT LUBRICANT
PROPERLY APPLIED

discharge and are hinged so that they open automatically when the fan stops—a simple matter.

"When the main haulage is on the intake, Door *D* must be blocked open. If the fan stops for any reason, such as the power going off, Door *C* opens and the air goes around the fan through the two fan intakes and Doors *C* and *D*. The fan motor is equipped with an automatic starter, and when the fan goes into operation Door *C* is shut immediately by the air pressure, as it is set to open when the pressure is released and to close when the fan starts and the pressure comes on again. When the main haulage becomes the return and the aircourse the intake, Door *A* is swung over to the opposite side of the frame. Door *C* is blocked open, and Door *D* is left free to open and close in accordance with whether the fan is running or stopped. The fan itself runs in the same direction at all times, reversal of the air current being accomplished by means of the three doors.

"Door *A* is hung with the door lugs perpendicularly above each other so that the door will be as close to the post as possible and yet work freely. The space between the door and the post is closed by nailing a heavy piece of canvas across it. Doors *C* and *D* are hung to open automatically by putting the top lug in each case 1¾ in. farther from the edge of the door post than the bottom, thus allowing the top hinge strap to protrude from the door edge 1¾ in. more than the bottom strap so that the door will stand level when closed by the air pressure but always will open when the pressure is released.

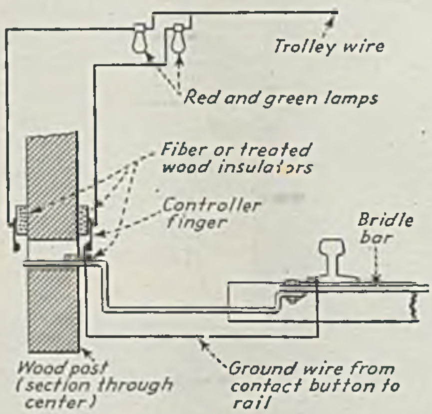
"The fan is a double-inlet Sirocco unit which has given twelve years of satisfactory service. It is belted to a motor and motor and fan are set level and solid to prevent vibration. The door system has been entirely satisfactory in eliminating ice trouble in the shaft."

Track-Switch Signal Device Has Improved Design

Lamps or other signals to indicate track-switch alignment are so advantageous from the standpoints of safety, time saving and, in some cases, locomotive power demand that their lack in many mines brings up the question: Why? Outstanding among the reasons is the difficulty in arranging a contact device sufficiently rugged and safe for the duty yet not over-costly considering the apparent simplicity of the problem. In use at Stanaford (W.Va.) mine of the Koppers Coal Co. is a mine-made contacting arrangement which appears to get away from several objections to the numerous other mine-made types which have been used over the country.

Referring to the drawing and to the photograph, an offset extension from the bridle bar slides in a slot cut through a post which is set against the rib. The extension carries an insulated contact button which is connected to the rail by a ground wire. For the respective track-switch positions the insulated button contacts controller fingers mounted on opposite sides of the post.

Red light burning—the switch is lined for the lead-off



Costs little but considered indispensable

The bridle-bar extension thus carries no current and consequently has no tendency to produce shock by reason of a contact between the switch throw and ground. Furthermore, the contacts are well away from the track and are not underfoot. The offset at the bridle end of the extension puts the latter down below "tripping" level and the offset at the other end positions the contacts up away from the dirt and moisture of the mine bottom.

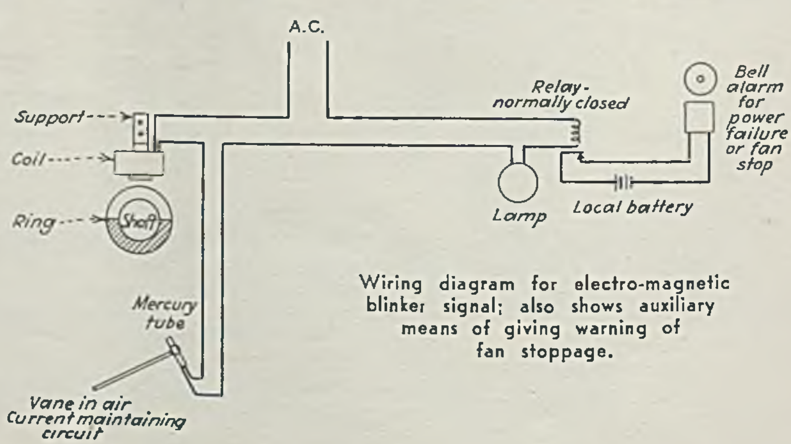
Lamps are mounted on conduit fittings and the wiring is protected where likely to be hit. The green light burns when the switch is lined for the main and the red light when thrown for the lead-off. This track switch is not the first one that William Jayne, general mine foreman, has designed. Even before going to Stanaford some six years ago he equipped switches at the Nellis (W.Va.) mine with mine-made contacts. The Stanaford type eliminates certain objections he found with his earlier designs.

Fan Blinker Signal Made With Electro-Magnet

"The requirement of the Pennsylvania Mining Law for a fan signal seems to be satisfied by a 'blinker light,'" states I. C. Wilhelm, electrical engineer, Imperial Coal Corporation, Johnstown, Pa., in reporting on the use of an electro-magnet to get the blinking effect. "Contacts mechanically operated eventually mean trouble and moving mechanical parts are to be eliminated wherever possible. Our scheme involves neither.

"As the accompanying sketch shows, a split ring—half iron or steel, half any non-ferrous metal—is clamped at any convenient point on the fan shaft. Mounted stationary with the pole face close to the ring is an electro-magnet—we used the pole piece and coil from a contactor. This coil is connected to an a.c. source in series with a lamp of suitable wattage. The changing impedance of the coil caused by the magnetic half of the rotating ring passing close to the pole results in a brightening and dimming of the lamp, which may be located anywhere. The sizes of the coil and the lamp for any particular voltage and frequency are easily determined by experiment and the junk box contains practically all the necessary materials.

"This, of course, is not suitable for high shaft speeds—say above 900 r.p.m.—but this limit is dependent somewhat upon the size of the lamp and the rate of filament cooling," concludes Mr. Wilhelm.



Wiring diagram for electro-magnetic blinker signal; also shows auxiliary means of giving warning of fan stoppage.

WORD FROM THE FIELD

To Transport Coal Via Barge From Buckheart Mine

Plans for barge shipments have been completed and construction started in extending tracks from the United Electric Coal Co.'s Buckheart operation, at Canton, Ill., to the Illinois River at a point about three miles north of Liverpool, where a modern dock will be constructed for loading coal into barges. The rail line, which will be constructed by the company's engineering organization, will be about 7½ miles long, of standard gage and operated by steam locomotives and regular bottom-dump coal cars.

The project was undertaken as the result of a mutual agreement between United Electric and the Marquette Cement Mfg. Co., which will use coal from the Buckheart operation for its cement plant at La Salle, Ill. The latter company has for many years operated its own barges on the Illinois and Mississippi rivers and, because of the advantageous location of Buckheart and the economy of transporting its own fuel, developed with United Electric the scheme to deliver the coal to the river.

The river dock near Liverpool is being designed and installed by the Koppers Co., the mechanism consisting of a large hopper with automatic feeder delivering to a 36-in. belt conveyor having a capacity of 400 tons per hour. The conveyor will extend about 300 ft. to the edge of the dock at the river channel, where adjustable mechanism, operated by pushbutton control, will lower or raise the belt for feeding to barges. Automatic barge-moving machinery will be installed for spotting barges alongside the dock. These facilities for the coal company will cost about $300,000.

The cement company will construct an unloading dock contiguous to its plant and also will provide additional barges especially for transporting this coal. This will involve an expenditure of about $350,000. The entire project is expected to be completed early in the coming autumn.

Sentinels of Safety Awards

"D" mine of the Union Pacific Coal Co., Superior, Wyo., was awarded the "Sentinels of Safety" trophy, donated by the *Explosives Engineer* magazine as the leader among bituminous-coal mines in safe operation during 1937. The mine worked 215 days, or 301,051 man-hours, without an accident causing loss of time to employees. The winner among anthracite operations was Jeddo No. 7 mine of the Jeddo-Highland Coal Co., at Harleigh, Pa., which was in operation 241 days, or 210,599 man-hours, with 15 lost-time accidents causing 300 days of disability to the men. The accident severity rate was 1.425 days lost per thousand man-hours of exposure to hazards.

Certificates of honorable mention were awarded to the following mines:

Bituminous—Bradford mine, Alabama By-Products Corporation, Dixiana, Ala; New Block mine, New Block Coal Co., Centerville, Iowa; Rockhill No. 8 mine, Rockhill Coal & Iron Co., Robertsdale, Pa.; Howard colliery, Norfolk & Western Railway Co. (fuel department), Chattaroy, W. Va.

Anthracite—Salem Hill colliery, Haddock Mining Co., Pottsville, Pa.; Olyphant colliery, Hudson Coal Co., Dickson, Pa.; Ebervale mine, Jeddo-Highland Coal Co., Ebervale, Pa.; Midvalley colliery, Hazle Brook Coal Co., Wilburton, Pa.

Keeping Step With Coal Demand

Bituminous Production

Week Ended	1938 (1,000 Tons)	1937* (1,000 Tons)
June 4	4,853	6,596
June 11	5,125	7,058
June 18	5,205	7,115
June 25	5,160	7,208
July 2	5,360	7,300
July 9	4,730	6,494
Total to July 9	153,084	224,559
Month of June	**22,850**	**31,776**

Anthracite Production

Week Ended	1938	1937*
June 4	1,128	976
June 11	870	1,086
June 18	706	973
June 25	925	909
July 2	951	999
July 9	317	679
Total to July 9	24,424	28,935
Month of June	**4,338**	**4,635**

* Outputs of these two columns are for the weeks corresponding to those in 1938, although these weeks do not necessarily end on the same dates.

Bituminous Coal Stocks

(Thousands of Net Tons)	June 1 1938	May 1 1938*	June 1 1937
Electric power utilities	8,253	8,404	8,446
Byproduct coke ovens	4,867	4,935	8,188
Steel and rolling mills	722	779	1,588
Railroads (Class 1)	5,041	5,548	7,391
Other industrials†	8,963	9,286	12,556
Total	27,846	28,952	38,169

Bituminous Coal Consumption

(Thousands of Net Tons)	May 1938	April 1938	May 1937
Electric power utilities	2,908	2,675	3,286
Byproduct coke ovens	3,236	3,457	6,434
Steel and rolling mills	603	649	1,153
Railroads (Class 1)	5,623	5,801	7,220
Other industrials†	7,623	8,271	10,764
Total	19,993	20,853	29,377

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

New Coal Sampling Methods Considered by A.S.T.M.

A new method of sampling coals classed according to ash content, to be applicable to ordinary commercial sampling and designed to have an accuracy such that in 95 cases out of 100 the ash content of the sample will be within ± 10 per cent of the true ash content of the samples, was submitted by the Committee on Coal and Coke at the 41st annual meeting of the American Society for Testing Materials at Atlantic City, N. J., June 27-July 1. A modification of the method is given also for conditions requiring greater accuracy. In the proposed method, coals are divided for sampling into four groups, depending on ash content, and each group is subdivided according to size of coal. The minimum size of increments as given is based on the quantity of coal necessary to represent the true size consist of the coal sampled.

A tentative revision was approved for publication in the standard methods of laboratory sampling and analysis providing for a change in the method for determining fusibility of ash to give essential furnace requirements and mention of specific furnaces which the committee has approved. A special section of the committee is being formed to investigate plastic properties of coals as affecting their combustion characteristics. In connection with testing expanding properties of coal during carbonization in coke ovens, arrangements are being made to distribute samples of coal of various ranks to different laboratories for making expansion tests by different methods. Such preliminary cooperative testing is believed necessary in the selection or development of a standard test procedure.

The Sectional Committee on Classification of Coals which functions under A.S.T.M. sponsorship in accordance with the procedure of the American Standards Association has developed proposed definitions for varieties of bituminous and sub-bituminous coals which were accepted for publication as tentative.

Anthracite Output Declines

Anthracite production mechanically loaded in 1937, according to complete returns from the U. S. Bureau of Mines, was as follows, in net tons: Eastern Middle Field, 701,498; Western Middle, 1,573,089; Southern 61,068; Northern, 8,318,068; Sullivan County, 30,014, or a total of 10,683,837 tons, compared with 10,827,946 in 1936.

Tonnage hand loaded was: Eastern Middle, 3,857,560; Western Middle, 6,468,512; Southern, 3,930,648; Northern, 17,589,212; Sullivan County, 56,582, or a total of 31,882,514 tons, as against 33,898,560 tons the year before. Output by strip pits was: Eastern Middle, 1,438,372 tons; Western Middle, 2,381,000; Southern, 1,243,667; Northern, 632,979, or a total of 5,696,018 tons, compared with 6,203,267 tons in the preceding year.

Tonnage from culm banks last year totaled 2,722,599, as against 3,193,972 in 1936. Coal reclaimed from river dredging last year totaled 760,474 tons, compared with 546,684 in the preceding year.

Total production from all sources, 51,745,442 tons, with a value of $197,598,849, compared with 54,579,535 tons in 1936, valued at $227,003,538. The average value of all breaker shipments last year was $4.03 a ton; washery shipments, $2.42; dredge shipments, $0.97; all shipments, $3.95.

Briquets and Packaged Fuel

Production of fuel briquets in 1937, according to the U. S. Bureau of Mines, amounted to 995,930 tons, valued at $6,393,723, as against 1,124,973 tons, valued at $7,143,133 in the preceding year.

There was an increase both in tonnage and value, however, in the production of packaged fuel last year, with output totaling 146,037 tons, valued at $1,287,320, as against 66,427 tons, valued at $505,331 in 1936.

C. F. & I. Buys Moffat Output

The entire output of the Moffat Coal Co., operating at Oak Creek, Colo., totaling about 200,000 tons annually, has been contracted for by the Colorado Fuel & Iron Corporation.

Gas Regulation Under Way

Orders affecting the natural-gas industry were issued by the Federal Power Commission on July 7 as it began administration of the Natural Gas Act, approved on June 21. Under this law, which authorizes regulation of transportation and sale of natural gas in interstate commerce, the Power Commission's orders initiate an investigation of natural-gas companies and direct that reports be filed, promulgate and prescribe rules of practice, and instruct the companies to file schedules of rates and charges and contracts and agreements for sale and transportation of gas, as well as to indicate their sources of supply.

Virginia Bans Dobie Shooting

Coal-mine operators of Virginia have been directed by the State Labor Department to enforce rules against dobie shooting rigidly and to resort to rock-dusting when necessary. The request was based on recommendations by the special commission that investigated the Keen Mountain mine explosion on April 22, in which 45 miners were killed (*Coal Age*, June p. 83). The commission found that dobie shooting, or surface dynamiting, caused the disaster and advised that the practice, banned by general law, be prohibited specifically by the General Assembly. On the advice of Governor James H. Price, State Labor Commissioner Thomas B. Morton dispatched individual letters to operators in which he requested their voluntary compliance.

Battle to Retrieve Lost Markets Started By National Coal Association

A CAMPAIGN to recover lost coal markets was launched on July 5 by the National Coal Association with the issuance to all operators of a bulletin setting forth some facts for all who are concerned about the bituminous coal industry. In announcing the step, Heath S. Clark, president of the association, stated that "the time has come to translate talk into action; it is now or never." Among the moves advocated by him toward equalizing the competitive battle with other fuels are an excise tax high enough to keep imported fuel oil out of the American market; putting a stop to the "dumping" of natural gas on the industrial market at give-away prices; regulation of rates charged by gas pipe lines; and applying the brakes to Federal subsidy of hydro-electric power.

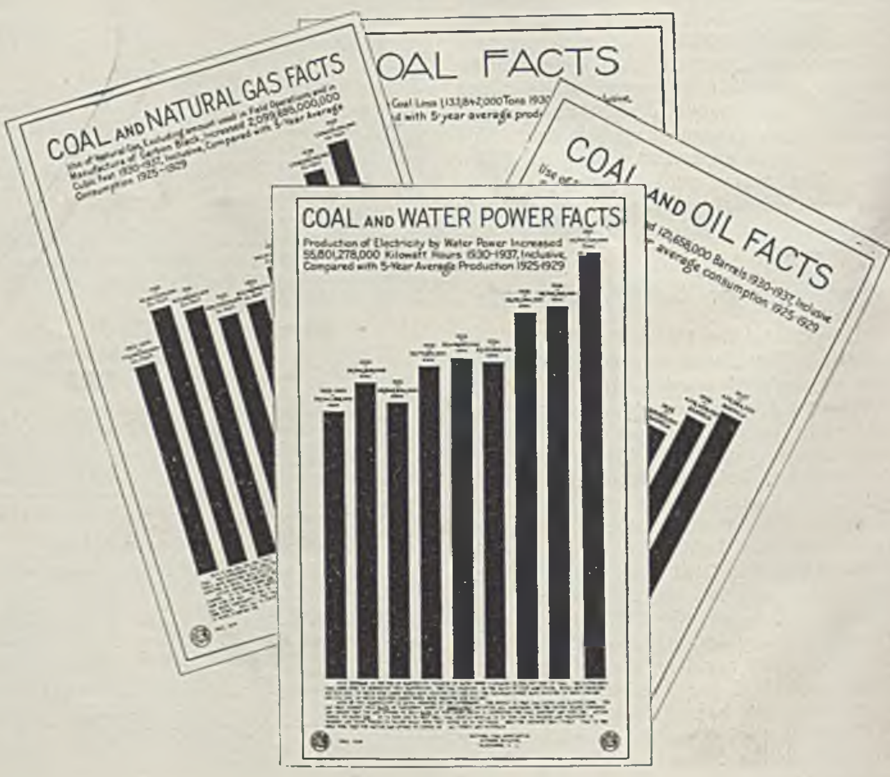
The only way to get action along these lines, Mr. Clark points out, however, is to get busy right away: first, to acquaint every person in the industry—executives, salesmen, office employees, mine workers, storekeepers, etc.—and every person within reach who is dependent upon coal for his job, or his business, or part of his business—that meaning railroad employees among others—with the facts and remedies; second, to enlist their concerted action toward obtaining pledges from their representatives in Congress (and candidates for Congress) to support the measures to accomplish these results.

Losses by the coal industry to the above competitors, it is pointed out in the bulletin, totaled 52,000,000 tons more last year than in 1930. At the same time, it is emphasized, manufacturing and other plants using these competitive sources of power are "hurting their own business because they have taken away from the coal miners the money to buy their products." In the same connection, attention is called to the fact that about 200,000 railroad employees are directly dependent upon the movement of coal.

The contribution of John D. Battle, executive secretary of the association, to the first skirmish in the campaign was a letter to the operators outlining suggestions for calling meetings of company employees to enlist their cooperation in the movement. Inclosed also are copies of resolutions adopted by the association's board of directors on June 29 in respect to amending the natural gas act, increasing the excise tax on imported fuel oil, opposing promotion of hydro-electric power projects through government subsidy, urging regulation of oil pipeline rates, and protesting against the lending of Federal funds to promote the construction of a proposed natural-gas pipe line from Montana-Wyoming gas fields to Duluth, Minn.

First of a series of posters issued in connection with the campaign is a bar chart entitled "Coal Facts," showing graphically the shrinkage in coal production between 1925-29 and 1938. Others following in a steady stream, each 11x17 in., enlarge on the foregoing themes, with facts, figures and diagrams. A small but interesting mailing piece states that "when labor works, it earns. When labor earns, it spends. When labor spends, it can buy your product. When labor buys your product, your business increases. The bituminous coal industry is by far the largest employer of labor among the

Telling the story with facts and figures



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Consult a JOY Representative on your problems.

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FRANKLIN . . . PENNSYLVANIA

fuel industries. If you use fuel produced with little labor, you thereby curtail the buying power of prospective customers."

The American Wholesale Coal Association is cooperating in the movement by mailing copies of the posters and charts to its members, urging that they do their part "in spreading this information and have employees talk it in their contacts. Make known to those with whom you do business that it is only through the use of coal that you are able to purchase from them and, whenever possible, do business with industries using coal in the production or manufacture of their products."

Action by the United Mine Workers of Ohio that is expected to prove helpful is an announcement through the State president, John Owens, that it is taking an active part in the effort to boost the sale of coal. In a conference in Columbus with coal producers of the State, according to the *United Mine Workers' Journal* of July 1, "President Owens and other officials offered their good offices in the sales activity in order to promote more working time at the mines."

Personal Notes

JAMES L. ASCOUGH has been appointed foreman at the No. 2 mine of the Amherst Coal Co., Amherstdale, W. Va.

JAMES M. BAGLEY has been elected president of the Bucoda Coal Mining Co., Seattle, Wash., vice James Bagley, deceased.

WALTER BANTA, general sales manager of the Lehigh Navigation Coal Co., Philadelphia, Pa., was elected vice-president of the organization on July 7. He will retain his old post in addition to his new responsibilities.

CHARLES E. BOCKUS, president, Clinchfield Coal Corporation; HOWARD N. EAVENSON, president, Clover Splint Coal Co.; and GRANT STAUFFER, president, Hume-Sinclair Coal Mining Co., were renamed to membership on the Natural Resources Production Committee of the Chamber of Commerce of the United States, according to an announcement during the last week in June.

JOHN BUSBY, formerly section foreman at the Dolomite mine of the Woodward Iron Co., Woodward, Ala., has been promoted to night foreman at that operation.

G. W. CHANDLER, section foreman at the Dolomite mine of the Woodward Iron Co., Woodward, Ala., has been transferred to the Mulga mine, Mulga, Ala., as mine foreman.

M. B. COULTER has been made foreman at the McKeefrey mine of the Mound City Coal Co., Marshall County, West Virginia.

HARRY S. COVINGTON resigned the presidency of the North American Coal Corporation, Cleveland, Ohio, effective June 25, withdrawing from all connection with the organization.

M. M. DRAKE, widely known in research activities, has been elected executive vice-president of the Illinois Reciprocal Trade Association, succeeding James W. Bristow, who resigned to become managing director of the Illinois Coal Strippers' Association, which has been revived after having been dormant more than six years. Directors of the Reciprocal Trade Association have approved a broad program of promotion and publicity intended to expand the industrial and economic resources of the State.

FRANK W. EARNEST, JR., was reelected president of Anthracite Industries, Inc., at its annual meeting, held July 1 in New York. These new members were named to the board of directors: JOHN C. HADDOCK, president, Haddock Mining Co., and H. M. SMYTH, president, St. Clair Coal Co.

R. E. Salvati

P. O. HAMER has been named superintendent the Point Lick No. 4 mine of the Hatfield-Campbell Creek Coal Co., Rensford, W. Va.

CECIL JENKINS has been appointed superintendent at the No. 9 mine of the Jamison Coal & Coke Co., Farmington, W. Va.

JOE F. KLANER, JR., formerly vice-president, has succeeded the late J. F. Klaner as president of the Alston Coal Co., Kelly-Carter Coal Co. and Windsor Coal Co., with headquarters in Pittsburg, Kan., and operations in Kansas and Missouri.

R. C. KLINGENSMITH has been made superintendent at the Eagle mine of the Getty Coal Co., Hepzibah, W. Va.

THOMAS MOORE has been named president of the Crescent Coal Co., Evansville, Ind., vice James H. Moore, who died March 11.

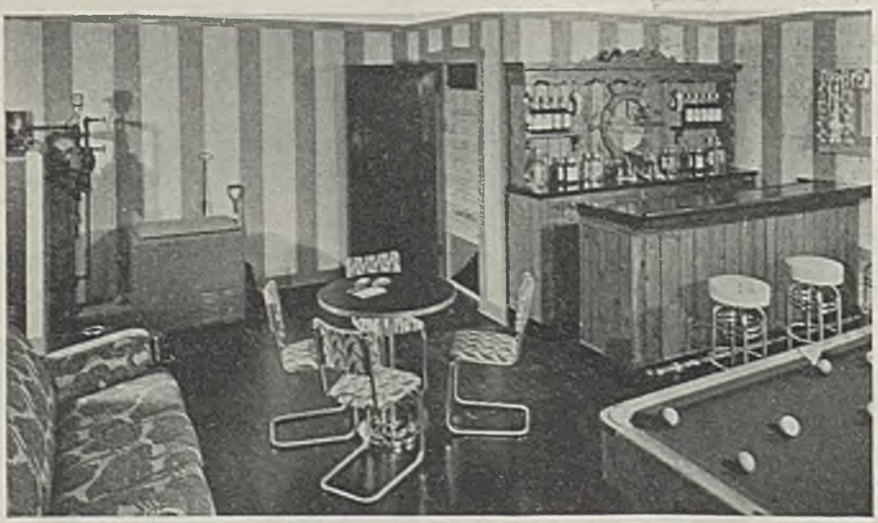
N. W. RICE, formerly president and now chairman of the board of the United States Fuel Co., Salt Lake City, Utah, has reassumed the presidency, vice D. D. Muir, Jr., deceased.

HENRY C. ROSE has been promoted to assistant production manager of the Pittsburgh Coal Co., with headquarters at Westland, Pa. He entered the employ of the company's production engineering department in March, 1928; was advanced to assistant superintendent of Montour No. 10 mine in July, 1934, and two years later became superintendent of the Westland mine.

RAYMOND E. SALVATI, general manager of the Island Creek Coal Co., has been appointed vice-president of the company and will combine the duties of both offices. He started with the company as a trackman, rising steadily to posts of increasing importance. He also is vice-president in charge of operations and general manager of the Pond Creek Pocahontas Co.

W. E. STINETTE has been named foreman at the Hugheston mine of Kanawha Coals, Inc., Hugheston, W. Va.

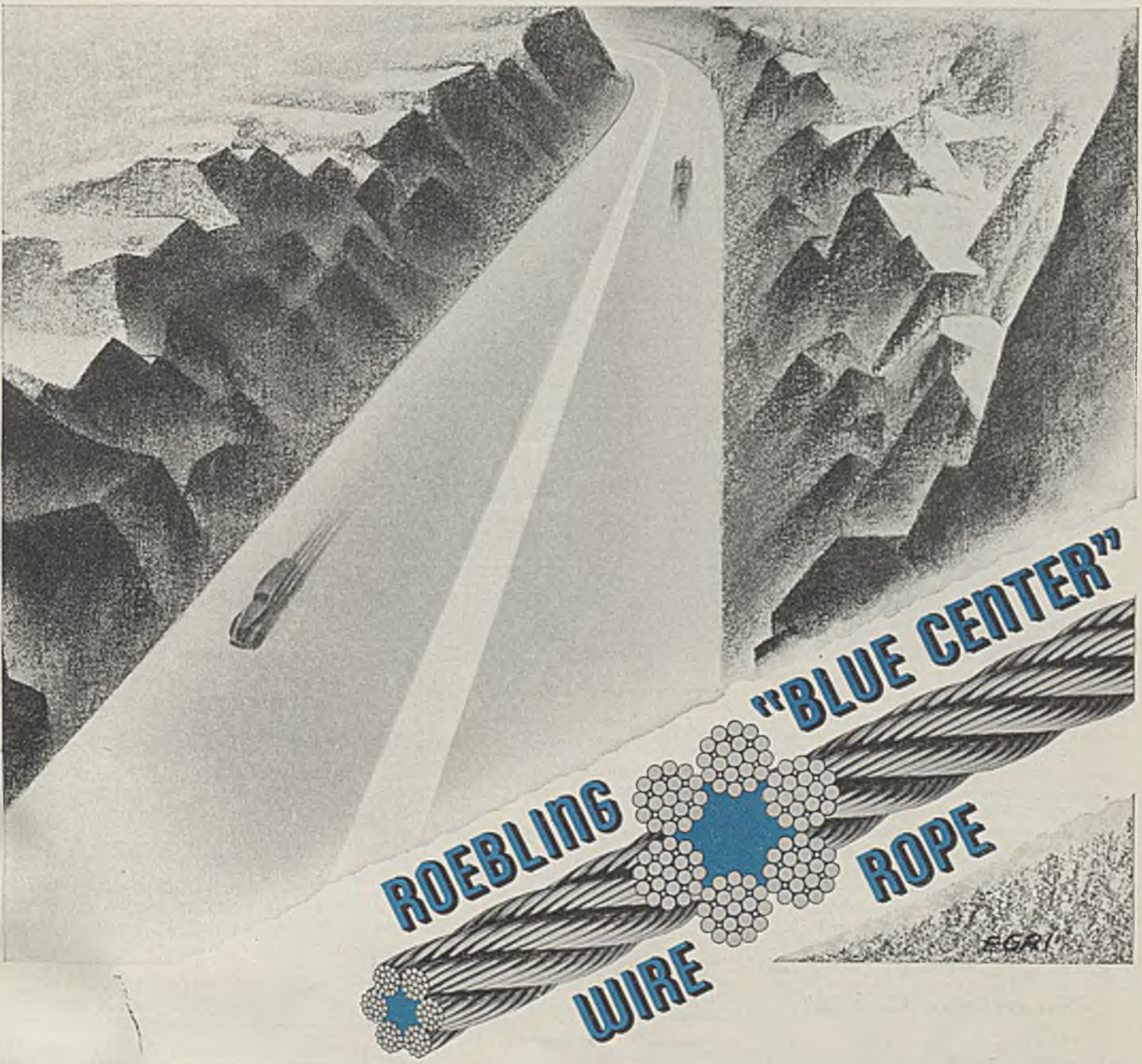
FREDERICK A. SWEET, JR., has been



Coal "Clinic" Advises on Basement Modernization

This 18x23-ft. recreation room is an outgrowth of the Chicago Coal Merchants' Association $2,500 basement modernization contest. In space provided by the Bell & Zoller Coal Co. in the Bell Building, this display room has been fitted up with modern fixtures and decorations, thanks to the cooperation of concerns interested in the home-modernization campaign. The Celotex Co. supplied the walling; Howell Co., the furniture; Brunswick-Balke-Collender Co., combination billiard-pingpong table and buffet bar; and the heating plant consists of a new type Link-Belt coal stoker and shovel-box bin filled with Zeigler Super-X stoker coal. In connection with the display the association maintains a permanent "clinic" to provide advice and assistance in basement modernization.

OPENING NEW ROADS TO ECONOMY



Try "Blue Center"...and see what it means in the way of safe, saving service! Into this rope Roebling has put its utmost steel making and rope fabricating ability!

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STRONGER—Wire of highest strength consistent with ductility and toughness

TOUGHER—Provides maximum resistance against wear, sudden shocks, vibration

SAFER—Unequalled for uniformity of quality

SAVING—Insures lowest general average operating cost

THE HIGHEST DEVELOPMENT IN ROEBLING WIRE ROPE

elected president of the Standard Coal Co., Salt Lake City, Utah, vice C. N. SWEET. The new president is a son of the founder of the company, the late Frederick A. Sweet, Sr., who headed it for two decades.

C. J. TURNER formerly mine foreman at the Dolomite mine of the Woodward Iron Co., Woodward, Ala., has been transferred to the Mulga mine, Mulga, Ala., as mine foreman.

D. A. ZUPA, a member of the field staff of Anthracite Industries, Inc., has been appointed a member of the arrangements committee of the Producers' Council Club, of New York. The club is affiliated with the National Producers' Council in the promotion of better housing throughout the United States.

P. & R. Loan Plea Approved; Union Offers Assistance

A petition by the Philadelphia & Reading Coal & Iron Co. for permission to borrow additional working capital was approved on July 16 by Howard B. Lewis, special master in reorganization proceedings of the company under Sec. 77B of the Federal bankruptcy laws. In a report on the petition Mr. Lewis declared that $2,500,000 might safely be borrowed on condition that the company file quarterly reports detailing the expenditure of the borrowed funds.

Cooperation in efforts to reorganize the company was offered by United Mine Workers officials on July 7 if the company will agree to continue operation of five anthracite collieries which it sought to close by court permission (*Coal Age*, July, p. 94). The offer was contained in a communication sent by a union committee to Mr. Lewis. The union said it would assist in seeking tax reductions and would cooperate under the terms of a contract with the company. The operations for which the company asked permission to close are the Bear Valley, Brookside, Hammond, Gilberton and West Shenandoah.

Rate on Bunker Coal Cut

A reduction in the freight rate on bunker coal from the Birmingham (Ala.) coal fields to Mobile from the old rate of $1.56 to $1.25 per ton, to meet barge competition, has been approved by the Alabama Public Service Commission, on petition of the Louisville & Nashville and Southern railway companies.

Six Killed by Roof Fall

Six miners were killed and three others injured on July 1 when a large section of roof fell in the Praco mine of the Alabama By-Products Corporation, Praco, Ala. Among the dead was J. I. Wingard, assistant superintendent of the operation. The cave-in is said to have occurred without the customary warning of creaking timbers and the victims were trapped without opportunity to seek safety. This was the first major accident at the mine since it began operations many years ago.

Coal Commission Presses Hearings To Determine Output Costs

WASHINGTON, D. C., July 15—Pressing on toward price regulation of bituminous coal under the coal control act, the National Bituminous Coal Commission has been holding hearings here for nearly two weeks to determine the cost of producing coal in Minimum Price Areas 1, 2, 3, 4 and 5. Sessions began July 6 covering Area 1, comprising Pennsylvania, West Virginia, Maryland, Ohio, Michigan and parts of Kentucky, Tennessee and Virginia. A week later came the start of the hearing on the remaining four minimum price areas, comprising districts 9 to 15, or all the rest of the regions not covered in the Denver hearing of June 13-16.

Pennsylvania district board representatives, though accepting the Commission's weighted cost figures for coal produced in 1936, contended that production costs for the first three months of 1938 had been materially boosted by increased compensation expenses, State mining legislation and greater unemployment payments. Higher selling cost, board expenses and taxes were cited as reasons for slightly higher proposed adjusted weighted average cost figures in northern and southeastern West Virginia and adjoining parts of Virginia. The Ohio and West Virginia Panhandle board representatives conceded the fairness of the Commission's cost figures in indicating their acceptance of them. Even where there were disagreements between Commission and district board figures, however, the differences were notably slight.

With the opening of the third hearing, on Wednesday, noteworthy progress was made from the start, with representatives from the various districts appearing in quick succession and presenting their testimony succinctly. The representative for District 11 (Indiana) called attention to the fact that a second wage increase went into effect there on Nov. 1, 1937, amounting to 2.90 per cent. Taking cognizance of this increase, the Commission found a weighted average cost of $1.6518 instead of $1.6366. Cost proposed by District Board 12 (Iowa) was $2.8406; District Board 15 (Missouri, Kansas, part of Oklahoma, Texas) pro-

Table I—Commission Cost Findings and Board Recommendations

	Mines Producing Over 50 Tons Daily: Commercial and Captive	Commercial Only	Captive Only	Total Under 50 Tons Daily	Total Ascertainable Tonnage
District 7					
As recommended by Coal Commission					
1936	$1.9732	$2.0111	$1.5882	$1.6321	$1.9728
1937 preliminary	2.1901	2.2271	1.9011	1.7755	2.1898
1937 final	2.1918	2.2288	1.9028	1.7755	2.1915
Current adjusted	2.2082	2.2453	....	1.7851	2.2071 [1]
As recommended by District Board					
Current adjusted	2.2108	2.2477	....	1.7852	2.2104 [1]
District 8					
As recommended by Coal Commission					
1936	1.8364	1.8094	1.9850	1.5767	1.8347
1937 preliminary	2.0361	2.0026	2.1889	2.5266	2.0343
1937 final	2.0426	2.0146	2.1594	1.5453	2.0402
Current adjusted	2.0578	2.0302	....	1.5542	2.0564 [1]
As recommended by District Board					
Current adjusted	2.0545	2.0208	....	1.6924	2.0535 [1]
District 9					
As recommended by Coal Commission					
1936	1.3969	1.3984	....	1.2701	1.3934
1937 preliminary	1.5551	1.5551	....	1.3071	1.5472
1937 final	1.5839	....	....	1.3124	1.5711 [3]
Current adjusted	1.5953 [3]	....	....	1.3148 [3]	1.5876 [3]
As recommended by District Board					
Current adjusted	1.5953 [3]	....	....	1.3148 [3]	1.5876 [3]
District 10					
As recommended by Coal Commission					
1936	1.6472	1.6576	....	1.7636	1.6489
1937 preliminary	1.7109	1.7056	....	1.8822	1.7126
1937 final	1.7602	1.7574	....	1.8336	1.7611
Current adjusted	1.7717	1.7689	....	1.8404	1.7726
As recommended by District Board					
Current adjusted	1.7758	....	....	1.8404	1.7766
District 11					
As recommended by Coal Commission					
1936	1.4647	....	....	1.5402	1.4661
1937 preliminary	1.6143	1.6137	....	1.5812	1.6134
1937 final	1.6384	1.6326	....	1.5689	1.6366
Current adjusted	1.6483	1.6425	....	1.5750	1.6469
As recommended by District Board					
Current adjusted	1.6697	....	....	1.6666	1.6697
As recommended by District Board....					
Current adjusted	....	....	....	....	3.6339

[1] Should be reduced approximately 0.3 mill to take care of out-of-line items detected by the Commission and Consumers' Counsel, which the Commission recommends be disallowed, in which recommendation the District Board concurs.

[2] Should be reduced 0.91 mill to take care of out-of-line and improper items detected by the Commission and Consumers' Counsel, which the Commission recommends be disallowed, in which recommendation the District Board concurs.

[3] Only eight months (May-December, 1937). The District Board recommended this since it felt that unusual labor costs would throw figures out of line if April, 1937, were used. The Commission concurred in the Board's view of this. As a general rule — unless there were unusual circumstances in the period — 1937 figures used in the compilations mean the period of nine months from April 1, 1937, through to the end of the year.

posed $2.0481; costs found and recommended for consideration in other districts are shown in the accompanying tables.

The Commission issued an order on July 1 declaring that substantially all bituminous coal moving in intrastate commerce in Wyoming directly affects interstate commerce in coal and is, therefore, subject to the provisions of Sec. 4 of the coal control act. Similar action had already been taken in regard to coal in Alabama, Oklahoma, Montana and Washington State. The orders are effective as of Aug. 1.

A test audit system was adopted by the Commission on June 28 to determine the accuracy of production cost data submitted by producers, the test to operate on the principle of bank examinations. The Commission disclaimed any intention of questioning the good faith or accuracy of cost reports, simply pointing out that the system of regulation of minimum prices by Federal authority requires that all possible steps be taken to assure that base determinations upon which prices are predicated be as accurate as possible.

Commission auditors select random returns as typical, beginning with January last, calling at operators' offices unannounced to check reports against original records. The audit check, it is felt, will increase confidence in the Commission procedure and will lead to better adaptation of the Commission cost-gathering methods to producers' accounting problems, eventually resulting in establishment of standard accounting practices.

Table I—Commission Cost Findings and Board Recommendations—Concluded

	Mines Producing Over 50 Tons Daily: Commercial and Captive	Commercial Only	Captive Only	Total Under 50 Tons Daily	Total Ascertainable Tonnage
District 12					
As recommended by Coal Commission					
1936	$2.6126	$2.6643	....	$2.2808	$2.5710 [4]
1937 preliminary	2.7617	2.8306	....	2.3342	2.7087 [5]
1937 final	2.9238	3.0039	....	2.1962	2.7993 [5]
1938 first quarter	2.6567	2.7428	....	2.3312	2.6198 [6]
Apr., 1937–Mar., 1938	2.8361	2.9195	....	2.2409	2.7419 [6]
May, 1937–Mar., 1938	....	....	....	....	2.7043
June, 1937–Mar., 1938	....	....	....	....	2.6735
Current adjusted	2.8496	2.9334	....	2.2484	2.7753 [7]
As recommended by District Board					
Current adjusted	2.8893	....	....	2.4988	2.8406 [8]
District 13					
As recommended by Coal Commission					
1936	2.1960	2.3155	2.0258	2.0204	2.1930 [9]
1937 preliminary	2.5327	2.5738	2.4253	2.0757	2.5243 [10]
1937 final	2.5412	2.5910	2.4253	2.0475	2.5304 [10]
1937 June-Dec.	....	....	....	....	2.4691 [11]
Current adjusted	2.4922	2.5519	....	2.0486	2.4854 [12]
As recommended by District Board					
1936	2.1624	....	....	1.9987	2.1597
Current adjusted	2.4292	....	....	2.1115	2.4238 [13]
District 14					
As recommended by Coal Commission					
1936	3.2098	3.2400	....	2.3723	3.1866 [14]
1937 preliminary	3.5928	3.6596	....	2.1701	3.5201 [15]
1937 final	3.8418	3.8973	....	2.3680	3.7629 [11]
1937 revised [16]	3.6710	....	....	2.2995	3.6049 [15]
Current adjusted	3.6947	....	....	2.3135	3.6563
As recommended by District Board					
Current adjusted	....	....	....	....	3,6339
District 15					
As recommended by Coal Commission					
1936	1.8965	1.8593	....	2.3572	1.9296
1937	1.9462	1.8954	2.5570	2.2990	1.9706
1937 final	2.0171	1.9748	....	2.4495	2.0473
1937, 8 mos	1.9790	1.9352	....	2.4436	2.0108
1937, 7 mos	1.9622	1.9182	....	2.4246	1.9947
1937 [17]	2.0191	....	....	2.4246	2.0481
Current adjusted [18]	2.0301	....	....	2.4348	2.0591
As recommended by District Board					
1936	1.8965	....	....	2.3115	1.9271
Current adjusted [19]	2.0278	....	....	2.2990	2.0481

[4] Commission recommended deletion of a few items, detected by Consumers' Counsel, found to be out of line and not justified; the effect on per-ton cost, however, would be negligible.

[5] Commission recommended deduction of 0.04 mill for out-of-line items.

[6] The Commission felt it was clear the nine-month 1937 period would not reflect proper costs; so costs for first quarter of 1938 were ascertained and these were averaged in with the last three quarters of 1937.

[7] This reflects only proportionate increase for 1938 unemployment and Coal Act taxes.

[8] Includes only mines paying union scale, and since it does not include as much tonnage as Commission's figure ($2.7753), the witness for the Board said, "the Commission's figure probably is a better figure."

[9] Commission recommends reduction of $0.0090 for out-of-line items; also deletion of certain costs found by Consumers' Counsel and not justified by operators.

[10] Commission recommends reduction of $0.0062 for out-of-line items.

[11] Due to special labor conditions obtaining in District 13 during April and May, 1937, the Commission recommended that costs for period June to the end of the year be used instead of usual nine-month period.

[12] Reflects only increased unemployment and Coal Act taxes over 1937 figure.

[13] District Board thought only last six months of 1937 should have been used as basis due to unusual labor conditions, and it figured accordingly.

[14] Commission recommends disallowance of out-of-line and improper items having effect of reducing this figure 0.0069; District Board agrees with this.

[15] Commission recommends disallowance of out-of-line and improper items having effect of reducing this figure $0.0213; District Board agrees with this.

[16] 1937 costs were revised after special study by Mr. Tryon to eliminate effect of seasonal changes and truly reflect proper labor costs.

[17] For seven-month period, assuming same proportions of strip and deep as reported in 1936.

[18] Commission considered seven-month 1937 period to be the fair period and used it in its tabulations.

[19] The District Board, in arriving at its current adjusted cost, used the nine-month period, but the witness said he had no reason to doubt that the seven-month period would give the more accurate figure. Only cost included in current adjusted figures which is not also reflected in the 1937 figures is for unemployment and Coal Act taxes. Figures are subject to reduction for out-of-line and improper items, as recommended by Commission and Consumers' Counsel and concurred in by the Board, but these amount to only a small fraction of a cent.

Table II—Mechanized and Hand-Mining

District 10 — As recommended by Coal Commission	Strip	Mechanical Loading	Hand Loading
1936	$1.3421	$1.6031	$1.9535
1937 preliminary	1.4188	1.7129	2.0800
1937 final	1.4319	1.7457	2.1793
District 11			
As recommended by Coal Commission			
1936	1.2727	1.5592	1.7911
1937 preliminary	1.4550	1.7340	1.8830
1937 final	1.4631	1.7636	1.9572
As recommended by District Board			
Current adjusted	1.4830[1]	1.8010[1]	2.1148[1]

District 15 — As recommended by Coal Commission	Strip	Deep	Deep, Commercial Only
1936	1.6384[2]	2.4309	2.4854
1937 preliminary	1.6384[2]	2.5786	2.5782
1937 final	1.8235	2.6216	
1937, 8 mos	1.7820	2.5834	
1937, 7 mos	1.7651	2.5473	
1937	1.7651	2.5473	
Current adjusted	1.7727	2.5658	
As recommended by District Board			
1936	1.6384	2.4309	
Current adjusted	1.7632	2.5786	

[1] Only mines producing more than 50 tons daily.

[2] Commercial only.

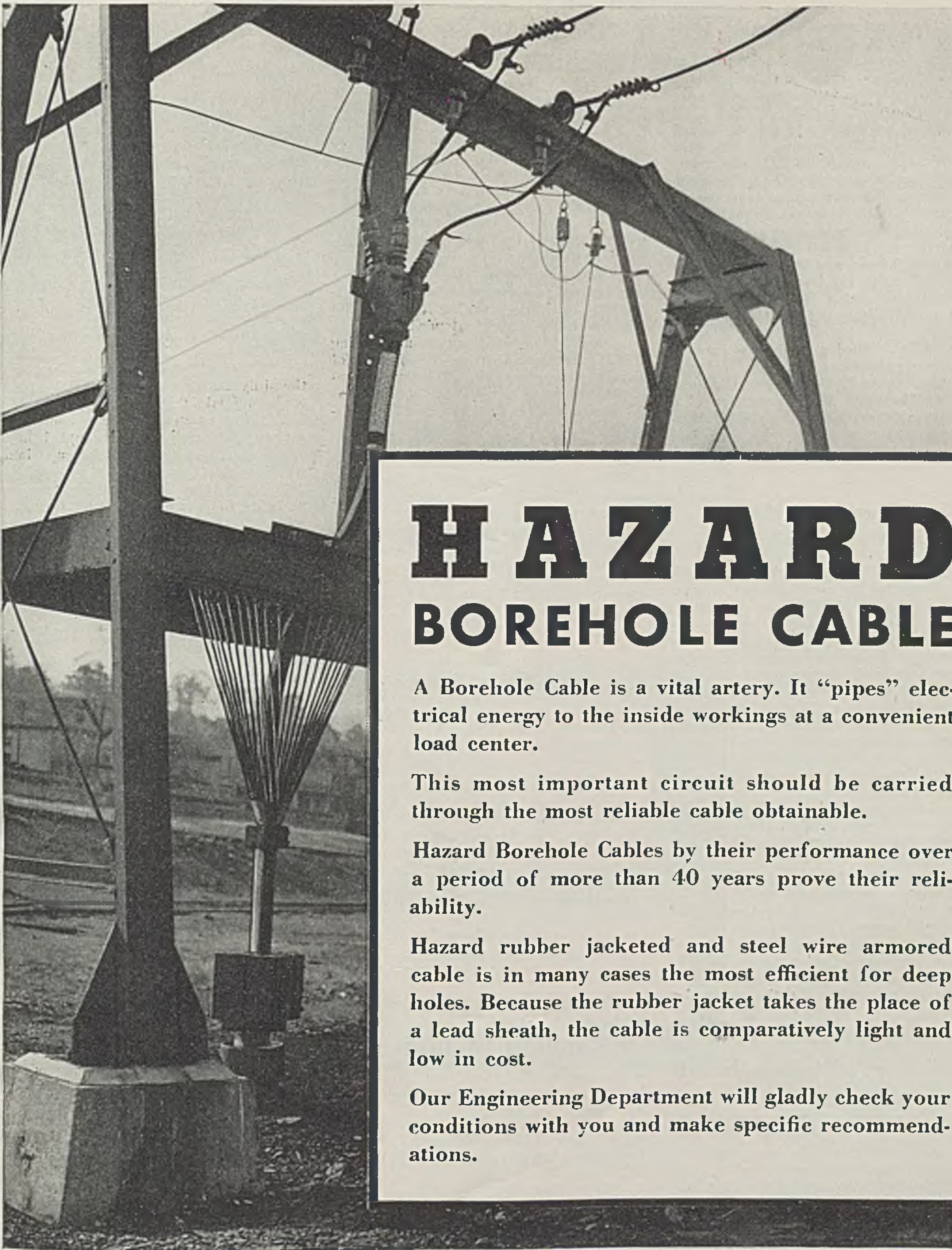
Action in the case of the Sunshine Anthracite Coal Co., Johnson County, Arkansas, before the Federal district court at Little Rock, was deferred on June 30, probably until autumn, F. L. McFarren, of counsel for the Coal Commission, stated in a hearing before the Commission on June 29 that it is clear that Congress considered the bituminous coal industry to include all producing areas within the United States except the eastern Pennsylvania anthracite region. He added that coal produced in every county in Arkansas has always been treated as bituminous for the purpose of regulation, and that therefore the Sunshine company was subject to the provisions of the coal control act.

The Commission announced on June 28 that a hearing on proposed prices to be submitted by producers' boards of the Rocky Mountain region would be held in Denver, Colo., some time in August. This hearing is to supplement that for the determination of costs held June 13-16 and is to be followed by another in the East for Eastern producers.

Oppose Funds for Gas Line

Coal interests have risen in arms against a proposal said to be fathered by the Kansas Pipeline & Gas Co. that the Reconstruction Finance Corporation lend $20,000,000 to finance construction of a natural-gas pipe line from southwestern Kansas to the Mesaba Iron Range in Minnesota. It is proposed that private capital raise $5,000,000, the government being asked to supply the remaining $20,000,000 needed.

Vigorous protests against the proposed loan were filed with the R.F.C. during the first week in July, however, by the National Coal Association, the National Bituminous Coal Commission, Appalachian Coals, Inc.; miners' unions, numerous individual coal operators, local



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Our Engineering Department will gladly check your conditions with you and make specific recommendations.

HAZARD INSULATED WIRE WORKS

DIVISION OF THE OKONITE CO.

WORKS: WILKES-BARRE, PENNSYLVANIA

New York Chicago Philadelphia Atlanta Seattle Dallas Washington

Pittsburgh Buffalo Boston Detroit San Francisco St. Louis Los Angeles associations, railroads and other interested parties. The Logan County (W. Va.) Coal Operators' Association said that "to allow such a loan would be to reduce even more the working time and wages of miners in Logan County."

James D. Francis, president, Island Creek Coal Co., Huntington, W. Va., telegraphed Jesse Jones, R.F.C. chairman: "If this loan is made it will deprive thousands of men of steady annual employment. More than 10,000 men are annually employed in producing coal now going into this territory. It is serviced by an additional 10,000 men, and if this business is lost it will mean the loss of wages at the mines and in mining communities of between $15,000,000 and $20,000,000 annually."

The R.F.C. issued a denial on July 11 that an application had been received from the Kansas Pipeline & Gas Co. for a loan of $20,000,000 for construction of a natural-gas pipe line. It was said, however, that promoters of the scheme had been in Washington lately in its behalf.

Coal-Combustion Service Set Up by Railroad

Designed to bolster lagging coal haulage by assisting the coal industry in marketing its output, the Chicago & Eastern Illinois Ry. has created a combustion engineering department headed by Charles S. Lammers, fuel-service engineer. Display and research headquarters have been established in the company's offices in the McCormick Building, Chicago, where coal producers, salesmen, brokers, dealers, analysts, manufacturers of heat and power equipment and their combustion men, as well as consumers, may find answers to their problems.

Mr. Lammers will have at his disposal the entire railway as his laboratory, employing each power or heat plant and locomotive as a research unit, with the whole company staff as advisory aides. The plan also contemplates study of other coal-usage problems such as review of steam and power plants as to grates, flues, draft, and kind and size of coal best suited for particular purposes. The new department likewise will cooperate with civic authorities in the prevention of air pollution.

Coal Map of Indiana Issued

A coal map of Indiana, compiled jointly by the department of geology of Indiana State Teachers' College and the Coal Trade Association of Indiana, has been issued by the latter organization. It shows the location of rail shipping mines, each identified by a number. Also shown, in alphabetical order, are the names of producers, name of mine, railroad location, vein of coal, county in which each mine is located, and an alphabetical list of the mines.

The map will be reissued periodically at times when it has been necessary to make changes. Copies—$1.75 with wooden rod at top and bottom, $1.50 without the rod—may be obtained from Jonas Waffle, managing director, Coal Trade Association of Indiana, 400 Opera House Block, Terre Haute, Ind.

"Hands-Off-Union" Order Given Harlan Fuel

The Harlan Fuel Co., Yancey, Ky., has been ordered by the National Labor Relations Board to cease interfering with efforts of the United Mine Workers to unionize mine workers in Harlan County, Kentucky, according to an announcement issued by the board on July 6. The order directed the company to reemploy 24 men who, it decided, were discharged for unionizing activities, and to disband as a company-dominated union, the Yancey Workmen Association, Inc.

Charging that representatives of the company had threatened the lives of union organizers, the board extended its order to prohibit the company from barring U.M.W. organizers from the streets of Yancey. The exclusion of union organizers, said the order, was an unfair labor practice in that it denied to tenant-employees the right to organize for collective bargaining under the Wagner act. Holding a 99-year lease on all land and buildings of the town, the company had contended that by virtue of its lease it was entitled to bar union organizers from entering the community.

The board also has issued a complaint charging the Straight Creek Coal Co., Inc., Straight Creek, Ky., with threatening U.M.W. organizers with death and discharging five employees for union activities.

Idle Plants Resume

Operations were resumed on July 5 at the Dolomite mine of the Woodward Iron Co., Woodward, Ala., after an idleness of two months. Normally the plant employs about 600 men.

Work also has been resumed at No. 2 mine of the United States Coal & Coke Co., Gary, W. Va., after a shutdown of several months. About 150 men are at work, compared with the regular complement of 470.

Work was started early in July giving re-employment to 165 men at the plant of the Star Coal & Coke Co., Red Star, W. Va., after being idle since April 1. The mine is under the supervision of W. W. Beddow, who assumed charge shortly before the mine was closed.

The Micco No. 3 mine of the West Virginia Coal & Coke Corporation, Switzer, W. Va., which has not been in operation for the last year, will be reopened about Aug. 15 with about 150 men employed, according to an announcement by A. F. Whitt, general superintendent. The mine has been fully mechanized.

Coming Meetings

- Pocahontas Electrical and Mechanical Institute: annual meeting, Aug. 18-20, Bluefield, W. Va.
- Sixth annual Illinois Mineral Industries Conference: Sept. 30-Oct. 1, University of Illinois, Urbana, Ill.
- West Virginia Coal Mining Institute: annual meeting, Oct. 7, Charleston, W. Va.
- National Safety Council: Silver Jubilee Congress, Oct. 10-14, Stevens Hotel, Chicago.
- Coal Producers' Association of Illinois: annual meeting, Oct. 11, Springfield, Ill.
- Coal Division, A.I.M.E.; Fuel Division, A.S.M.E., and Western Society of Engineers: joint meeting, Oct. 13-15, Palmer House, Chicago.

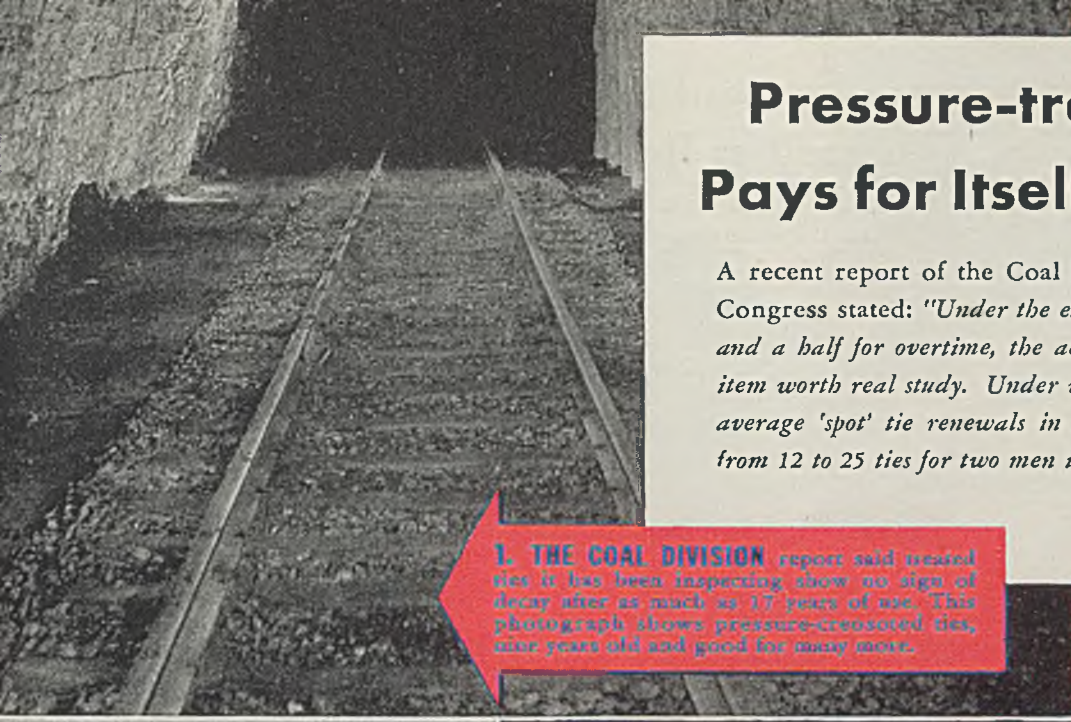
Safety Needs Salesmanship Contends P. A. Grady

Promoting safety is best accomplished by practicing the art of salesmanship rather than by a series of peremptory orders, declared P. A. Grady, general superintendent, Carrs Fork Coal Co., Allock, Ky., in an address on injury reduction at the July 29 meeting of the Big Sandy-Elkhorn Coal Mining Institute, Pikeville, Ky. After canvassing the various alternatives, this method was adopted in securing the use of electric cap lamps starting three years ago.

"It was the first effective campaign made by the company to sell the men an idea that was to our mutual interest. To most of our key men it was their first training in salesmanship, and the commodity sold was safety. There was something visible to the eye by which they could measure progress, even though proved benefits were yet to come. It was an exercise in management." After that, other drives were started one at a time and with certain goals—100 per cent first-aid training, hard hats, safety shoes, other safety clothing, etc. "We have not completed them all. We will. However, we have gone far enough to know that they do produce results. We have proved to our workmen the interest that we are taking and they are going along."

Placing safety rules in the hands of the workmen and instructing foremen from time to time over long periods to see to their enforcement will not make men careful. "Their carefulness is only in proportion to the efforts we are putting forth." Safety signs, bulletins and bulletin boards should be changed frequently so that they will not become commonplace. Small group meetings are at present proving very effective. Copies of the fatal-injury report sent out by the State are posted each month, not only at the mines but also where they can be read by women and children.

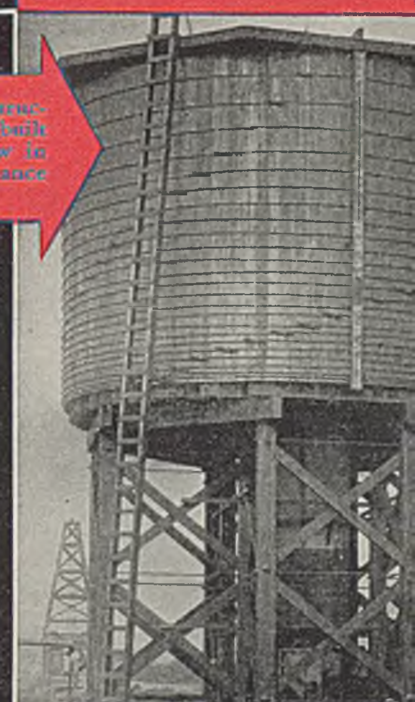
Rather than long annual or semi-annual exhortations to promote safety, foremen are supplied with weekly reminders and the injury record of each man. Foremen are taught to study the habits of these men, and also are instructed to determine, by casual interviews, the attitude of each man to safety work. The latter step disclosed a number of men who were "bulletin-board shy." A check of the records of these men disclosed that most of them had suffered an injury at one time or another and some of them several. This led to the conclusion that the safety work was not entirely effective among the men for whom it was most intended. Adopting the principle that introducing the thought of fear in the minds of these employees and members of their families would stimulate their interest, first-class letters, describing fatalities and offering safety suggestions,



Pressure-treated Timber
Pays for Itself in Labor Cost

A recent report of the Coal Division of the American Minin Congress stated: *"Under the existing wage contracts and with tim and a half for overtime, the actual cost of 'spot' tie renewals is a item worth real study. Under varying conditions in many mines th average 'spot' tie renewals in main haulage tracks studied vari from 12 to 25 ties for two men in one seven-hour shift."*

1. THE COAL DIVISION report said treated ties it has been inspecting show no sign of decay after as much as 17 years of use. This photograph shows pressure-creosoted ties, nine years old and good for many more.



2. WATER TANKS and their supporting structures have much greater durability when built of pressure-treated timber. They are low in first cost and have practically no maintenance expense.

3. COMPANY HOUSES, stores and other structures can be given longer life, with lower maintenance costs by the use of pressure-treated timber. The Wood Preserving Corporation can supply creosoted-treated timber when used in direct contact with the ground, and salt-treated timber for other parts of the buildings. Salt-treated timber is clean, odorless, can be painted, and is not discolored by treatment.

OTHER PRODUCTS AND USES FOR PRESSURE-TREATED TIMBER AND OTHER KOPPERS PRODUCTS FOR THE MINING FIELD

Tipples . . . Piling . . . Guard Rails . . . Fences . . . Poles . . . Buildings, Bins, Sheds . . . Piers, Docks, Wharves . . . Platforms . . . Flooring . . . Tanks, Sumps, Vats . . . Crossing Plank . . . Barge Sides and Bottoms . . . Cable Ways . . . Conduit . . . Culverts . . . Flumes . . . Trench lining and covers . . . Conveyor Decking and Supports

●

Koppers Rheolaveur Process . . . Menzie's Automatic Cone Separators . . . Koppers-Llewellyn Automatic Washers . . . K-R-M Dry-Cleaning Separators . . . Coal Tipples . . . Koppers-Birtley Dedusters . . . Carpenter Centrifugal Dryers . . . Boiler and Power Plants . . . Mine Shops . . . Fast's Couplings . . . American Hammered Piston Rings . . . Cylinder Packing . . . Bronze and Iron Castings . . . Flotation Oils . . . Bituminous-base Paints . . . Coal Tar Roofing . . . Waterproofing . . . Tarmac for paving.

4. THE BUMPERS of these mine cars are of pressure-creosoted yellow pine. It is estimated that these bumpers saved from $10 to $40 per car compared with other types of bumpers. The toughness and resiliency of wood gives it a natural fitness for bumpers and pressure treatment gives it long life. Treated timber is also used for mine car bottoms.

THE WOOD PRESERVING CORPORATIC

PITTSBURGH, PA.

Subsidiary:

NATIONAL LUMBER & CREOSOTING COMPANY

TEXARKANA, ARK.-TEX.

K O P P E R S

were mailed to each employee. Letters were varied in accordance with the classes of employees to which they were sent.

Reactions to these letters were mixed. Accident-free employees generally approved, while employees who had suffered injuries in the past were silent. In tracing down the reason for this, it was decided that "the man who has never been injured fears injury and death more. The one who has been injured finds out that the pain was not as great as expected. He recovered, but has not been cured of taking chances," and in many cases seems to delight in posing as a "wounded hero." Consequently, "we try in every way possible to let the careless worker know that he is being tagged," as that is the best way of bringing home to him his responsibility for working safely.

Safety Teams in Keen Contest

First honors in the eighth annual safety day meet of the Monongahela Valley Coal Mining Institute, held at Morgantown, W. Va., on July 16, were won by the first-aid team from No. 93 mine of the Consolidation Coal Co., Jordan. It was necessary to work an extra problem, however, before a decision was reached, as the team from No. 97 mine, Rivesville, was tied for first at the end of the regular test, both teams having perfect scores. The Maiden mine team of the Kelley's Creek Colliery Co. was third, with a score of 99.72 per cent.

In the contest for colored teams, representatives from Consolidation No. 93 also came out on top. A boys' team from No. 4 mine of the Continental Coal Co. was unopposed, but scored 98.8.

Stream-Pollution Bill Dies

The stream-pollution bill finally approved by the House of Representatives on June 13—*Coal Age*, July, p. 93—was killed by "pocket" veto by the President. Disapproval by Mr. Roosevelt was expressed in a memorandum which said in part:

"This bill provides for the legislative assumption of responsibilities of the executive branch, and, therefore, runs counter to the fundamental concept of our budget system that the planning of work programs of the executive agencies and their presentation to Congress in the form of estimates of appropriation is a duty imposed upon the Chief Executive and not one for exercise by the legislative branch."

To Reopen Gebo Mines

Three of the mines formerly operated by the Owl Creek Coal Co. at Gebo, Wyo., are to be reopened and operated by independents, with more than 125 men employed. P. H. Burnell, former superintendent for the Owl Creek company, announced on June 30 that he had taken over mines Nos. 2 and 4 and had acquired government leases held by the company. Operation and government lease on mine No. 1 have been acquired by A. B. Haff and David King. All three mines, which were closed last January, will be operated on a contract basis, catering primarily to railroads.

Management and Operating Problems Probed at Rocky Mountain Meeting

- Rock-dusting, mine-safety fundamentals and the advantages of systematic timbering.
- Training for mine employees, supervisors and engineers.
- Shaker conveyors in a southern Colorado mine; mobile loaders in a western Colorado operation.
- Storage conveyors, box-car-loading methods and portable crushing units at a Wyoming mine.
- Controlled slack preparation and recent trends in coal preparation in general.
- How many cars per trip? and automatic mine-car couplers.
- Modern methods of coal cutting.
- Deep-well pumps for mine drainage.
- Standardization possibilities in the coal-mining industry.

MORE than 150 members and guests gathered to discuss the above topics at the 36th regular meeting of the Rocky Mountain Coal Mining Institute, held June 23-25 at the Shirley-Savoy Hotel, Denver, Colo. H. C. Marchant was elevated to the presidency in the annual election and F. W. Whiteside was chosen secretary-treasurer.

In unanimously adopted resolutions, the institute expressed gratification over the establishment of a U. S. Bureau of Mines research station for coal utilization at Golden, Colo. The institute also resolved that, in view of the reversal in the injury trend in late years, its membership should couple modernization of mining practices and methods with the equally important matter of protecting the lives of the miners, and also pledged cooperation with all agencies, State, Federal, etc., in plans for educating miners and mine officials in safety and efficiency.

The congratulations of the institute were extended the general staff of the Union Pacific Coal Co., George A. Brown, superintendent, and the staff of the Superior group of mines, which group ("B," "C" and "D," in order) has received three Sentinels of Safety trophies in the past five years, the last in June, 1938. Cooperation of the men as a whole was given the major credit by Mr. Brown in his acknowledgment of the institute's felicitations. The record of the group, he pointed out, has been made under "tough" conditions, which, among other things, required the adoption of systematic methods of timbering from which no variations are permitted. The results of this step are a major factor in the Superior record. As long as the interest of the men is held, Mr. Brown concluded, no trouble will be encountered in holding past gains.

"It must be borne in mind," declared Gilbert C. Davis, manager, Stag Canon Branch, Phelps Dodge Corporation, Dawson, N. M., in opening the technical sessions with a discussion of rock-dusting at his operation, "that the practice is but one of a series of steps taken to guard against explosions and generally make a safe coal-mining operation. Experience has very definitely and tragically proved that all safety work must be kept in unison to make possible the results that have been accomplished."

Rock-dusting in a determined way at Dawson followed the last explosion in 1923. Hand in hand go the following, which are painstakingly observed:

1. Adequate ventilation.
2. Installation of a sprinkling system with a line into every working place to provide water for the cutter bars of all mining machines, for wetting the coal as it is loaded by hand or machine, and for washing down all working places to minimize the quantity of coal dust carried in the ventilating current.
3. Daily inspections of all working places by the firebosses for accumulations of dust.
4. Reduction in trip speed to reduce derailments.
5. Abolishment of car topping.
6. Use of solid-bodied cars to eliminate spillage along haulage roads.
7. Regular cleaning of main haulage roads, with accumulations not permitted.
8. Standardization of shotfiring on the following basis: electrical firing from the surface with all men out of the mines; permissible power with not over 1½ lb. per hole; return of any unused powder to the surface magazine; prohibition of delay detonators; charging of holes to eliminate any possibility of "cross firing"; and adobe tamping to the collar of the hole.
9. Electric cap lamps.
10. Monthly inspections for unsafe conditions by a committee of workmen.
11. Standardization of wiring and installation of electrical appliances.
12. Goggles, safety hats and safety shoes 100 per cent underground.
13. Standardization of timbering.
14. Standardization of clearance between tracks and timbers.

Spreading Adobe First Step

One of the first steps in rock-dusting was spreading adobe in haulage entries and aircourses to a depth of 3 to 4 in., which was followed by "muditing," or the application of adobe and water with a cement gun. Also, some entries were coated with cement. Another step was the application of adobe dust and later limestone dust by blowers. In the course of time it was felt that a heavier coating of dust was desirable, and dry dust was applied by a cement gun to the haulage entries and—through the stoppings—aircourses. "No better or more thorough means has yet been found and this method is in use today. . . . Around 275 sacks of dust are handled through the cement gun in a shift with a crew of three men."

Available information indicates that one of the first rock-dust barriers was used in 1914. After trying several types, the Standard Bureau of Mines dust barrier was adopted. "Standard practice is to erect a battery of rock-dust barriers across each entry between each panel. . . . This very definitely divides the mine into small sections." The first dust used in barriers was adobe gathered from the highways,

The Shell engineer gave this mine's personnel a schooling in proper lubrication

THE Cahaba Red Ash Coal Co., Inc., of Birmingham, Alabama, operates its mine in single units . . . where the failure of any part of a unit would result in great expense and loss of production.

Experiencing difficulty in lubricating their equipment due to large amounts of water and rock dust, Mr. Z. G. Elmore called a Shell engineer in to survey the company's entire lubrication problem.

After a complete check-up, the Shell engineer recommended the proper Shell Coal-Mine Lubricants for each particular job. But he went further—his study of their problem had convinced him that much of the difficulty was due to improper handling and application of the lubricants. *So he took the mine personnel to school!*

Right on the spot, this Shell engineer conducted a short course in correct lubrication methods . . . showed the miners how each lubricant should be handled and stored . . . how it should be applied to each machine to keep operation safe and efficient.

As a result of this Shell man's enterprise, the Cahaba Red Ash Coal Company is now operating with greater assurance against lubrication failure and *at a reduced cost per ton of coal produced.*

This case history from the Shell files again demonstrates what Shell experience plus Shell products can do to the bogey of "lubrication failure." Whatever your particular problem—call on Shell. Simply write or phone your nearest Shell office.

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followed by other types of inert material. Finally, raw limestone dust ground to 200-mesh was adopted. This dust cakes when wetted and dried, and consequently is not desirable for wet mines. Working places are kept dusted to within 50 ft. of the face by hand casting by men who devote their entire time to it and wear respirators.

"Through experiments by the Bureau of Mines, it was determined that mine dust at Dawson must analyze 70 per cent ash to prevent the spread of an explosion. Mine dust is sampled at intervals of four months and, should any sample disclose less than 70 per cent inert matter, the district from which the sample was taken is promptly and thoroughly redusted." Better illumination is an important by-product.

"During the eight-year period through 1937, in the production of slightly more than 2,200,000 tons of coal at Dawson, there was used 3,891¾ tons of rock dust . . . an average of 3.54 lb. per ton of coal produced. During this eight-year period there was spent for rock-dusting $60,389.13, an average of 2.74c. per ton. It may be said that this is a very heavy fixed charge. However, it does not look so bad when I tell you that the 1923 explosion cost more than $125,000 merely to recondition the mine for reopening."

Practically the same practice is followed at the Boncarbo mine of the American Smelting & Refining Co., Cokedale, Colo., said C. R. Garrett, general superintendent. The aim for a number of years has been to rock-dust each section at least once a week, covering the four sections of the mine at least once a month. With a 1¼-ton M-S-A duster, two men will apply about this quantity in a day's time in openings with tracks. Hand casting, however, is employed in rooms, aircourses and manways, in which process two men can apply about 150 sacks a day. Tight cars are used, so that there is very little spillage along the haulage roads. Consequently, about the only place dust tends to collect is at points where gathering locomotives make up trips for the main-line units. This is loaded out before rock-dusting is done.

Credit for awakening Western operators to the importance of dusting was given to John E. Jones, now safety engineer for the Old Ben Coal Corporation, Illinois, by Mr. Garrett, who remarked that his company, as a result of Mr. Jones' missionary work, bought dusting and testing equipment and started out in earnest in January, 1925. Since that time and up to June 1, 1938, 1,300 tons of dolomite dust has been applied at a material cost of about $9,000 and a labor cost of about $4,000, or $10 per ton. With a production of 1,945,000 tons, cost per ton is ⅔c.

While operators appreciate the value of rock-dusting, they are likely to balk at the initial cost of satisfactory protection, said G. O. Arnold, Boncarbo mine superintendent. Actual cost will vary widely in accordance with the hazard presented; the average operation probably would have to spend $150 to $200 per mile of roadway and airway for recognized protection, plus 1c. to 2c. per ton annually to retain this protection. If the operator is unwilling or unable to undertake the initial expenditure, Mr. Arnold suggested that at least 90 per cent of the standard could be attained by thoroughly treating the major danger zones at an expenditure of about 50 per cent of what recognized full protection would involve.

Close supervision is necessary to assure dusting in accordance with the standards set up, said T. H. Butler, supervisor of mines, Union Pacific Coal Co., Rock Springs, Wyo. All mines should be rock-dusted, he contended, and this should be supplemented by the use of electric cap lamps and permissible powder. The Bureau of Mines, said E. H. Denny, district engineer, Denver, recommends rock-dusting of all mines except anthracite, with barriers as a secondary defense against explosions. F. C. Miller, chemist, Colorado Fuel & Iron Co., Trinidad, Colo., declared that he had exploded a sample of mine dust containing 80 per cent inert matter and recommended that humidification accompany rock-dusting, inasmuch as dry dust must have a higher percentage of inert material to be equally as safe as damp dust.

Coal mining with shaker conveyors in a seam less than 4 ft. thick at one of his company's operations was described by George B. Dick, vice-president, Gordon Coal Co., Walsenburg, Colo. The roof consists of a tender slate, and the bottom is very soft for 1 to 6 ft. under the coal. The bottom is brushed in entries to provide a clearance of 5½ ft. over the rail and under the timbers. No brushing is done in rooms.

The first two conveyors were installed in a solid block of coal on one side of the mine on July 8, 1937, and were put to driving the openings for the triple-heading entry system decided on. One heading serves as the aircourse, the second as the main-haulage opening, and the third as a storage for empties and loads. As transportation, on the basis of available information, seemed the key in shaker-conveyor mining, it was decided, in addition to other measures, to use 40-lb. rail throughout. The original plan was to drive to the boundary with the headings and mine on the retreat. "This, of course, called for entries to be driven on a 3½-per cent grade" to facilitate locomotive haulage and drainage.

Duckbills Used in Headings

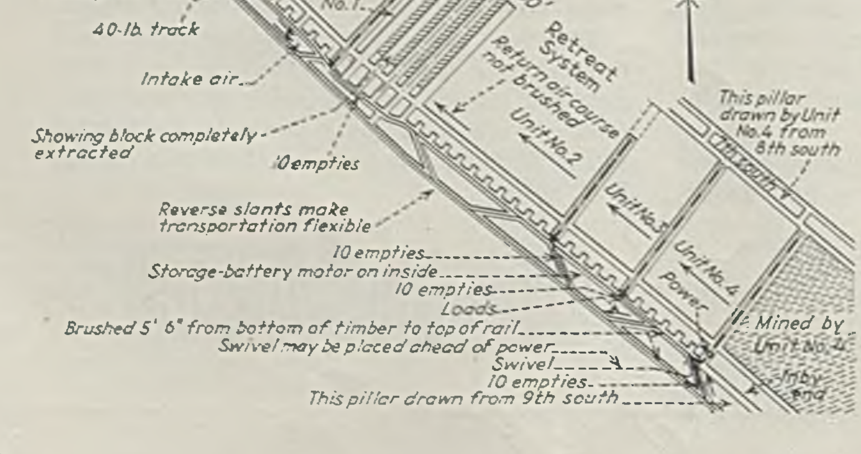
The first experimental rooms, however, were turned when the headings had been driven 500 ft. to get around the main sump and also provide empty and load storage room, with the idea of getting the necessary experience on which to lay out the final plan of operation. Duckbills were used in driving the 10-ft.-wide headings and proved quite satisfactory both in loading the coal and also the bottom material taken up in brushing. On Sept. 1, 1937, the third conveyor unit was installed and experiments in rooms were begun.

Originally it was planned to turn the rooms on 40-ft. centers and drive them 20 ft. wide to a depth of 250 ft. However, 15-ft. rooms on 20-ft. centers and 18-ft. rooms on 30-ft. centers also were laid out. In the case of the 20-ft. rooms, experience showed that changing many timbers to be able to use the duckbill cut down the number of cycles per seven-hour shift. The 15-ft. rooms resulted in an increase in the number of cycles and a decrease in timber changing, also accompanied by a decrease in tonnage per cycle. With the 18-ft. rooms, the same number of cycles as in the 15-ft. rooms was obtained, with practically the same tonnage in seven hours as with the 20-ft. rooms. So 18-ft. rooms on 30-ft. centers were adopted.

Units are operated two seven-hour shifts five days a week with four-man crews. Linear advance in unbrushed entries has averaged 40 to 42 ft. throughout the mine, including all timbering and moving of swivels and 90-deg.-angle troughs. Chain supports have been found more satisfactory than rollers in eliminating buckling of the pans up to 250 ft. Some difficulty in holding two 20-deg. swivels on the same pan line is being eliminated.

With a hard-natured coal, considerable attention has been devoted to shooting. Usually, a buster shot and two rib shots are employed. The buster is tamped solid, while the first three dummies in rib shots are tamped lightly and the remainder solid. Cutting is done in the soft bottom,

Retreat system of conveyor mining used by the Gordon Coal Co.



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which is mucked and loaded before shooting. Crossbars are set to the face before shooting, using timber jacks, which facilitate moving the supports after partly loading the face to make room for permanent posts. All electrical connections for each unit are placed on a panel board at the discharge end of the conveyor. Adjustable pedestals on the top and bottom facilitate moving the board.

In brushing entries with a four-man crew, 42 in. of bottom can be removed for a distance of 80 ft. in two shifts. Doing the same work by hand, two men would take up only 10 ft. per shift. To facilitate transportation, slants are driven from the empty storage entry to the main entry every 300 ft., thus placing each unit in a separate block and giving it ample space for empty and load storage. This allows each unit to work without interference with any of the others. In conclusion, Mr. Dick stated: "We feel that the working of conveyors is safer than the old system, due to the fact that we have a better class of miners, close supervision, and concentration of all the work in one area."

At the National Fuel Co. mines, in Weld and Boulder counties, Colorado, said Roy M. Williams, general superintendent, 240-ft. rooms are driven on 60-ft. centers and the pillars are removed on a 45-deg. angle with shaker conveyors, which have been successful in a 3½- to 4½-ft. seam that could not be worked otherwise. Main haulageways are brushed 2 to 2½ ft. with the shakers, which advance 10 to 15 ft. per seven-hour shift. As the seam is very uneven, the pan lines are hard to hold and consequently duckbills are not employed. Three shifts are worked in winter, and the average is around 35 tons per shift with a four-man crew. In some places, an 18-in. band over the coal must be taken down and gobbed. Operations are now being extended into a territory where the coal runs about 4 ft. thick and is overlaid by an 8-in. band. Presenting many difficulties even with machines, this territory would be impossible to work by hand.

Coal Breakage Reduced

Accompanying his remarks with a movie, Glen Sorenson, superintendent, Kemmerer Coal Co., Kemmerer, Wyo., discussed preparation practices at the No. 8 mine of the company, opened during the late summer of 1937. Seam thickness ranges from 10 to 16 ft., all clean coal, and the dip is about 23 deg. west. The coal is mined on the room-and-pillar system, using chain-and-flight and 36-in. belt conveyors to 5-ton steel cars.

Although some of this coal is consumed by railroads and industrial plants, the greater portion goes into the domestic trade. Consequently minimum breakage and thorough removal of degradation is important. The first step in reducing breakage was the use of a shield in the rotary dump. This eases the coal down onto a set of grizzlies which allow the fines to fall through first into the hopper and thus cushion the lumps. From pit car to picking tables the coal moves without encountering a right-angle turn in the flow. The tipple proper is equipped with shaking screens, picking tables and loading booms.

All prepared sizes above 1⅝-in. are loaded into closed cars by box-car loaders with 16-ft. booms. Cross conveyors are used from the loading booms to the box-car loaders are of the chain-mat type for removing degradation, which is carried back to an elevator on the inclosed bottom strand. The elevator discharges the fines into the mixing conveyor, from which they are recirculated to the screens.

H. C. Marchant
New Institute President

"Storage conveyors for use while changing box cars are an important part of this plant," and eliminate most of the tipple stoppages that otherwise would be necessary, with consequent increase in tipple man power and power consumption and higher peaks and higher maintenance growing out of intermittent operation. The storage units consist of apron conveyors on the opposite side of the cross conveyor from the discharge end of the loading booms. While storing, the conveyor travels at 5 ft. per minute, allowing 5 tons of coal to be accumulated and providing about six minutes for a car change. When a car is changed, the storage unit is reversed and at the rate of 2 ft. per minute the coal is fed onto the chain-mat cross conveyor. If car changing requires more than 6 minutes and the storage conveyor becomes loaded, it automatically shuts down the tipple.

One problem in plant design was whether to screen, crush and remix the lump or size the mine-run with a separate crusher in making stoker coal. This problem was overcome, Mr. Sorenson reported, by placing the crusher on a self-propelling truck and using it either under the mine-run chute or moving it over to the mixing-conveyor gallery for crushing any desired size. "This installation made it possible to size mine-run direct from the belt and thus avoid running the entire tipple while preparing this coal."

A cooperative effort by both management and employees is the best method of making a mine-safety program work, declared Matt Strannigan, safety engineer, Southern Wyoming Coal Operators' Association. First-aid training is a good method of keeping injuries down, as experience at mines under the jurisdiction of his association shows. Each employee should have in his possession a set of rules and regulations outlining his duties. "Safety meetings have been organized in southern Wyoming and have proved a success."

Specific recommendations for the promotion of mine safety presented by Mr. Strannigan included: adequate ventilation; rock-dusting, especially in dusty and gaseous mines, supplemented by washing down dusty ribs and timbers; heavy rail on all main haulage roads with ample clearances on both sides; proper installation and maintenance of electrical equipment, accompanied by frequent inspections and necessary repairs on the surface; use of safety clothing; and placement of responsibility of mine accidents on those who are responsible.

Most mine accidents, analysis shows, could have been prevented. They fall into four classes: (1) those for which the injured was responsible; (2) those in which other workmen were involved; (3) those for which the management is responsible; and (4) unavoidable accidents. "We may summarize," said Mr. Strannigan, "by saying that mine safety can be achieved only by the wholehearted cooperation of all concerned in carrying out a definite program."

Strongly indorsing the previous speaker's remarks on the need for cooperation, R. R. Knill, safety engineer, Union Pacific Coal Co., made the point that management first must be sold; otherwise, there is no hope for success. Management, he continued, has the duty of furnishing adequate supervision and carefully thought-out working plans, and must educate employees in safe habits and working methods. Safety meetings help break down employee antagonism to programs for the prevention of injuries. Mr. Knill would class as first in importance those accidents for which the management is responsible and holds that safety is no more than efficient operation, which in turn demands good supervision. Mechanization, he concluded, has materially reduced the injury hazard.

Analyzing the changes in the industry in the past two decades, Thomas Allen, chief coal-mine inspector for Colorado, Denver, presented, in a forthright fashion, the need for better training of new mine employees and supervisors. An abstract of his paper starts on p. 38 of this issue.

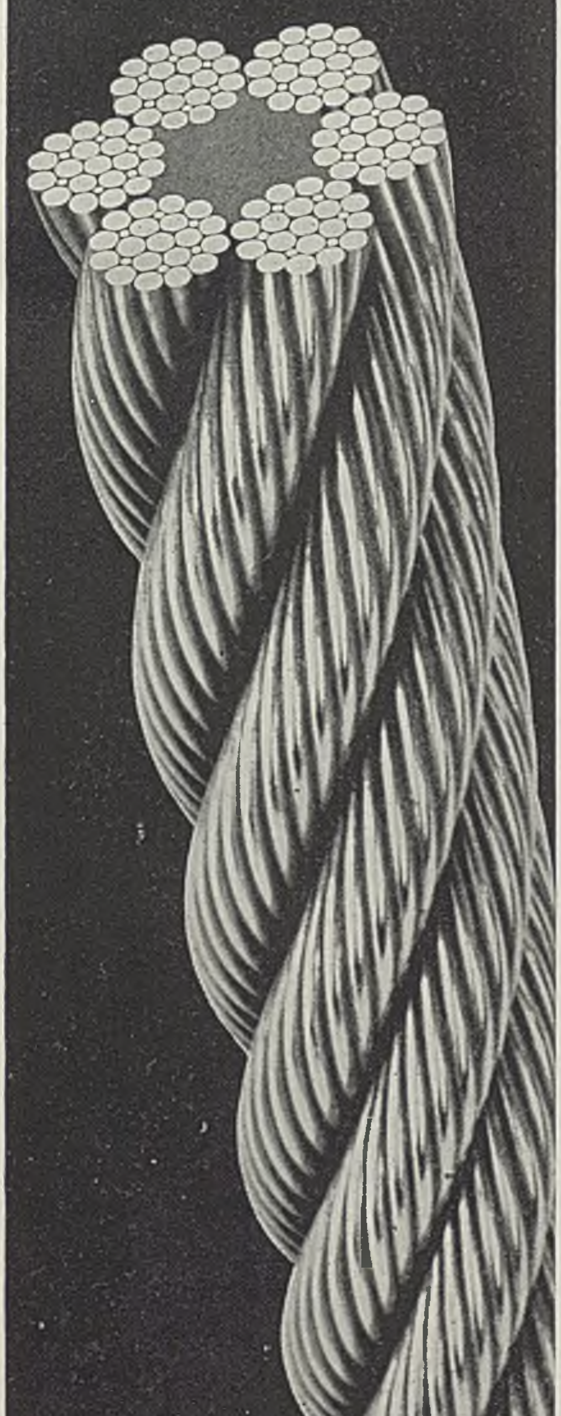
Training New Men

The Union Pacific Coal Co., said Mr. Brown, finds its mine forces in the past three or four years composed of about 25 per cent of high-school graduates, making it necessary to find some means of educating these boys in safe and efficient working methods. This is done by placing one boy in each unit crew, with special instructions to crew members and unit foremen to look after his training. As it has worked out, the percentage of injuries to these new men has been very low, and the boys in many capacities soon become just as capable as the older employees. Roof control, however, is a ticklish problem which cannot be learned in a short time, and for that reason only one boy is assigned to a crew, as it is felt that two or more would increase the hazard.

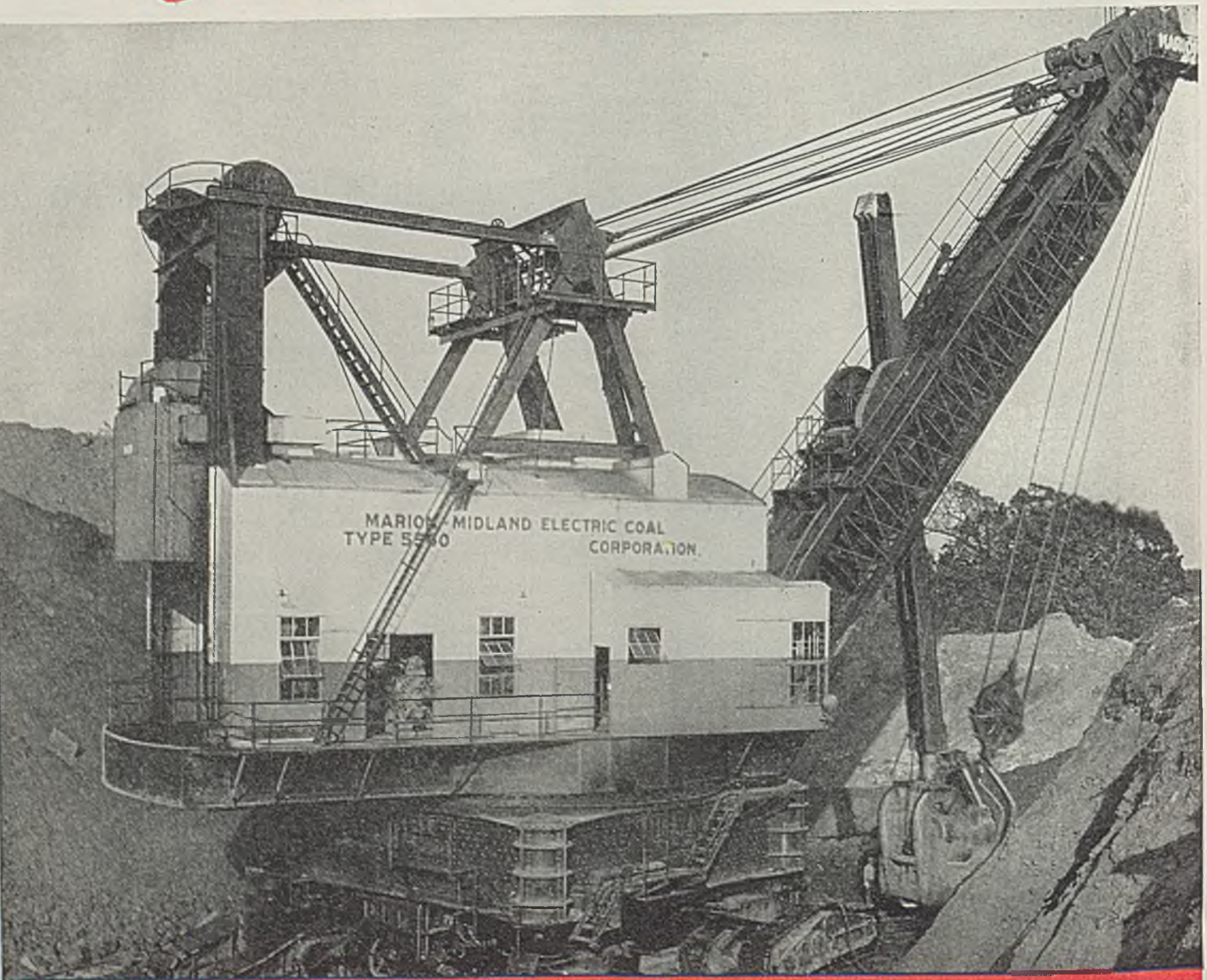
Vocational training of prospective mine employees, Mr. Brown felt, should be taken up primarily through the high schools, and his company now is trying to evolve such arrangements. Already, however, the company has established classes for training men, particularly for supervisory positions, and more than 100 unit foremen have passed examinations on their qualifications.

Production and preparation at the Oliver Coal Co., Somerset, Colo., was the

(*Turn to page 74*)



A *27-ton*



Built for the Midland Electric Coal Corporation, this Marion shovel originally swung a 20 cu. yd. dipper. In October 1937, the capacity was increased nearly 40% by installing a 27 cu. yd. dipper. This shovel is self-leveling, moves under its own power on a series of crawlers with overall width of nearly 42 ft. A complete plant in itself. Six different Texaco Lubricants are in regular use.

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Crater COMPOUND

theme of a motion picture introduced by Ronald C. Oliver, vice-president. Mechanization of the mine was started in May, 1937, using mobile loaders, and the usual difficulties in changing over from hand to machine methods were encountered, including a discovery that cars were too small and haulage was too slow. These conditions have since been rectified, and haulage motorized for greater efficiency. Training of mine employees to some degree was found a necessity, and in this connection, Mr. Oliver pointed out, the greatest difficulty was to prevent men from memorizing answers rather than really understanding the problems.

"A few years back a letter from the general manager could be expected almost any time telling the general superintendent or the superintendent how easily one could save their wages if they could lower the slack percentage by 1 per cent," said Fritz Nyman, chief engineer, Utah Fuel Co., Castle Gate, Utah, in a paper on controlled slack preparation, read in his absence by William Moorhead, of the same organization. "Today the picture has changed to the extent that if a lump of coal does come to the tipple the chances are 2 to 1 that it will go to the crusher. Thus one-third of the mine production that must of necessity be in the form of slack once was considered a drug on the market but now has increased in popularity until in the year 1937 it constituted over three-fourths of our production. For this reason we are forced to as careful preparation of slack as is customarily afforded the domestic sizes.

Users Specialize in Coal

"Today we have such widely specialized consumers of coals as those who use it in the many types of stokers, both industrial and domestic, those who burn powdered coal, those who use it in the production of coke and the byproducts of coke; the railroads, which are requiring a more suitable and uniform product; the smelters, the dairies, the sugar plants, the brick manufactories and untold others, each requiring a coal for their specific purpose free of foreign material and—perhaps most important of all—one on whose uniformity they can depend. In order to satisfy the demands placed upon us by the present users and keep abreast and ahead of the inroads of other fuels, the Utah Fuel Co. is exerting every effort to turn out a product of definitely known value as to the several factors that make a coal desirable. This is possible only by having a thorough understanding of the coal produced by the various mines, the nature and effect of the impurities in it, the heat value, size distribution in the various stoker fuels, grindability, coking characteristics, quantity of dust present, softening and fusion point of the ash, and many other characteristics that limit or widen the coal market."

The first advance toward solving these many problems was the installation of a complete coal-testing laboratory under the supervision of the preparation engineer working in cooperation with the combustion engineer and the sales department. This laboratory is so completely equipped that when necessary "we can sample and analyze for size each car of slack that leaves the tipple." Installation of an automatic sampler is under consideration to eliminate the possibility of human error, after which the sample from each car will be analyzed for size.

"It will be from this size analysis that we hope to determine many of the characteristics of that certain car of coal." A complete analysis of each car is impracticable, but "we will run a sufficient number of them so that a relationship can be established between the size distribution and other qualities of the coal." This stems from the tendency of certain impurities to go into certain size fractions so that a change in the percentage of a fraction may be expected to change the character of the coal. While this conclusion still is open to question, "we are confident that the correlation we will make between sizes and properties of the fuel is far better than a guess."

In conjunction with laboratory tests a thorough study of the individual plants using slack coal is being made by the combustion engineer as a preface to definite recommendations. Customer complaints are another source of information, and these complaints are given precedence over all other work. Face samples are taken at regular intervals to reveal changes in conditions which could not be determined by the eye and which might, if the coal were concentrated in certain lots, result in poor performance in the customer's equipment. "Still another check on slack quality is to know its source," or whether it is screened from mine-run or is derived from crushing. "We find this makes a great difference both as to screen sizes and analysis."

About 75 per cent of the Wyoming commercial output also is sold as slack, reported G. A. Knox, superintendent, Gunn-Quealy Coal Co., Quealy, Wyo., and the proportion is expected to increase. Consequently, operators must realize that that is the grade they will have to market in the future and must take the necessary steps to prepare this size to meet the customer's desires. In this connection, said I. N. Bayless, assistant general manager, Union Pacific Coal Co., increased attention should be given to face methods. The position of the kerf and the fineness of the cuttings, for example, offer a field of study in the controlled preparation of screenings.

Cutting machines originally were designed for making a kerf at the bottom only to effect relief when dislodging the coal by explosives. "But the advancement in the art of cutting coal with a machine quite naturally prompted the desire to cut this kerf at some place in the coal seam other than the bottom," said John H. Emrick, manager, Sullivan Machinery Co., Denver. "So there have come into existence cutting machines to meet every demand—bottom cutters, top cutters, center cutters and shearers—all mounted on trucks to operate on a mine track or not so mounted but arranged to be drawn across the floor while in operation, as desired."

Factors in Choosing Cutters

When considering the method of cutting or type of machine, "the question of what one wants to accomplish very properly arises." The factors in the choice, therefore, are: (1) the mine conditions, (2) the market to be served and (3) "the wage scales and the percentages of them to be paid for various social securities and insurances." The old rule was a cut as deep as the seam is high, but now cutter bars are longer unless the cut becomes so deep that the coal will not be easily dislodged in the sizes demanded by the market or the deeper cut leaves the roof in an unsafe condition.

Shearing also was prompted by the desire to increase the percentage of the higher-priced sizes, and while this desire still obtains the combination of two cuts has other advantages. Less pressure is needed to dislodge the coal, increasing safety and lessening timber expense, especially where the roof is not firm. Also, the two cuts facilitate moving the coal out in a pile which can be handled more easily by mechanical loaders. In some mines the shearing cut also facilitates breaking the coal at a parting where it is desirable to leave top coal for roof support. This is particularly true with lignitic coals, which tend to break level with the top of the shear. Generally,

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Rocky Mountain Leaders

H. C. Marchant, assistant to the president, Colorado & Utah Coal Co., Denver, Colo., was elected president of the Rocky Mountain Coal Mining Institute at the 36th regular meeting, held in Denver, Colo., June 23-25. Mr Marchant succeeds Fritz Nyman, chief engineer, Utah Fuel Co., Castle Gate, Utah, acting president.

F. W. Whiteside, consulting engineer, Denver, was chosen secretary-treasurer with Mr. Marchant's elevation to the presidency.

Vice-presidents elecred were:

Colorado—George B. Dick, vice-president, Gordon Coal Co., Walsenburg.

New Mexico—P. H. Holland, foreman, Stag Canon Branch, Phelps Dodge Corporation, Dawson.

Utah—F. W. Koelling, foreman, Liberty Fuel Co., Latuda.

Wyoming—H. C. Livingstone, assistant chief engineer, Union Pacific Coal Co., Rock Springs.

Directors for the ensuing year are:

Colorado—C. E. McWhorter, manager, Denver office, Goodman Mfg. Co., and C. R. Garrett, general superintendent, American Smelting & Refining Co., Cokedale.

New Mexico—Horace G. Moses, general manager, Gallup American Coal Co., Gallup, and L. C. White, vice-president, St. Louis, Rocky Mountain & Pacific Co., Raton.

Utah—Wilford Ruff, Sullivan Machinery Co., Salt Lake City, and Walter F. Clarke, superintendent, Independent Coal & Coke Co., Kenilworth.

Wyoming—C. M. Shott, general superintendent, Sheridan-Wyoming Coal Co., Monarch, and Glen E. Sorenson, general superintendent, Kemmerer Coal Co., Frontier.

however, horizontal cutting is thought of in such cases.

Dirt bands in the coal must be reckoned with and success has been realized by cutting them out entirely or by cutting above or below or both and then removing them. Machines to do this are available in both track- and floor-mounted types. Narrow kerfs might not have been so well received ten or fifteen years ago, but today this practice is "giving gratifying results under certain conditions, even in seams of coal 7 to 10 ft. thick."

Extending greetings to the institute, D. Harrington, chief, health and safety branch, U. S. Bureau of Mines, Washington, D. C., in a message presented by D. J. Parker, of the Bureau's Salt Lake City (Utah) station, asked that the organization give serious consideration to the rise in major disasters in late years. It is significant, he thought, that the worst disasters in recent months have occurred on night shifts in mechanized mines where explosives were being used while the working shift was in the mine. Interruption of ventilation is another factor figuring in some recent disasters. In the past nine months at least four major disasters resulting in 94 deaths have been due to blasting with the shift in the mine.

How many cars should be hauled per trip, from the standpoint of the heating effect on the locomotive motors, was analyzed by D. E. Renshaw, mining section, industry engineering department, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., in a paper read by J. B. Howe, of the Westinghouse Denver office. An abstract of Mr. Renshaw's paper begins on p. 43 of this issue.

Summarizing briefly the history of mine pumping, P. F. Robbins, Worthington Pump & Machinery Corporation, Denver, described the design and operation of deep-well turbine pumps, pointing out that they were developed to meet a need for mounting the motor equipment at a higher level or on the surface.

Systematic Timbering Pays

Mechanized loading has revolutionized mining practices in the past ten years, said Hugh McLeod, chief coal-mine inspector for Wyoming, and Walter H. Walsh, deputy chief inspector, in opening a discussion of systematic timbering presented by Mr. Walsh. Under the old system of contract loading, according to the authors, too much was left to the judgment of the miner and consequently the condition of his place reflected his personal habits. Supervision, also, largely was confined to casual visits to working places made primarily to comply with the law. The new type of work calls for a new system of supervision and in many cases a new type of supervisors.

Ability to handle and control roof requires some experience, which brings in an element of time when considering training of men and supervisors. "The simple and logical solution to the problem, of course, was the adoption of some method of systematic timbering adapted to suit a particular need or condition." The readiness with which an inexperienced person becomes acquainted with systematic timbering is one of its outstanding advantages. A second advantage is the provision for manways which materially eases the task of moving supplies and increases the safety of this operation.

Systematic timbering also promotes the complete extraction of pillars and improves pillaring conditions. Orderly retreat naturally is supplemented by a method of systematic timber recovery, which is made much safer if timbers are installed systematically in the first place. The Union Pacific Coal Co., for example, has had few injuries from recovery, even though 75 per cent of the timber used at the working faces is recovered and used a second time.

But perhaps the outstanding result of systematic timbering, contended Messrs. McLeod and Walsh, is the reduction in fatal and serious injuries which has resulted wherever this plan has been adopted. In addition, the neat working places have a material effect on the workmen's attitude toward his job and any safety measures which may be instituted.

While the history of standardization work in the coal industry shows some progress, said G. B. Southward, mechanization engineer, American Mining Congress, Washington, D. C., in a paper read by F. V. Hicks, superintendent, Union Pacific Coal Co., Winton, Wyo., not a great deal has been accomplished because of the wide variations in mining conditions. Standards are worth consideration, Mr. Southward continued, only if they improve operating conditions, increase productivity or promote safety. Furthermore, development of standards is not a one-man job, as they should be formulated by groups which can bring a wide experience to the task. And where standards can be applied, the experience of mining companies has shown that they increase efficiency.

Breaking down the field for standardization into four classifications, Mr. Southward expressed the opinion there is only a limited field for the standardization of mining systems, due to wide variations in conditions. The same applies to mining operations, but in the field of mining equipment the possibilities are more numerous, although complete standardization of mining equipment is hardly practicable. Performance records and cost accounting offer a number of opportunities for standardization of records and methods of gathering and compiling the data.

Establishment of standards is much more difficult in the Western States, declared R. L. Hair, general superintendent, Colorado Fuel & Iron Co., Pueblo, Colo., in a written discussion presented by H. H. Machin, Boulder, Colo. His company, however, said Mr. Hair, has made some progress in the standardization of equipment, including crushers, box-car loaders, frogs and switches, steel ties, rail sizes and other classes of equipment, thus reducing inventories. Least progress has been made in electric motor standardization due to the large numbers salvaged in closing down operations.

"The operator generally cannot justify scrapping serviceable equipment in order to standardize unless it is figured out in dollars and cents that he is warranted in doing so," was another conclusion by Mr. Hair, who felt that even after standards have been adopted they might be upset by improvements in equipment. In fact, general standards might hamper to some extent research by mechanical and electrical manufacturers.

Interchangeability of motors with NEMA frames was one type of standardization in which manufacturers had an opportunity to take a forward step, said Benedict Shubart, Shubart & Schloss, Denver. In the case of mining machines, locomotives, etc., it is almost impossible to standardize because of the improvement constantly being made. However, certain details, such as wheel size, clearances, etc., offer a field for progress.

Mechanical Stoker Sales Advance Sharply

Sales of mechanical stokers in May last totaled 4,969 units, a gain of 37 per cent over the preceding month, according to statistics furnished the U. S. Bureau of the Census by 112 manufacturers (Class 1, 59; Class 2, 30; Class 3, 27; Class 4, 27; Class 5, 12). This compares with sales of 3,628 units in the preceding month and 6,782 in May, 1937. Sales by classes in May last were: residential (under 61 lb. of coal per hour), 4,437 (bituminous, 3,697; anthracite, 740); small apartment-house and small commercial heating jobs (61 to 100 lb. per hour), 195; apartment-house and general small commercial heating jobs (101 to 300 lb. per hour), 199; large commercial and small high-pressure steam plants (301 to 1,200 lb. per hour), 92; high-pressure industrial steam plants (more than 1,200 lb. per hour), 46.

Overcharged Shot Blamed For Volpe Mine Blast

An overcharged shot of pellet powder—a non-permissible explosive—was the probable cause of the explosion on June 2 in the Butler colliery, operated by the Volpe Coal Co., Pittston, Pa., in which ten men were killed (*Coal Age*, July, p. 106), according to an announcement on July 8 by the U. S. Bureau of Mines following an investigation of the disaster. The gas accumulation, says the Bureau's report, was caused by a disruption of ventilation due to a squeeze in an adjacent portion of the mine.

The overcharged shot of pellet powder apparently was fired from the power line by a miner who was found dead on the gangway at the foot of the chamber in which the blasting was done. The Bureau states, however, that "there were other possible sources of igition of the gas in the area at the time of the explosion."

Exhibition Mine on View

After preparations lasting several months, a permanent exhibition mine, sponsored by the Pocahontas Operators' Association in cooperation with the Pocahontas Fuel Co., Inc., was formally opened to the public at Pocahontas, Va., during the fourth week in June as one of the features in connection with the annual convention of the National Editorial Association. An accompanying exhibition was staged by the Norfolk & Western Ry.

The "show" mine has been reconstructed from the original entry, said to date from

George A. Kaseman

1883, in a 12-ft. seam of Pocahontas coal. The entrance is through an old fan-blower chamber, traverses the seam in a "U" direction for about 900 ft., with an exit through the mouth of the original entry. Rooms, spaced at intervals, show an old undercut by hand pick before the introduction of cutting machines; a modern cutting machine, tamping explosive preparatory to shooting, loaded mine car, illustrations of rock-dusting in progress, timbering, and an exhibit of various sizes of coal, as well as many other features of interest to persons desirous of viewing the various operations incident to the mining of coal.

The "workings" are well ventilated and lighted to permit a good view of everything without destroying the illusion of actual mining conditions, and the tunnel is sufficiently high and wide to permit automobiles to traverse the entire mine. Inspiration for the scheme came from W. E. E. Koepler, secretary, Pocahontas Operators' Association, and the preparations were under the direction of W. J. German, general superintendent, Pocahontas Fuel Co., Inc.

New Preparation Facilities

ALDEN COAL CO., Alden Station, Pa.: Contract closed with McCarter Iron Works for installation of 15-ft.-diameter Chance cone in existing breaker to clean all sizes of buckwheat and larger at a rate of up to 200 tons per hour; also new sizing shakers and belt loading facilities, including facilities for loading box cars; to be ready for operation in latter part of August.

BUCHANAN COUNTY COAL CORPORATION, No. 1 mine, Big Rock, Va.: Contract closed with American Coal Cleaning Corporation for American pneumatic coal-cleaning plant and auxiliary equipment including a new type "Twin-Dex" separator with mechanical deduster for treating minus 40-mesh x 0 material; capacity, 60 tons per hour of 1¼-in. x 0 coal.

CRANBERRY IMPROVEMENT CO., Hazleton, Pa.: Contract closed with Deister Concentrator Co. for three Deister-Overstrom "Diagonal-Deck" coal-washing tables for the treatment of rice, barley and No. 4 buckwheat sizes.

PEABODY COAL CO., Westville No. 24 mine, Danville, Ill.: Contract closed with Allen & Garcia Co. for a new cleaning plant to wash all sizes from 6-in. down; capacity, 4,500 tons daily; to be ready in late autumn.

Obituary

A. P. BRADY, 58, formerly active as an operator in the bituminous coal field of northern West Virginia, died June 28 at Morgantown, W. Va. He was a brother of A. Spates Brady and W. R. Brady and the late Samuel D. Brady.

S. H. ROBBINS, 73, chairman of the board, Youghiogheny & Ohio Coal Co., Cleveland, Ohio, died June 24 in that city. His first connection with the coal industry began nearly a half century ago with Osborn, Sager & Co., of which he eventually became a partner. He left that organization in 1899 to assist in forming the Pittsburgh Coal Co., leaving the latter in 1902 to help organize the Youghiogheny & Ohio company.

GEORGE A. KASEMAN, 69, president, Albuquerque & Cerillos Coal Co. and Defiance Coal Co., Albuquerque, N. M., was killed June 23 by the premature explosion of an oil-well time bomb near Hobbs, N. M. Prominent in business circles in New Mexico for 47 years, Mr. Kaseman also was president of the Albuquerque National Trust and Savings Bank.

ELLIOTT DAVIS, 48, employed for many years as mine foreman at the Chauncey colliery of the Chauncey Coal Co., Plymouth Township, Pa., died suddenly on July 8 of a heart attack.

KEITH DOANE QUARRIER, 64, long known in the coal industry of West Virginia, died July 1 at Fort Lauderdale, Fla., of a heart ailment after an illness lasting two years. A graduate in electrical engineering from Purdue University, he had been connected with the Carbon Fuel Co., Carbon, W. Va., since 1901.

PERCY HAMILTON BROWN, 75, formerly vice-president of the Greenwood Coal Co., Lawton, W. Va., and a pioneer operator in Fayette County, died July 17 in a Hinton (W. Va.) hospital after an illness of more than six weeks.

Industrial Notes

CENTRIFUGAL & MECHANICAL INDUSTRIES, INC., St. Louis, Mo., has appointed M. A. Matthews, formerly of the coal-preparation division of the Jeffrey Mfg. Co., at Terre Haute, Ind., as sales representative to the coal industry. His new connection becomes effective Aug. 1.

POMONA PUMP CO. has made Jule H. Coffey vice-president in charge of sales, vice W. H. Day. The latter resigned and has become general sales manager of Peerless Pump Division, Food Machinery Corporation.

CONNECTICUT BLOWER CO. has appointed these two additional sales engineers: Julius Lamparzyk, Cleveland, for exclusive sales in Ohio, and Arthur Polaton, Louisville, for Kentucky sales.

Koppers-Rheolaveur Co. has appointed W. S. McAleer as manager. A graduate of Carnegie Institute of Technology in 1917 with the degree of Mechanical Engineer, he was associated for several years with Heyl & Patterson, Inc., joining the Koppers Construction Co. in 1926.

Worthington Pump & Machinery Corporation has transferred William J. Daly, formerly Detroit district sales manager, to the Philadelphia office to succeed C. H. Chaw, deceased.

Trade Literature

Coal Preparation Equipment — Link-Belt Co., Chicago (Book No. 1655, 60 pp., illustrated). Covers the Link-Belt line of equipment for preparation, handling and drying of bituminous coal to meet exacting markets. The Link-Belt Simon-Carves washery is stressed and described in detail and outstanding installations are illustrated and discussed.

Dust Collectors — Northern Blower Co., Cleveland, Ohio (4-pp. bulletin). Gives specifications and describes construction and operation of Norblo collectors.

Elevator Rope—Broderick & Bascom Rope Co., St. Louis, Mo. (32-pp. catalog). Gives details of rope constructions and contains definite recommendations as to ropes best suited for different types of elevators, as well as an article on factors affecting the service of elevator rope.

Flow Meters—Brown Instrument Co., Philadelphia, Pa. (8-pp. folder). Under the title "Jim Is Right," explains how these units, by metering steam, water, oil and other fluids, can bring to manufacturing processes many of the economies effected in power production.

Heat-Treated Alloy Steels—Joseph T. Ryerson & Son, Inc., Chicago (4-pp. bulletin). Gives description and data on the physical properties of Ryerome and Nikrome "M," used for a great variety of heavy-duty applications.

High-Intensity Lifting Magnets—Dings Magnetic Separator Co., Milwaukee, Wis. (Catalog No. 22, 16 pp., illustrated). Describes construction and design of units for economical metal handling, including operating data.

Instruments — General Electric Co., Schenectady, N. Y. (Brochure GED-638, 32 pp., illustrated). Entitled "When You Can Measure," this booklet tells in brief the contributions of GE engineers and scientists to the art of measurement.

Pipe Tools—Beaver Pipe Tools, Inc., Warren, Ohio. Model-B bulletin (8 pp.) features the Beaver Model-B convertible power drive, to which, from time to time, may be added necessary units to convert it into a portable pipe- and bolt-cutting machine with simplified oiling system. Form 438 is a 4-pp. condensed catalog, with descriptions, illustrations and prices.

Power Units — Allis-Chalmers Manufacturing Co., Milwaukee, Wis. (MS-224, 24 pp., illustrated). Describes and pictures outstanding characteristics of gasoline, kerosene and natural-gas units, with dimensions and specifications.

Pressure Lubricators — American Chain & Cable Co., York, Pa. (4-pp. folder). Illustrates and describes the Acco-Morrow pressure lubricators, showing how pressure lubrication is possible even with common oil holes and without the use of any special fittings.

Remote Transmission—Brown Instrument Co., Philadelphia, Pa. (Folder No. 94-1, 4 pp.). Describes the Brown system for remote transmission of measurement and control in hazardous atmospheres where the use of electrical transmission is not permissible.

Safety Equipment—Willson Products, Inc., Reading, Pa. (34-pp. catalog, illustrated). Lists the complete Willson line of industrial safety devices, including goggles, respirators, welding helmets and handshields, welding glass, blasting helmets, etc.

Self-Priming Centrifugal Pumps—Deming Co., Salem, Ohio (Bulletin No. 3000, 4 pp., illustrated). Gives description, performance tables and sectional views of electric-motor and belt-driven units, gasoline-engine units, and lightweight portable units.

Two-Stage Centrifugal Pumps — Ingersoll-Rand Co., Phillipsburg, N. J. (Bulletin 7067, 16 pp., illustrated). Gives complete specifications and operating characteristics of the Cameron Class GT unit designed to operate at modern motor, turbine and engine speeds; available in capacities from 100 to 2,200 gal. per minute for discharge heads up to 800 ft.

Variable-Speed Hydraulic Coupling—Hydraulic Coupling Division of American Blower Corporation, Detroit, Mich. (16 pp., illustrated). Includes description of operation and types of control of Vulcan Sinclair hydraulic coupling for use in industrial drives.

Permissible Plates Issued

Four approvals of permissible equipment were issued by the U. S. Bureau of Mines in June:

Jeffrey Manufacturing Co.: Type L-400 loading machine; 50-hp. motor, 250-500 volts, d.c.; Approvals 346 and 346A; June 3.

Goodman Manufacturing Co.: Type 360-B loading machine; three motors, 50, 4 and 1½ hp.; 250-500 volts, a.c.; Approvals 347 and 347A; June 29.

Coal-Mine Fatality Rate Shows Shrinkage

Accidents at coal mines of the United States caused the deaths of 40 bituminous and 9 anthracite miners in May last, according to reports furnished the U. S. Bureau of Mines by State mine inspectors. With a production totaling 21,995,000 tons, the death rate among bituminous miners was 1.82 per million tons, compared with 2.53 in the corresponding month of last year.

The anthracite fatality rate in May last was 2.11, based on an ouput of 4,270,000 tons, as against 3.74 in May a year ago.

For the two industries combined, the death rate in May last was 1.87, compared with 2.08 in May, 1937.

Fatalities during May last, by causes and States, as well as comparable rates for the first five months of 1937 and 1938, by causes, are shown below.

COAL-MINE FATALITIES IN THE UNITED STATES IN MAY, 1938, BY CAUSES AND STATES

State	Underground: Falls of Roof	Falls of Face	Haulage	Gas or Dust Explosions	Explosives	Electricity	Mining Machines	Suffocation	Total Underground	Shaft	Open-Cut and Surface	Grand Total
Illinois	2	...	...	...	...	...	...	1	3	...	1	4
Indiana	...	...	1	...	...	...	...	...	1	...	...	1
Iowa	...	...	1	...	...	...	...	...	1	...	...	1
Kansas	1	...	...	...	...	...	...	...	1	...	...	1
Kentucky	5	...	1	...	...	1	...	...	7	...	...	7
Montana	1	...	...	...	...	...	...	...	1	...	...	1
New Mexico	1	...	...	...	...	...	...	...	1	...	...	1
Ohio	2	1	...	...	...	...	...	...	3	...	...	3
Pennsylvania (bit.)	6	1	...	...	...	1	...	...	8	...	...	8
Tennessee	1	...	...	...	...	...	1	...	2	...	...	2
Virginia	2	...	...	...	1	...	...	...	3	...	...	3
West Virginia	4	1	...	1	1	1	...	...	8	...	...	8
Total (bituminous)	25	3	3	1	2	3	1	1	39	...	1	40
Pennsylvania (anthracite)	4	...	1	...	1	1	...	1	8	1	...	9
Total	29	3	4	1	3	4	1	2	47	1	1	49

FATALITIES AND DEATH RATES AT UNITED STATES COAL MINES, BY CAUSES*

January–May, 1937 and 1938

Cause	Bituminous: Number Killed 1937	Number Killed 1938	Killed per Million Tons 1937	Killed per Million Tons 1938	Anthracite: Number Killed 1937	Number Killed 1938	Killed per Million Tons 1937	Killed per Million Tons 1938	Total: Number Killed 1937	Number Killed 1938	Killed per Million Tons 1937	Killed per Million Tons 1938
Falls of roof and coal	242	174	1.266	1.345	58	62	2.466	3.135	300	236	1.397	1.582
Haulage	98	52	.513	.402	14	10	.595	.505	112	62	.522	.416
Gas or dust explosions:												
Local	3	10	.016	.077	....	1	.....	.051	3	11	.014	.074
Major	27	60	.141	.464	....	8	.....	.404	27	68	.126	.456
Explosives	16	6	.084	.046	8	5	.340	.252	24	11	.112	.074
Electricity	19	14	.099	.108	1	1	.043	.051	20	15	.093	.100
Machinery	15	10	.079	.077	1	....	.043	.....	16	10	.075	.067
Shaft	10	2	.052	.015	2	2	.085	.101	12	4	.056	.027
Miscellaneous	14	5	.073	.039	8	4	.340	.202	22	9	.102	.060
Stripping or open-cut	11	1	.058	.008	4	8	.170	.404	15	9	.070	.060
Surface	29	15	.152	.116	8	2	.340	.101	37	17	.172	.114
Total	484	349	2.533	2.697	104	103	4.421	5.208	588	452	2.379	3.030

*All figures subject to revision.

WHAT'S NEW

In Coal-Mining Equipment

TROLLEY GUARD; CONVEYOR BELT

B. F. Goodrich Rubber Mfg. Co., Akron, Ohio, offers a new trolley-guard material consisting of a cloth-inserted rubber sheet $\frac{3}{32}$ in. thick and 9 in. wide, made in 25-ft. lengths. The sheet is folded double and given a secondary cure so that it will retain a U shape. It is installed by slipping it over the trolley wire like a saddle and cutting notches or holes at intervals for the hangers.

Pointing out that no rubber is completely proof against the effects of sunlight, Goodrich also offers new rubber compounds for conveyor belts that are said to have greatly increased resistance to light checking. As an example of the advantages of the new compounds, Goodrich submits the accompanying illustration showing belting made of old-style compounds as compared with the new materials.

BLUEPRINT PAPER

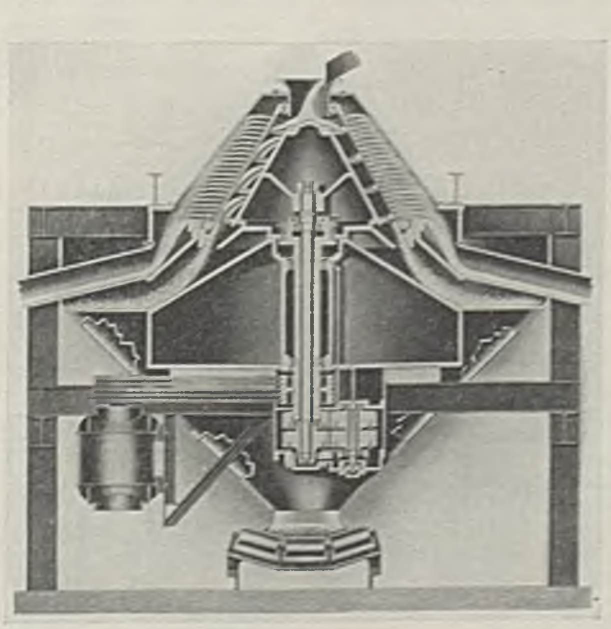
A new series of blueprint papers of "an unusually deep blue color and an extremely wide printing range" is offered by the Keuffel & Esser Co., Hoboken, N. J. Known as "Series 60," these papers are handled the same as conventional papers, although they are a light blue instead of yellow before exposure. White lines of the reproductions, according to the company, stand out in sharp, legible contrast equal to original drawings, while tracings of varying transparency can be printed successfully with a single setting of the machine or strong blueprints may be made from any tracing within a broad range of machine speeds. Danger of over- or under-exposure is said to be reduced, eliminating the necessity for trial prints and speeding production.

CENTRIFUGAL DRYER

Centrifugal & Mechanical Industries, Inc., St. Louis, Mo., offers a new centrifugal dryer and sludge reclaimer for use either in drying 1-in. to 0 washed coal or in reclaiming washery sludge and rendering it salable. Essentially, the unit consists of two rotating elements, one an outside conical screen frame and the other an inside solid cone with downward-spiraling flights. Both elements rotate in the same direction, with the screen slightly faster than the solid cone. Material is fed into the top, falls onto the solid cone and is thrown against the screen by centrifugal force, whereupon the liquids begin to pass through the screen. The slight differential in the speed of the two elements results in the screen moving slowly around the inner solid cone, in the course of which the material is carried down to the bottom, or discharge point, by the flights, all the time entering zones of increasing centrifugal force which tend to remove all liquids not held on the solids by surface tension. Liquids through the screen fall into a launder with two openings fitted with pipe flanges.

Continuous in operation, the new dryer and sludge reclaimer, the company points out, has been brought to a high state of efficiency and mechanical reliability, while the continuous principle permits the handling of large tonnages. The unit, it is stated, requires no more labor to operate than an ordinary electric motor; operates with a much lower maintenance cost per ton of material processed than any other dryer of similar capacity; requires no heat; reduces initial investment for equipment and floor space; and will "deliquify solid materials at a lower cost than any other known method."

One unit, the company states, is in use at the St. David (Ill.) mine of the Central States Collieries reclaiming salable coal from sludge, reducing ash of 32 per cent and moisture of 31 per cent to 10.6 and 11 per cent, respectively. An Indiana installation is handling up to 100 tons of coal per hour, reducing free moisture from 25 to 30 per cent to less than 7 per cent. An Illinois installation is processing minus $\frac{5}{16}$-in. coal at 75 tons per hour, which enters the dryer with a moisture of 25 per cent. An average of 30 tests, it is stated by the manufacturer, shows that all but 2 to 3 per cent of the free moisture is removed.



CONVERTIBLE ENGINE

To fill the need for sturdy, medium-speed engines in the 200- to 300-hp. range, Fairbanks, Morse & Co., Chicago, offers the Model 36-A-8 vertical convertible diesel and gas engines. Built in both six- and eight-cylinder combinations, these engines develop 35 hp. per cylinder at 720 r.p.m. Both

diesel and gas engines in this series are offered for stationary service, with diesels in complete unit-built F-M electric generating sets as well, in addition to other services. Features cited by the company include: simplicity, neat appearance, completely self-contained design, strength, dependability and excellent fuel and lubricating-oil economy.

ELECTRICAL CONTROLS

New "De-ion" linestarters for a.c. motors up to 5 hp., 220 volts, and 7½ hp., 440 and 550 volts, now are available in an oversized cabinet providing an unusually large wiring space, says the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. These starters may be used where over-all dimensions are not a limiting factor, and are available with a separate pushbutton, a built-in start-stop pushbutton or with a built-in hand-off automatic switch.

Dust- and water-tight pushbutton stations for heavy-duty service where protection from fumes, dust and moisture is desired are another Westinghouse development. These stations, according to the company, are suitable for applications subject to rough handling, where the high control currents of magnetic controllers for large motors must be withstood for long periods and where reliability is important. Stations of one to four units are available. A maintained-contact unit also is available by using a standard momentary unit with an interlock unit.

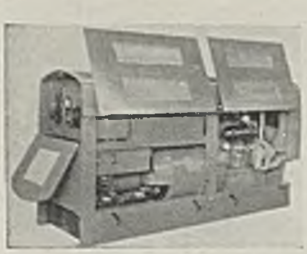
Westinghouse also offers what it terms a "simple, moderately priced 'Silverstat' regulator in a range of sizes for the automatic voltage control of small a.c. and d.c. generators." The device is said to be of the direct, quick-acting rheostatic type which regulates the voltage by varying directly the resistance in the field circuit. It has no vibrating contacts and no parts requiring readjustment or replacement at frequent intervals, the company states.

RESPIRATOR

For use in Type A dusts, Chicago Eye Shield Co., Chicago, offers the Style 92 Bureau-of-Mines-approved respirator with filter units having an effective breathing area of 45 sq.in., said to eliminate fatiguing resistance and greatly increase the comfort of breathing. Filter units, it is pointed out, adjust automatically to movement and compensate for all facial variations. Weight is kept to a minimum and vision is not obstructed. The mask is fitted with a diaphragm to permit conversation.

DIESEL ARC WELDER; AIR CLEANER

A new diesel engine said to compare favorably with the gasoline engine in simplicity, weight, cost and operating speed has been adopted for driving arc-welding generators, the Lincoln Electric Co., Cleveland, Ohio, announces. Fuel costs, according to the company, are cut 33 to 86 per cent, depending upon fuel-oil price. In many cases, total savings run as high as 40c. per hour.



The generator employed with the new unit is the 300-amp. "Shield-Arc SAE" machine equipped with dual-continuous control—a method of providing the right size and type of arc for every electric-welding application.

Lincoln also offers the "Linconditioner," a new machine stated to condition air by filtering out approximately 95 per cent of the dirt particles from air in the vicinity of grinding, welding and other shop operations. The machine also draws smoke and heat away from the work. It also can be adapted to blowing smoke, if desired. The conditioner consists of a fan powered by a ¼-hp. motor which produces suction in a flexible metal tube. The air is exhausted into a filter in the periphery of the power unit.

LARGEST TIRE

Construction of what it terms the industry's largest heavy-duty truck tire has been completed by the Goodyear Tire & Rubber Co., Akron, Ohio, for use on large earth-moving vehicles. Size of the tire is

24-32; weight is 1,200 lb. This 30-ply tire, when inflated to 75 lb., has an outside diameter of 82 in. and a load capacity of 25,000 lb. The rim, with a flange 3½ in. high, is 17 in. wide. Tread is the standard Goodyear "Sure Grip" design used on tractor tires. The tire uses a protective flap weighing 17 lb.

ELECTRODES

A complete line of shielded-arc welding electrodes, stated to be quieter in operation, faster in welding time, better producers of beads with a fine appearance and wider in adaptability per rod, is offered by the McKay Co., Pittsburgh, Pa. No change in customary operating practice is necessary, it is pointed out.

DIESEL TRACTORS; ENGINES

Announcing the D2 "Caterpillar" diesel tractor, the smallest of its line (four cylinders, 25½ hp. at the drawbar, 31½ hp. at the belt, only three engine-operating adjustments), Caterpillar Tractor Co., Peoria, Ill., points out that it is well suited to hauling supplies, working the smaller rotary scrapers or maintaining or building mine roads, etc. Fuel savings of 60 to 80 per cent are expected. Twin radiators are provided, one for cooling water and the other lubricating oil. A hot-water

manifold on the side of the fuel-filter housing keeps the diesel fuel at the proper temperature regardless of climatic or operating conditions.

The D4600 six-cylinder 66-hp. diesel-engine unit has been added to the Caterpillar line of industrial diesel engines. Normal governed speed is 1,400 r.p.m., and the engine is said to be well suited for use in shovels, draglines or hoists or for driving an electric generator. A 14-hp. two-cylinder gasoline starting engine is mounted at the rear of the main engine.

Another engine unit is the D3400 four-cylinder 33-hp.-at-1,525-r.p.m. diesel unit, stated to be the proper size for powering small portable equipment, ⅜-yd. draglines and shovels, small industrial locomotives and 15-kw. electric generators. This unit includes a twin radiator and a 10-hp. gasoline engine for starting.

PLANER GAGE

Lufkin Rule Co., Saginaw, Mich., has added to its line the No. 900 "Master" planer and shaper gage. Used as a planer gage, tool settings from ¼ to 9 in. can be made with an extension, or ¼ to 6¼ without the extension. The gage also

serves as an adjustable (sliding) parallel. It can be used on base, on end or flat on either side. Base width is ⅝ in.; length is 5⅛ in. The base also is fitted with a level.

SHUT-OFF VALVE

An automatic shut-off valve for use in the supply line above flexible hose for conveying compressed air, steam, gas or fluids under pressure, and which immediately shuts off the supply when there is a break in the hose or it becomes disconnected, is offered by the D. J. Murray Mfg Co., Wasau, Wis., under the trade name "Murray-Lorge."

DRIVE CONTROL

Reeves Pulley Co., Columbus, Ind., announces a new type of automatic remote control for use with the Reeves vari-speed "Motodrive.' The complete control consists of a bellows shifting mechanism mounted on the "Motodrive," an adjustable pressure-reducing valve located as desired, any auxiliary valves required and connecting pipes.

Fluid pressure is transmitted by means of oil, water, steam, gas or air to the bellows shifting mechanism which operates to increase or decrease the speed of the "Motodrive" and consequently the driven-machine speed.

OIL RECLAIMER

A new oil reclaimer selling for approximately $300 is announced by the Bucyrus-Erie Co., South Milwaukee, Wis., which states that it departs from the complicated distilling processes previously employed in this type of equipment. Resulting simplicity and low operating cost, together with low first cost, are said to make oil reclamation really economical for owners of trucks, tractors or other gasoline or diesel engines. Transformer, heat-treating and other fluid industrial oils also may be reclaimed, according to the company, which points to recovery of up to 90 per cent of average crankcase oil at an over-all cost of about 9c. per gallon. Such reclaimed oil is stated to be even better than new oil.