COAL AGE

Established 1911—McGraw-Hill Publishing Company, Inc.

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

SYDNEY A. HALE, *Editor*

New York, August, 1936

Rehabilitation

One way to rejuvenate an industry is by cooperation in research, but, lacking that, much progress can be made by cooperation in furnishing information as to advances in practice so that the work of all the minds in the industry becomes available to everyone. This is helpful not only to the nation and mankind in general but more particularly to the industry that develops this line of activity. No matter how distinguished may be the staff and line of any enterprise, if the knowledge of all the industry is pooled the progress will be still greater.

With every staff jealously guarding its determinations of technical fact, no industry can advance, and none of the staffs can achieve much, nor can manufacturers devise equipment which has only limited use and exemplification. In Great Britain paid investigators go from mine to mine to correlate findings and to make them under the conditions confronting the several operations. Studies are constantly being made, but a simpler way is to keep an open house to investigators or to have every company divulge in articles the studies it is making. Only a live industry in these years of progress deserves to survive.

Accident Prevention

Many times the men who have toiled so hard to improve the safety record of the coal-mining industry must have felt like blood-brothers to the mythical Sisyphus condemned forever to push a huge rock to the top of a hill only to see it roll down again. But the gains made during the past three years are proof that their task is not hopeless. And the achievement of May, when bituminous mining had the highest tonnage per fatality ever recorded by the Bureau of Mines, furnishes dramatic evidence that the road to greater victory is not blocked. Such a record reflects credit upon both men and management and is the finest tribute possible to agencies and individuals who have labored unceasingly for safety even when the immediate results seemed discouraging.

Accident prevention is not a one-man job. Both management and men must be completely sold on its financial and humanitarian rewards. But the drive for safety must come from the top. That top pressure will mean still further improvement. As George B. Pryde told the Denver convention of the Mine Inspectors' Institute: "Management is the absolute answer to accident prevention in industry. When management views accidents as a reflection on the industry and a symptom of managerial inefficiency, then we may expect to obtain better safety records." There is no disputing the soundness of that conclusion.

Coal for Agriculture

Those who study the products and uses of coal can find numerous possibilities in modern scientific reports for expansion of its markets. Some of these markets, of course, may be illusory, but others are intriguing and, perhaps, important. Over a century ago a wholly scientific experiment proved that a plant took something from the air—probably carbon—and that the weight of the plant increased more than that of the soil decreased. A truly unscientific conclusion that has persisted until the present day was drawn from the experiment, to wit: that the plant took no carbon from the soil, though scientists had to admit that it took other elements from that source. So it was not a correct inference that, because a plant in normal life drew most of its carbon from the air, applying the same element to the soil in appropriate combination was a useless procedure.

It is reported that Clara Hires, of Millburn, N. J., is growing, in tightly sealed jars, plants set in agar-agar mixed with other constituents, and these plants are thriving even better than if grown under normal conditions. One may be permitted, therefore, to wonder whether the theory that carbon dioxide in the air is essential to certain plant life is not the result of an unscientific deduction; but until it is known that Miss Hires' transparent soil does not generate carbon dioxide one cannot be sure that the theory is absolutely false. But it is shaken at least. All of which does not prove that coal in the soil will supply plant carbon. One must not be as unscientific in deduction as scientists sometimes have been.

Planning Ahead

MINING MEN too often go ahead without planning. In the instance of the New Waterford shaft, in Nova Scotia, however, the conditions were ascertained in advance, and preparations were made to meet them by cementation. As sinking progressed holes were drilled to find water, and it was sealed as soon as it was found. No reliance was placed on the old gag: "It's a great thing if you can get by with it." Too often the shaft sinker goes ahead without preparation until he gets into trouble, and then blames what he calls his bad luck. He would do better to drill his shaft site, note where he will get water, prepare to seal it before he comes to it, and then he will have no regrets and his shaft will be completed on schedule and at the estimated cost.

An anthracite coal area was carefully drilled. The basin was mapped and means of draining it by gravity was discovered. The necessary tunnel to carry away the water was constructed to be ready as soon as the need for its services arose. As a result, the mine rapidly developed an adequate tonnage and was mined out many years before mines where no such prior knowledge was obtained and no such provision was made; daily outputs were higher and the mine made profits far greater than could otherwise have been expected. "Go ahead and damn the torpedoes" may be a good navy practice, but is a dangerous guiding principle for a mining engineer.

Pumping Problems

EFFORTS have been made to clarify the vexed problem of mine ventilation by using experience in regard to the passage of water through a pipe as an example of the conditions obtaining when air passes through mine passages, but the manager's difficulties with piping often might be helped by reversing the process and using his ventilation experience as an example, because pumping and piping are none too well understood.

One of these pumping problems is that of determining the size of the suction pipe, though it is often treated as of no moment. With a pump suction, one obviously cannot expect to get the full effect of the atmospheric pressure of 34 ft., or thereabouts, even at sea level, and perhaps only 25 ft. of it can be utilized, because a complete evacuation cannot be obtained when starting the pump. But, whatever the effective balance of air pressure, it must suffice to force water to the pump in sufficient volume to supply it with water as fast as it is being pumped out. Consequently, the pipe should be large enough for this purpose.

Where the water will flow into the pump without suction, because the pump is on a level with the sump or actually below it, the suction line can be made smaller than the discharge, if that discharge has to operate against a considerable load. In a certain mine where the pumps and the pumproom are normally submerged 2½ ft. and may be submerged as much as 18 ft., and where also the water has to be discharged up a shaft, the intake pipes are of 12-in. and the discharge pipes are of 16-in. diameter.

Where, however, the pump is elevated above the sump, distance from sump to pump is long, discharge lift is small, discharge distance short, the discharge pipes should be made smaller than the suction pipes. There is no fixed ratio, therefore, between suction and discharge pipes: each should be made of a size representative of conditions. It must be remembered, however, that as soon as the suction pipes are made too small, a severe suction arises to make the required quantity of water pass through them and, with such a depression, entrained air is drawn out of the water and a back pressure results which may reduce the suction; so it is well to provide suction pipes of sufficient diameter.

ROBINSON RUN MINE

+ Averages 15.6 Tons Per Man-Shaft With All Machines in Pillar Sections

By IVAN A. GIVEN
Associate Editor, Coal Age

USING mobile loaders for both solid work and pillar robbing, the Christopher Mining Co., formerly the C. L. S. Coal Co., extracts 90 per cent or more of the marketable portion of the seam at its Robinson Run No. 1 mine, five miles north of Morgantown, W. Va. In incorporating the principle of pillar extraction into its mining plan, the company has standardized on retreat working; i.e., development entries are driven to the boundary, after which rooms and pillars are mined back to the main entry serving the property. On the basis of billing weights, average output per man-shift underground. including foremen, repairmen, blacksmiths, extra men and others engaged primarily in work connected with production, as distinguished from preparation and other surface activities, was 15.6 tons in May, when all machines were operating in pillar sections. An even better performance is expected when additional equipment is installed to provide the desired balance between development and pillar mining.

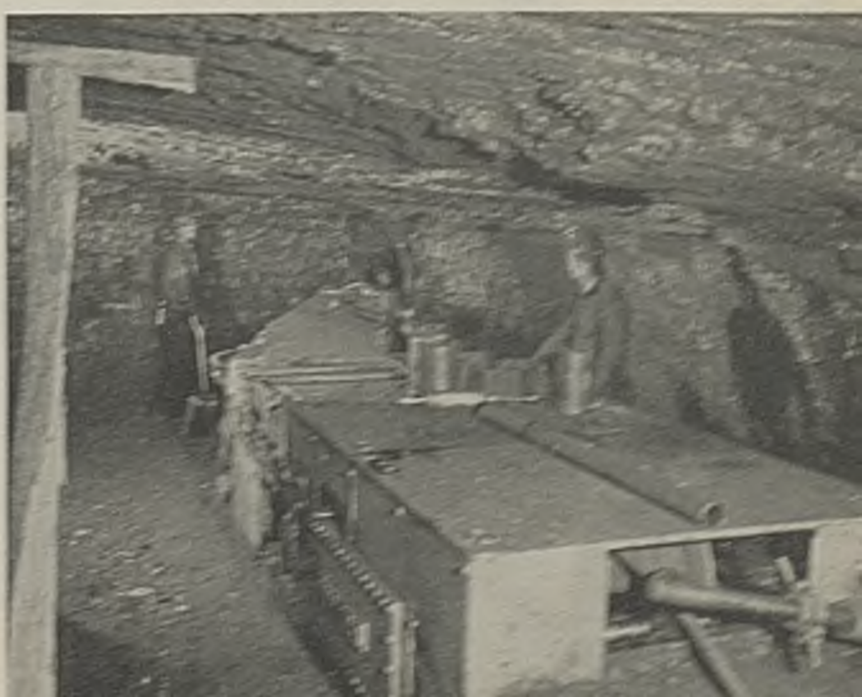
The limitations of mechanical loading in the matter of cleaning at the face have been given full weight in the design of surface preparation facilities at the Robinson Run mine, which is equipped to ship either by rail over the Monongahela R. R. or by water from the Maidsville dock on the Monongahela River. Provisions accordingly have been made for complete cleaning on the surface, where sufficient light and continuous supervision are available, as contrasted to cleaning at the face, and where the cleaning operation can be performed by men trained for the job. The preparation system, therefore, has been laid out to provide for preliminary picking, crushing, secondary picking and removal of degradation at the mine tipple, equipped to make slack, nut, and egg or lump. From this tipple the coal is trucked either to the river loading dock (primarily for slack shipments) or to the company's rail tipple, where it is rescreened and the lump or egg picked for the third time before being loaded into cars.

Average thickness of the Pittsburgh seam mined at Robinson Run is 8 to 9 ft. This thickness, however, includes an average of 18 in. of "head coal" of poor quality, which is left up to protect the characteristic Pittsburgh drawslate ranging from 3 to 4 ft. in thickness and overlain by the Pittsburgh "Rider" coal, averaging 1 ft. in thickness. Consequently, extraction is carried up only to the line of separation between the main bench of marketable coal, which is 6½ to 7½ ft. thick, and the head coal. The bottom is a hard fireclay. Cover varies from a minimum of zero at the outcrop to a maximum of 300 ft. Although composed mainly of limestones, no difficulty has been experienced in breaking the overburden and falls are secured after each section of a pillar is mined out.

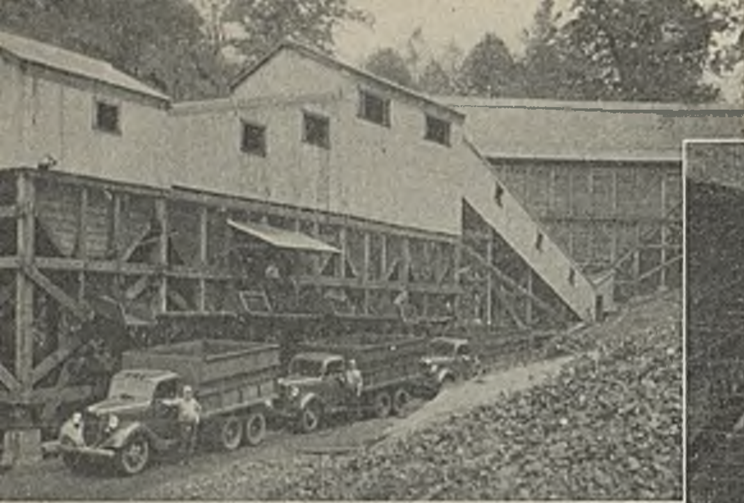
Access to the coal is by means of a main entry, made up of four headings 14 ft. wide on 30-ft. centers, driven to the left of the major area to be extracted. From this main entry, room entries up to the time this article was prepared were driven to the right to the boundary, whereupon rooms were driven and the pillars extracted on the retreat back to the barrier along the main entry. With the installation of a third loading machine, the plan shown in Fig. 1, developed by Frank E. Christopher, president, will be adopted. Under this plan, one of the three loading machines will be used solely for developing working sections for the other two machines, which in turn will go in and mine out the rooms, room pillars and entry chain pillars on the retreat.

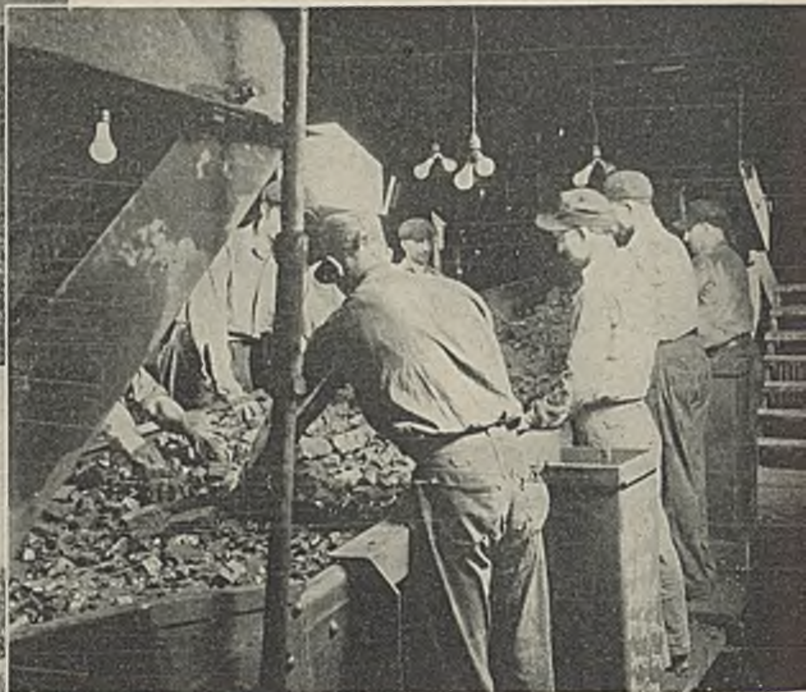
Three room entries providing a minimum of six working places in either the development or robbing stages comprise

Places in development sections will be undercut and sheared on both sides by this track-mounted cutting and shearing machine



first and second stages of picking are performed in Robinson Run mine tipple (left). Behind the tipple is the 500-ton raw-coal storage bin.



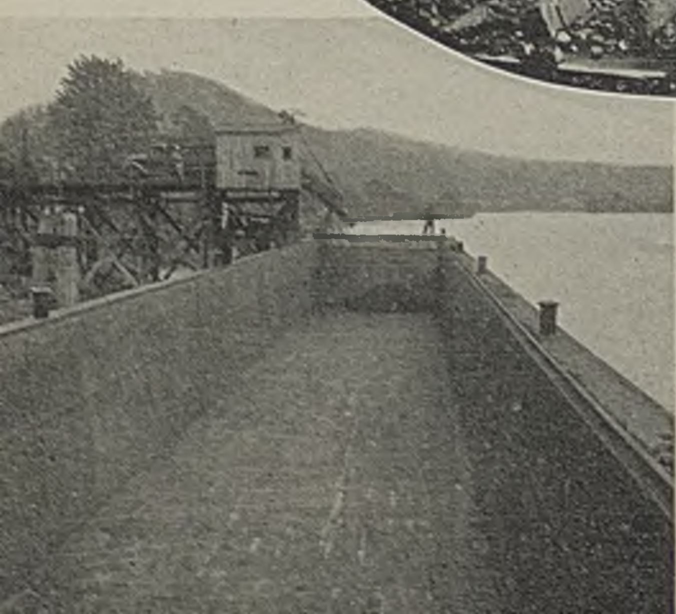


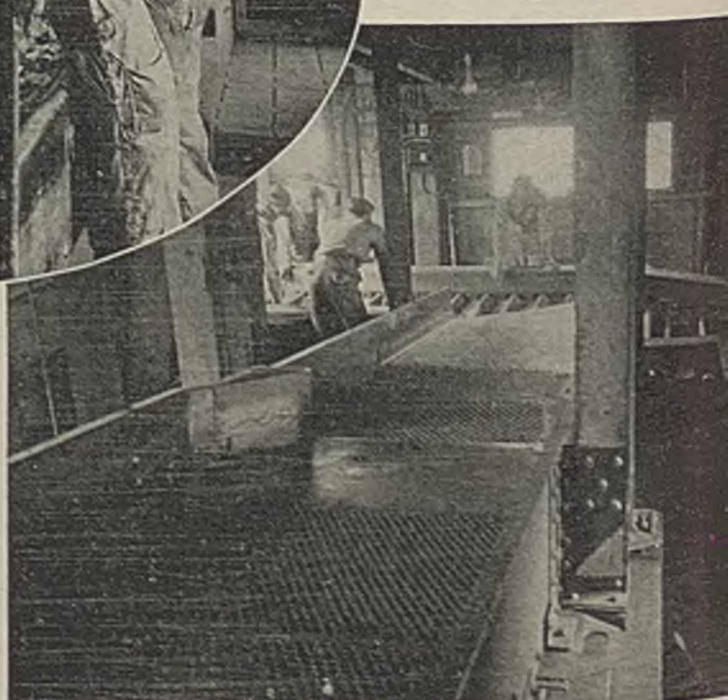
First stage in cleaning at Robinson Run: primary picking table in mine tipple.

the rail tipple, the
l is rescreened and
en a final cleaning
ore going to the rail-
road cars.

After leaving the primary table, the coal passes through a pick breaker (background) onto the secondary picking table for the second stage of cleaning.

Run river ship-
made from Maids-
on the Mononga-
hela River.





The final stage in preparation of Robinson Run coal: rescreening and picking at the rail tipple.

a machine section under the new plan. To develop such a section, three pairs of room entries, each made up of two 14-ft. headings on 30-ft. centers, are turned to the right off the main entry. Distance between adjacent headings is adjusted to give a solid pillar of coal 86 ft. wide. To facilitate haulage in the robbing stage and also shorten air travel, "pick-up" roads, consisting of single 15-ft. places, are driven from the first entry of a group of three across the other two and into the first entry of the adjacent group. These pick-up roads are driven on 184-ft. centers as the room entries advance, and each one in turn is used as a haulway on the retreat out of the section.

When a group of three room entries is driven to the boundary, the development loader then moves on up the main entry and starts another group of entries. Its place is then taken by a room-and-pillar machine, which starts a pair of rooms on one of the three entries, mines them out and continues work until rooms are started on all three entries in the step system shown in Fig. 1. Under this system, six working places always are available, in addition to such places as may be established in extracting the chain pillars. With the stepped break-line formed, mining is carried down to the main-entry barrier pillar, the pick-up roads being used in order.

Rooms on 23-Ft. Centers

Rooms are driven 15 ft. wide on 23-ft. centers, leaving an 8-ft. pillar which can easily be broken through with one mining machine cut. As the room length from heading rib to heading rib is only 86 ft., crosscuts between rooms are not required. As soon as a room breaks through into the adjacent heading, the pillar is mined out by the pocket-and-stump method (Fig. 2). Under this system, the mining machine drops back 4 ft. from the end of the pillar and makes a 16-ft. cut, which is blasted down and loaded. Upon completion of loading, the 4-ft. stump is drilled and shot and the top is allowed to cave. The mining machine then drops back another 4 ft. and the process is repeated.

When a room pillar is worked down to the entry stump, the chain pillar is robbed back to a point opposite the room neck in substantially the same manner. Two cuts, however, are required to pierce a chain pillar. In starting the extraction of a chain pillar, the first pocket is driven straight through, leaving a small triangular stump. In driving the second and succeeding pockets, on the other hand, the mining machine, in making the first cut, is sumped in on an angle at the right and pulled out square at the left, the angle at the right making it easier for the loading machine to get at the coal. In making the second cut, the process is reversed and the machine is sumped straight in on the right and gripped out on an angle at the left to recover as much of the stump coal as possible.

How Robinson Run Did It in May

Number of loading machines working	2
Character of work	Pillar
Total tons shipped	*31,385
Number of loading-machine shifts worked	60
Total man-shifts charged to underground operation	2,014
Tons produced per man-shift underground	15.6
Total number of cars dumped	6,716
Total places cleaned up	1,268
Tons per place	24.7

* Shipments represent approximately 90 per cent of the mine output.

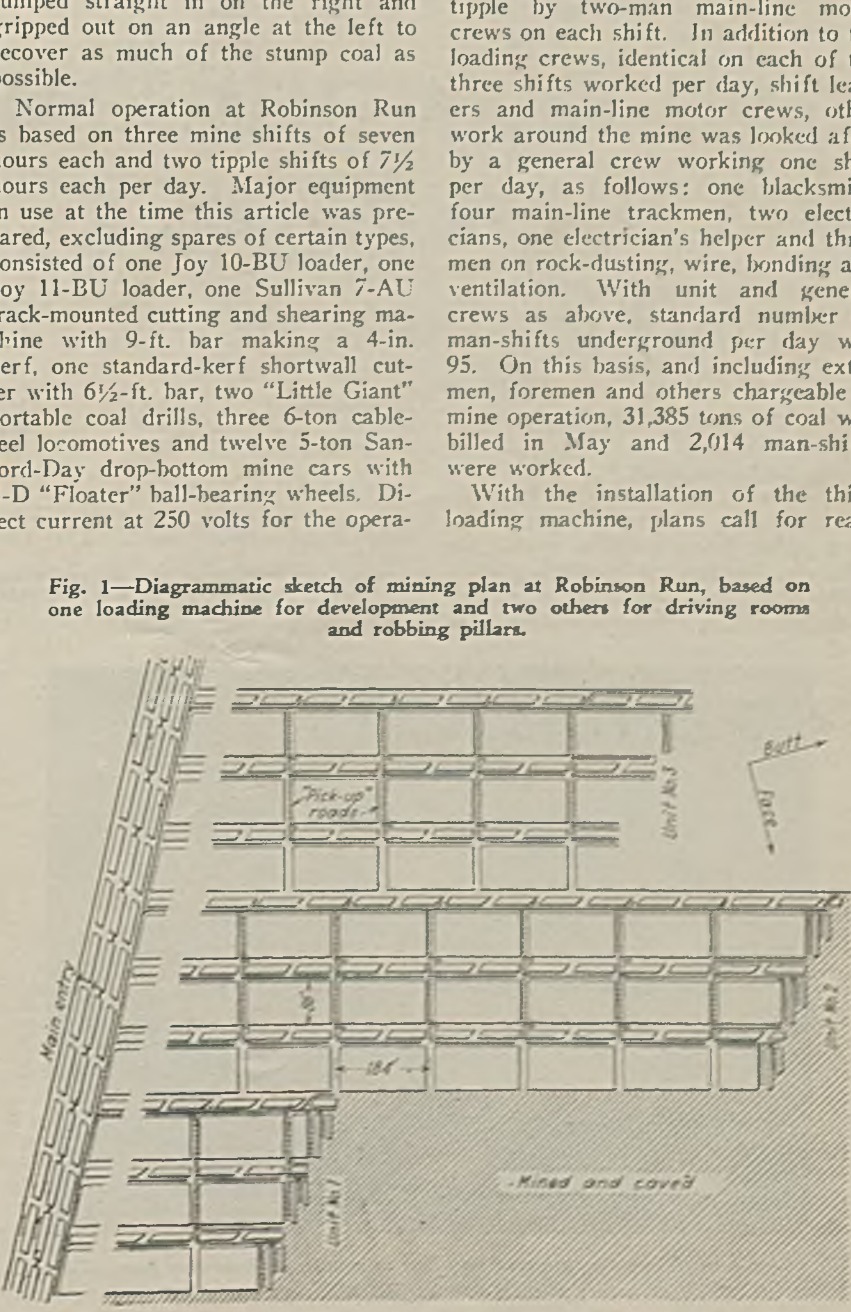
★ ★

Normal operation at Robinson Run is based on three mine shifts of seven hours each and two tipple shifts of 7½ hours each per day. Major equipment in use at the time this article was prepared, excluding spares of certain types, consisted of one Joy 10-BU loader, one Joy 11-BU loader, one Sullivan 7-AU track-mounted cutting and shearing machine with 9-ft. bar making a 4-in. kerf, one standard-kerf shortwall cutter with 6½-ft. bar, two "Little Giant" portable coal drills, three 6-ton cable-reel locomotives and twelve 5-ton Sanford-Day drop-bottom mine cars with S-D "Floater" ball-bearing wheels. Direct current at 250 volts for the operation of underground equipment is supplied by a 150-kw. General Electric motor-generator set with manual controls.

The standard crew for the loading unit in which the shortwall cutter was included, then in room-and-pillar work, comprised thirteen men, as follows: one loader operator; two facemen, or helpers, engaged in clean-up and other work around the machine; three machine men, who both cut and drill the coal; one shotfirer, loading and firing shots; two trackmen; two timbermen; one motorman; and one brakeman. In the case of the other unit, which included the 7-AU cutter, the make-up of the crew was identical except that the number of machine men and drillers was reduced to two. One shift leader on each of the three shifts looked after the operation of both loading units, and coal was hauled to the tipple by two-man main-line motor crews on each shift. In addition to the loading crews, identical on each of the three shifts worked per day, shift leaders and main-line motor crews, other work around the mine was looked after by a general crew working one shift per day, as follows: one blacksmith, four main-line trackmen, two electricians, one electrician's helper and three men on rock-dusting, wire, bonding and ventilation. With unit and general crews as above, standard number of man-shifts underground per day was 95. On this basis, and including extra men, foremen and others chargeable to mine operation, 31,385 tons of coal was billed in May and 2,014 man-shifts were worked.

With the installation of the third loading machine, plans call for rear-

Fig. 1—Diagrammatic sketch of mining plan at Robinson Run, based on one loading machine for development and two others for driving rooms and robbing pillars.



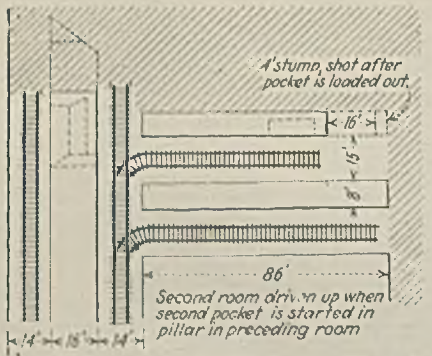


Fig. 2—Pocket and stump method of pillar extraction at Robinson Run

rangement of the loading-unit and general crews as in Table 1. Under this plan, the 7-AU cutter is assigned permanently to the development unit, operated by a ten-man crew on each shift. Crews of twelve men per shift are assigned to the room-and-pillar units, which will include shortwall cutters—in one case of a late high-capacity type with standard-kerf bar 7½ ft. long. Man-shifts per day on this basis, excluding extra work, total 127. Output is expected to be 2,200 to 2,500 tons per day, marking the third major jump in tonnage since the opening of the mine in August, 1934. Plans also are being prepared for two additional openings near the original tract on Robinson Run before the end of the year, which are expected to bring the company output up to 100,000 tons or more per month. Both the new mines will be worked on substantially the same system as No. 1.

The operating cycle in a place in a room-and-pillar section normally starts with timbering, particularly when driving a pocket through a pillar next to the gob. In development sections, on the other hand, the timberman—only one is included in a crew—has more of a roving commission, with his efforts directed primarily toward insuring safe working conditions, with the element of support a minor factor. Upon completion of timbering, the trackmen extend, shorten or change the track as required. Cutting and drilling follows and the same crew also bug-dusts the cut and loads and shoots the holes. The drill is carried on the cutter from place to place.

Undercutting only is the practice in room-and-pillar sections, and in these sections the cuts are shot with four holes placed as in Fig. 3. The breaker shot is fired first and the three top holes next in succession. In development sections, on the other hand, places are

Table I—Standard Mine Force at Robinson Run With Three Loading Machines in Operation

Loading Crews	Rooms and Pillars, Nos. 1, 2, 4, 5, 7, 8, Per Shift	Development Nos. 3, 6, 9 Per Shift	Total Per Day, Three Shifts
Motormen	1	1	9
Brakemen	1	1	9
Trackmen	2	2	18
Timbermen	2	1	15
Cutting, drilling, shooting	4	3	33
Loader operators	1	1	9
Helpers	1	1	9
Total	12	10	102
Main-line haulage			*6
General labor			†9
Total			117
Shift leaders			‡3
Foremen			2
Electricians			3
Blacksmiths			1
Mechanics			1
Grand Total			127
Expected daily output, tons			2,200–2,500

* Two men on each of three shifts per day.
† Three men on each of three shifts per day.
‡ One on each shift per day.

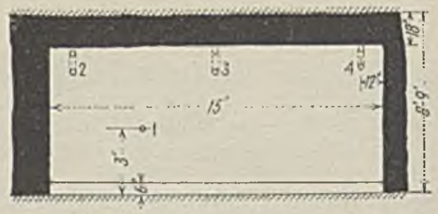


Fig. 3—Hole placement in shortwall places

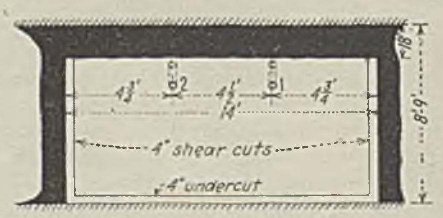


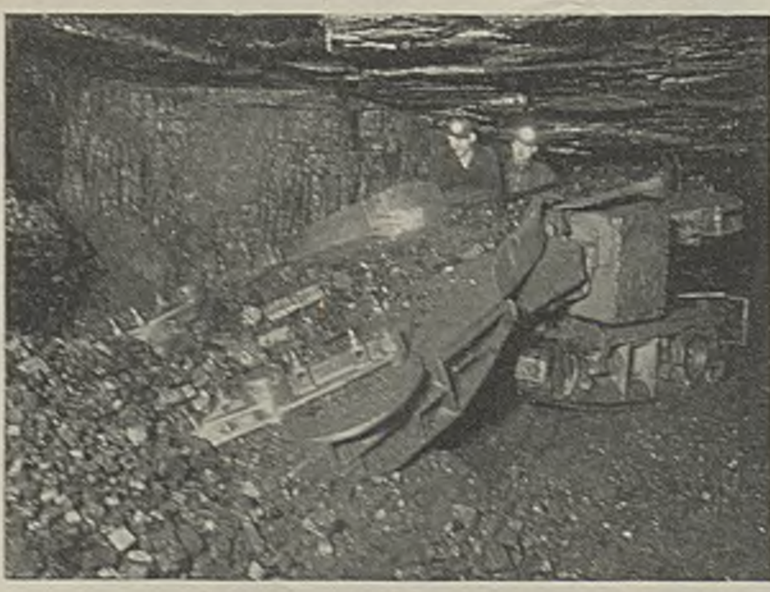
Fig. 4—Hole placement in places undercut and sheared on both sides

undercut and sheared on both sides by the 7-AU machine and are shot down with two holes placed as in Fig. 4. "Duobel G" in 1½x8-in. sticks is used to break down the coal.

To complete operations in a place, the coal is loaded and the face, if more than one cut is to be taken out, as in solid work, is cleaned up by the loader helper or faceman ready for the cutting and drilling crew. With the two loaders in operation, the twelve cars were divided up into units each consisting of a locomotive and four cars. Six additional cars will go in service with the third loader and the total of eighteen will then be divided up into four units and spares—one unit for each machine and the other en route.

In serving the loader, the entire trip is headed into the place to bring the end car under the loading boom. As soon as this car is filled, it is pulled out and kicked into the nearest available place. In a similar manner all the other cars in the trip are filled and detached, with the exception of the car next to the locomotive, which is never uncoupled. When the last car is loaded, the trip is bumped up and coupled, whereupon the main-line locomotive crew takes it over and starts for the outside, leaving an empty trip and locomotive in exchange. Main-line tracks are laid with 45-lb. rail on wood ties; room-entry and room tracks with 30-lb. rail on Bethlehem steel ties.

Mine cars are dumped into a 500-ton bin on the surface, from which the coal is elevated to the mine tipple by a belt conveyor. In the tipple, the raw mine-run is first screened to take out the slack, after which the oversize is passed over a shaking picking table for preliminary cleaning. This table discharges to a McNally-Norton vertical-pick breaker with integral screen, adjustable for crushing the feed to a maximum of 8 in. down to a maximum of 2½ in. Degradation made in the crushing process is screened out and the



Loading machines also are used in pillar extraction at Robinson Run. This machine is starting into a pocket in a room pillar

Table II—Specimen Analyses, Robinson Run Coal, Before and After Preparation

	Coal in Place	½-In. Lump*	1-In. Slack†
Moisture (per cent)	1.7	0.61– 0.83	1.3
Volatile matter (per cent)	36.6	35.69–37.63	37.1
Fixed carbon (per cent)	53.4	55.23–57.59	54.7
Ash (per cent)	8.3	6.01– 6.62	6.9
Sulphur (per cent)	2.9	2.14– 2.41	2.79
Softening temp., ash (deg.F.)	......	2,300–2,495	2,310
Fusion temp. ash (deg.F.)	2,300	2,495–2,620	......
B.t.u.	13,800	14,208–14,344	13,890

* Range of analyses in 1936 by railroad purchaser.
† Tipple slack sample, analyzed by Bituminous Coal Producers' Board for District 3, Dec. 24, 1935.

oversize then passes to a second shaking picking table for secondary cleaning. The mine tipple is equipped with separate 12-ton bins for slack, nut, and egg or lump, and with two additional bins of the same size for pickings.

From the mine tipple the coal is trucked to the river-loading dock or to the rail tipple. When loading on the river, the slack is trucked directly to the barge station, while the nut and egg or lump go to the rail tipple. The nut is loaded on No. 1 track at the rail tipple after rescreening and removal of the degradation; egg or lump, after passing over the picking section of a picking table-loading boom, is loaded on No. 2 track. Undersize resulting from rescreening at the rail tipple is run to a 12-ton bin, from which it is trucked to the barge station and loaded with the main slack output.

Approximately 10 per cent of the mine output is rejected in preparation, which fact is reflected (Table II) in substantial reductions in ash and sulphur and an increase in heat content. Robinson Run coal moves primarily in the railroad and general steam markets. It goes mostly into the territory east and north of lines from Toledo, Ohio, to Morgantown, W. Va., to Washington, D. C. Sales are handled by the Pittsburgh & Fairmont Coal Co., Pittsburgh, Pa.

MANAGEMENT MUST LEAD

+ If Safety Work Is to Yield Maximum Results*

By GEORGE B. PRYDE
Vice-President, Union Pacific Coal Co. Rock Springs, Wyo.

REDUCTION OF ACCIDENTS now demands something more tangible than slogans if lasting benefits are to be obtained, as the increased use of machinery and intensification of mining operations has made accident prevention a serious problem. Much haphazard and useless effort was expended in the early days of the safety movement, when, seemingly, the idea was that propaganda in sufficient volume would bring startling safety records. This myth has been largely exploded and now it is recognized that any safety program, to be effective, must take into consideration certain psychological factors, for, after all, if results are to be secured, we must recognize that we are dealing with human beings with all their vagaries of temperament and intellect and consequently must chart a course that will appeal to them and their pride of accomplishment.

In establishing a safety program, several broad principles may be laid down.

1. Great care should be exercised in selecting new employees because, with their lack of mining tradition, a special appeal must be made to them to observe the safety rules. The reception and treatment of a new man on the job often determines his future with the company. He must be impressed with the importance of safe workmanship and efficient performance.

2. All new employees should be required to take a physical examination, including a rigid eye test. Where this system has been established, it has been found that many whose physical condition would make them a hazard to themselves and their fellow employees have been kept off the payroll, thus eliminating many potential injuries growing out of the inherent hazards of mining work.

3. Men should be properly trained in their work. Great care should be exercised in assigning a new man to a job. The work should be thoroughly explained to him and he should be impressed with the fact that a job means something, that the company is interested in his welfare and that it will be up to him to cooperate fully to the end that he may be protected from injury in the course of his employment. Needless to say, it is imperative that the employees' safety be assured by surrounding them with every possible safeguard.

4. Proper supervision should be given all employees. Supervisors should be men of good judgment, capable of directing men and thoroughly familiar with all phases of the work. Also, they should plan each job, issuing definite instructions, and when the work is dangerous direct all operations personally.

5. Discipline should reinforce safety

★ ★

MANAGEMENT is the absolute answer to accident prevention in industry. It is the duty of the employer to surround his employees with all reasonable safeguards to reduce the continuous toll that industry exacts and decrease the great social loss that accidents involve. Injuries are paid for directly by the employer through compensation to the men themselves, or indirectly through taxes to support those rendered unfit to earn a livelihood. When management views injuries as a reflection on the industry and a symptom of managerial inefficiency, then we may expect better safety records.

* Abstract of an article entitled "Suggested Methods of Reducing Mine Accidents From the Viewpoint of the Mine Operator," presented at the Denver convention of the Mine Inspectors' Institute of America, July 1.

rules. This means training men to act in accordance with established safety rules, supplemented by fair and just application of penalties by the supervisor for infractions of these rules. Flagrant disregard of safety rules should subject the offending employee to discharge. Supervisors should be firm in all of their decisions and should insist that their instructions be carried out fully. They should, of course, provide a good example by rigid adherence to all safety rules. Only in this way can the respect and cooperation of the employees be secured.

The Union Pacific Coal Co. has become convinced that there must be some incentive for safety work beyond the written rules and regulations. In 1926 we inaugurated a system of giving watches in districts working the entire year without a fatal injury, in addition to gold medals, oil paintings, electrical appliances and other things to members of the supervisory staffs at mines making notable progress in preventive work. This scheme, however, failed to function as expected because the awards were made by balloting by the men, and popularity, rather than an interest in safety, often was the deciding factor.

System of Awards Changed

In the last half of 1931 an entirely new system of awards was adopted. Each mine in the system was divided into two or more sections with a section foreman in charge of each. At the end of the year there were nine sections in which no lost-time injuries had occurred, and to determine the prize winners the names of all employees in the nine sections were placed in a bowl from which the winning names were drawn. The awards were two five-passenger automobiles to the employees and $150 and $100, respectively, to the foremen of the sections winning the automobiles. Whenever an injury occurred in a section it automatically eliminated all employees in that section from participation in the prize drawing.

This same procedure was followed in 1932, and from that time forward our safety record continued to improve. However, in 1933 the awards were changed to one automobile as first prize, with the cost of the second automobile divided into several cash awards, thus allowing more men to participate.

One drawback to this method was the length of time between awards. Employees seemed to lose interest over a period of a year and, therefore, for 1936 we decided on monthly awards, as follows: underground and surface workmen at each mine, one prize of $15, one of $10 and one of $5; unit foremen underground, one prize of $10. These awards are made to each mine working a full calendar month without a lost-time injury, and recipients are determined by drawing from a bowl containing the names of all employees at the operation. Also, the offer was made that in any month in which the system worked without a lost-time injury the awards would be doubled for that month.

This method seemed to obtain instantaneous results. In the first three months of operation, with five districts and eight mines involved, the entire system suffered only one injury in each of the three months. Up to the time this paper was prepared, two districts, employing 600 men, had a perfect record from the first of the year.

Comparing this year's record with 1935, we find that in the first three months of last year we suffered twelve lost-time injuries, working 63,059 man-hours per injury, while in the same period in 1936 we suffered three lost-time injuries, working 303,903 man-hours per injury.

George B. Pryde

Monthly safety meetings have been held in each district for a number of years and have been an important factor in accident reduction. These meetings afford the men an opportunity to get together and discuss with each other and with the officials the safety problems arising in their own particular places. Also, they give the management an opportunity to present new ideas and keep ever before the men the idea of working safely.

In October, 1927, it was decided that a method of standardizing jobs should be worked out. In accordance with that conclusion, what is known as the "Code of Standards" was compiled with the aid of staff members to show standard methods of doing the various jobs around the mines. A copy was given to every member of the supervisory staff. Evaluation of the accomplishments growing out of the Code of Standards is, of course, difficult, but we feel that it has been a major factor in reducing injuries because it eliminates "rule-of-thumb" methods previously in force and substitutes training of men to do similar jobs in the same way. We have demonstrated that men will work more safely when taught standard practices, as they become more familiar with the work.

All those in any position in the supervisory organization had a voice in compiling the code, as all subject matter was submitted to them before it was published, and they were instructed that thereafter no deviation would be allowed from the rules except after conference with the general officers. It has been found necessary to amend the Code of Standards from time to time, and we are at present rewriting it to incorporate newer practices. Practices which were standard when the book originally was compiled have now become obsolete and we desire to keep it up to date. For that reason, it is being entirely rewritten with the aid of the members of the staff, who have been asked to pass on all amendments. Properly compiled and properly followed, such a book of standards will prove a valuable aid in safety work.

Must Read Rule Book

"Rules and Regulations for the Government of All Employees of the Union Pacific Coal Co." was issued in November, 1929. It was given to all employees, who were required to receipt for the book and also were required to read it. This book, also, has proved a potent factor in reducing accidents because it sets forth a method of handling each job and in this way employees become familiar with their work and the best way of doing it. The rules have proved of incalculable benefit in promoting safe working.

Recently, attractive and well-lighted safety bulletin boards have been put up. Safety posters are changed frequently by men especially delegated to this task. If properly carried out with attractive posters changed at frequent intervals and boards maintained in first-class condition, this idea, also, is a splendid aid to safety. Other methods of reducing injuries include the wearing of protective goggles, which will practically eliminate eye injuries, and the use of hard-toed shoes and hard hats, which also will practically eliminate foot and head injuries.

Summing up, it may be said that safety work must be a continuing campaign based on system and efficiency. It must be a program of interest to both employer and employee. No matter how much money may be spent or how sincerely and honestly the employer may try to apply safety principles, little will be accomplished if the employees do not cooperate. Conversely, no matter how hard employees may strive to improve safety conditions, little progress will be made if the employer is not strongly in favor of the work.

ELECTRICAL DISTRIBUTION

+ For Mechanical Mining in New Orient Follows New Plan Covering Life of Property

By J. H. EDWARDS
Associate Editor, Coal Age

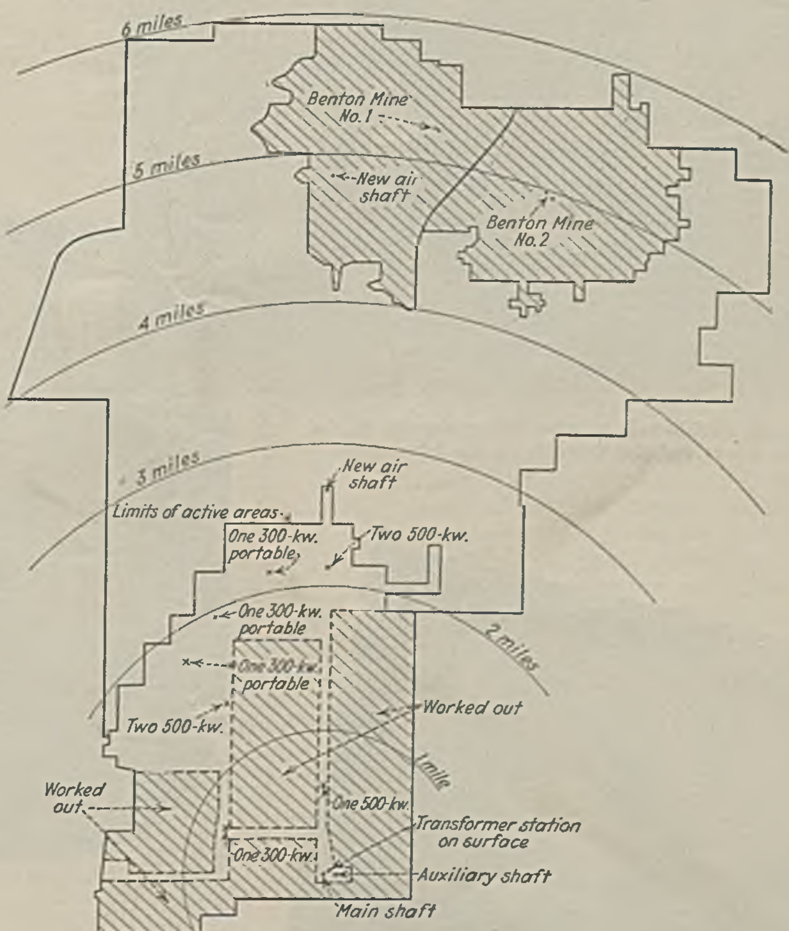
TO MAINTAIN the underground distribution system of a large mechanized mine in a manner which will provide full voltage unfailingly to all working places and to main hauls in spite of the rapid advance and long distances encountered is a problem which requires careful engineering coupled with long-term forecasting of mining progress. To insure that electrical distribution will be kept in step with its mechanical mining the Chicago, Wilmington & Franklin Coal Co. recently made complete surveys and forecasts of power requirements for the Orient mines and as a result has embarked on a program of change designed to meet the progressing and ultimate requirements.

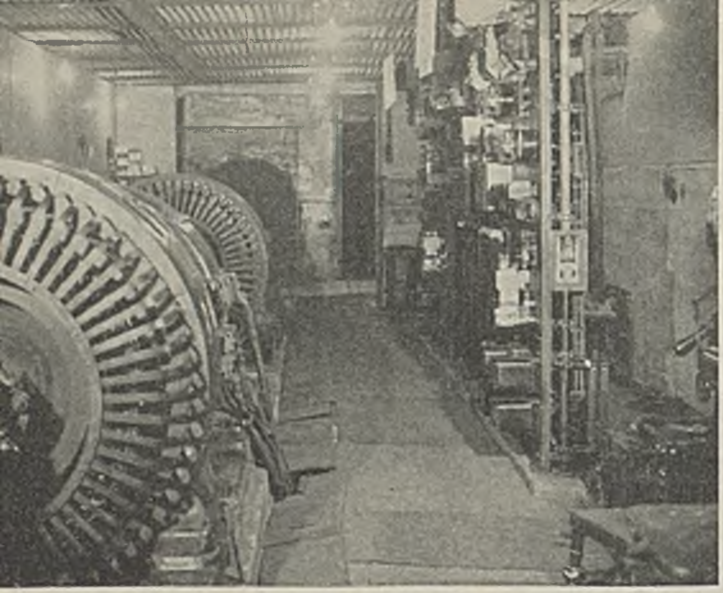
These two mines, Orient No. 1 and New Orient, located in adjacent territory of 96- to 126-in. No. 6 seam coal in Franklin County, Illinois, have been operated by mechanical loaders for several years. Since New Orient—the newer and larger mine—now hoisting 10,000 tons per day and holding the world's record by having hoisted 15,174 tons in eight hours—presented the most intricate problem, its electrical distribution will be discussed in greater detail. Ground was broken at this mine in 1921 and in 1925 the major equipment was put to work on a large-scale operating basis. A skip hoist powered by two 2,000-hp. d.c. motors hoists the coal through a 500-ft. shaft located at a corner of the property and six miles from the farthest boundary. A large portion of the surface of the mining property is susceptible to flooding: This was one of the reasons for the shaft location and also a factor which had a material bearing on the question of surface vs. underground electrical distribution.

Power is purchased from the Central Illinois Public Service Co. at 60 cycles 33,000 volts and is distributed at lower voltages from a transformer and switching station situated but a few hundred feet from the main and auxiliary shafts. Up to 1928 the 275-volt d.c. power for mining operations was generated in one central substation situated near the shaft bottom and containing four synchronous motor generators of 1,400 kw. total capacity.

A decentralization of d.c. substation capacity was started in 1928, thus placing the motor generators at points along the main haulage. Since that date the mining has been changed from tonnage-contract hand loading and cutting to complete mechanical loading with all inside labor on a day or monthly basis. Overheating of the 2,300-volt three-con-

New Orient mine: indicating present positions of stationary and portable underground substations in relation to active areas and showing approximate distances from hoisting shaft. Distribution voltage has been changed from 2,300 to 4,000

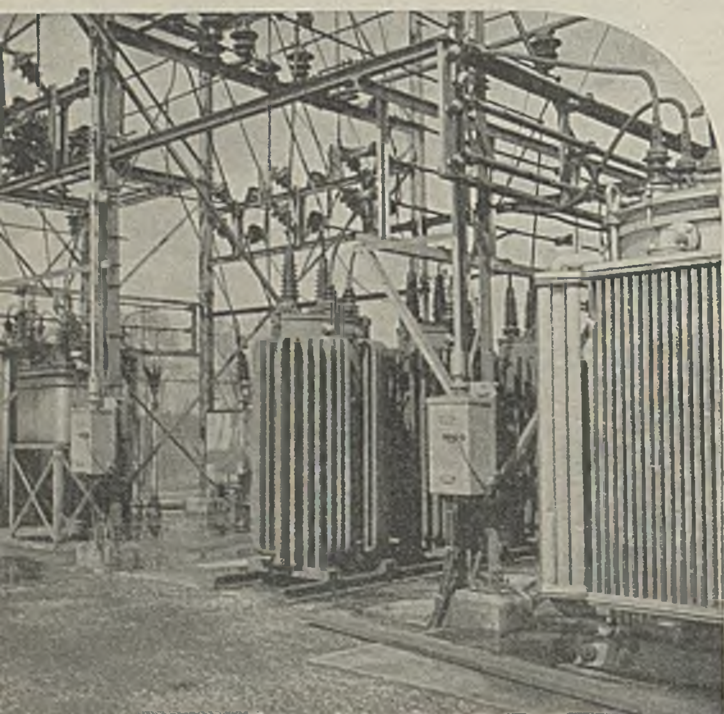




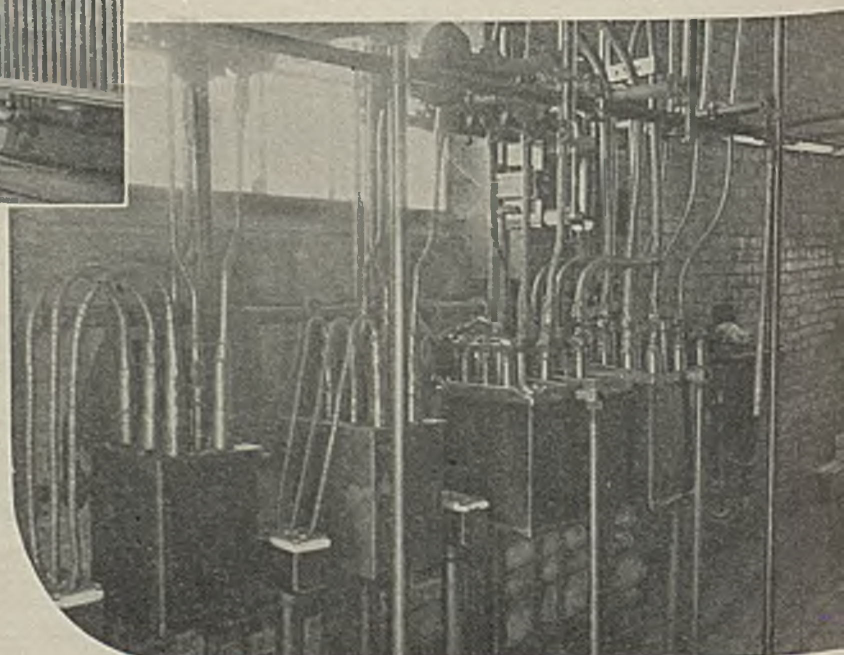
s semi-permanent substation, containing two 500-kw. units, has upper walls and a roof of fireproof board and steel, which parts will be moved to the next location

Steel covers over motor-generator and control truck units obviate any necessity for building a room for portable substation operation. This is an operating illustration of a 300-kw. unit in New Orient mine.

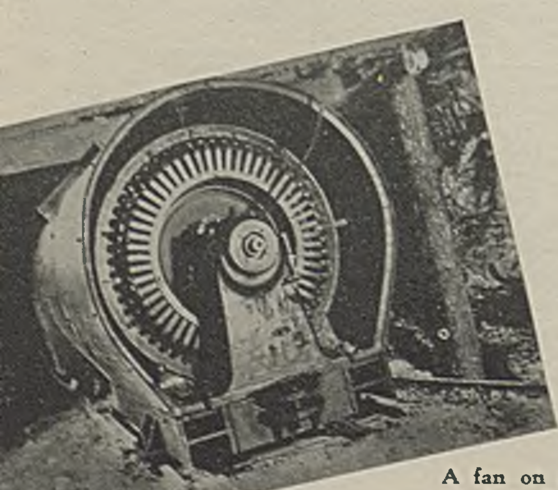
Operating view of the semi-automatic control truck showing the steel-canopy roof protection



rators for 33,000-volt switches are contained in the angular boxes on steel columns in the foreground



At the right hand are the two new electrically interlocked oil switches which change transformer connections to reduce no-load losses on idle days



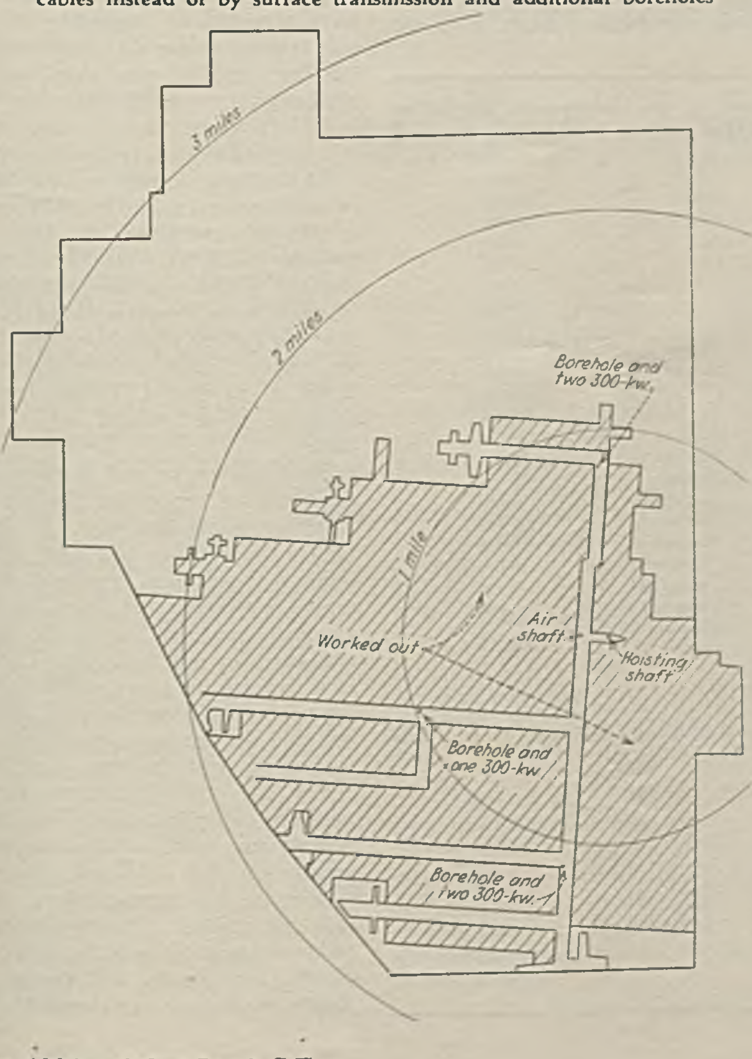
A fan on the shaft at the far end blows air through the barrel-shaped cover of this portable 300-kw. motor-generator set ductor underground cables supplying the substations and an increasing difficulty in maintaining a minimum voltage of 220 in the rooms when main haulage locomotives draw heavily in the areas called for fundamental changes. The voltage difficulties existed although the circuits had been well maintained and several—up to as many as nine—1,000,000-circ.mil copper cables were operated in parallel as d.c. feeders.

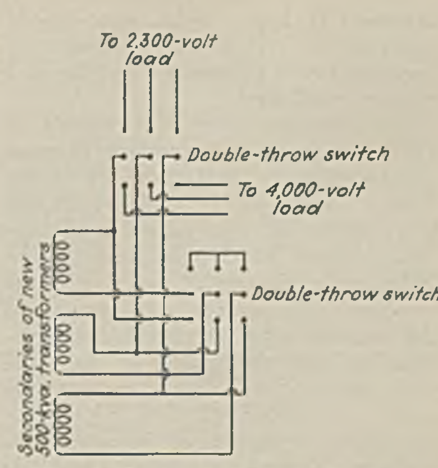
The engineers of the company were called upon to study and report on the situation, but, in order to preclude overlooking avenues that possibly might be blinded to the local men because of their very nearness to the problem, a consulting engineering company, Allen & Garcia Co., was called upon to make a survey and report. The final plan was based on a thorough consideration of that report together with the recommendations of the local engineers. The Allen & Garcia report proposed two alternative plans: One was to supply the underground substations through borehole cables fed by surface extensions of 33,000-volt lines, and the other to continue to feed the stations by cables entering the mine through the shafts, but to change the a.c. voltage from 2,300 to 4,000, which would require rewinding the synchronous motors of the substation units. The latter plan was adopted.

The report included a forecast of power-maintenance requirements and costs for the remaining life of the mine, assuming production is continued at the present rate of 10,000 tons per day. The schedule of detailed costs is set up by periods of 200 working days each. The period is based on two loading-machine units mining a panel in 100 working days and the use of five units which in 200 working days mine an area corresponding to a block 1,000x 1,500 ft.

Relocations of substations for each period have been indicated on a map. Projected costs of carrying this underground electrical-distribution system forward vary considerably from one period to the next. The average will approximate $10,000 per period, but the minimum and maximum figures will be about 50 per cent and 200 per cent of that average. Approximately $40,000 was spent in the first period, which

Orient No. 1 mine. At present three underground substations are in use; these located at boreholes. Within two years the voltage will be changed from 2,300 to 4,000 and future extensions of a.c. distribution will be by underground cables instead of by surface transmission and additional boreholes





Electrically interlocked double-throw switches change the transformer connections and shift to a load of different voltage for idle-day operation

included rewinding the synchronous motors.

The plan is to utilize portable substations situated near the room load centers. Direct-current transmission will average 1,000 ft. and the maximum will be 2,000 ft., as compared to an average of one mile with the former system, in which rooms were supplied from substations along the main haulways. To date three 300-kw. semiautomatic units have been converted to portable type and are in use at load centers. Four additional portable units will be required ultimately. All planning has been based on continuation of the regular practice of operating the cutting machines during the loading shift.

To reduce cost of moving the portables and at the same time to make it practicable to move them more often, an unusual design was employed in converting the units and this work was done in the mine shop. Steel hoods over the motor-generator and control trucks obviate any necessity of preparing special rooms for the set-ups. The motor-generator hood consists of a barrel-shaped steel casing with hinged inspection doors at the bearing and brush-holder positions and open at both ends to permit circulation. A disk fan installed on the outside end of the generator shaft blows air through the length of the hood. Advantages of the design are: protection from roof material, fire protection, a degree of ventilation which permits greater loading, and shielding to reduce the chance of injury to men who may have occasion to pass near the set.

Semi-permanent substations for supplying power to the main hauls will be moved about every five years, and to reduce the cost of these moves a semi-permanent underground building has been developed. The movable part consists of steel and fireproof board which is set on top of concrete walls or foundations 4 ft. high. Sides, from top of walls to the ceiling, are covered with fireproof board (Transite) and the roof is corrugated steel.

For about five years in the future all 4,000-volt power will continue to enter via the auxiliary shaft at the top works. Then a change will be made which will place 4,000-volt feed cables in the up-cast airshaft, which was completed in 1931 and is situated 2¾ miles from the works. This change will necessitate the building of a 33,000-volt transmission line and the moving of the three large transformers now situated at the main a.c. substation.

Original equipment of this main substation consisted of three 1,667-kva, 33,000-2,300/4,000Y transformers which normally supplied the entire 2,300-volt load of the top works and underground substations, and three 500-kva. spare units which normally were used only to carry the loads of idle days and idle periods when the large transformers could be disconnected from the line to reduce no-load losses. The underground-substation changes required connecting certain of the transformers for 4,000-volt operation and the continuance of 2,300 volts for top works, including a 200-kw. substation unit in the hoist house, and for stationary motors at the shaft bottom.

The three old 500-kva. transformers have been retained as the regular supply for the 2,300-volt load. The 1,667-kva. units supply only the 4,000-volt running-day mine load. The new 500-kva. units normally carry the 2,300-volt bottom load, but on idle days that load circuit is shifted to the old 500-kva.'s and the new 500-kva.'s are reconnected to take the 4,000-volt underground load relinquished by the large transformers.

This switching of the new transformers from 2,300-volt delta to 4,000-volt Y and the shifting from one load circuit to the other is accomplished by two double-throw electrically interlocked oil switches situated in the control room of the hoist house and operated from a dead-front board equipped with visual signals. At the outside substation the 33,000-volt disconnect switches of the 1,667-kva. transformers and of the old 500-kva. transformers have been equipped with motor operators to eliminate the necessity of a man going to the substation to throw the switches, which job was not a pleasant one on a rainy day when the chance of shock, although almost nil, was increased.

The illuminated pushbutton controls of these motor operators are also on the main board in the auxiliary hoist house. At certain times during idle periods when all 4,000-volt underground motor generators can be shut down, even the old 500-kva. transformers are disconnected from the line to save no-load losses.

No difficulty was encountered when the voltage was raised from 2,300 to 4,000 on the underground cables. For the most part (22,000 ft.) these cables are of the following type: 400,000-circ. mil, three-conductor, varnished cambric, insulated for 5,000 volts, no ground conductors, lead sheath, flat steel armor, and jute over all. The practice for some years, after decentralization of substations was begun, was to install these armored cables in the airways. Now the standard practice for the 4,000-volt service is a cable having a non-metallic covering, containing grounded conductors, and installed in the right-hand upper corner of the main haulway.

Corona Shielding Unnecessary

Cables of sizes Nos. 3 and 4 now being purchased for 4,000-volt service to feed portable substations have three 19-strand conductors, 5,000-volt 10/64-in. rubber insulation, three No. 10 stranded neutrals or grounds and an 8/64-in. rubber jacket. Shielding to protect the rubber from corona is not included because the available evidence did not assure that such shielding is necessary and also because of certain difficulties that strip-mining companies have reported as happening to 4,000-volt trailing cables due to distortion or "balling up" of the shielding. For semi-permanent 4,000-volt cables (those to be left in one place for over a year) it is planned to specify braided covering.

At the time of this writing the total of underground cable, in addition to the 22,000 ft. operating on 4,000 volts, includes: 1,250 ft. 400,000-circ.mil non-metallic sheath, varnished cambric, no ground wires, woven braid; 500 ft. No. 4/0 rubber insulation, not shielded, no ground wires, woven jacket; and 2,500 ft. of No. 4, rubber insulation, shielded, three ground wires, rubber jacket.

Steel messenger and marline will be the means of supporting the non-metallic cables along haulways. In order to reduce the expense and labor of installation it is proposed to support the messenger by pieces cut from 1½-in. galvanized extension bar of the standard type used for pipe hanging. These bars have holes ½ in. apart which will serve for fastening onto the roof expansion bolt and for the bolting of a loop to be formed to hold the messenger wire.

For the ground returns necessary with the old type cables which have no neutral wires but which were put into service on the 4,000-volt Y-grounded system, the d.c. return feeders and track rails are utilized. Rail weights are as follows: mains 60 to 70 lb., cross entries 60 lb., and panels and rooms 30 lb. Room tracks are not bonded; instead

Principal D. C. Equipment Constituting the Load Served by the Underground Distribution System at New Orient Mine

Number in use	Designation	Make	Type	Size
31	Loading machines	Joy	5BU	35-hp.
6	Mounted cutters	Sullivan	CLU	50-hp.
2	Mounted cutters	Sullivan	7AU	80-hp.
40	Shortwall cutters	Sullivan	CE7	30-hp.
20	Conveyors (pit-car loaders)	Duncan		1½-hp.
2	Entry drivers	McKinley		120-hp.
44	Coal drills	Chicago-Pneumatic		
65	Blowers	American	Sirocco	½-hp.
2	Blowers	American	Sirocco	10-hp.
1	Rock-duster	M.S.A.[1]		20-hp.
1	Portable air compressor	Sullivan		25-hp.
2	Locomotives	G.E.[2]	Haulage	20-ton
1	Locomotive	G.E.	Haulage	15-ton
5	Locomotives	G.E.	Haulage	13-ton
1	Locomotive	Jeffrey	Haulage	13-ton
2	Locomotives	Jeffrey	Haulage	10-ton
2	Locomotives	W.[3]	Haulage	10-ton
35	Locomotives (slow speed)	G.E.	Cable reel	8-ton
8	Locomotives (high speed)	G.E.	Cable reel	8-ton
4	Locomotives	G.E.	Cable reel	6-ton
1	Locomotive	Jeffrey	Haulage	6-ton
1	Locomotive	Ironton	Battery	8-ton

[1] Mine Safety Appliances. [2] General Electric. [3] Westinghouse.

Automatic Reclosing Breakers Which Sectionalize the D.C. Distribution and Protect Substation Machines at New Orient Mine

		Make	Type	Size
2	Automatic breakers	A.R.C.B.[1]	K.S.A.	4,000-amp.
1	Automatic breaker	A.R.C.B.	K.S.A.	6,000-amp.
1	Automatic breaker	A.R.C.B.	2-3	3,000-amp.
7	Automatic breakers	A.R.C.B.	D.H.D.X.	1,200-amp.
2	Automatic breakers	A.R.C.B.	KSA	1,200-amp.
4	Automatic breakers	A.R.C.B.	AHDX	800-amp.
3	Automatic breakers	W.[2]		2,000-amp.

[1] Automatic Reclosing Circuit Breaker. [2] Westinghouse.

copper returns are used. Panel and main tracks are equipped with long-type electric welded bonds.

A change which has a bearing on the load distribution and one which is now about to be put under way is the building of main haulage partings and the use of swing or intermediate locomotives to haul from the panels to these partings instead of having the main haulage locomotives pull from the panels.

Rewinding of the New Orient motor generators to operate on 4,000 volts instead of 2,300 volts was done in the mine shop. This required new coils, and they were purchased from a coil specialty company.

In the other Orient mine, No. 1, also the underground distribution will be changed from 2,300 volts to 4,000 volts and will be maintained in much the same manner as has been outlined for New Orient. At the No. 1 mine the present set-up consists of d.c. engine-driven generators in a power house at the main shaft and five 300-kw. motor generators located in three underground substations, all operated from purchased power and distributing d.c. power to five territories, the load centers of which are 2,200 to 7,000 ft. from the substations.

In the forecast prepared for this mine also the required changes and costs were set forth for periods of 200 working days and their number determined by the time required to deplete the property at the present rate of 4,500 to 5,000 tons per day. The plan calls for one new motor generator which will be a portable type, also for the changing of one of the existing five machines to portable.

Three power boreholes are in use and, according to the plan of 4,000-volt underground distribution, no more will be drilled. Rewinding of the motor generators will be started in about two years and at that time the transformers will be reconnected for 4,000-volt feed. Savings in power-distribution losses will pay the total cost of rewinding the five synchronous motors in about 800 working days.

Thus at both Orient mines there now exists a carefully conceived plan for maintaining the underground electrical distribution in a manner that will match the efficiency demanded as a complement to mechanical mining. Following the plan according to periods as gaged by mining progress will assure that at no time will mining efficiency suffer because electrical development has not kept pace with operation requirements.

SMALL STRIPPING UNITS

+ Produce High Daily Tonnage

Under Sternberg Operating Plan

WITH TWO stripping units having an aggregate capacity of 4½ cu.yd. and a loading shovel with a 1½-cu.yd. dipper, the Sternberg Coal Corporation, Boonville, Ind., has been shipping an average of 1,100 tons of coal in seven hours for the past year and expects, by changes in its present preparation plant, to increase this average to 1,500 tons with the same equipment. Overburden on tracts now being stripped averages 22 ft. in thickness and coal is trucked an average of two miles from the various pits operated by the company to the preparation plant just outside the city limits of Boonville.

Tracts stripped by the Sternberg organization to date have varied in size from 30,000 tons to 120 acres, with larger parcels in prospect. The Indiana Fifth Vein seam, running up to 7 ft. in thickness, is recovered in all cases. Distances from the preparation plant to the various tracts range from ¾ to 4 miles. As a general rule, only virgin acreage is leased, but in a few cases coal under shallow cover that had been left by deep mines is worked.

Standards also call for a minimum average thickness of 3 ft. and a maximum depth of overburden of 35 ft. Prospecting on the various tracts under consideration is handled by a full-time crew of two men with a hand-operated churn drill, which sinks holes to give the desired information on coal thickness, depth and character of cover, dip, etc. From this information and the lay of the land, the method of attack is formulated for each tract.

Maximum flexibility and an ample supply of coal at all times are the twin goals of the Sternberg management. Consequently, four to six pits are kept open, so that at least one is available for stripping and another for loading coal at all times. Stripping and loading are never carried on in the same pit at the same time, thus preventing interference between the two operations and consequent loss of output. As a result of this policy, both stripping and loading units constantly are being shifted from one pit to another, such moves, under normal conditions and with the equipment in use, usually requiring one to two hours.

Stripping equipment comprises a Model 95 Northwest dragline with 75-ft. boom and 3-cu.yd. Northwest bucket and a Model 6 Northwest shovel with 25-ft. boom, 18-ft. dipper stick and 1½-cu.yd. dipper. Both units are powered by Twin City carburetor-type engines burning either gasoline (generally for starting) or No. 1 furnace oil (running). Coal is loaded by a Model 105 gas-driven Northwest shovel with 1½-cu.yd. dipper.

The two stripping units, as conditions may dictate, may be worked separately in separate pits or may be combined and worked together in the same pit, depending upon conditions and thickness of overburden. Except at the outcrop and other places where the cover is thin and therefore generally consisting of clay and sand resting on the black slate, or boney, overlying the coal, the overburden includes a substantial proportion of hard and soft shales.

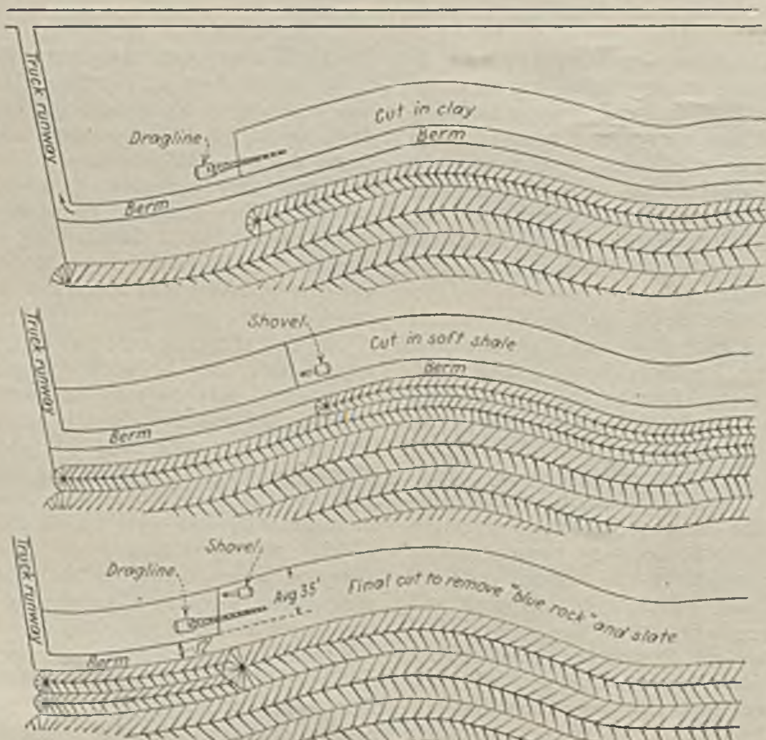
Where average thickness prevails, overburden make-up is about as follows: black slate, or boney, 1 to 2 ft., resting on the coal; very hard gray shale ("blue rock"), 2 to 10 ft.; soft shale, 5 to 6

Left—Dragline making a box cut, with the shovel helping out in digging the soft overburden. Right—An example of the Sternberg tree-planting program. Trees on the spoil bank in the background are slightly more than one year old. Slips have been set out on the new spoil bank in the foreground, but are not yet large enough to show in the picture

ft.; clay and sand, 6 to 7 ft. Under conditions permitting operation of the two units separately—reasonably thin overburden and absence of hard material—they can uncover approximately 30,000 tons a month on the average. If worked together, average tonnage uncovered is reduced to 25,000. Pits with light or soft overburden generally are operated during the slack summer months; pits where rock must be moved are reserved, as far as possible, for winter work.

Operation of the stripping units together generally is necessary where the overburden thickens and the blue rock comes in. In other cases, the units may be operated together for convenience, greater speed in making a box cut or for reducing the time required to uncover certain tracts of coal, the shovel dumping where the dragline can pick up the spoil for disposal. If rock must be worked, however, the general practice is to make a dragline cut down to the soft shale (Fig. 1). Next, the shovel takes off the soft shale, which can be dug without shooting. The shale is dropped by the shovel along the edge of the coal. Then the dragline moves down on top of the hard shale, which is drilled and shot, and, together with the shovel, takes up the blue rock and slate over the seam. In this operation the rock is dug by the shovel, which dumps it next to the spoil bank, where it can be picked up by the dragline and deposited on the bank. Spoil rows made in previous operations serve as toes when the final stripping cut is made.

Fig. 1—Three stages in the removal of overburden containing blue rock or other hard material, using dragline and shovel separately and in combination



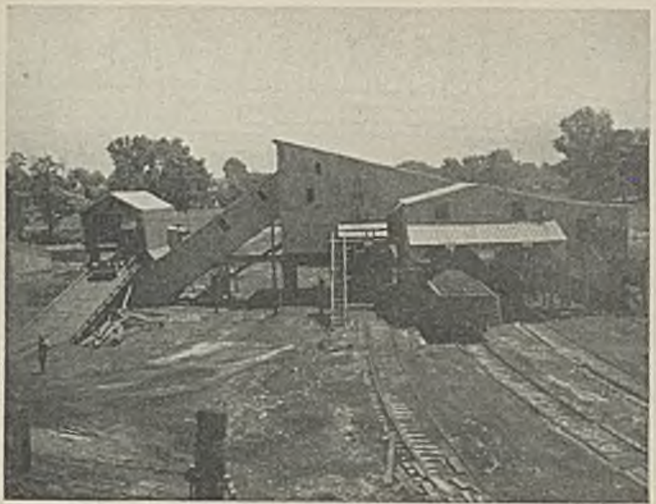
The blue rock is drilled with Jackhamers using $\frac{7}{8}$-in. hexagonal drill steel in the length required. Detachable bits $2\frac{1}{4}$ in. in diameter from point to point (six points) and with side hole are employed. Rock shooting is done with 20-per-cent gelatin and hole spacing averages 8 ft. The same equipment also is used in drilling the coal, which is broken up by pellet powder in $1\frac{3}{4}$x8-in. sticks.

Prior to loading, the top of the coal is cleaned off by a LeTourneau "Angledozer" on a Caterpillar 40 diesel tractor, hand shoveling, wire brushes and com-

Table I—Code Authority Analyses of Certain Sizes Shipped From the Sternberg Preparation Plant

As Received:	1¼-in. Screenings (a)	Egg (b) 3x2-in.
Moisture	10.88	9.56
Ash	9.43	7.60
Volatile matter	34.91	37.51
Fixed carbon	44.78	45.33
Sulphur	3.79	3.46
B. t. u.	11,273	11,837
Moisture-Free:		
Ash	10.58	8.40
Volatile matter	39.17	41.47
Fixed carbon	50.25	50.13
Sulphur	4.25	3.83
B. t. u.	12,649	13,088
Fusion temperature of ash, deg. F.	2,037	2,170

(a) From 2-in. round-hole screenings. (b) From 2x6-in. egg.



Sternberg preparation plant in the outskirts of Boonville. Trucks dump into the 25-ton hopper at the left

Picking on the main shaker and on the belt conveyor leading to the crusher in the Sternberg preparation plant

pressed air. The Angledozer was selected because of the great flexibility offered by its various adjustments, which make possible cleaning by continuous trips lengthwise along the pit, pushing the refuse either to the right or to the left; road building, ditching, and other activities.

The loading shovel dumps directly into 4- or 6-ton end-dump trucks, each owner-driven, which are hired by the hour. To provide a road for the trucks past the shovel, a 12-ft. coal berm generally is left next to the high wall, although under the system of stripping employed all the coal can be loaded without inconveniencing the establishment of haulage roads for removing the succeeding cut. If all the coal should be loaded, which occasionally is the practice, the berm is left intact throughout the length of the pit and then is loaded out in one operation. The trucks in this case operate on the bottom.

Two runways are made into each pit and, contrary to general practice at large strip mines with a long life, are not constructed through the spoil bank but are cut down through the overburden on the opposite side at the most advantageous points. As the stripping advances, new runways are constructed to replace the old, which in many cases necessarily must be made steeper each time a cut is removed. Runways and other roads, after a subgrade has been built up, are surfaced with pickings from the preparation plant.

Planting of trees on spoil banks is a regular practice of the Sternberg Coal Corporation. Such plantings primarily are locusts, with a sprinkling of catalpas, and growths of as much as 6 ft. the first year have been recorded. In ten to twelve years, it is expected, spoil banks will produce a plentiful supply of posts.

Moving under the trade name of Star Hill, a literal translation of the name Sternberg, the product of the various pits is prepared in a three-track cleaning and screening plant making 2-, 3-, 4- or 6-in. lump; 2-, 1½-, 1¼- or ¾-in. screenings; and the corresponding sizes of egg or furnace. Provisions now are being considered for the shipment of nut as a fourth primary size, in which case, by the proper arrangement of gates and chutes, lump would be crushed and recirculated to the main shaker screen by the present return conveyor; egg would be loaded on the No. 3, or lump, track; nut on the No. 2, or egg, track; and screenings on the regular screenings, or No. 1, track. A 175-ton three-compartment bin with filling conveyor is included in the plant facilities to make possible truck shipments of screenings to near-by industries with limited coal-receiving facilities. All other sizes, however, move out by rail.

Coal from the pits is dumped into a 25-ton receiving hopper, from which it is fed onto a chain-and-flight elevating conveyor leading up to the main shaker screen. Screenings made on this screen go either to the screenings bin or to a car on the No. 1 loading track. Lump and egg are picked on the lower section of the screen and then, if only primary sizes are being loaded, pass over bar-type degradation screens to scraper-type loading booms, also equipped with stations for pickers. For breaking down lump or egg or both when required, a 30x30-in. single-roll Jeffrey crusher is installed. This crusher is adjustable to crush down to 2 in., and receives coal from the shaker over a belt conveyor, also provided with picking stations. By means of a chain-and-flight return conveyor, the crusher product can be returned to the main screen or loaded on one or both of the Nos. 2 and 3 tracks, either by itself or in combination with the primary sizes regularly made on the main shaker.

Loading shovel completing work in a box cut. Trucks move by the shovel on a 12-ft. berm of coal. The Angledozer used in cleaning off the coal appears in the rear

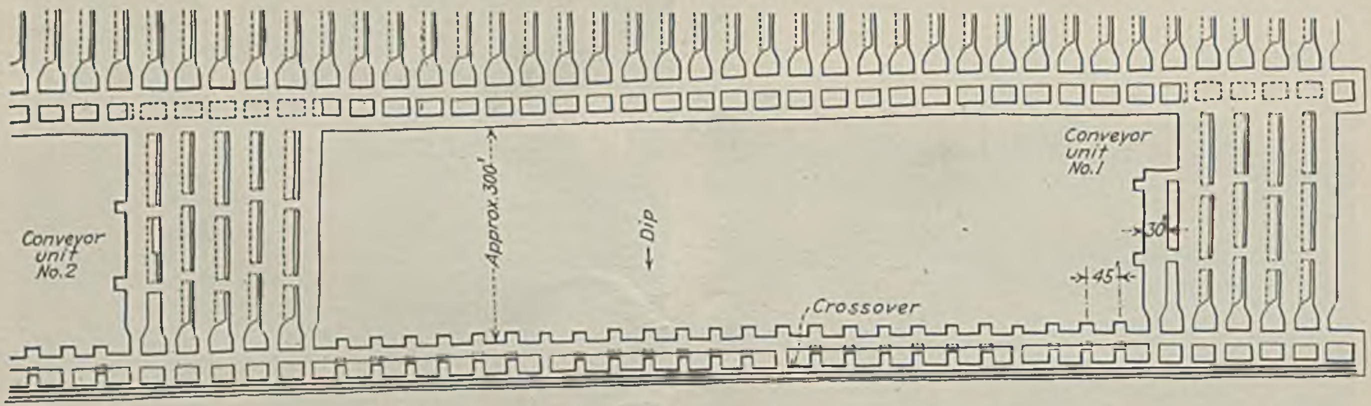


Fig. 1—Diagrammatic sketch of mining plan at Dines. Two conveyors operate on each level, alternating in position

SHAKER CONVEYORS

+ Work in Groups of Two Per Level At Colony Coal Co. Mine

Using shaker conveyors with self-loading heads, the Colony Coal Co., Dines, Wyo., produces 1,200 to 1,250 tons per day with an average of 100 man-shifts underground when working at the winter rate. This output is obtained from eleven shaker-conveyor units, not all of which may be in operation on any one shift, installed in the No. 9 seam, averaging 7 ft. in thickness, and the No. 13 seam, averaging 10 ft. in thickness. Not all of the height is extracted, however, as such bottom coal as remains after cutting is left in place and from 6 in. to 1 ft. of top coal is left up to protect the roof, which is a tender shale.

Average pitch of the seams at the Dines mine is 23 per cent to the west, and they are developed by underground coal slopes driven downhill by pit-car loaders or, in cases where lower levels already are available, uphill by shaker units. With the exception of the pit-car-loader output when downhill slopes are being driven, the entire mine production comes from the shaker equipment.

Except where local conditions require a departure from established practice, mining on each level is done on the retreat from the property line or other limit of entry extension. Entries serving a level are made up of two headings each 16 ft. wide on approximately 40-ft. centers, with the lower heading normally acting as the haulageway. These entries normally are turned off the slope at a slight upward angle to give, as far as possible, a grade of 1 to 2 per cent in favor of the loads, which permits the cars, which are controlled by a retarder (p. 336 of this issue), to move under the conveyor discharge by gravity.

Headings are driven by crews of three men each, making the total for an entry—two headings—with one trimmer and a motor runner, eight. Development work on a level also includes the initial cuts in room necks and chain pillars in anticipation of the installation of room units when the entry is driven to the limit. All working places at the Dines mine, both headings and rooms, are ventilated with 12-in. blowers and Mine-Vent. Consequently, no crosscuts are made for ventilation in rooms and only every 315 ft. in entries.

Equipment employed in advancing an entry consists of two shaker conveyors with Universal loading heads, two Goodman 12AA shortwall cutters with 7-ft. bars and Bowdil chains and bits, two Cincinnati portable electric coal drills, two 12-in. tubing blowers and Mine-Vent, one cross conveyor, one car retarder and one 8-ton trolley locomotive. The loading station for both places is in the haulage heading, where both the haulage-heading conveyor and the cross conveyor, equipped with a side drive (p. 335 of this issue) to allow it to be operated from the aircourse unit, discharge into the same car. Conveyors are positioned 4 or 5 ft. from the lower rib.

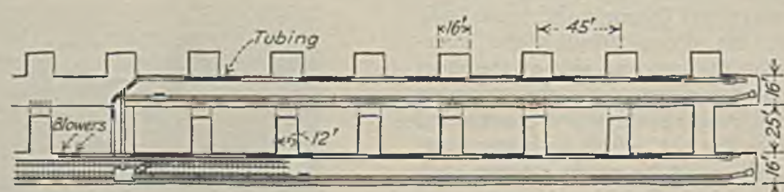


Fig. 2—Details of entry-driving system using cross conveyor to bring all coal to one loading point

Loading stations are established every seventh room in advancing entries, at which places, 315 apart between centers, the entry chain pillar is cut entirely through. From such a station the entry is advanced approximately 100 ft. beyond the next through crosscut and loading station, which permits installation of sufficient track in front of the station to accommodate the locomotive and a reasonable number of cars. As the haulage heading is advanced, three cuts are loaded out of what eventually are the openings through the chain pillar for the room conveyor—made every 45 ft.—and the fourth cut is made but not shot down. Thus, room for the initial conveyor setting is provided.

To balance the output of the two heading conveyors, room necks also are driven in two cuts as the aircourse advances. With the object of facilitating installation of the room-conveyor drive, which is set below the center of the aircourse, this heading is cut so that the bottom is approximately level, rather than with the normal pitch. Thus the fourth cut from the haulage side is made in the bottom coal left in the lower side of the aircourse. Four top holes and two lower, or "buster," holes are used in shooting headings, as a general rule, and each round is loaded with eleven to twelve sticks of pellet powder.

The haulage heading at Dines is double-tracked with crossovers at approximately every other through crosscut to facilitate trip movement. These crossovers are laid so that the car can be stationed on them in a position approximately parallel with the center line of the heading while being loaded. Positioning of the car on the crossover or on the lower track applies only in driving headings, however, as the upper track customarily is used when loading room and pillar coal.

Units driving rooms and pulling pillars at Dines are limited to two per entry, or level, each in a single place. One such unit, consisting of a 25-hp. Eickoff, Cosco or Goodman shaker conveyor with Universal loading head modified to suit operating conditions at the mine, mining machine, drill, blower and tubing, is set up at the inbye end of the entry. The other, if the entry is of sufficient length, is installed just outbye the fourth crosscut from the first, or approximately 1,200 ft. nearer the slope. When the first works out to where the second started, the first is moved approximately the same distance ahead, the two units thus alternating in position on the retreat to the slope.

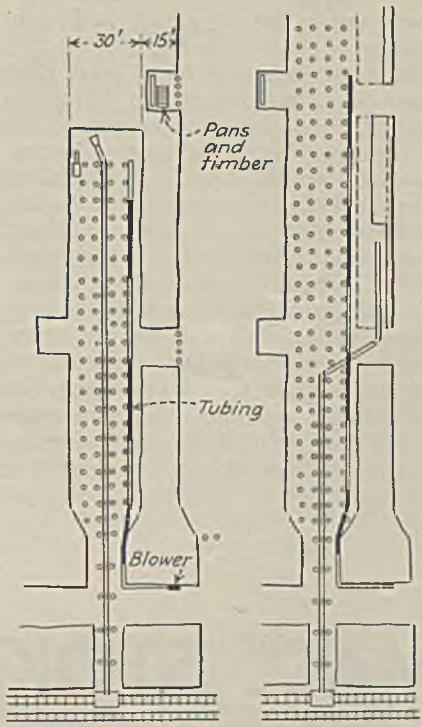


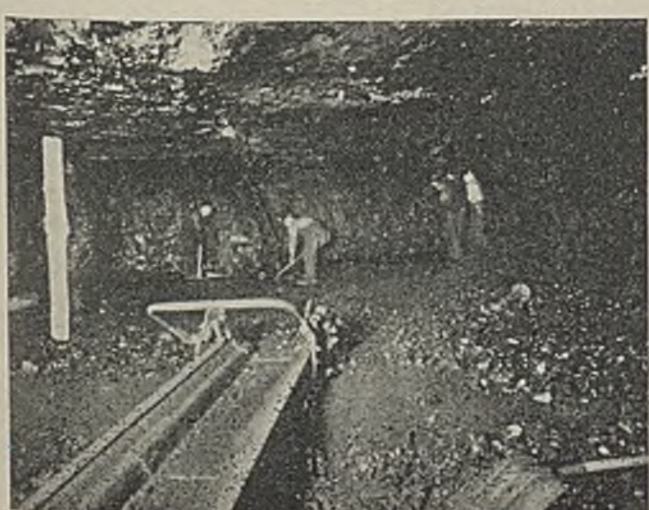
Fig. 3—Left, room-driving plan; right, method of slabbing room pillars

Rooms are driven approximately 30 ft. wide on 45-ft. centers directly up the pitch to a depth of about 300 ft., depending upon the distance to the upper level. The pillar is robbed back immediately, and driving and robbing include recovery of as much of the coal in the stumps and pillars on the upper level, previously worked out, as possible. Crews on room units are made up of a trimmer on the heading; two machine men, who cut, drill, load holes and shoot; one loading-head operator and two face men. All men at the face, however, are available for other than their regular tasks, and the crew does all the work necessary in advancing the room and removing the pillar.

Conveyors are fitted with troughs 13 ft. long, allowing two 6½-ft. cuts to be taken out before an extension is necessary, and are suspended from posts by chains fastened to hooks welded to the pan connectors. The conveyor is carried on the center line of the room and the loading head is moved from side to side with the tail rope of the cutter or with a crowbar. Operations at the face are based on cleaning up one side of the cut, usually the left, at the start. As soon as room is available, drilling of the shotholes is begun and follows the loading across the face. Six holes, loaded with an average of fourteen sticks of pellet powder, normally are drilled in a 30-ft. face. When loading is completed, the cutting machine moves over to the right-hand corner, sumps in and starts to cut. Other crew members meanwhile extend timbers, add a pan if necessary, extend the tubing and perform any other necessary work, after which the face is shot down and the process repeated. One six-man crew under this system has loaded as high as 123 cars, holding an average of 3,300 lb. of coal each, in seven hours.

Crosscuts on approximately 100-ft. centers are driven two cuts deep in the left-hand rib as the room advances. These, as indicated above, are not for ventilation, which is supplied by a

Cutting and drilling at the face of a room at Dines mine in preparation for another loading cycle after timbering and other activities are completed



Start of operations on a freshly shot cut of coal. When one side of the place has been cleaned up, drilling and other face-preparation activities will begin

blower and tubing, but instead serve as storage spaces for pans and timber released from service when retreating out of a place. Consequently, as a room advances, it cuts into a crosscut from the previous room every 100 ft., in which the crew finds all the pans and timber necessary for the next 100 ft. of advance. In addition to the two rows of timbers from which the conveyor is suspended, two other rows, one on each side, are carried forward as the room advances.

Upon completion of work in a room, all but 2 or 3 ft. of the pillar on the right is removed by slabbing. While the last cut is being loaded at the face, the cutting machine moves back to the lower end of the inbye pillar and starts making a cut up the pitch to the top. The conveyor is broken and a ball joint and swivel are inserted to bring the end of the shaker into position at the lower end of the cut, whereupon loading proceeds up the pitch. The loading head is left off the conveyor in loading the slabbing cut. A second slabbing cut is made when the first is completed, finishing operations on the pillar, whereupon the process is repeated on the next lower pillar, the pans for the upper section being stored in the crosscut to the left of the place. Upon completion of slabbing operations, the timbers are pulled and stacked in the crosscuts, which are protected by a row of breaker posts. A row of breakers also is set in the room neck and the place is allowed to cave. Caving usually extends to the surface, although that is not desired because of difficulties with ventilation, entrance of moisture and danger of fire from crush and spontaneous combustion.

An 8-ton gathering locomotive on each level handles empty and loaded cars between the conveyor stations and the slope landings. Cars are controlled under the conveyor discharges by the retarders referred to above.

W. D. Bryson, Dines, Wyo., is manager of operations for the Colony Coal Co. Louis LaSalle is mine superintendent.

HOW DO SMALL STOKERS

+ Fit Into Merchandising Program On Coal for Residential Heating?

THAT the small stoker is the most effective weapon the coal industry can employ in defending its domestic markets against further encroachments by oil and gas no longer is seriously challenged. Any lingering doubts on that score are dissipated by the steadily increasing volume of sales. Only four years ago, oil burners were outselling their coal rivals in heating service at the rate of nearly 10 to 1; last year, however, the ratio was less than 4 to 1. Moreover, in 1936, stoker units outsold gas-burner installations by more than 2 to 1. And the stoker sales-curve is still rising.

Figures compiled by the Bureau of the Census from reports from manufacturers who produced approximately 91 per cent of the total value of the stoker-industry output in 1933 show sales of 14,212 Class 1 units (stokers with a capacity of less than 100 lb. of coal per hour and designed for residential use) in that year. The following year, sales rose to 23,214 units, and last year the total was 41,126. Sales of Class 2 units (stokers with a capacity of 100 to 200 lb. per hour and suitable for apartment houses and small commercial heating jobs) were 1,206 in 1933, 2,282 in 1934 and 3,162 units in 1935.

The sales record for the first five months of the current year shows 13,075 Class 1 and 737 Class 2 units. For the corresponding period last year the totals were 6,062 and 528 units, respectively, and for 1934 they were 3,452 and 370 units, respectively. During the January-May period in 1933, sales of only 2,093 Class 1 and 121 Class 2 units were reported. Sales of Class 1 units during the first five months of 1936 were more than double those reported for the corresponding period in 1935, and the combined total for Class 1 and 2 units was 109.6 per cent ahead of last year.

How Can Gains Be Increased?

Gratifying as these gains are, the real goal will not be reached until installations of residential stokers overtop the combined totals for all competitive fuels. The problem then is what is being done and what more can or should be done to accelerate the rate of growth in stoker sales. Is it a question of price? Is present equipment adequate? Are coal producers doing their part in preparation and sizing? Is the service offered by retail coal merchants all that it should be? Can the merchandising and distribution set-up of the stoker manufacturer be improved? Should relations between manufacturers and the coal industry be closer?

Many producers believe that the solution of the major problem lies in their more active participation in stoker selling. In several cases, operators have become district agents for equipment adapted to the successful burning of their coals. Ground-floor offices have been turned into stoker display rooms. Going a step farther, some producers have taken over the entire output of a manufacturing plant, which they market under their own name. In a still larger number of cases coal operators have financed development work in coal-burning equipment and later, in some instances, have carried on merchandising activities either through their own sales departments or through a subsidiary company.

Two anthracite companies are definitely in the manufacturing field with stokers for burning buckwheat and rice. A third producer—one of the largest in the industry—markets a chestnut-coal stoker through an affiliated organization. Certain other hard-coal interests are known to be studying the possibilities of selling a stoker line bearing their own trademarks. A few bituminous companies also have entered the stoker-manufacturing field either directly or through affiliates. The most recent large-scale venture is that of a low-volatile producer who is now making a stoker custom-built for his coal.

As an alternative to the direct invasion of the manufacturing field by the coal producer, it has been suggested that arrangements be made with existing manufacturers to build stokers specifically designed for uniform performance results with the coals of a particular operator who would market the equipment as his own through his retail-dealer outlets. Under this plan, by minor changes in design or adjustment, the same manufacturer might be able to turn out individualized lines for a number of coal companies. Such a plan, it is argued, would not only appeal to the retailer, who would be assured that the stoker was specially adapted to the coal he was selling, but also would reduce manufacturing and distribution costs and thereby widen the market for such equipment.

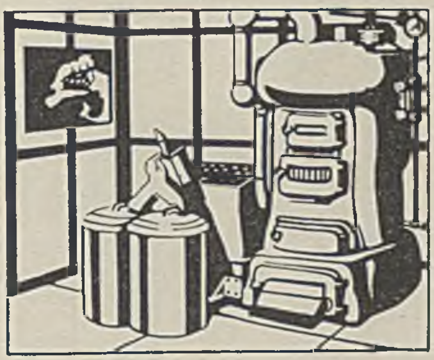
While the idea of a stoker specially designed to burn the coals of a particular district is indorsed by many producers, most mining companies that have given special study to supplying coal for stoker use do not favor stokers built for and sold by an individual producing company. The major opposition, as revealed in a survey of this group by *Coal Age,* is based on the conviction that such a plan would increase competitive difficulties by destroying opportunities for cooperation between the individual producer and the manufacturers as a whole. Some producers, in fact, emphasize their complete divorcement from manufacturing and stoker sales in promoting the use of stoker equipment.

Against Limited Selection

"The stoker owner," says one coal-company executive, "ultimately will prefer a machine that permits him a fairly wide latitude in the choice of coal to be used. If a coal producer markets his own stoker, other stoker manufacturers likely will work against the use of his coal. The chances are most retail dealers buying other coals will foster the idea that buyers of his stoker are limited to one source of supply. The problem of stoker service, which is beyond the present service facilities of most coal companies, also enters. It would seem much better for the coal producer to prepare his product in such a manner that it would perform to best advantage in the largest number of stokers merchandised in the area of his economic distribution."

Although many retail coal merchants have been quite successful as stoker salesmen, only a minority look kindly upon the idea of tying up with a stoker ostensibly limited in its use to the coal of a single producer. In some communities, too, coal-dealer hostility to the stoker still persists because overemphasis has been placed upon low-priced fuel and, in the competitive scramble, margins on stoker coals have been unduly depressed. "Our business is selling coal, not equipment," expresses the attitude of retailers who fight shy of equipment-servicing obligations and also echo the opinion of the operating group that fears too close identification with one particular make of stoker will multiply their competitive difficulties.

In the endeavor to serve the growing market for domestic stoker coals, special treatment and sizing have been adopted by an increasing number of producers. Approximately 80 per cent of the operators covered by the *Coal Age* survey either wash or spray their stoker coal. Spraying with oil, calcium chloride or some proprietary solution is done as a regular routine by about half the producers treating coal; in the case of the other half, such treatment is optional with the buyer. Oil treatment is the more popular. Where an extra charge is made for the treatment, the average is 10c. per ton in territory east of the Mississippi River; some Rocky Mountain producers charge 25c. The use of magnets to remove tramp iron is growing.



Except in the case of one burner designed for chestnut, buckwheat and rice are the sizes recommended for anthracite stokers by both equipment manufacturers and coal producers. With bituminous stokers, manufacturers usually do not recommend a top size larger than 1¼- or 1⅜-in., with the lower limit—except on slack—at ⅛-in. Professor Mitchell, speaking at the Urbana Short Course in Coal Utilization (*Coal Age,* July, 1936, pp. 305, 306), expressed the opinion that, to avoid noise, the top size should not exceed 1-in. Sizes actually available for stoker use, however, cover a much wider range. In addition to straight or modified 2-in., 1½-, 1- and ¾-in. screenings, Illinois, for example, offers 2x5/16-in., 2-in.x28 mesh, 1½x¾-in., 1½x5/16, 1½x¼, 1¼x¾, 1¼x5/16, 1¼x¼, 1¼x48 mesh, 1x5/16, ⅞x8 mesh, ¾x5/16, ¾x¼, ¾x⅛, 5/16x10 mesh, 5/16x48 mesh and ¼-in.x10 mesh.

The Indiana range includes: 2x1¼-in., 2x¾, 2x⅜, 2x½, 2x48 mesh, 1½x¾, 1½x10 mesh, 1¼x¾, 1¼x½, 1¼x⅜, 1¼x¼, 1¼x⅛, 1¼x48 mesh, ¾x½, ¾x⅜, ¾x⅛, ¾x10 mesh and ¾-in.x48 mesh. Eastern Kentucky has 2½x1/16-in., 2x⅜, 1½x⅜, 1¼x⅜, 1¼x¼, 1x¼ and 1x⅛-in., while the western part of the State offers, among other sizes: 1¼-in. nut-and-slack, 1¼x¾-in., 1¼x⅜, 1¼x¼ and ¾x⅝-in. Southern Ohio sizes include 1½x1-in., 1½x1 with 15 per cent slack, 1¼x⅜-in. and 1½-in. nut-and-slack. In the Maryland-Pennsylvania group, the average range is from 2x1-in. down to 1x½-in. or 1-in. slack.

Virginia stoker coals include 2x1¼-in., 2x⅝, 2x⅛ and 1¼-in., 1- and ¾-in. slack. In addition to 2-in., 1- and ¾-in. nut-pea-and-slack, 1¼x¼-in., 1⅛x⅝ and 1x2-in. sizes are on the stoker coal list of the West Virginia high-volatile districts. The West Virginia low-volatile stoker-size range takes in 1¼- and ⅝-in. slack, 1¼x⅝-in., ¾x¼, ⅝x⅛ and ½x¼-in. coals. In the Southwest, 1¼-in. seems to be the top size, while the range in the Rocky Mountain States is from 1⅝-in. slack and 1½x1-in. pea-and-slack down to ¾-in. screenings. Because of mixing and resizing facilities, the specific sizes mentioned in these paragraphs must be considered merely as indicative of the sizes available rather than as an all-inclusive list.

Consumer Reactions Favorable

Retail and consumer reactions to stoker coal generally have been extremely favorable. At times complaint is made that the coal has too many fines or makes too large clinker. Most complaints, reports one operator, are due to faulty adjustment of the stoker, but "by far the most serious are due to inefficient dustless treatment." Faulty adjustment, particularly of air controls, and improper application, including installations too small for the job, are frequent causes for dissatisfaction. Improper installations and manipulation loom large on the complaint scoreboard. Over 90 per cent of the complaints received by one large company were chargeable to lack of understanding of what a stoker can do, how it should be operated and what coal "is best adapted to deliver the results desired."

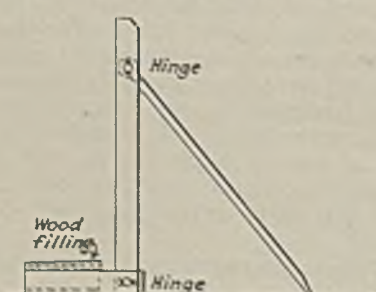
Definite determination of the average increased demand for coal for domestic stokers is impossible because available statistics in most cases are not sufficiently detailed. Many of the same stoker sizes move in both industrial and retail channels. The question of how long a producer has been serving this market also enters into the picture. Individual estimates of increases in tonnage in 1934 over 1933 range from a loss of 28 per cent (due to industrial declines) to an increase of 55 per cent. Comparing 1935 with 1934, increases from 1.4 per cent to more than 100 per cent are reported by individual producers. Apparently the market is worth cultivating.

NOTES
From Across the Sea

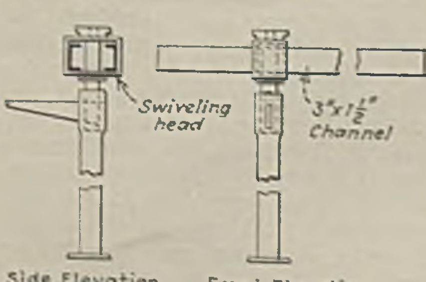
AT THE MINE of the Wemyss Coal Co., 20,000 steel props are in use, all of which are made of 60-lb. steel rail, 4½ in. from top of ball to base of rail. The ball and web are cut off one end of the rail and the base of the rail is bent over the end so as to extend down over the ball 3 in. This curved end is set against the roof and the lower end is left flat.

Prior to the introduction of steel props, says *The Iron and Coal Trades Review*, the roof was regarded as bad, but by use of these props it has become good. A wood cap is used over the top of the prop, and above the cap a corrugated steel cap or "bar" is driven. All props are withdrawn, and withdrawal is carefully supervised, with the result that over a period of twelve months prop renewals have cost only 0.1c. per ton, and the cost of steel caps is slightly lower.

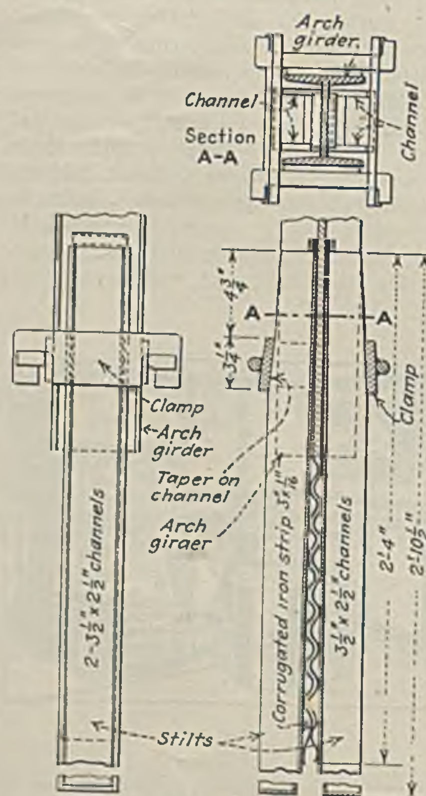
Head of Wemyss standard steel prop



Gib and rance to keep pitching coal from falling forward



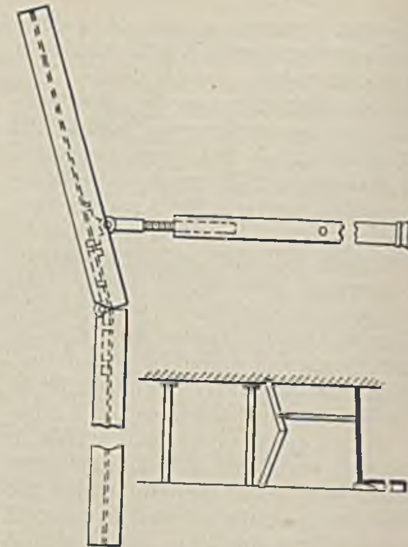
Safety prop with cantilever



Steel stilt for steel arch

At first, steel arches were set on wood stilts, and the latter were never recovered. The stilts were sometimes tightly engaged by their bolts and sometimes were quite loose, dependent on the care with which the workmen adjusted them. Consequently, the resistance of the several arches to the settlement of the roof was unequal, and an arch might settle on one side more than on the other under equal roof pressure. A steel stilt has now been introduced with a tapered clamp that is driven by the blows of a hammer to the end of a taper on one end of the stilt, which stilt consists of two channels, forming jaws, held apart beyond the taper by a corrugated iron strip that can be made of such an anti-flattening strength that it will give the desired resistance to the downward movement of the arch. The stilt clamp is erected after the arch is in position, and pressure is applied to the jaws by a few sharp blows with a hammer, causing the clamping plates to ride over the inclined faces and thus put the stilt under load.

In this country a post occasionally is set against the face of the coal to prevent it falling after being undercut, a block being set between the coal and the post. Where at the Weymss colliery the coal seam rises sharply the device shown is used. It embodies a "gib," or arm,


Over-rance and toggle post keeps coal face from tippling

placed under the coal; a "rance," or light steel prop, set close to the face and a back-stay holding the rance in place. Another arrangement, known as an "over rance," has a two-piece support forming a toggle, or angle. A screw jack attached to the upper part of the support when tightened to refusal holds the coal in place, being supplemented by a wedge under the coal near the face of the working. Another safety provision is a service prop with cantilever, the latter embodying two 5x1½-in. channels. Thus accident prevention at the Wemyss colliery is not "wishful thinking" but mechanical provision.

IN NO CASE, said M. A. Hogan, Safety in Mines Research Board (British) at the Midland Institute of Mining Engineers, had he found corrosion-fatigue in a galvanized rope. Some ten years ago the investigators of the Board had found galvanized ropes that were definitely inferior because at that time apparently the galvanizing process was not so thoroughly understood and the steel in the wires was injured through heat-treatment. Some people condemned the use of swivels, but they have been used in important installations at many collieries without marked damage to the rope. They should not be used on any rope in which the several layers are twisted in contrary sense to prevent rotation. In a locked-coil rope, where the outer layer is wound in a contrary direction to the inner, tampering with the twist of a rope will give immediate trouble, because once the balance between the layers is upset, one strand of wires will become overloaded and another will lose its true share of the load and the overloaded strand will fail. But, in a simple Lang-lay rope with round strands, conditions are not quite so bad, because a slight untwisting does not cause any fundamental change in the stress distribution of the rope.

Wörnle's test, Mr. Hogan stated, showed that a Lang-lay rope, if wound over a flat cylindrical surface, has only about 40 per cent of the life it would have if used in a properly grooved pulley. A flat cylindrical drum shortens the life of a round-strand winding rope.

Antiseptic to prevent decay of the cores of winding ropes is under consideration, but any antiseptic strong enough to prevent bacterial action in the core is usually much more corrosive than the weak acid resulting from bacterial decomposition. A harmless antiseptic has yet to be found.

A long rope, added Mr. Hogan, is less subject to injury by shocks than a short one, and this to some extent explains why most of the trouble with ropes is found near the capel end, because the shocks on decking affect a much shorter rope length and are, therefore, more severe than the shocks at pick-up, although in the latter case a heavier load is being lifted. A big hoisting engine probably is more accurately controlled than a small one and both accelerating and retarding forces work more smoothly. In a deep shaft the weight of the rope safeguards it from damage at pick-up, so that a lower factor of safety is admissible for a deep shaft than for one that is shallow.

R. Dawson Hall

On the ENGINEER'S BOOK SHELF

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

Laboratory Studies of the Inflammability of Coal Dusts: Effect of Fineness of Coal and Inert Dusts on the Inflammability of Coal Dusts, by A. L. Godbert and H. P. Greenwald, U. S. Bureau of Mines. Bulletin 389, 29 pp., paper. Price, 5c.

Notes on Testing the Explosibility of Coal Dusts and a Proposal to Have an International Test Method, by George S. Rice and H. P. Greenwald, U. S. Bureau of Mines. Information Circular 6878, 8 pp.

Both the United States and Great Britain have been endeavoring to find a simple method of testing coal dusts that will give "inflammability" values comparable with those of "explosibility," made at great expense and labor, in experimental mines.

Methods in use at Sheffield, England, and developed by the Safety in Mines Research Board, says the first publication, were to blow the dust downward through a vertical-tube furnace heated electrically to 700 deg. C. The dust was carried through the furnace by a blast of oxygen under a pressure of 30 cm. of mercury.

All dusts passed a 150-mesh screen with 0.0033-in. openings and were held in a 200-mesh screen with 0.0025-in. openings (Institution of Mining and Metallurgy standard sieve scale) and were mixed with incinerated fullers earth. "Inflammability" of a coal dust was measured by the least proportion of the inert dust required in a mixture to prevent flammation on passing through the furnace. To promote accuracy, the test was made severe, but the values of "inflammability" were about ten times as great as the explosibility values as determined in the Board's gallery at Buxton, introducing difficulties in translating laboratory results to the larger-scale tests.

So the U. S. Bureau of Mines used air instead of oxygen, still using calcined fullers earth as the inert dust. It also provided a pressure of 42 cm. of mercury, and results most comparable to experimental mine tests were found at 720 deg. C. The "inflammability" is measured by the percentage of inert material in a mixture that just suppresses flammation in the laboratory furnace. A few figures are quoted in a table herewith, the meshes described being of the Tyler standard.

British coals the percentages of volatile matter of which by ash-and-moisture-free analysis were equal to those of American coals were less flammable than the latter coals, but on passing above 37 per cent volatile matter the British coals seem to approach American coals in their flammable character and at 40 per cent might be expected to be more readily ignited.

Taking the 20-mesh x zero coal dust and removing the —200-mesh fraction, the coarser coal was mixed with the finer in seven percentages. The calcined fullers earth was similarly screened, and the inert dust mixed in seven similar proportions. In the table given, only those figures which relate to tests with the —200-mesh inert dust will be used and only those figures given that have reference to Pittsburgh coal from Allegheny County:

Coarse Dust	Fine Dust	Inflammability Percentage
100	0	38
90	10	50
80	20	61
70	30	64
60	40	71
30	70	75
0	100	80

It may be added that with an increase of the percentage of fines in the inert dust less of that dust was needed to prevent flammation in every instance. Conversely, with an increase of the percentage of the fines in the coal dust, more inert dust was needed to prevent flammation.

The second publication is complementary to the first and was presented at the International Conference on Mine Safety Research held at Dortmund, Germany, Sept. 23-28, 1935, and just released. It details the conditions which enable an explosion to occur and be maintained, and the difficulties against which an explosion must contend, and urges that all tests must be made with these conditions clearly set forth. No results should be considered as apart from these conditions.

"Inflammability" of American Coal of Varying Size

State	County	Bed	Percentage of Inert Dust Needed to Suppress Flame: With Minus 20-Mesh Coal Dust	With Minus 150- to Plus 200-Mesh Coal Dust
W. Va.	Raleigh		14	
W. Va.	Mercer	Pocahontas No. 6	20	
Pa.	Somerset	Lower Kittanning	29	
Pa.	Cambria	Upper Kittanning	40	
W. Va.	Fayette	Sewell	48	
Ala.	Jefferson	Mary Lee	56	
W. Va.	Fayette	Sewell	57	56
Pa.	Fayette	Pittsburgh		69
Ky.	Letcher	Elkhorn		74
Pa.	Allegheny	Pittsburgh	64	65
Ill.	Saline	No. 5	61	67
W. Va.	Boone	Alma		71
Utah	Carbon	Book Cliffs	65	70
Ky.	Union	No. 9	67	71
N. M.	Colfax	Raton	67	73

Mine Plant Design, by W. W. Staley. McGraw-Hill Book Co., Inc., New York. 386 pp., 5¾x9 in.; cloth. Price, $5.

This volume brings together information that will enable the mining man to design structures and mining plants so that their capacities and strengths will be equal to the demands made on them. It does not enter into the matter of planning structures, but rather of building them when planned and arranged; thus it is adapted almost equally for the use of every kind of mining engineer whether working at a coal or at an ore mine.

Several pages are given to the graphic statics underlying the design of simple beams, roof trusses, footings and head-frames; this is followed by a chapter on mine hoists, another on the handling of water, the measurement of water flow and mine pumps. Compressed air and mine haulage follow, with the care of batteries. These are followed with consideration of the power-plant problem, including a section on diesel-oil engines and accessory equipment; also the measurement of brake horsepower. Mine ventilation has a brief section dealing rather with resistance of airways than with mine fans.

As the author says in his preface: The mining engineer often has to use transferred or second-hand equipment and must be prepared to determine the size and nature of the requirements. At other times the manufacturer supplies the plant and furnishes, beforehand, plans and specifications, but the engineer, nevertheless, should be able and prepared to check these, so that he can be assured that they will render safely, efficiently and surely the service demanded of them. This book furnishes the means by which such demands may be determined, and by which the strength and capacity which each part must develop can be appraised.

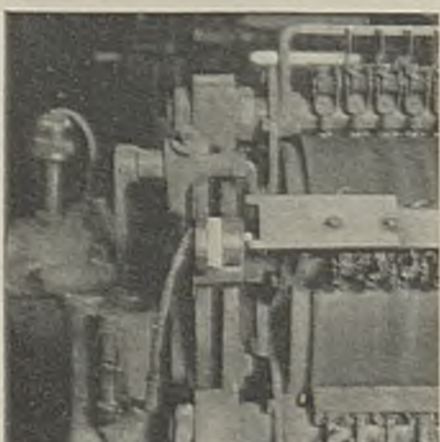
OPERATING IDEAS

From Production, Electrical and Mechanical Men

Converter Control Improved By Adding Snap Switch

An ordinary surface-type snap switch, two pieces of fiber and a few feet of control wire are the only materials required to protect a manually controlled synchronous converter against accidental loading when only the pilot brushes are engaging the commutator. The accompanying illustration shows the snap-switch arrangement thus applied by W. C. Porter, electrical engineer, Powellton (W. Va.) division, Elkhorn Piney Coal Mining Co.

The fiber base on which the snap switch is mounted is fixed to the brush holder supporting yoke. When the brushes are raised the switch is snapped "off," and when the brushes are lowered it is snapped "on." This switch is connected in series with the holding coil of the manually operated d.c. single-pole breaker which ties the machine positive to the substation bus.



Raising the brushes operates the snap switch and deenergizes the holding coil of the d.c. manual breaker

Obviously if the machine brushes are not engaged, the breaker armature therefore will not stay up when raised by hand preliminary to closing the breaker and then the knife switch to throw the mine load onto the machine. Failure to lower brushes appears to be the operating error committed most commonly with manually operated synchronous converter substations. Those substations which have not been converted to automatic starting are located as a rule close to the mine portal and are operated without regular attendants and therefore are likely to be started by men who may forget to lower the brushes. The snap switch stands guard to warn against this possibility.

Rigid Conduit Forms Duct For Locomotive Cable

An insulated rigid-conduit cable guide and a special compartment for jack and rerailers are included in a design employed by the New River Co. in rebuilding locomotives for operating in lower coal. The provision for storing the jack makes it practicable and convenient to comply with a new West Virginia law requiring every mine locomotive to carry a jack.

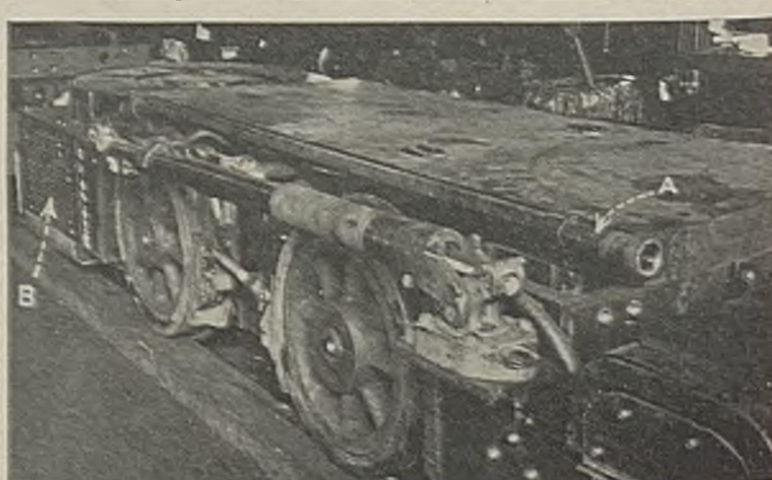
The accompanying illustration, from a photograph made in the central shop at Mt. Hope, shows the thirteenth locomotive of its type to be rebuilt since the work was started somewhat over a year ago. It is a 6-ton General Electric machine with No. 823 motors, and the conductor cable reel, originally on top, was moved to a space provided at the end by lengthening the frame. The reel used is the General Electric CY21 Form F type.

Instead of carrying the trailing cable under the locomotive covers to the controller end, a conduit for guiding the cable was installed on the side of the frame level with the covers but outside of the frame. This conduit (*A*) is insulated from the locomotive frame to lessen the chance of the cable insulation breaking down and also to prevent arcing in case a bare spot does develop unseen on the cable.

The conduit, 1½-in. black pipe 7 ft. 8 in. long, is fitted with specially made brass bushings screwed onto the ends. These bushings are flared and polished on the inside to minimize wear on the cable. For its full length the conduit is covered with an insulation consisting of two layers of oiled linen applied half-lap and two layers of surgical tape. The conduit and each layer of insulation as applied are given a coat of General Electric No. 880 protective paint. Clamps securing the conduit to the locomotive frame fit over the insulation.

The compartment for one jack and two rerailers occupies a space to one side of the reel and the perforated door to this compartment is indicated by *B* in the illustration. This door is held at the bottom by a flange and at the top by two harness snaps hooked in metal loops

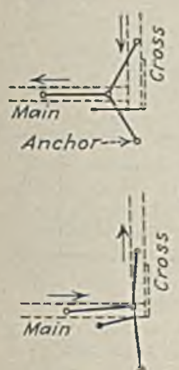
Rebuilding to lower dimensions included several improvements



which extend through slots in the door. These snaps are secured by chains to prevent loss. To gain entrance to the compartment the snaps are removed from the loops and the top of the door is pulled away slightly and then lifted free. Use of a door without hinges insures more certain and less obstructed access and eliminates the chance of an open door left swinging in a dangerous position.

Conveyor Runs Cross Unit Through Side Drive

After considerable experimentation with and development of earlier types, officials of the Dines (Wyo.) mine of the Colony Coal Co. evolved the side-drive shown in the accompanying illustrations



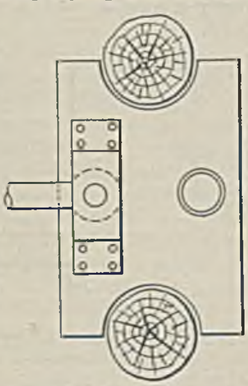


Fig. 1 (Left)—Showing how the motion of the main conveyor is imparted to the cross conveyor; Fig. 2 (Right)—Plan view of anchor

to permit operation of a cross or other conveyor of the shaker type from the main conveyor. Such a drive has as one objective the elimination of a regular

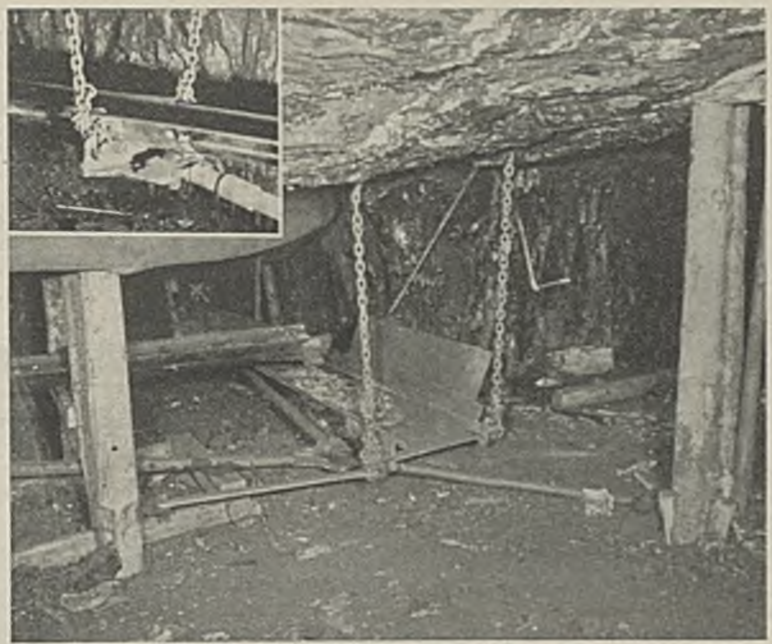


Fig. 3—General view of side drive. Inset shows method of connecting driving arms to conveyor lines

drive for the cross conveyor. Another objective was the imparting of a stroke parallel with the center line to the cross conveyor. Conveyors at Dines are suspended by chains from posts or the top.

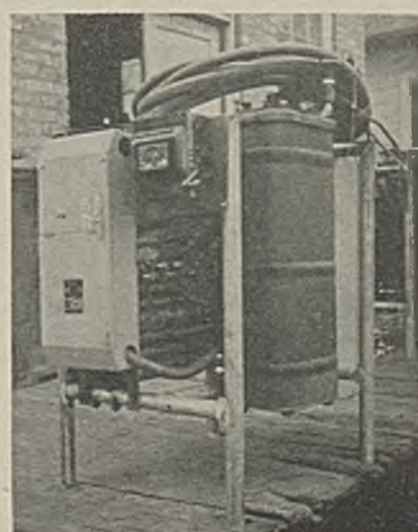
The drive consists essentially of a main driving rod connected to the main shaker conveyor, a secondary driving rod connected to and operating the cross conveyor, an anchor rod and anchor, and a radius rod for holding the cross conveyor in position against the thrust of the main driving rod. The two driving rods and the anchor rod are connected by a common shaft, or pin, so that as motion is imparted to the main driving rod the connection point is correspondingly displaced, thus causing a similar motion, but at right angles, to be transmitted through the secondary driving rod to the cross conveyor, as indicated in Fig. 1. The anchor rod works in an anchor plate constructed as in Fig. 2, which shows the semicircular cutouts in which posts are set, as well as the cup for a screw jack. The pin to which the anchor rod is attached is held in a strap riveted to the anchor plate. Connections between the driving rods and the conveyor lines are made as in the inset in Fig. 3, which is a general view of the side drive.

Conveyor and Cutter Controls Combined in One Unit

Controls for the conveyor and cutting machine included in a loading unit at the mines of the Union Pacific Coal Co., Rock Springs, Wyo., are combined in a single unit equipped with the necessary leads for connection to the 250-volt d.c. circuit and return. The units making up the control are mounted on a welded $1\frac{1}{4}$-in. pipe frame and consist of a 200-amp. E.C. & M. Type A safety switch with knockouts and terminals for attaching the cutting machine cable; a 100-amp. safety switch of the same type as the first and connected in parallel with it to serve the conveyor motor through a Cutler-Hammer drum-type controller and a Post-Glover resistor; and a Bulldog safety switch for light circuits mounted beside the 100-amp. safety switch. Like the 200-amp. safety switch, the 100-amp. and lighting switches include knockouts for convenience in attaching the various circuits.

As indicated in the accompanying illustrations, the drum controller is mounted on the front of the pipe frame with the resistor behind it. The 200-amp. safety switch is installed on one side of the frame and the 100-amp. and lighting switches on the other. The return from the 200-amp.

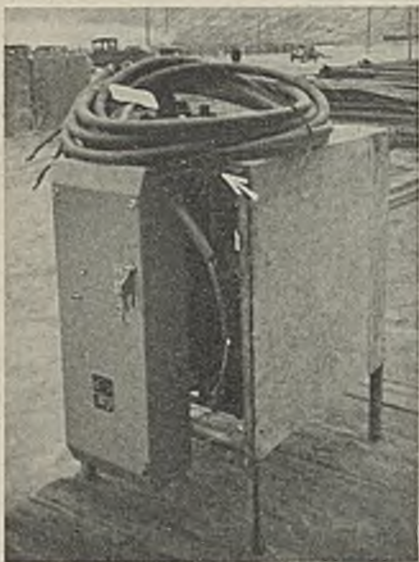
Half-front view of control unit, showing 100-amp. safety switch, lighting switch, drum controller and, in the rear, the resistor



★ ★

Elbow Grease

KEEPING a mining operation running efficiently naturally requires the expenditure of that form of effort picturesquely termed "elbow grease." But the use of elbow grease is not the whole story, as this commodity, like other types of lubricants, can be increased in quality, reduced in quantity and applied in the proper manner for smoothest operation. Knowledge, of course, is the best means of obtaining these objectives, which this department is organized to supply to coal-mining men. To help us do this, we solicit the short-cuts to lower cost, higher efficiency and greater safety developed by operating, electrical, mechanical and safety men throughout the industry. So send yours in, along with a sketch or photograph if it will help to make it clearer. *Coal Age* will pay $5 or more for each acceptable item.



Half-rear view of unit, showing main leads and 200-amp. safety switch mounted on frame. The ground bolt (arrow) appears on the top of the frame at the right. The length of three-conductor cable on top of the control unit is used to make the connection to the conveyor motor.

main switch is connected to a ground bolt on the frame, which also permits attachment of the main return wire to the track or other circuit. When the unit is in place in the mine, a safety ground circuit is installed between the conveyor frame and control frame. Conveyor drives at Union Pacific mines are equipped with 25-hp. motors; cutting machines with 50-hp. motors. Weight of a control unit completely assembled is 178 lb.; height is 36 in.; floor space, 22x24 in.

Old Feed Drums Used In Car Retarder

Retarders for controlling trips under conveyor discharges are built around discarded feed drums from cutting machines at the Dines (Wyo.) mine of the Colony Coal Co. A few retarders have been built up from pipe, but feed drums are preferred because a braking surface already is available on the drum.

In constructing the retarder, a crank is added to the drum shaft to permit winding up the rope by hand after it has been paid out. The drum is then mounted in brackets made of steel bars welded to a base of steel plate bent in the form of a right angle. Strap brakes are provided for each braking drum and are attached to arms fitted with counterweights.

To allow the drum to revolve and pay out the rope the counterweights are raised by a cable running over pulleys to a lever at the car trimmer's station. Releasing the lever allows the counterweights to drop and lock the drum against movement. The free end of the retarding cable, a wire rope, is fastened in the coupling link between two cars, using a clevis and pin.

Retarder in place ready for service

Working Hints From a Shopman's Notebook; Cutting New Spur-Gear Teeth

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

CUTTING new teeth in a 24-in. spur gear with a 2$\frac{1}{2}$-in. face on a 10-in. hand milling machine is described below. A total of twelve teeth were broken out of the gear, six in one place and single teeth at other places. The gear was first preheated so that it was hot enough throughout to permit building up with an acetylene torch the places where the teeth were broken out. More metal than was required was added to permit machining. After welding, the gear was put back in the preheating fire until next day.

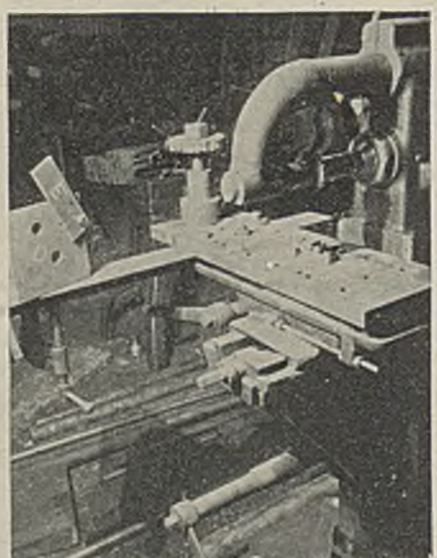


Fig. 1—Showing equipment employed to hold gear firmly while new teeth are being cut

No cutter was on hand to cut the new teeth to the proper shape and the table on the milling machine had only one T-slot for bolting down parts. To hold the gear to the table, I used a piece of 1x2x24-in. cold finished bar steel drilled with a 1-in. hole 4 in. from the end and two other $\frac{5}{8}$-in. holes near the center for bolting the bar to the table, as in Fig. 1. A piece of $\frac{5}{16}$x2x3-in. angle was bolted to the bar against the end of the table.

Next, a piece of 4$\frac{7}{8}$-in. shaft was chucked in the lathe and a 1-in. hole was drilled through it, after which the shaft was turned down to the same size as the bore in the gear (1$\frac{13}{16}$ in.) for a distance of 3 in., leaving a 2-in. shoulder (Fig. 2) for the gear to rest on. This shoulder also raised the gear high enough to permit the cutter to cut the entire width of the face without cutting into the 1x8x24-in. bar. A part then was made of a piece of steel $\frac{5}{8}$ in. long by 4$\frac{1}{2}$ in. in diameter with a 1-in. hole in it to clamp the steel bar and Part *C* (Fig. 2) together, thus holding the gear firmly while the cutting is done (Fig. 3). A piece of $\frac{3}{8}$x4x6-in. angle 6 in. long (*D*, Figs. 1 and 4) was then clamped to the $\frac{5}{16}$x2x3-in.

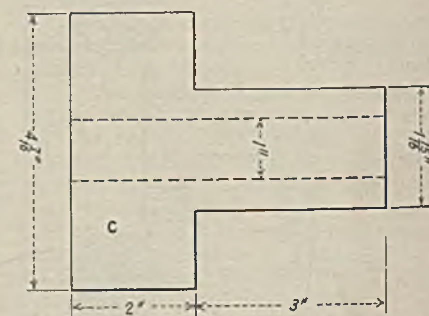
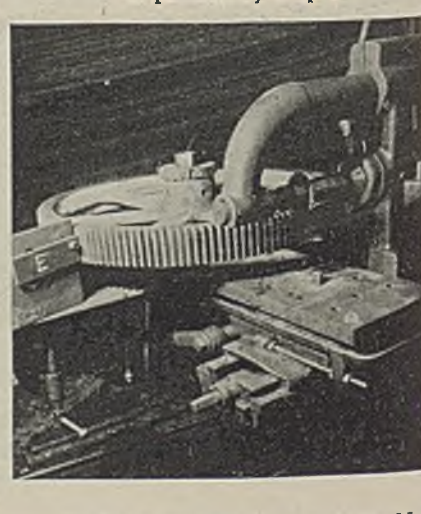


Fig. 2—Details of Part *C*

Fig. 3—Cutting a tooth with the gear held in position by Stop *E*



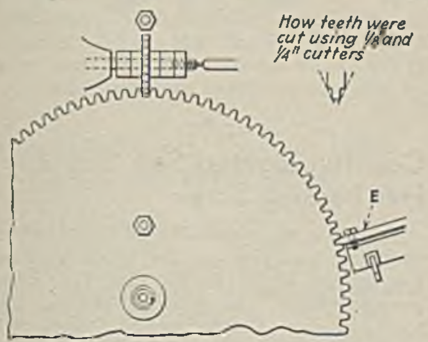


Fig. 4—Sketch of method of holding gear in position for cutting new teeth (Stop *E* is placed with 1/8-in. cutter at bottom of good teeth)

angle back just enough from the gear to allow the built-up teeth to pass it.

Stop *E* (Figs. 3 and 5) was made from a piece of 5/16x2x6-in. steel. The end was ground to fit the gear teeth snugly. Then a 3/8-in. hole was drilled 3/4 in. in from the end and 1/2 in. down from the top edge. The gear was turned to bring a good tooth in line with the 1/8-in. cutter so that the cutter just cleared the bottom of the tooth without removing any metal. Angle *D* was then adjusted so that Stop *E* was between two good teeth. *D* and *E* were clamped together and the 3/8-in. hole in *E* was marked on D, then drilled 5/16 in. and tapped 3/8 in., 16 USS tap. A 3/8-in. capscrew was used to clamp *E* to *D*. Angle *D* in turn was clamped immovably to the 5/16x2x3-in. bar.

The built-up gear section then was placed under the cutter and the gear lifted with the vertical feed until it was cut through to the bottom side. A 1/8-in. cutter was used for this full-depth cut. Then, by releasing the 3/8-in. capscrew, Stop *E* was lifted and the next tooth was brought around, after which *E* was pressed down tight and the capscrew tightened. The nut on the 1-in. bolt holding the gear in place was loosened to allow the gear to be moved, and then tightened.

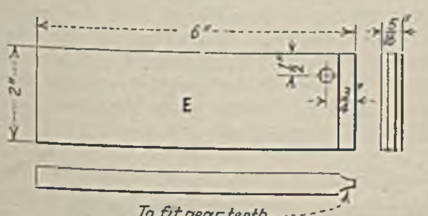
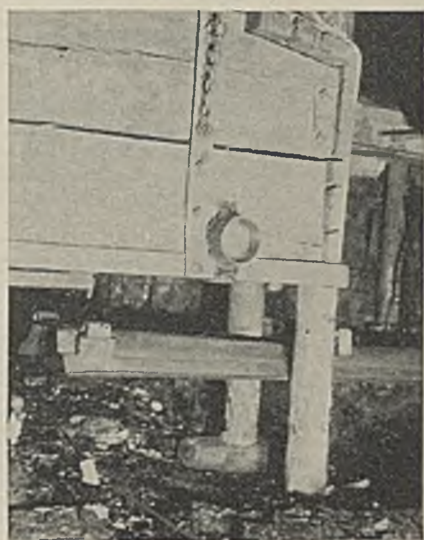


Fig. 5—Showing construction of Stop *E*

After all the built-up teeth were cut with the 1/8-in. cutter the gear was moved back with the horizontal feed and a 1/4-in. cutter was put on the arbor. Depth of the cut with the 1/4-in. cutter was determined by placing good teeth in line with the cutter and then adjusting so that the cutter just cleared the sides of the teeth. Then the built-up teeth were recut with the 1/4-in. cutter as shown in Fig. 5. The outside diameter of the gear was trued up in the location of the new teeth by putting a 1/8-in. cutter on the arbor and backing the gear up so that the cutter just cleared one of the good teeth, after which the ends of the new teeth were cut. Finishing of the new teeth can be done with a file or small grinder, as there is not much metal to be removed after cutting new teeth in the manner described. If a cutter of the proper shape is used, it can be employed to finish the teeth after the rough cutting is done.

Pipe and Reflector Make Trip Marker

Low cost and convenience feature trip markers developed at the Dines (Wyo.) mine of the Colony Coal Co. The marker consists of a 3-in. length of 4-in. pipe to one end of which is welded a hook of strap iron for hanging it on the car. The warning element is a red bullseye reflector similar to the reflectors used on highway markers and warning signals. Two of the markers are hung on every trip or individual car while in transit or standing underground, one on the front and the other on the rear.

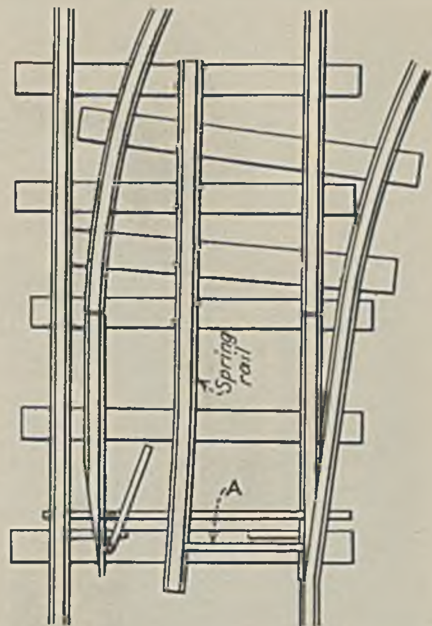


Dines trip marker in position on a car

Spring Rail Holds Switches In Room Turnouts

For use on room or crosscut turnouts equipped with loose switches, or "latches," Anthony Shocikoski, foreman, Cochran Coal Co., Salina, Pa., offers the spring-rail idea illustrated in the accompanying sketch. The spring rail consists of a piece of rail 6 or 8 ft. long, one end of which is spiked to the ties ahead of the switches, as shown. The other end, which is between the switches, is not spiked, and is free to move from one side to the other; in other words, to act as a spring. Flat-steel bars slightly longer than the distance between the switches and the spring rail are fastened to each switch.

When Bar *A*, for example, is moved around and wedged against the spring rail, the switch is pushed tight against the through rail and held in position, thus avoiding trouble from a loose switch. Also, the rail provides a spring-switch action, and in case a car is dropped out of a place through a turnout set for the straight, the switch will open to let the car pass and then will return to its original position. Consequently, if cars are pushed into the entry there is no possibility of their running into the working place and endangering men therein.

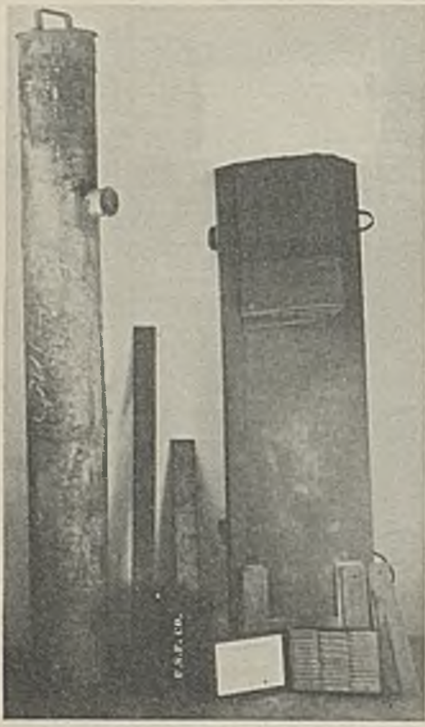


Spring rail assures positive switch operation and promotes safety

United States Fuel Co. Safety Hints

To facilitate treatment of any injuries which may be incurred, first-aid materials are kept at a convenient point in all working sections in the mines of the United States Fuel Co., in Carbon County, Utah. These materials are packed in metal canisters with aluminum or ribbon seals which can easily be broken but at the same time greatly lessen the possibility of pilferage. A record is kept in each canister showing dates opened, names of men

Sand bags are kept warm at all times in this container fitted with an electric strip heater



Canister and first-aid materials for each mine station

treated, names of men giving the treatment, together with the number of the old and new seals.

At each first-aid station a small metal can about 10 in. in diameter and 16 in. deep is mounted on a concrete crosscut stopping to accommodate several small canvas sacks filled with sand, which are kept warm and ready for use in keeping injured men warm and alleviating shock by an electric strip heater. This method of assuring a proper supply of warming agents eliminates difficulties encountered with chemical heat pads, which, while very convenient, rapidly become unusable in damp mines and frequently are subject to pilferage. If such pads are kept on the surface, the injured man may have to suffer for some time before he can be brought out.

The mines of the company are about 150 miles from the nearest good hospitals, and, while hospital service is maintained at each mine, it sometimes becomes necessary to transport patients from either the towns or the mines to regular hospitals for emergency operations or convalescence. Only one passenger train daily is available from a station approximately twenty miles from the mines. Consequently, to facilitate prompt handling, where necessary, the company has fitted up a special ambulance car which can make the trip in about three hours. To make the car, a standard two-door Ford sedan was modified by splitting the rear seat and back cushions in halves so that one half can be removed quickly. Individual front seats are provided in this model of car, and the seat on the right can easily be removed by taking out the cotter-pins. This provides space for a regular ambulance cot made of aluminum tubing.

The extra wide doors on the car readily admit the cot with patient on it without hindrance or tipping. One leg support of the cot is placed over a small metal peg fitted in the bottom of the car, which prevents movement of the cot while the car is in motion. The body of the car is regularly insulated against heat and cold, preventing sudden changes of temperature inside the car. Non-shatterable glass is standard equipment, and a hot-water heater is provided for use in severe cold weather. The driver's seat is left in place, but it may be necessary to put an offset in the gear-shift lever to provide shifting freedom with the cot in place in the car. The left side of the rear seat provides room for an attendant, who is supplied with the proper bed pan, urinal, sputum dish, thermos bottle, etc., for keeping the patient comfortable. Two spare tires are carried on the car, and when not in use as an ambulance the seats and cushions are restored to their regular places and the car is used for other mine service.

Crossing Design Assures Trouble-Free Operation

Operation since installation with no trouble has characterized the underground crossing shown in the accompanying illustrations, now in service at the Dines (Wyo.) mine of the Colony Coal Co.

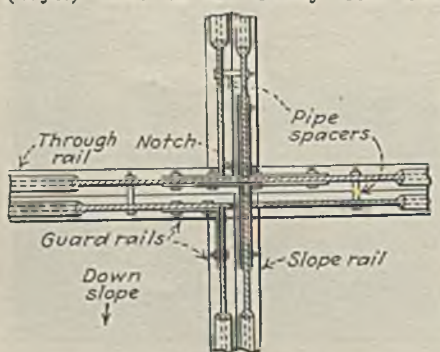


Fig. 1—Construction details, underground crossing

The crossing is installed where a slope and level track intersect. The through rail (Fig. 1) is not broken at any point. Instead, a cut is made through the ball of the rail and just deep enough in the web to allow the flange of the wheel to pass. Cross rails on the slope track, however, are cut through, but are fastened securely in place by angle straps bolted to the through rails, as indicated. Guard rails are held securely at the proper distance from the main rails by pipe spacers placed over the bolts.

Counterweighted Saw Guard Has Locking Screw

To lessen the possibility of injury while operating the saw in the wood-working shop of the Union Pacific Coal Co., Rock Springs, Wyo., the guard shown in the accompanying illustration has been developed by the shop staff. In designing the guard the major objective was the development of the proper equipment for

Saw guard in raised position (arrow points to locking screw)

keeping the bottom edge of the guard parallel with the bench while it was being raised and lowered. This was accomplished by the addition of an auxiliary arm and links (shown above the two supporting arms in the accompanying view). A counterweight on an arm on the opposite side of the main supporting shaft is adjusted so that it just balances the weight of the guard and supporting and auxiliary arms, so that the guard will stay in any position to which it is raised. A setscrew with handwheel on one of the shaft bearings makes it possible to lock the guard in any position. When not in use, the guard is lowered to the bench. If a piece is to be sawed, the guard is raised just sufficiently to let the piece past and then is locked in position.

Fig. 2—General view of the underground crossing in the Dines mine

WORD FROM THE FIELD

Miners Displaced by Machines Placed on WPA Jobs

E. S. McCullough, joint labor board arbiter in northern West Virginia, suggested that miners thrown out of work by the installation of mechanical loading and conveying equipment be placed in WPA jobs. The suggestion, which was made following a series of conferences in Fairmont, W. Va., beginning July 20, has been indorsed in Washington, and more than three thousand miners will be given work on public projects.

The labor board, which is composed of members of the Northern West Virginia Subdivisional Coal Association and United Mine Workers officials of District 31, asked Mr. McCullough for a solution of the problem. The umpire said that rotation of work at the mines among those displaced would not furnish sufficient relief to justify the attempt.

Illinois Stripper Started

A strip mine is being opened by the Little John Coal Co. about three miles south of Victoria, in Knox County, Illinois, on the Galesburg & Great Eastern RR., a short line road which connects with the Chicago, Burlington & Quincy at Wataga, six miles east of Galesburg. The stripping unit will be a 950 Bucyrus-Erie shovel with a 32-cu.yd. dipper, the coal to be loaded with an 85-B Bucyrus-Erie shovel. Truck haulage will be used to transport the coal to a Jeffrey washing plant. The coal will be prepared in the usual sizes from 6-in. down.

The new operation taps a virgin field of about 20,000,000 tons of No. 6 coal averaging 4 ft. in thickness, with an average overburden of 36½ ft. The product will be distributed jointly by the Central Indiana Coal Co. and the Sterling-Midland Coal Co. when production begins, which is expected to be early in November. Officers of the Little John Coal Co., with headquarters in Indianapolis, Ind., are R. H. Sherwood, president; B. E. Lundblad, vice-president, and William H. Stewart, general superintendent.

Inspect New Bethlehem Mill

The new $20,000,000 continuous strip-sheet mill of the Bethlehem Steel Co. at Lackawanna, N. Y., had its formal opening on June 30, when C. M. Schwab, chairman of the board, and E. G. Grace, president of the company, were hosts to an inspection party of editors of prominent industrial publications and newspapers. The new mill, which has an estimated annual capacity of 600,000 gross tons, consists of eleven main buildings and five smaller ones covering 22 acres of floor space, with complete facilities for hot- and cold-rolling and processing of coiled strip and sheets.

This venture, the largest single enterprise undertaken by Bethlehem in recent years, explained Mr. Grace, was dictated by the growing demand for flat-rolled products. Although the automobile industry is primarily responsible for the great increase in demand, "there has been a corresponding enlargement of the field for ducts, containers, siding, roofing, furniture, and formed and stamped products. Their possible application in many new forms leads us to the opinion that the flat-rolled products are destined to even more extensive use."

Keeping Step With Coal Demand

Bituminous Production

Week Ended:	1936 (1,000 Tons)	1935* (1,000 Tons)
June 6..........	6,545	8.679
June 13..........	6.732	9.256
June 20..........	6.728	4.772
June 27..........	6.900	6.483
July 4..........	6.507	2.561
July 11..........	6.846	4.582
Total to July 11	211.015†	194.747†
Month of May	28,541	26.849
Month of June	29,415	30.117

Anthracite Production

June 6..........	797	1,387
June 13..........	838	1,450
June 20..........	766	1.115
June 27..........	1,086	1,464
July 4..........	830	711
July 11..........	761	635
Total to July 11	28.385†	29.845†
Month of May	4.577	4.919
Month of June	3,958	6.642

* Outputs in these columns are for the weeks corresponding to those in 1936, although these weeks do not necessarily end on the same dates.
† Adjusted to make comparable number of working days in the two years.

Bituminous Coal Stocks

(Thousands of Net Tons)

	June 1 1936	May 1 1936	June 1 1935
Electric power utilities	5,645	5,613	6,333
Byproduct ovens......	4,064	3,515	5,592
Steel and rolling mills	873	807	1,381
Railroads (Class 1)...	4,521	4,674	6.875
Other industrials*....	7,469	6,837	9,280
Total	22,572	21,446	29,461

Bituminous Coal Consumption

(Thousands of Net Tons)

	June 1 1936	May 1 1936	June 1 1935
Electric power utilities	2,806	2,711	2,448
Byproduct ovens......	5,408	4,993	4,043
Steel and rolling mills	1,077	1,157	931
Railroads (Class 1)...	6,596	6,841	6,045
Other industrials*....	8.560	9,515	7,699
Total	24,447	25,217	21,166

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

Power Conference to Consider Natural-Resource Policies

With approximately three thousand scientists and engineers from the United States and nearly fifty foreign nations in attendance at the sessions of the Third World Power Conference, to be held Sept. 7-12 at Washington, D. C., the conference is expected to result in a compilation of an inventory of the world's power resources. The papers will set forth statistical material on the extent of the coal, oil, gas, water power, etc., in the member nations of the conference, the experience of these countries in their use, and plans for their conservation and most effective utilization.

Past experience in the use of natural resources will be discussed. As a result of this survey it is hoped that it will be possible to determine whether the world is spending its natural resources too rapidly, how long they will last, and what might be substituted in case of the exhaustion of any one; whether these resources are being handled efficiently; whether there may be a basis for possible readjustments in the international exchange of resources; and what are the extent of resources in little known regions.

An important paper to be presented on the first day of the conference is "Organization of the Production, Processing and Distribution of Coal and Coal Products," and similar features in regard to petroleum products will be covered in another address on the same day. "Significant Trends in the Development and Utilization of Power Resources" will be a high spot of the second day's sessions. On the third day, there will be a paper on "Conservation of Petroleum and Natural Gas." Topics of the fourth day's sessions will be "National and Regional Planning and Their Relation to the Conservation of Natural Resources" and "Planned Utilization of Water Resources." On the last day of the conference, attention will be given to "National Power and Resources Policies."

Plans have been perfected for the series of nine study tours to be held in connection with the conference (*Coal Age*, June, 1936, p. 257), four to precede the Washington sessions and to be repeated afterward, with a ninth tour following the conference extending from New York to the Pacific coast and from the Tennessee Valley to Montreal, Canada. The itinerary of the touring coal party will include an inspection of the mining of coal in mines of differing degrees of mechanization in the Pittsburgh (Pa.) area, bulk handling of coal, cleaning and grading plants, shipment of coal, and production of coke primarily for the coke itself as distinct from obtaining coke as a byproduct of gas manufacture. The pre-conference coal tour will start from New York on Aug. 31 and terminate in Washington on Sept. 6, the post-convention party leaving New York on Sept. 14 and returning a week later.

Inspectors Log Accident-Prevention Progress At Get-Together in Denver

THE WHY OF SAFETY progress in the past was coupled with the what of the future in the deliberations of operating and safety men at the 27th annual convention of the Mine Inspectors' Institute of America, held at the Shirley-Savoy Hotel, Denver, Colo., June 29, 30 and July 1. James Berry, Columbus, Ohio, chief, Ohio Division of Mines, and new institute president, officiated at the technical and business sessions for Thomas Stockdale, Bramwell, W. Va., district mine inspector and retiring president, absent because of illness. A lighter note was sounded by McAuliffe's Kiltie Band, of Rock Springs, Wyo.

Unscheduled events were the introduction of John McNeill, San Diego, Calif., who became Colorado's first coal-mine inspector in 1883 at the age of 30 and served for ten years; Sylvester A. Binek, Bismarck, N. D., whose 26 years gave him the honor of being the youngest State inspector in attendance at the convention; and Eugene McAuliffe, president, Union Pacific Coal Co., Omaha, Neb., who discussed briefly the essentials of accident prevention. Columbus, Ohio, was chosen as the scene of the next annual convention.

Opening the technical sessions, Thomas Allen, chief inspector of coal mines for Colorado, Denver, outlined mining methods and safety practices in the Rocky Mountain region, pointing out a wide variation in coal thickness, physical conditions and presence or absence of water and gas. Working methods include all forms of the room-and-pillar system, longwall in districts containing the thinner seams and chute, stoping or other systems in pitching beds. With a few exceptions, the tendency in the region is toward the panel system to isolate each district in the mine from other workings.

No Lagging in Safety Work

"The Rocky Mountain region is not behind other fields in the United States in its efforts toward greater safety." Safety measures adopted include: State codes and inspection departments in all States, supplemented by a number of company inspection staffs; continuous education in safety methods, accident-prevention and first-aid; certification of underground officials in all States; maintenance of rescue stations at strategic points by operator groups; installation of branches of the Joseph A. Holmes Safety Association; maintenance of underground and surface workings in "fair condition," with ready adoption of any changes offering a possibility of bettering the safety record; and a cooperative attitude between miners and operators. "In more recent years a great change in attitude seems to be prevalent. All those interested in the industry appear to be more alert to the greater possibilities of efficiency and safety in the mines."

Difficulties in securing mine laws adequately meeting present-day conditions were sketched by Hugh McLeod, chief, Wyoming Department of Mines, Rock Springs, Wyo., in opening the discussion. Widespread adoption of mechanical loading equipment has marked developments in Wyoming in recent years. In addition to provisions of the State mine law, a number of companies have instituted other safety regulations. Better illumination of working places is necessary to increase visibility and reduce injuries. Several Wyoming mines have adopted systematic timbering to decrease injuries from falls of roof, primarily as a result of the adoption of mechanical loading. In one case, 580 men mined 700,000 tons with only seven lost-time injuries—a striking example of the value of system. Protective clothing has been very helpful. Concluding, Mr. McLeod declared that the attitude of management is directly reflected in safety results.

Argue Shooting on Shift

Prompted by questions from J. E. Jeffreys, Des Moines, and E. A. Farnsworth, Centerville, Iowa State mine inspectors, delegates then took up the question of shooting on shift, opposed by the Iowa representatives. Colorado miners, said James R. Lord, district representative, United Mine Workers, are desirous of cooperating fully with the operators in promoting safety and favor the elimination of shooting on the shift. Pointing out that the last Wyoming explosion was in 1924, Mr. McLeod expressed the opinion that proper regulations to govern shooting on the shift and their adequate enforcement will prevent injuries from this cause.

Calling attention to the institute study of the shooting-on-shift question made some years ago, Dr. J. J. Rutledge, chief mine engineer, Maryland Bureau of Mines, Baltimore, stated his belief that the introduction of permissible powder was one of the greatest boons granted American mines. The latter statement was indorsed by Mr. Farnsworth, who doubted, however, that it was absolute insurance against ignitions of dust. Shooting on the shift is becoming a vital subject in Colorado, stated Mr. Allen, through the introduction of mechanical loading equipment, of which twelve to fourteen units now are in operation under experimental permits. Operation of these machines calls for some blasting on the shift and, said Mr. Allen, the problem can be approached by adopting proper regulations and insisting on their unvarying application. Machines, properly regulated, possess certain safety factors and also offer the possibility of eliminating the arduous labor necessary under older mining systems.

Defending permissible explosives, Richard Maize, State mine inspector, Pennsylvania bituminous division, Uniontown, Pa., pointed out that both on- and off-shift shooting prevail in Pennsylvania. Some mines work three shifts per day. If blasting is restricted in such mines, their efficiency will be reduced, the income of the operator will suffer and eventual demoralization of the industry is a prospect. If permissible explosives are handled properly, they are 1,000 times safer than black powder, so why try to restrict their use? The answer rather may be in some cases changes in the mining system and improvement in ventilation.

James Berry
President-elect, Mine Inspectors' Institute of America

"We have today definite means of determining the quantity of air passing into and through our mines; the means of determining the different gases in the air, the temperature and humidity of the air, the fineness and explosibility of coal dust in the mine; the quantity, fineness and nature of the dust in the air in metalliferous mines in relation to the silicosis hazard and the means of detecting the quantity and nature of gases produced by explosives," stated James Dickson, chief inspector of mines for British Columbia, in pointing out some ways of using such information in improving atmospheric and other conditions underground. Mr. Dickson's paper was read by P. D. McMurrer, safety director, West Virginia Department of Mines, Charleston, W. Va.

Some improvements in safety equipment and certain safety problems were outlined by B. W. Dyer, district mining supervisor, U. S. Geological Survey, Salt Lake City, Utah, in discussing Mr. Dickson's paper. The electric methane detector should be more extensively used, as it greatly simplifies testing for gas and, with the anemometer, adjusting air quantities to various parts of the mine. The need for better illumination at the face has been intensified by the growth of the mechanical loader, as also the need for some system for continuously sprinkling the face to keep down dust. In the use of explosives, improper hole placement results in several hazards, and now cutting machines with 9½-ft. bars bring up the problem of using more holes or increasing powder quantity per hole. In some instances there is a tendency to increase the quantity above the permissible limit. More research on the problem is necessary, along with greater care in use.

Safety Reflects Supervision

"Safety and efficiency are governed largely by the amount and manner of supervision," declared Mr. Maize in analyzing the relationship between frequency of inspection and accident reduction. In Pennsylvania, the bituminous mining law prior to 1911 did not require supervision of the working places in gaseous mines if they had been examined by a fireboss three hours before working time. In so-called nongaseous mines, assistant foremen were not required by law, and places had to be visited only once every other day. "As a result of this infrequent and inefficient requirement for inspection of working places, the accident rate was exceedingly high," with the result that prior to 1911 production per fatality averaged about 275,000 tons. After adoption of the 1911 law, providing for more supervision, the accident rate declined and production per fatality rose to 570,000 tons in the period 1931-35. The effects of more intensive supervision are graphically illustrated in Fig. 1 (fatalities from 1900 to 1935 in relation to the number of State mine inspectors) and Fig. 2 (production per fatality).

In addition to increased inspection of working places by mine officials, the Pennsylvania law also requires: testing for gas and inspection of places in gaseous mines by machine runners before taking machines past the last crosscuts, supplemented by additional tests and inspection every 30 minutes while in the place; use of explosion-proof electrical equipment in gaseous mines, coupled with inspection each week by coal company electrical department and regular check by a State electrical inspector; inspection of his place by the miner before going to work, supplemented by additional examinations at frequent intervals during the day; inspection of hoisting ropes and cages every 24 hours, with testing of safety catches at least every 60 days; and inspection of boilers internally and externally at least every six months.

"With all the work we have done along the line of accident prevention," contended Mr. Maize, "the coal mines of this country still are the poorest supervised of any industry. Not poorest in quality of supervision, because we have some of the best-trained men in the world supervising our coal mines, but poorest in quantity; and despite the fact that those engaged in the coal-mining industry during the past several years have effected a substantial decrease in fatality and injury rates . . . we still occupy last place in the American safety movement." This, according to experienced safety engineers, has been due to high death and injury rates underground resulting from inadequate supervision and infrequent inspections. Practical experimentation by progressive mine owners in increasing supervision has shown that "greater efficiency and economy can be obtained by limiting the number of mine workers for each supervisor to twenty or less, and the maximum should not exceed 25 under the most favorable circumstances."

How to Get Better Supervision

"I agree that the first thing we should assume is the fact that supervision not only will prevent accidents but will create better efficiency and operation at lower cost," said William Roy, safety director, Hanna Coal Co., St. Clairsville, Ohio, in opening the discussion. "I also believe that we should agree upon what supervision is, why it is necessary and what kind of supervision is right. Coal companies are paying thousands of dollars to supervisors whose work is doing more harm than good," and therefore to keep supervision at peak efficiency it should be checked regularly. The supervisor "is the man who makes the profits. Why should not his work, his actions, his ability be checked as the auditor checks your financial standing?"

Sketching conditions peculiar to coal mining and coal-mine workers which complicate supervision, Mr. Roy stated that with changing systems of mining "we are ushering in a new age of cooperation," in which "we must not only have supervision and inspection but must have it of the right kind. The very fact that we need supervision and inspection also is proof that some men will not obey set standards or comply with safe practices, and this is where the supervisor or inspector is as necessary as the auditor, but he must be a man of the right sort."

Investigations by supervisors and inspectors have been a major factor in the long-continued search for the best and safest mining system for Hanna mines. "At the present time, we have more inspections and closer supervision than ever before." Rules to govern inspections have been established and as a result every officer of the company can at any time determine just what conditions prevail at the mines and what men are responsible. On the basis of such inspections, superintendents, mine and section foremen, outside foremen and maintenance foremen are graded for eligibility for safety and operating awards, the grading providing for demerits for conditions dangerous to workmen, inefficient workmanship and violation of safety rules, with additional demerits for any injuries incurred by men in their charge and merits and demerits for cost performance.

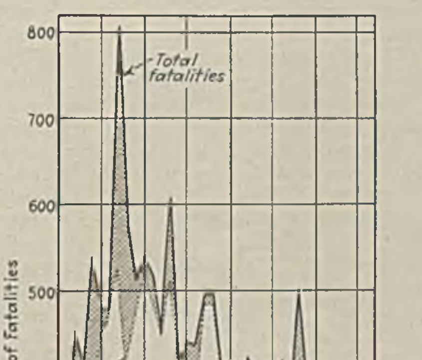


Fig. 1—Fatalities at Pennsylvania bituminous mines compared with number of mine inspectors

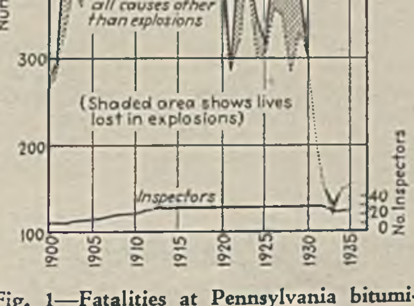


Fig. 2—Production per fatality, Pennsylvania bituminous mines, 1900-1935

"This system is giving the best results yet obtained and, if kept in effect, will, I believe, result in better operating experience with reference to both efficiency and economy, as well as safety." As evidence of progress being made, accidents per 1,000 man-days dropped from 1.726 in 1929 to 0.361 in 1935; tons per accident rose from 2,235 in 1929 to 16,260 in 1935; and tons per fatality increased from 108,166 in 1929 to 1,357,740 in 1935. The best record was 3,292,511.55 tons without a fatality. "All this time, supervisors and inspectors were giving more time and attention to the workers and lately inspectors are not only inspecting the workers but the supervisors as well. It is costing some money, but I believe it is paying and will continue to pay dividends."

Confirming Mr. Maize's conclusions, N. P. Rhinehart, chief, West Virginia Department of Mines, Charleston, W. Va., cited some examples showing the direct relation between inspections and fatalities. In West Virginia, added Mr. McMurrer, investigation has shown that 75 per cent of all employees are employed on the day shift and the remainder on the other shifts. This 75 per cent has had only 55 per cent of the fatal injuries, as compared to 45 per cent of the fatalities in the second group on the other shifts.

Safety Fundamentals Outlined

"Reduction of mine accidents appears to depend upon the same fundamentals whether considered from the viewpoint of the mine operator, miner, State mine inspector or safety engineer," declared E. H. Denny, district engineer, U. S. Bureau of Mines, Denver, in presenting the safety engineer's viewpoint. "Conditions of mine operation with respect to safety are governed in most States by a mining law, usually somewhat general in its provisions, but more specific than laws dealing with other industries. Methods of mining development and practice evolved through experience have been handed down from generation to generation; many of these are intended to avoid injury to men and loss of property.

"To carry out the intent of these bases of law and experience relating to safety, supplemental measures and conditions are necessary. Among these may be: (1) planned safety rules adapted to the mine and compliance by both officials and miners with such of these rules as pertain to their work; (2) a supervisory force adequate and competent to administer the mining laws and safety rules; (3) discipline adequate to secure compliance with safety measures; (4) safeguards against mechanical, electrical, falling and other hazards; (5) mining operations planned with respect to safety of workers; (6) active safety organization of officials and employees; (7) education of officials and employees in safety practices; and (8) an active sustained interest in safety by management and employees."

Duties of the safety engineer, therefore, may include: understanding of State mining regulations and imparting of them to others as necessary; assembly and application of safety rules; adequate guarding against mechanical, electrical, falling and similar hazards; suggestions for changes in mining systems and practices to promote safety and efficiency; maintenance of good ventilation; supervision over handling and use of explosives; elimination of any conditions tending to increase the dust-explosion hazard; adoption of provisions for preventing underground fires; collection, analysis and use of accident statistics; care of injuries; and enlistment of the cooperation of management and men to insure that methods of preventing injuries are adopted and carried out.

Amplifying his reference to sealing in response to a question by Mr. Maize, who expressed the opinion that airtight sealing of abandoned workings may not be proper in all cases, Mr. Denny declared that much can be said on both sides. Abandoned areas, Mr. Denny stated, either should be thoroughly ventilated or sealed off. If the area is large, however, leaving it open may require an excessive quantity of ventilating air and even then there is no assurance that all of the area is being reached. Analysis of the atmosphere behind seals will show: ineffective sealing (high oxygen content); CO (if present, fire still dormant; if absent, fire very low or out); CO_2, a warning against release into live workings. How ventilation is conducted past the area is another factor bearing on whether to seal or leave open, depending upon whether leakage or outflow will go into the intake or return circuits. Sealing off explosive gases offers still another problem, again influenced by the mining system and airway location. If explosive gases are sealed off completely, the result may be a powder magazine unless the percentage of inert gases is high. Whether the outlet is into the intake or return again enters the picture. In certain cases, where conditions favor them, pressure releases into the return are provided where gases are sealed. Liability of coal to ignition by spontaneous combustion is another factor influencing the adoption or rejection of sealing. In any case, when and when not to seal is dependent upon the specific conditions prevailing at the mine in question.

Education Prevents Injuries

Presenting the viewpoint of the miner on accident reduction, O. F. Nigro, international board member, District 15, United Mine Workers, Denver, stated that "the question is one of education and not rigidity of rules . . . A set of stringent rules adopted and posted at a pithead for the guidance of employees will not contribute one iota to the safety of life and limb and the safeguarding of property unless those who are directed to carry out such rules and regulations are patiently educated to understand and actually made to know why such rules and regulations must be carried out in spirit as well as in letter." Observation shows "that there is no desire on the part of employees to disregard safety rules and regulations when the matter is brought before them in an enlightening manner and the proper consideration that is due human factors is made manifest." Due regard for the psychology of the employee, therefore, will go far toward solving the problem of his attitude toward safety measures.

"The most important part in any accident (or injury) prevention campaign is job training," contended Mr. Rhinehart in opening a discussion of accident prevention from the standpoint of the State mine inspector. Such training, modified as required to fit the particular needs of each group, should be extended not only to the miner but also to inspectors and company officials and should stress the safety angle. Safety education is vital, and "has possibilities far beyond the usual application. . . . Very little practical effort has been made in this prolific field. . . . Long-time planning in training and education is preferred to hasty campaigns." Protective clothing, a part of educational work, "is reducing accidents far beyond the knowledge of the average mining man."

Safety publications are an important means of disseminating accident-prevention ideas and keeping up interest. Examinations by State departments offer "one of the strongest weapons known to build a safety organization for the future," and first-aid, mine-rescue and safety questions will make future bosses much more safety-minded when they enter upon their duties. "The original idea of reducing mine accidents by inspections was correct, but there is a broader field in this work than there has ever been before, with the possible exception of major disasters. Uniform and thorough inspections have not been developed sufficiently to reduce all types of accidents. It should be universally known and practiced that every inspection means the thorough investigation of every phase of mining." Safety meetings have been very beneficial in accident reduction, and the idea should be extended. Finally, success requires confidence that the goal is worth while and can be achieved.

Any safety program, to be successful, must take into consideration the fact that human beings and their vagaries of temperament and intellect are being dealt with and that a course must be charted which will appeal to their pride of accomplishment, declared George B. Pryde, vice-president, Union Pacific Coal Co., Rock Springs, Wyo., in presenting the operator's viewpoint. "It is needless to say that the leader in safety work must be the employer," as, no matter how capable and intelligent the personnel may be, little lasting benefit will result without the company's backing. An abstract of Mr. Pryde's paper appears on p. 319 of this issue.

"Unquestionably the machine age has brought new problems in accident-prevention to the industry," said James McSherry, director, Illinois Department of Mines and Minerals, in analyzing the influence of mechanized mining on injuries. Detailing conditions in Illinois, Mr. McSherry declared his belief that "the introduction of machinery should have a good effect generally on our accident experience." The State began compiling mining statistics in 1882, and it was about 1900 that accidents that might be charged to "mechanization" began to make their appearance. By 1913, one-half of the State's output was undercut by mining machines and 76.5 per cent was hauled by locomotives. "About that time, it could really be said that Illinois was getting into the business of mechanizing its mines." In 1935, 90 per cent of the output of deep shipping mines was undercut, and 54 of these mines used mechanical loading equipment in that year, producing 60.25 per cent of the deep-mine output.

Machines Promote Safety

As to the effect of mechanical devices on the injury record, results have varied with the work done by the individual operating organizations. Over a 53-year period, fatalities per 1,000 men employed have averaged 2.3; non-fatal injuries involving a time loss of seven days or more, 21.4 per 1,000 employees; fatalities per 1,000,000 tons produced, 3.1; and non-fatal injuries per 1,000,000 tons, 29.3. In the period 1931-35, including also hand-loading operations, fatalities per 1,000 men employed have averaged 1.8; non-fatalities, 23.9; fatalities per 1,000,000 tons, 2.2; non-fatals, 29.5.

In the mechanical mine, said Mr. McSherry, the face boss has a better opportunity to enforce safety regulations. The "speed-up" system, on the other hand, works against maintenance of a good safety record, and in a few cases in Illinois accidents were markedly reduced and tonnage increased by discarding it. Mechanization also has brought electricity into more extensive use, with consequent increase in injuries from this source, and much more work is necessary in this classification.

Splendid progress has been made in the promotion of safety, declared Mr. McAuliffe in commending the work of the U. S. Bureau of Mines, State mine departments and organizations, and the technical press. There still is much work to be done, however. "What we want is more vision, more foresight and a better relationship with the mine worker." Strife between miner and operator has been responsible in the past for many injuries and disasters, but better days are in sight. Mechanical loading was a distinct forward step from the safety standpoint, Mr. McAuliffe asserted. While some disadvantages result, these are greatly overbalanced by a reduction in the area covered by mining operations and a better quality of supervision and direction by foremen.

With the introduction of loading equip-

★ ★

Institute Leaders

James Berry, chief, Ohio Division of Mines, Columbus, was chosen president of the Mine Inspectors' Institute of America at the Denver meeting, succeeding Thomas Stockdale, district mine inspector, Bramwell, W. Va. Other officers were elected as follows:

Vice-Presidents—Richard Maize, State mine inspector, bituminous division, Uniontown, Pa.; J. J. Rutledge, chief mine engineer, Bureau of Mines, Baltimore, Md.; and Thomas Allen, chief inspector of coal mines, Denver, Colo.

Secretary—C. A. McDowell, personnel director, Pittsburgh Coal Co., Pittsburgh, Pa.

Assistant Secretary—J. J. Forbes, supervising engineer, safety extension service, U. S. Bureau of Mines, Pittsburgh, Pa.

Treasurer—Dr. Rutledge.

Editor-in-Chief—J. W. Paul, mining engineer, Pittsburgh, Pa.

Editor-in-Chief Emeritus — James T. Beard, Danbury, Conn.

Publicity Editor—R. Dawson Hall, engineering editor, *Coal Age*, New York.

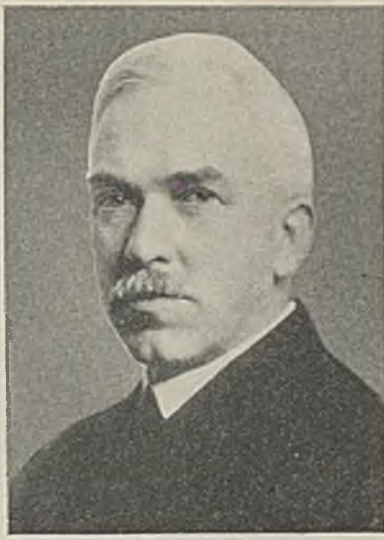
ment, said D. J. Parker, district engineer, U. S. Bureau of Mines, Salt Lake City, Utah, some felt that injuries would increase. This, except for temporary rises while experience was being gained, has not been the case. Mechanization, however, introduces some hazards, including: larger unsupported roof area in some cases; presence of electrical current at the face over longer periods of time; noise, which possibly may have some bearing on fatigue; and, offering the greatest hazard, the tendency toward blasting on the shift, which, while successfully accomplished at many operations, is not adaptable to all conditions. Mechanization advantages include concentration of workings and men, making possible much closer supervision.

In his district, remarked Joseph Bierer, district mine inspector, Morgantown, W. Va., which produces about 5,000,000 tons annually, introduction of loading equipment (about twenty units in the past six months) has brought up the problem of inadequate timbering and inspection. He welcomed the installation of track-mounted cutting equipment because of greatly reduced possibilities for injury. Heretofore, men engaged in cutting have suffered twice the number of injuries, in proportion to number employed, of any other class of workers. Introduction of loading equipment, on the other hand, has brought in the electric drill, creating another hazard.

In Iowa longwall fields, said Mr. Farnsworth, mines using mining machines have 25 per cent fewer injuries due to falls of roof and coal than pick mines. Conveyor operation, however, has proved unsuccessful in longwall because of the increased injuries from this cause. Citing a number of individual records, Mr. McLeod called attention to timbering methods at certain Wyoming mines employing shaker conveyors which have materially reduced injuries, even though roof conditions are bad. Mechanization of Wyoming mines has been accompanied by a marked improvement in the accident record.

Rescue Training Necessary

Emphasizing the need for training new men in mine-rescue and fire-fighting work so that the industry will be prepared for an emergency even though much improvement has been shown in recent years, C. L. Lutton, safety director, H. C. Frick Coke Co., Pittsburgh, Pa., in a paper read by J. J. Forbes, supervising engineer, safety extension service, U. S Bureau of Mines, Pittsburgh, presented the results of a canvass of mining men experienced in the work to obtain their views as to how such training should be accomplished. Suggestions fell into three classes, stated Mr. Lutton, as follows: assumption of the task, as properly within its scope, by the Bureau of Mines, which should, at the Bruceton (Pa.) experimental mine or other adaptable mines, maintain the proper underground facilities to enable it to create controllable mine fires and other correlative disaster conditions where practical experience could be given prospective crew members; adoption by companies with the wherewithal of the principle of setting aside mines where the proper precautionary measures could be taken and the proper facilities constructed for creating mine disaster conditions for training their personnel; and maintenance by companies of mine sections with the proper facilities for the introduction of smoke where hypothetical problems might be worked out under conditions approximating actual. General preference was expressed for the first alternative, with some suggestions that, if this proved inexpedient, either the second or third be followed.



Dr. O. P. Hood

Expressing doubt that the stage has been reached where mine-rescue and fire-fighting can be dispensed with, V. O. Murray, safety engineer, Union Pacific Coal Co., Rock Springs, Wyo., stated that increased use of electricity, in particular, had brought about the ever-present possibility of fires. Rescue and fire training should be regular, consistent and under the supervision of the best of instructors. Training by the Bureau of Mines is best, while the second alternative could be followed by some large companies. The third alternative, however, is not practicable.

The importance of proper training was stressed by Mr. Maize, while David J. Roderick, Pennsylvania anthracite inspector, Hazleton, Pa., expressed the belief that in fighting fires, air should be carried along with the men instead of using apparatus. Mr. Forbes called attention to the need for stimulating interest in work of this type, which has been lagging in past years. Training of crews and maintenance of equipment at private rescue stations should receive more care, and full-scale maneuvers at mining operations should be adopted as a means of interesting and educating personnel. Concluding the discussion, the convention approved a motion to name a committee, as suggested by Mr. Lutton, to formulate a plan to promote practical training in fire fighting, rescue and recovery.

Mining and safety conditions in 1900 and 1936 were compared by Thomas Moses, president, H. C. Frick Coke Co., Pittsburgh, Pa., first vice-president and charter member, in a discussion of the history of the institute, read by George H. Deike, president, Mine Safety Appliances Co., Pittsburgh. Lauding the work of mine inspectors in past years, Mr. Moses sketched the growth of the safety movement and improvement in mining operation between 1900, when average output per man per day was 2.98 tons and inside common labor received \$1.73 for nine hours' work, and 1936, with a scale of \$5.26 and a per-man-per-day output (1934) of 4.40 tons.

Personal Notes

John A. Clark, Jr., formerly superintendent of the Continental Coal Co. operations at Rivesville, W. Va., has been made general manager of the Lemont Coal & Coke Co., with headquarters at Uniontown, Pa.

J. H. Edwards, associate editor, *Coal Age,* has been made chairman of the committee on applications to mining work of the American Institute of Electrical Engineers.

H. S. Ellsworth has resigned from his position with the Ohio River Co., a subsidiary of the West Virginia Coal & Coke Co., to accept an appointment as master mechanic of the mines and central power plant of the Lillybrook Coal Co., Lillybrook, W. Va.

A. C. Fieldner, chief engineer, Experiment Stations Division, U. S. Bureau of Mines, has been advanced to chief of the technologic branch of the Bureau, vice O. P. Hood, retired. In his new post, Dr. Fieldner will continue to direct coal research by the Bureau and administratively supervise the various experiment stations, the office of chief engineer, Experiment Stations Division, being absorbed by the office of chief of the technologic branch.

D. L. Hansen, president, American Independent Coal Co., and a member of the Bituminous Coal Producers' Board for District 17 (southern Colorado) under the Guffey Bituminous Coal Conservation Act of 1935, has been elected a director of the Colorado-New Mexico Coal Operators' Association.

O. P. Hood, chief of the technologic branch and chief engineer of the mechanical division of the U. S. Bureau of Mines, retired on June 30 after 25 years' service with the Bureau. Born in 1865, Dr. Hood was educated in Worcester and Rose polytechnic institutes, serving later as professor of mechanical engineering at Kansas Agricultural College and then at Michigan College of Mines. He joined the Bureau of Mines Pittsburgh Experiment Station in 1911, taking charge of fuel investigations, which he coordinated, and also developed mechanical and engineering research pertaining to safety in mines. After completion of the new building of the Pittsburgh Experiment Station, which was planned and designed under his direction, he was transferred to the Washington office of the Bureau. There he continued fundamental research on the mechanism of combustion in fuel beds and carried out nation-wide sampling of coal and its analysis in connection with government purchases of coal on specifications. In 1926 Dr. Hood became chief of the technologic branch.

Fred S. McConnell, vice-president in charge of operations, Enos Coal Mining Co., was elected president of the Indiana Coal Producers' Association at the annual election held in Terre Haute. Hugh B. Lee, vice-president in charge of operations and general manager, Maumee Collieries Co., was chosen vice-president, and Michael Scollard was reelected secretary-treasurer for his nineteenth successive term.

Gomer Reese, general superintendent, Kemmerer Coal Co., Lincoln County, Wyoming, has resigned and moved to Littleton, Colo., where he will develop and operate a mine.

O. G. SHARRER, superintendent of Hanna No. 4 mine of the Union Pacific Coal Co., has been elected Mayor of Hanna, Wyo.

GODFREY M. S. TAIT has become affiliated in a consulting capacity with the legal firm of Moyle & Wilkinson, Washington, D. C., which specializes in practice before government agencies. Captain Tait formerly was technical adviser to NRA and later was appointed chairman of the National Coal Board of Arbitration under NRA.

EDWARD D. WILLIAMS, Ashland, Pa., has been made superintendent of the Locust Summit central breaker of the Philadelphia & Reading Coal & Iron Co.

Financial Reports

Consolidation Coal Co., Inc., and subsidiaries—Net profit for quarter ended March 31, $304,968 after interest, depreciation, depletion, federal income and excess profits taxes and other charges, including $228,461 profit from North Western Fuel Co., a wholly owned subsidiary.

M. A. Hanna Co. and subsidiaries—Consolidated net profit for quarter ended June 30, $474,054 after depreciation, depletion, federal income taxes and other charges; $430,373 profit in preceding quarter and $526,503 profit in second quarter of 1935.

Lehigh Valley Coal Corporation—Net profit for three months ended June 30, $14,786 after depreciation, interest, depletion, federal income taxes and minority interests, compared with a net profit of $104,976 in second quarter of last year. Net profits for six months ended June 30, $572,131, compared with $475,575 in first half of 1935.

Philadelphia & Reading Coal & Iron Corporation and subsidiaries—Net loss for twelve months ended June 30, subject to year-end adjustments, $4,241,294 after interest, depreciation, taxes, minority interest and other charges, compared with $5,021,242 loss for twelve months ended June 30, 1935. Of the 1936 loss $643,357 was assignable to iron-manufacturing activities, compared with a similar loss of $860,660 in the 1935 period.

Pittsburgh Terminal Coal Corporation—Net loss for three months ended June 30, $139,114 after depreciation, depletion and other charges, compared with $135,724 loss in first quarter and $134,446 loss in June quarter a year ago.

Pittston Co.—Consolidated net income for the quarter ended March 31, $75,660 after depreciation, depletion, amortization, interest, provision for subsidiary preferred dividends, minority interest, federal taxes and other deduction. In the first quarter of 1935 there was a net loss of $368,544.

Pond Creek Pocahontas Co.—Net loss for quarter ended June 30, $4,585 after depreciation, depletion, federal income taxes and other charges, compared with net profit of $104,512 in the preceding quarter and net profit of $29,817 in second quarter of last year.

United Electric Coal Cos.—Net profit for three months ended April 30, $29,817 after charges and taxes, compared with $14,766 profit in the corresponding period of 1935.

Virginia Iron, Coal & Coke Co.—Net loss for three months ended June 30, $60,508 after taxes, interest, depreciation, depletion and other charges, compared with $21,446 loss in preceding quarter and $29,555 loss in second quarter last year.

Industrial Notes

ROCKBESTOS PRODUCTS CORPORATION has established an Ohio district office at 1149 Union Trust Building, Cleveland, with John C. Wise, formerly of the New York office, as manager. Ohio territory formerly was under the joint jurisdiction of the Pittsburgh and Chicago offices.

STEPHENS-ADAMSON MFG. CO., Aurora, Ill., has appointed F. E. Dunlap as branch manager of conveyor sales and engineering for Michigan with offices in the Book Tower, Detroit.

C. R. Cox, formerly general superintendent of Ellwood works of the National Tube Co., has been elected vice-president in charge of engineering and operations of the company, succeeding P. C. Patterson, who has been associated with the company for 49 years.

PORTABLE LAMP & EQUIPMENT Co. has moved its general offices and warehouse from 405 Penn Ave. to 72 First Ave., Pittsburgh, Pa. WILLIAM K. WILBUR, vice-president of the company, has moved to Bluefield, W. Va., where he will be in charge of Southern territory.

Bond Issue for New Equipment

Purchase of new mine cars and improvement of plant and equipment are planned by the Wyoming Valley Collieries Co., anthracite producer, with offices at Scranton and operations in Luzerne County, Pennsylvania. The company is floating a bond issue of $500,000 to finance the improvements and to retire short-term debts.

Coming Meetings

• Pocahontas Electrical and Mechanical Institute: Second Annual Industrial Exhibit, Aug. 20-22, Bluefield, W. Va.

• New River Coal Operators' Association: smokeless coal industrial exhibition, Aug. 27-29, Mt. Hope, W. Va.

• American Chemical Society: annual meeting, Sept. 7-11, Pittsburgh, Pa.

• World Power Conference. Sept. 7-12, Washington, D. C.

• International Railway Fuel Association: annual meeting, Sept. 16 and 17, Hotel Sherman, Chicago, Ill.

• National Safety Council: 25th annual safety congress and exposition, Oct. 5-9, Atlantic City, N. J.

• West Virginia Coal Mining Institute: annual meeting, Oct. 9 and 10, Logan, W. Va.

• American Institute Mining and Metallurgical Engineers, Coal Division: annual meeting, Oct. 21-22, Pittsburgh, Pa.

Preparation Problems Engross Combustion Engineers

Nearly sixty producers and distributors of industrial coals from eight States were present at the fifteenth in the series of fuel engineers' meetings sponsored by the fuel engineering division of Appalachian Coals, Inc., held July 10 at Cincinnati, Ohio. J. E. Tobey, manager of the fuel engineering division, who presided, said the meeting was held because "improvement in the uniformity and sizing of coals, through better use of present facilities of producers, railroads and consumers, will help to increase satisfaction in the use of industrial coals."

J. B. Morrow, preparation manager, Pittsburgh Coal Co., opened the meeting with an address on "The Economics of Coal Preparation," describing modern sizing and cleaning methods and pointing out the enhancement in value of the operator's product in suiting coals to the needs and demands of all types of consumers. Reporting screen analyses of nut and slack coals from Appalachian Coals mines, O. O. Malleis, manager of inspection and laboratory work, ACI, discussed the trend in ash and volatile content of fine coal sizes from the same mines. Byron M. Bird, chief concentration engineer, Battelle Memorial Institute, spoke on "Limitations of Coal-Cleaning Processes," which precipitated a lively discussion. H. F. Hebley, engineer, Commercial Testing & Engineering Co., discussed "Segregation and Its Reduction," and D. R. Mitchell, professor of mining engineering, University of Illinois, spoke on "Coal Segregation."

New Preparation Facilities

CRUMMIES CREEK COAL CO., Crummies Creek, Ky.: contract closed with Jeffrey Mfg. Co. for tipple equipment to replace machinery destroyed by fire; new equipment consisting of dump hopper, reciprocating plate feeder, scraper retarding conveyor and cable conveyor with head terminal, handling 300 tons an hour to existing tipple.

B. & L. COAL CO., Peckville, Pa.; contract closed with Wilmot Engineering Co. for Wilmot-Menzies hydro-separator for cleaning rice; capacity, 20-25 tons an hour.

BINKLEY MINING CO. OF MISSOURI, Bevier, Mo.; contract closed with McNally-Pittsburg Mfg. Corporation for tipple and washery for strip mine with an over-all capacity of 400 tons per hour. The plant will classify the prepared product into six sizes, with complete crushing and mixing facilities. Washing capacity is 300 tons per hour of 3x0-in. coal, and equipment will consist of one McNally-Norton automatic washer and one reconstructed Simon-Carves washer with Norton automatic controls added. The plant is to be completed about Dec. 1.

FIDELITY FUEL CO., Shaft, Pa.: contract closed with Wilmot Engineering Co. for Hydrotator washing equipment, including sizing and dewatering screens, for preparing rice and barley; capacity, 50 to 60 tons per hour; to be completed about Sept. 1.

HEIDELBERG SALES CO., No. 1 colliery, Avoca, Pa.: contract closed with Chance Coal Cleaner for washing and screening equipment with a capacity of 125 tons of egg to buckwheat No. 4, inclusive, to be installed about Aug. 21. Equipment includes: one 8-ft. diameter Chance cone for egg to pea, inclusive; one 7-ft. square Chance cone for buckwheat Nos. 1 to 4; shaker screens; crusher rolls; etc.

ISLAND CREEK COAL CO., Mine No. 7, Holden, W. Va.: contract closed with Koppers-Rheolaveur Co. for mechanical cleaning facilities with a capacity of 400 tons per hour, including a Rheolaveur washer for 5x¾-in. coal and a dry-cleaning installation for ¾x0-in. coal. The equipment will be added to the facilities of the present tipple.

LITTLE JOHN COAL CO., Victoria, Ill.: contract closed with Jeffrey Mfg. Co. for complete preparation plant with washery and Jeffrey water-clarification system for new strip mine (p. 339 of this issue). The mine output will be crushed to minus 6 in. and washed at the rate of 400 tons per hour in two Jeffrey-Baum automatic three-compartment jigs. The plant is to be laid out for an ultimate capacity of 600 tons per hour by addition of a third jig.

POCAHONTAS CORPORATION, Pocahontas, Va.: contract closed with McNally-Pittsburg Mfg. Corporation for McNally-Norton pick breaker installation for breaking lump coal to 8 in. with provision for rescreening after breaking.

TENNESSEE CONSOLIDATED COAL CO., Palmer, Tenn.: contract closed with the Deister Concentrator Co. for No. 7 Deister-Overstrom "Diagonal-Deck" coal-washing tables for ⅜x1-in. and ⅜x0-in. coal, with Leahy heavy-duty double-surface "NO-Blind" vibrating screen for making separations at ⅜ in. and 20 mesh; to be installed about Aug. 1.

Kentucky Safety Meets Set

Harlan County's first-aid and mine-rescue contest will be held at Harlan, Ky., on Aug. 15, according to an announcement by John F. Daniel, chief of the State Department of Mines and Minerals. Tentative arrangements have been made to hold the Hazard meet on Sept. 19 and for the West Kentucky contests at Madisonville on Oct. 3.

Agency Plans Move Forward

Steps toward the formation of coal sales agencies in northern West Virginia and Indiana are moving forward, conferences having been held and committees named to formulate plans. The West Virginia committee, to decide if an agency is desirable and a satisfactory plan can be formulated, consists of J. Noble Snider, executive vice-president, Consolidation Coal Co.; Edward Page, president, New England Coal & Coke Co.; T. E. Johnson, vice-president, Hutchinson Coal Co.; D. J. Carroll, vice-president in charge of sales, Continental Coal Co.; R. A. Courtney, president, Courtney Coal Co.; with S. Dunlap Brady, president, Osage Coal Co., ex-officio.

The Indiana committee, which was instructed to draft a plan for submission to the Coal Trade Association of Indiana as soon as possible, is composed of the following: H. D. Wright, vice-president, Republic Coal Co.; O. L. Scales, sales manager, Enos Coal Mining Co.; W. M. Zeller, Jr., president, Knox Consolidated Coal Corporation; Earl Shagley, secretary, Walter Bledsoe & Co.; R. E. Snowberger, sales manager, Binkley Coal Co.; C. M. Templeton, president, Sterling-Midland Coal Co.; A. V. Grossman, vice-president, United Collieries Co.

Anthracite Interests Organize Corporation To Direct New Promotional Plans

HARD-COAL producing and selling interests have organized a new agency—Anthracite Industries, Inc.—to direct the campaign recently announced for a mass appeal to consumers in the anthracite-burning markets. A cooperative program to tell the public the advantages of anthracite as a domestic fuel and to familiarize consumers with the latest developments in equipment and controls to promote the more economic and convenient use of hard coal is being worked out by the new organization. According to a preliminary announcement, special effort will be placed on demonstrating automatic stoking equipment now available, thermostatic controls for hand-fired furnaces, service water heaters and modern cooking ranges. Further development of meritorious equipment which has not yet reached the production stage also will be encouraged.

Funds for the major campaign will be raised by tonnage assessments on the producing companies. Retail groups also will be asked to participate in localized campaigns. Present plans call for a three-year campaign. Just how much will be expended during that period has not definitely been decided, but probably will be controlled largely by developments and reactions as the initial promotional work gets under way. It is expected, however, that at least $750,000 will be spent annually (*Coal Age*, July, 1936, p. 311). Some groups associated with the new movement estimate that the expenditures for the first three years will total $3,000,000. While the equipment angle has been stressed in announcements of the campaign, just what part manufacturers will play in the program has not been disclosed.

Cooperative Attack Long Debated

Organization of Anthracite Industries, Inc., marks the culmination of prolonged efforts to unite the producers in a joint promotional campaign. Although the Anthracite Institute has acted as a clearing house for general publicity and the Anthracite Institute Laboratory at Primos, Pa., has done yeoman service in testing equipment and in developing engineering data, many leaders in the industry long have felt that a more direct appeal to the consumers was essential if the decline in demand was to be checked and lost markets regained. Several years ago the operators did start a cooperative advertising campaign in a number of newspapers, but this venture was soon abandoned.

Since then the advocates of joint action have struggled to line up the industry for further cooperative promotional endeavor. Several times it looked as if these efforts would succeed, but internal disagreements would wreck the movement. In some cases, action was blocked by the revival of ancient animosities between the "old-line" and "independent" groups; in others, the insistence of one or more important factors on playing a lone hand ended hopes for cooperative effort. Despite these handicaps, however, leaders in the group favoring a joint campaign kept up the fight for united action. This steady pressure, new alignments and the intensification of the marketing difficulties finally paved the way for agreement.

Both producing groups are represented on the directorate of Anthracite Industries, Inc. An advisory committee of retail dealers in the Middle Atlantic and New England States also has been named to work with the new organization. Frank W. Earnest, Jr., formerly vice-president and general sales manager of the Spencer Heater Co., has been elected president of Anthracite Industries, Inc., with headquarters in the Chrysler Building, New York City. The members of the board of directors are: Thomas Dickson, Dickson & Eddy; A. C. Dodson, president, Weston Dodson & Co.; Eliot Farley, president, Delaware, Lackawanna & Western Coal Co.; John Gilbert, president, Madeira, Hill & Co.; F. W. Leamy, senior vice-president, Hudson Coal Co.; Donald Markle, president, Jeddo-Highland Coal Co.; Oscar F. Ostby, president, Independent Anthracite Coals, Inc.; Ralph E. Taggart, president, Philadelphia & Reading Coal & Iron Co.; and J. B. Warriner, president, Lehigh Navigation Coal Co.

Plan Anthracite Week

Plans for the second annual observance of "Anthracite Week" were developed early last month at a meeting of the recently formed Anthracite Citizens' Conference (*Coal Age*, July, 1936, p. 311) at Hazleton, Pa. The week beginning Sept. 21 was selected. The conference also decided to extend the scope of the observance by soliciting attendance from all parts of the anthracite-consuming area as well as the anthracite region itself. Special efforts will be made to encourage attendance from consuming centers such as New York, Philadelphia, Boston, Washington and Baltimore.

The avowed purpose of the Anthracite Week observance is to publicize "the superiority of anthracite as a domestic fuel in an effort to reclaim lost markets and to restore hard coal to its former

★ ★

STOKER SALES GAIN IMPETUS

SALES of mechanical stokers in May last totaled 3,913, of which 3,547 were small residential-size units, according to statistics furnished the U. S. Bureau of the Census by 108 manufacturers. This compares with sales of 2,745 units in the preceding month and 1,987 in May, 1935. Figures for the first five months of this year show that 14,865 units of all types and sizes were sold, compared with 7,410 in the corresponding period a year ago. Sales by classes in the first five months of this year were as follows: residential (under 100 lb. of coal per hour), 13,075; apartment house and small commercial heating jobs (100 to 200 lb. per hour), 737; general heating and small high-pressure steam plants (200 to 300 lb. per hour), 299; large commercial and high-pressure steam plants (over 300 lb. per hour), 754.

dominating position in the industrial world. Automatic heating equipment will be among the displays to demonstrate how hard coal can be burned without the inconvenience of stoking and hand removal of ashes. Anthracite's non-coking and smokeless qualities will be featured in tie-ins with anthracite dealers." The movement originated in the anthracite region last year and was fostered by local commercial interests who were alarmed by the steady declines in tonnage and the consequent decrease in payrolls.

A.S.T.M. Modifies Procedures And Plans New Methods

Three detailed committee reports were presented on coal and coke and gaseous fuels at the 39th annual meeting of the American Society for Testing Materials, held June 29-July 3 at Atlantic City, N. J. With a record-breaking attendance of 1,171 registrants, formal sessions were held and more than 100 technical papers and reports were presented.

Committee D-5 on Coal and Coke announced that it is planning to prepare a method of test for fineness of coal and coke to determine the efficiency of treatment with chemical and oil compounds. Results obtained from tests [illegible] determinations made by different laboratories of [illegible] friability determined by the [illegible] and [illegible] by the [illegible] specified in the Standard Methods of Laboratory Sampling and Analysis of Coal and Coke (D 271-33) were reported as sufficiently promising to justify further studies so that the [illegible] can be used as permissible equipment in the standard test. A revision of the standard methods of determining volatile matter of sub-bituminous coal, lignite and peat contained in the standard methods of analysis, in which the tests are given a preliminary heat treatment to prevent rapid evaporation of moisture and gases, was approved for publication as tentative. The modification brings out the fact that certain low-temperature cokes, peat cokes, chars, anthracites and semi-anthracites also should be given such preliminary treatment and includes more detailed instructions.

At a meeting of the committee it was agreed to recommend to the society a revision of the Standard Method of Sampling Coal (D 21) to provide for mechanical reduction of gross samples of coal to a convenient quantity for transmittal to the laboratory. This is accomplished by crushing and riffling samples. It is believed that this mechanical method of reducing coal samples will be widely used by coal producers and consumers who have occasion to do much coal sampling, as the method is much more rapid and less expensive than the hand method. The mechanical method supplements but does not replace the hand method of reduction.

A proposed method developed by the Sectional Committee on Classification of Coals, which is sponsored by A.S.T.M. under American Standards Association procedure, covering the designation of coal sizes when the results of screen analyses tests are taken to represent the condition of the coal as sold, was approved as a tentative method. This does not cover the standardization of screens used in the commercial preparation of coal but applies only to natural continuous ranges of sizes as produced by mining, handling, crushing, screening, etc. The sectional committee announced that while sufficient information has not yet been obtained to justify the formulation of specifications for the classification of coals according to type, it had reached tentative agreement that the types of coal should be classified into two groups, namely, banded and non-banded coals, and that these two groups should each be subdivided into three classes, making six classes of coal types.

A revision of the Tentative Specifications for Classification of Coals by Rank (D 388-35 T) was approved. This substitutes an agglomerating test for the agglomerating value test, as the former has the advantage of simplicity, no special apparatus being needed. All available data show that the classification of none of these coals will be changed by this substitution.

PERMISSIBLE PLATES ISSUED

Three approvals of permissible equipment were issued by the U. S. Bureau of Mines in June, as follows:

Goodman Manufacturing Co.: Type 412KN-2 shortwall mining machine; 50-hp. motor, 220 volts, a.c. Approval 302; June 5.

Jeffrey Manufacturing Co.: Type 44-DD loading machine; two 15-hp. motors, 250-500 volts, d.c. Approval 303 and 303A; June 8.

Sullivan Machinery Co.: Type 9-B shortwall mining machine; 50-hp. motor, 250 volts, d.c. Approval 304; June 19.

New Alabama Mine Planned

Development of a new drift mine near Adamsville, Walker County, Alabama, has been begun by the Brookside-Pratt Mining Co. The operation, which is to be gradually developed into one of large capacity, is on the St. Louis & San Francisco R.R. and will be known as Lindbergh. The company expects to construct a tipple and preparation equipment of modern design to produce all merchantable sizes of coal. When development is sufficiently advanced the mine will be completely mechanized.

TVA Sued Again in Alabama

Continuing its struggle against the inroads of the Tennessee Valley Authority, the Alabama Power Co. filed a suit July 16 in the Cullman County (Ala.) Circuit Court against the Cullman County Electric Membership Corporation to restrain it from engaging in the electric utility business. The bill of complaint sets forth that TVA is engaging in "unfair competition and practices" against the utility and that the Cullman corporation has not complied with the laws of the State to permit it to engage in the utility business, whereas the power company has complied with state laws and is actually engaged in rendering service in many of the areas which the Cullman corporation purposes to serve.

Coal Symposia Will Headline Chemists' Meeting

Coal symposia on hydrogenation, carbonization mechanism of solid-fuel combustion, constitution of coal and briquetting will feature the 60th anniversary meeting of the American Chemical Society, to be held Sept. 7-11 at Pittsburgh, Pa. The symposia will be under the direction of the society's division of gas and fuel chemistry, of which Dr. G. C. Mallett, of Appalachian Coals, Inc., Cincinnati, Ohio, is chairman.

Dr. F. S. Sinnatt, director of fuel research, Department of Scientific and Industrial Research of Great Britain, will present a paper at the session on hydrogenation. Other speakers will be Dr. M. Pier, research director, I. G. Farbenindustrie A. G., Germany, and Dr. T. E. Warren, fuel research laboratories, Canadian Department of Mines. Research reports will be made by Pennsylvania State College, the coal research laboratory of Carnegie Institute of Technology, and the U. S. Bureau of Mines.

Speakers at the symposium on the carbonization of coal will include Dr. R. E. Gilmore, Canadian Department of Mines; Prof. Frank Douglas, Colorado College, and representatives of the Illinois Geological Survey and Carnegie Institute. Carnegie chemists will reveal the results of a study on the influence of the rate of heating on the carbonization of several coals. They have published findings on some Pittsburgh coals, but new data, they report, make it necessary to modify some of their previous conclusions.

Fundamental knowledge of the mechanism of combustion of solid fuels will be covered in a third symposium. Research studies will be reported by Dr. H. C. Hottel, Massachusetts Institute of Technology; Prof. H. F. Johnstone, University of Illinois, and by scientists at Battelle Memorial Institute, Pennsylvania State College and Carnegie Institute. Speakers at the constitution of coal will include Dr. Harold Hibbert, McGill University; Dr. Reinhardt Thiessen, U. S. Bureau of Mines; Dr. Walter Fuchs, Pennsylvania State College, and Dr. Reinhardt Thiessen, U. S. Bureau of Mines.

Briquetting of coal will be discussed at a special session at which E. R. Kaiser, Battelle Memorial Institute, and Prof. C. A. Basore, Alabama Polytechnic Institute, will speak. Lignites will be the theme of Dr. Irvin Lavine, University of North Dakota. Dr. H. R. Fife, Carbide Carbon & Chemicals Corporation, will describe new research on briquetting coal.

Old Timers Celebrate

Featured by first-aid contests, parade, banquet, field sports and entertainment including the Brennan male chorus of 30 voices, the Union Pacific Coal Co. Old Timers' Association held its twelfth annual reunion June 19-20 at Rock Springs, Wyo. The parade, which followed the business meeting, was led by the famous McCormick Kiltie band, with brass bands from Rock Springs, Reliance-Winton, Superior and Hanna taking part.

At the annual banquet, Frank Tallmire, treasurer of the Old Timers' Association, was toastmaster, and addresses were made by President McAuliffe, the Right Rev. Fred Ingley, Episcopal Bishop of Wyoming, and William Ritchie, of Omaha, Neb. Forty-year gold service buttons were presented by Mr. McAuliffe to Thomas L. Edwards, John McTee, Jr. and Matthew Morrow, Sr.

The field-day events which preceded the reunion were participated in by 23 first-aid teams. The team from Superior B took first place with 499 1/3 points out of a possible 500; Winton was second, with 497 2/3; and Superior C took third, with 497. Hanna Japanese boy scouts led their division, with 498 2/3; senior girl scouts from Superior topped their class, with 499 2/3, and junior girl scouts from Rock Springs were winners with 495 1/3.

Bootleg Operations Blown Up

Employees of the Stevens Coal Co. dynamited one "bootleg" mine after another on its property in the Shamokin Valley area of the anthracite region in Pennsylvania on July 3, closing the mine entrances, and sought to destroy every independent working on its holdings. The company took this action after the rescue of and subsequent death of a bootleg miner who had been trapped for 22 hours by a fall of rock.

Tells Alabama's Coal Story

A series of "information letters" dealing with the Alabama coal industry has been started by the Alabama Mining Institute under the editorship of Hubert E. Mills, assistant secretary and statistician. The object of these publications is to impress upon the public the importance of this basic industry and its part in the prosperity of the State. Letter No. 1, issued July 6, under the subheading "Formation and Deposits," shows the different fields into which the coal belt is divided. Subsequent letters will recite history, mining methods, cleaning and preparation, uses, byproducts, marketing and other problems.

First-Aid Scores High

First place in the Monongahela Valley Coal Mining Institute first-aid meet, held July 18 at Morgantown, W. Va., was won by Consolidation Coal Co. team from Mine 97, Rivesville, with 1,498 points out of a possible 1,500. Second place went to Kelleys Creek Colliery No. 1 team, with 1,496 plus; it was necessary to work an extra problem to reach a decision between this team and No. 1 team from the Continental Coal Co. plant at Cassville, which scored 1,496 minus. Fifteen teams were entered in the mines division.

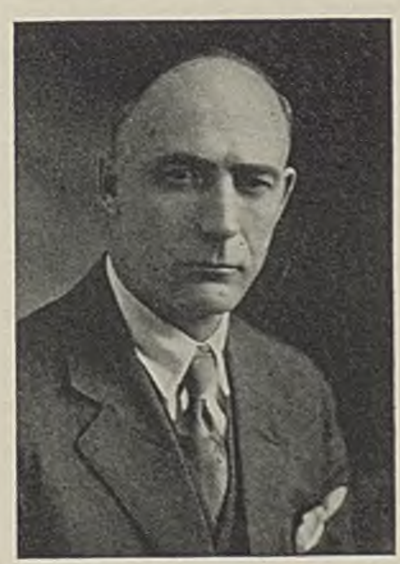
Old Ben to Reopen Mine

Mine No. 11 of the Old Ben Coal Corporation, at Christopher, Ill., is being mechanized and will be reopened early in August with approximately 500 men, it is reported. The mine has been closed since 1928, when it employed about 700 men.

Shaft Sinking, Cutting, Air Power and Steam Attract Many to Nova Scotia Meeting

COAL MINES, their boiler-feed waters, the relative cost of their electric and compressed-air services, their coal-cutter chains and picks, their shafts as exemplified by the No. 12 Waterford Shaft, a stone's throw from the sea, and their markets were the bedrock of the sessions of the Forty-Ninth Annual Meeting of the Mining Society of Nova Scotia held June 25-27 at Pictou Lodge, Pictou, N.S.

When the hydrogen-ion concentration (pH) reaches 12, boiler plates are said to be subject to pitting, declared J. L. Bowlby, analytical engineer, Dominion Coal Co., Glace Bay, in a progress report on the boiler waters in Cape Breton's colliery district. As the pH recently has been kept at about 11.2 in the Dominion Coal Co.'s boilers, no evidence is available in Cape Breton to ascertain the pitting point, but it has been found that with lime-and-soda treatment, if the alkalinity lies between 11.0 and 11.4, the boilers will be free from corrosion. With any lower alkalinity, corrosion occurs, so he advocated the range between those figures as being safe and desirable with



N. T. Avard
Mining Society's new president

soda-lime treatment; 1 lb. of lime is generally used to 7 lb. of washing soda. At the Central power plant, however, soda ash is being substituted for washing soda, using the same equivalent proportions. At Waterford Lake, a 1-to-1 mixture of soda ash and trisodium phosphate is satisfactorily employed, while at Sydney Mines and No. 3 power plant in Sydney, a commercial phosphate treatment is giving good results, but at a somewhat greater cost.

However, added Mr. Bowlby, the alkalinity need not be so high when phosphate is used in feed-water treatment. A range of from 10.5 to 11.0 pH will suffice, possibly because the phosphate salt has a higher buffer action. The boilers with this degree of alkalinity do not scale materially. When alkalinity is kept at the proper figure, there is always enough carbonate (or phosphate) to remove calcium from solution and sufficient hydroxyl to precipitate the magnesium. In preliminary studies with lime and soda, close attention must be given to the ratio of carbonate to hydroxide alkalinity as determined by titration; enough of the former must always be present to throw down the calcium, or calcium-sulphate scale will coat the boiler surfaces.

Abuse and misuse have had much to do with the disuse of steam and compressed air underground, in the opinion of M. W. Booth, steam engineer, Dominion Steel & Coal Corporation, speaking at the afternoon session, at which G. E. Cole, president, Canadian Institute of Mining and Metallurgy, presided. At Princess Colliery a duplex pump using steam, compound and condensing, failed for mechanical difficulties. Had a steam-turbine drive been used with a high-speed turbine pump and every steam economy used, the installation might have been made as efficient as an electrically driven unit, "but the central electric supply station and all that it means or promises (not always the same) turned the scale against steam." Then also the fire hazard operated against steam. Perhaps the hot steam lines, rather poorly insulated, were more or less responsible for setting on fire the No. 3 Springhill mine. Only recently a steam plant underground was said to be giving results superior to those obtainable with compressed air or electricity.

Compressed Air Is Cheap

But with compressed air came a simple and cheap method of transmission and freedom from fire hazard. Its advantages are: (a) entire safety, (b) mechanical simplicity, (c) flexibility and control, (d) convenience in remote places and in small units, (e) low first cost. Since the introduction of the "Victualic" joint, maintenance of tight joints and erection of lines has ceased to be a problem.

With air, one rarely has to worry about exact design and size of pump or hoist, so long as the equipment is big enough, for compressed air is fundamentally self-controlling and can be controlled easily. If a car leaves the road or encounters obstruction, a compressed-air engine will slow down or stop without excessive damage; a motor is not made that way. For this reason, with it, ropes and gears last longer. Compressed air is a slow-speed medium, though some are trying to speed it. It is simple to install and, in reciprocation, when operating at low load, it works with efficiency, which the electric motor, under low load, does not.

When frost appears in the exhaust pipe of a pump or air engine, air is working efficiently. When the exhaust is relatively warm, air is being wasted. One engine, with an exhaust which was warmer than usual, was recognized as an "air eater." With a flow meter it was found that it consumed 1,730 cu.ft. of air per minute to produce 25 hp.; about 70 cu.ft. per unit of horsepower, or three times what it should be taking.

With electricity, to get low speed, gearing must be introduced, involving extra cost, maintenance and equipment. The motor, declared Mr. Booth, is an efficient apparatus at the load for which it is designed when running at constant speed, but starting and stopping a motor and running it at variable loads reduce its efficiency. Also the motor is not adaptable; it must operate near its full load and characteristics. More spare motors, therefore, have to be kept on hand than spare compressed-air equipment. Electricity, he added, is always hazardous, especially in a gassy mine. The induction motor has poor control characteristics, an ambition to maintain speed, willy nilly. If a car leaves the track, it is a challenge to the motor, and it strives its best to keep going, smashing equipment and breaking ropes, which latter accordingly have to be heavier, giving more weight to be dragged around.

A compressed-air turbine, said S. G. Naish, eastern district manager, Peacock Bros., Sydney, will pass as much air when not under load as when loaded, and its efficiency is low. Men brought up with electricity will be careful with it, but not men who have had experience solely with compressed air. Unless the water is properly removed from the air, said Alex. McEachern, chief inspector, Dominion Coal Co., Glace Bay, it will be carried into the pipes and equipment, and the efficiency of the air will be lowered. Pipe losses are often large.

Compressed air is not entirely safe, asserted T. L. McCall, chief mining engineer, Dominion Coal Co., for, if released by a sudden break in the transmission line, compressed air might, at the break and in the rapidity of its escape, generate frictional electricity. The capacity of such electricity to ignite a gaseous or dusty atmosphere in a coal mine is not definitely known but is being investigated in several quarters. Besides, a big hoist—say of 1,300 hp.—would require 26,000 cu.ft. of air per minute. Such a quantity of air would require huge pipes to convey it and a large area on the surface to compress it. Electricity alone could provide the means for operating such a large hoist. Use of air for ventilation, said Mr. McCall, also wastes air and makes it inefficient. Leaks also reduce efficiency, which is one-seventh that of electricity. Electricity, declared another speaker, was the more efficient means of transmitting and using power. Once installed, no one would think of going back to compressed air. An electric pump is more reliable than one using steam or compressed air.

Air's Advantages Argued

Safety and cost are the two considerations, said R. S. Bigelow, Goodman Manufacturing Co., Chicago, Ill. A South African firm recently declared that it had saved $3,000 a year by a shift from compressed air to electricity. In rebuttal, Mr. Booth said both compressed air and electricity had their place and should be used where conditions favored each. He had been intentionally biased in his address, it having been prepared with the idea that E. L. Martheleur, chief electrical engineer, Dominion Coal Co., Sydney, would act as protagonist of electricity. The reciprocating air motor was not as wasteful as the turbomotor; perhaps that was why Holman Machines, Ltd., stuck to reciprocation. Answering Mr. McEachern, he declared that water in pipes and pipe leakage represented a condition now not prevalent. A little soapsuds will prevent oil from traveling the pipes. He agreed with Mr. McCall that large hoists could not profitably be driven by compressed air. Reciprocating engines, said W. S. Lecky, Holman Machines, Ltd., Montreal, P.Q., were not so wasteful as air turbines and do not wear so much. Collieries are obliged to be economical and should study these costs, with caution in jumping at conclusions.

Of the three markets of the Maritime Provinces (Nova Scotia and New Brunswick)—the home market, Quebec and Ontario—each has entirely distinct problems, declared E. Gerow, district manager of coal sales, Dominion Steel & Coal Corporation, Toronto, Ont. In the Maritimes, the fuel-burning equipment is such as is capable of operating with any Nova Scotia coal, at least within reasonable limits, and purchasers have learned how to handle coal from the various localities. The domestic furnaces of these provinces are of ample capacity to carry the loads required. Thus the problem is merely to provide a fuel of the greatest economy and to show that, on the basis of cost per B.t.u., the price compares favorably with competing coals. However, if the load be exceptionally variable, with high peak demands or long banking periods, the operator must be prepared to provide a fuel that will best meet such irregular demands even if the cost per B.t.u. on normal operation may be a little excessive.

Moreover, the habits and desires of the consumer must be considered. Some will have preference for large or small coal or coal of a particular kind, and such matters must be borne in mind. Mechanical stokers for heating purposes at first were recommended for all types and qualities of coal, but it has been found that the introduction of these devices has made the purchaser rightly more selective than ever. Again, stokers may be installed either for economy or convenience. If for the latter, ease in handling is the most important consideration, and economy must be regarded as a subordinate consideration in supplying the coal. Foolproof, trouble-free coal is the desideratum. Consistent and suitable grade and sufficiency of supply are the essential elements of the Maritime market, where the consideration is to retain a market hitherto restricted to the product of those provinces.

Maritime Markets Analyzed

About 90 per cent of the Quebec bituminous market uses Cape Breton coal and, with unimportant exceptions, has equipment, large or small, that will handle such coal. In Ontario, however, not only is the coal obtainable diverse but the equipment provided. It is, Mr. Gerow declared, the most competitive market on the continent, and Nova Scotia suffers because it can supply only certain definite sizes, whereas the competitive coal is of all sizes and mixtures of sizes which certain consumers believe are best suited to their specific equipment and uses. As some of the equipment is not suitable to Nova Scotia coal, the salesman must pick out only such consumers as can burn that fuel with advantage.

It is the salesman's opportunity to suggest the purchase of equipment that will enable the consumer to burn Nova Scotia coal and effect an economy in so doing, and whenever changes are made in installations, or new installations are made, he should suggest the use of equipment that is suitable to the effective combustion of coal from that province. In the Province of Quebec, certain refractories are replaced every season, whereas, in the Province of Ontario, replacements are expected to be made only once in five to ten years. Modern furnace-cooling devices which reduce the need for such replacements should be advocated.

In discussion, Mr. Gerow said that Nova Scotia found a market as far as London and Hamilton, Ont., and thence to Orillia, on Lake Simcoe, and to the foot of Georgian Bay. Some goes also to Sudbury and Copper Cliff, in northern Ontario. Whether Nova Scotia would do well to make all the changes in its tipples necessary for screening and mixing coal as is customary in the United States was questioned by Mr. Booth.

Cutting coal where there is no weight to break down the material is difficult, declared Mr. Naish, reading the paper prepared by P. J. O'Donnell, longwall mechanician, Dominion Coal Co., New Waterford, at the Friday afternoon session, at which A. D. King, general manager, Minto Coal Co., Minto, N.B., presided; hence, cutting in a longwall face is more effective than in narrow rooms and headings. The Dominion Coal Co.'s experience has shown that, where water is present, cuttings churn into a pasty mass which chokes the chain and can be kept clear of the cut only with difficulty. An advantage with special-steel

★ ★

Jubilee Year Officials

N. T. Avard, managing director, Maritime Coal, Railway & Power Co., Amherst, was elected president of the Mining Society of Nova Scotia at its forty-ninth annual meeting, held June 25-27 at Pictou, N. S. Other officers chosen are: Alex McEachern, chief inspector, Dominion Coal Co., Glace Bay, first vice-president; Dr. D. F. McDonald, professor of geology, St. Francis Xavier University, Antigonish, second vice-president; S. C. Mifflen, office engineer, Dominion Coal Co., Sydney, secretary-treasurer.

Members of the Council are: Michael Dwyer, Minister of Mines, Halifax; H. C. M. Gordon, assistant mining engineer, Acadia Coal Co., Stellarton; J. C. Nicholson, general superintendent of mines, Dominion Coal Co., Glace Bay; T. L. McCall, chief mining engineer, Dominion Steel & Coal Corporation, Sydney; H. Hines, district superintendent, Dominion Coal Co., Sydney; H. J. Kelley, vice-president and general manager, Dominion Steel & Coal Corporation, Sydney; D. H. McLean, resident superintendent, Acadia Coal Co., Stellarton; Col. D. H. McDougall, consulting mining engineer, Montreal, P. Q.; A. D. King, general manager, Minto Coal Co., Minto, N. B.; J. W. McLeod, managing director, Greenwood Coal Co., Thorburn; J. P. Messervey, deputy inspector of mines, Halifax; F. W. Gray, assistant general manager, Dominion Steel & Coal Corporation, Sydney; A. L. Hay, mining engineer, Dominion Coal Co., Glace Bay; J. W. McFarland, manager, Atlantic Gypsum Co., Cheticamp; J. G. A. Stevenson, superintendent, British Metals Corporation (Can.), Stirling Mine; T. J. Casey, mine manager, No. 1B colliery, Dominion Coal Co., Cape Breton.

picks is that with them longer faces are permissible and greater outputs can be handled from individual units. Indirectly, also, such picks reduce electrical repairs, for with them the switch is less abused, because the "inching" of the chain in changing picks occurs less often than with the more rapidly blunted carbon-steel picks.

Picks tipped with Stellite or tungsten carbide, with the high resistance of those alloys to abrasion, are proving useful, but a good angle of rake and adequate clearance are with difficulty combined with adequate support of the brittle insert tip. Without such a correct angle of rake and clearance, the machine may not hold in the cut, and power consumption will be high. This type of bit is most useful where a uniform material has to be cut, but does not do so well because, it is believed, of shock, where foreign material occurs in the seam. Here an alloy-steel pick is preferable. A Carboloy-tipped pick gave excellent results at No. 10 colliery of the Dominion Coal Co., but at No. 16 colliery, though conditions are less severe on carbon-steel picks, the tips broke off, probably due to the shocks resultant on the presence of foreign material.

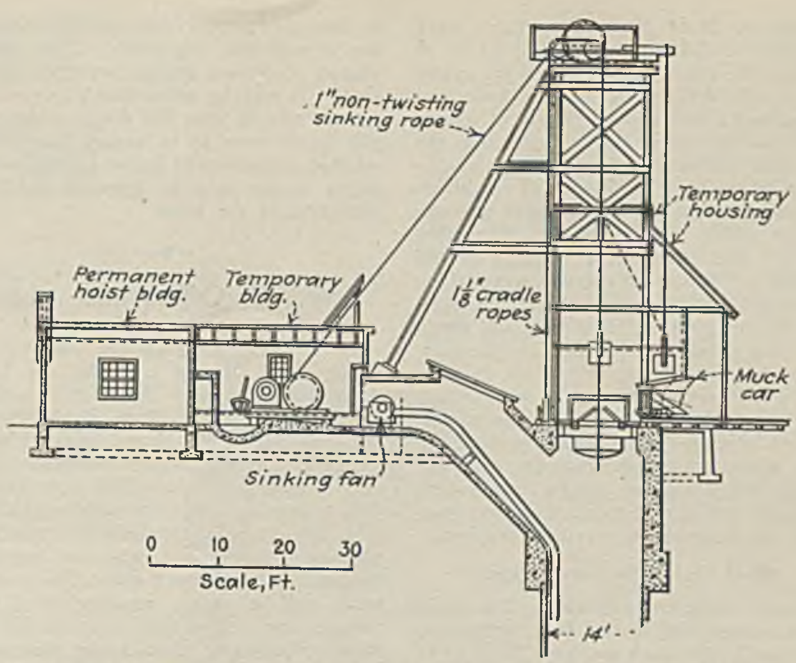
Side rubbing of picks in cutting, which is undesirable, is attested by the polished appearance of the pick, said Mr. O'Donnell. When it is observed, the taper should be increased until the polish appears only on a narrow line along the cutting edge. The standard cutter bar, which is 4 in. thick, is none too strong for underground conditions. A thin cutter bar requires careful handling; a thin seam, small depth of cut and soft cutting conditions are ideal for such bars. With a thin bar, the range of pick lines is limited. Cutter bits should be changed as soon as increased power consumption and inability of the machine to stay close to the face indicate that the bits are blunt.

Harder Coal Needs More Positions

Five-pick-line chains may be used where the seam cut is soft and friable and where large size cuttings are desirable, but the seven-pick-line cutter chain is standard. Where the material is tough and tends to form grooves with ridges between the pick lines, nine- or eleven-line chains are used. In each case, the outside lines are at a fixed angle to the center. The most commonly used chains have these outer lines at 50 deg., but 60 deg. is used where a thick kerf is desired. The various lines are arranged between these limits. Where the material is tough, and the chain has an insufficient number of lines, ridges high enough to rub the pick blocks may be formed, setting up further friction.

Because of the wide angle of the pick blocks, side thrusts occur and cause friction, so that, to balance these, wide pick blocks are set as much as possible on opposite sides of the chain adjacent to each other. Picks should be equally spaced on any given line so that all will do equal work. Because they are more heavily loaded, and because they cut on a solid angle rather than on a flat face, more picks should be placed in the outer rows than in others, and an extra pick or picks may be added to the bottom line to maintain the cutting plane at the desired level.

High chain speeds throw the coal clear of the chain and clean the cut better than low speeds, and the same result is attained when cutting above the bottom. Chain lines, chain speed and speed of advance are all related. In a few unusual cases, omitting certain picks, a complete line, or one from each line gives a slight advantage, but this destroys the balance and, in hard coal, may be dangerous, for the machine may fling itself out of the cut.



Section through hoist and air shaft, No. 12 colliery, New Waterford, showing cradle and inclined air pass

Slack chains will jam when entering the guides, and tight chains cause friction and power losses. A chain that is slack running light may become tight when cutting, as fine coal cakes under the boxes at the end of the cutter bar. Hard coal needs a tighter chain than a soft one.

Picks should be set to gage. A projecting pick will deliver a violent shock to the whole mechanism and, becoming blunted, will be a drag on the cutting, but if the machine is disposed to climb the bottom, picks may be placed a little further out than in the normal setting. However, the other lower lines must be pulled out in due proportion to their distance from the center line.

In discussion, Mr. Naish declared that pyrite cannot be cut by any ordinary bit but can only be yanked out, and it is the shock which accompanies this action that destroys the bit point. Hard material, such as anthracite or salt, can be cut with the right kind of bits. When 17 ft. of face can be cut with tool steel, with tipped bits 120 ft. can be cut in the same time. At the Malagash salt mine, a 50-hp. motor was needed for cutting, and blowers had to be used to keep the motor cool. With special bits, 25-hp. suffices, and the use of blowers is not necessary. But this is a case of cutting a hard substance, not of yanking out an uncuttable sulphur ball.

Tipped bits, for this reason, do not last any longer in the New Waterford coal mines than in the Malagash salt mines. About 90 per cent of the cutters in the United States have a ring-type cutter head which lubricates nicely. In shales or abrasive material, the ball-type cutter head works to advantage.

In a written communication, Prof. H. Sano, of Tokyo University, Tokyo, Japan, read by the secretary, said that in Japan, bits are being made from old rails. Siliceous wood, said R. S. Bigelow, is found in the seams of Japan, and this wood, which causes much trouble in cutting, may be found anywhere in the seam. In South Africa, stalagmites, or spires, occur in the coal, and in Australia, rolls which make cutting difficult. The sprocketed cutter bar, said Mr. King, had made a great improvement in cutting. With other machines, too much cleaning was necessary and the life was too short. The Minto mines cut in clay, which is extremely abrasive, and a chain lasts only four months.

At No. 12 colliery, New Waterford, declared W. C. Risley, construction superintendent, Dominion Coal Co., Sydney, a shaft 14 ft. in diameter in the clear and 765½ ft. deep, was sunk, with the aid of cementation, wherever needed, at a point only 250 ft. from high-water mark of the shore, facing the Atlantic Ocean, where the cliff was 40 ft. high. As every preparation was made, from the outset and in the progress of the work, to determine the need for cementation and to provide it wherever necessary, the work proceeded without any unnecessary delay. Diamond drilling had demonstrated that heavy flows of water might be expected to a depth of 250 to 300 ft. After the shaft had been driven to a depth of 35½ ft. and the cementing to a depth of 65 ft., the shaft sinking was turned over to a contractor who completed it and sunk an average of 6 ft. 3½ in. per day, excluding work in the Harbour seam, to which the sinking was made, and lined 15 ft. 4½ in. daily. The contractor used 2.13 lb. of 40-per-cent gelatin dynamite per cubic yard of excavation, and the material he passed through, excluding the Harbour seam, consisted of 56.6 per cent shale, 34.5 per cent sandstone, 4.3 per cent sandstone and shale, 3.2 per cent coal, 1.0 per cent hard limestone and 0.4 per cent clay.

In the entire depth of the shaft, observed Mr. Risley, pilot holes were kept 8 to 12 ft. in advance of the sinking, and, if no feeder was struck, the hole was drilled to a depth of 20 or 30 ft. Two holes were drilled on a diametral line, each 12 to 18 in. from the shaft perimeter. When water was struck, drilling ceased, the hole was capped, and a mixture of one bag of cement to 75 gal. of water was pumped into the hole. The mixture gradually was strengthened to three bags for 75 gal., if conditions appeared to favor a building up of pressure and the sealing of the crevices. If possible, the hole was sealed at a pressure of 600 to 1,000 lb. When the crevices were taking an undue quantity of cement, and the pressure did not increase, stone dust and sometimes fine sawdust were added to the mixture to lower the cost. From six to eight holes usually were necessary to seal the bottom. Some cementation of the sides was attempted after the lining was completed, for 2 gal. of water was entering the shaft per minute, but when one section was sealed, the water was forced to another, and practically no ultimate improvement resulted.

Steel Cradle Prctects Sinkers

A steel cradle covered with a 3-in. wood deck and suspended by two 1⅜-in. wire ropes was hung in the shaft and kept 30 or 40 ft. above the shaft bottom. It acted as additional protection of the men at the bottom against falling rock particles, as a suspended weight for guide ropes, as a setting platform for starting and stripping concrete forms and for cementation through the lining. Two cylindrical 1-cu.yd. buckets were kept in continuous service delivering to a steel end-dump car at the surface, which was operated by main-and-tail rope haulage. The rock was dumped into the sea automatically, but in cold and stormy weather a laborer kept the chute and track clear.

The buckets carried on an average 12.9 cu.ft. of effective excavation, so about sixteen buckets removed a foot of excavation. One bucket was lifted per man-hour. The concrete used was made of one bag of portland cement to 5½ cu.ft. of well-graded beach gravel, which mixture had a compressive strength in 28 days of 2,500 to 3,000 lb. per square inch. An average of 48 ft. was concreted at a stage, the entire work requiring nine hours. Concrete was placed day and night during phenomenally cold weather, the concrete being delivered at a temperature between 60 and 90 deg. F.

Actual field work began early in October, 1933; excavation for the shaft collar was started by the company Oct. 16; the contractor took over plant and equipment Dec. 19, and his work was finished July 25, 1934. Work proceeded on a three-shift basis.

In discussion, it appeared that a François-Derrihan duplex-plunger air pump with ball valves was used to deliver the grout. It had 2-in. plungers, operated at 60 r.p.m., and delivered 12 gal. each minute. A 2-in. pipe with release valve delivered the grout to a flexible hose which went down the shaft. Pressures of 600 to 800 lb. and sometimes even 1,000 lb. per square inch were used. Behind the lining, such pressures would be excessive, so only 250 to 300 lb. per square inch were used in general, but sometimes 500 lb.

One-inch pipes, said Mr. McCall, would suffice, as he had found in Princess shaft when grouting behind cast-iron tubbing. The shaft was sunk, not raised, because the roadways had not reached the location of the shaft when sinking began. Need for speedy action to supply the air required for an increased production made it obligatory not to wait for the arrival of the subterranean aircourses at the projected foot of shaft. It may be added that other reasons for not raising were the distance the material would have to be hauled, the lack of suitable storage room below ground and the desire in no way to interfere with the operation of the mine.

W.V.U. Offers Fellowship

In cooperation with the Monongahela Valley Coal Mining Institute, the Upper Monongahela Valley Association and the Monongahela West Penn Public Service Co., the School of Mines, West Virginia University, offers its first research fellowship in mining for the school year 1936-37. The fellowship is open to college graduates who have had a satisfactory training in physical sciences and who are especially qualified to do research work. The research work will be on the benefication of bituminous coal. The fellowship is for nine months, beginning Sept. 1, the student being granted a stipend of $500 and free tuition.

Obituary

Joseph J. Vigneau, 57, former publisher of the Keystone coal catalogs and directories, which he sold to the McGraw-Hill Publishing Co. about ten years ago, died July 1 in Homeopathic Hospital, Pittsburgh, Pa. He also was at one time president of the Instruments Publishing Co., retiring from active service six months ago because of ill health.

Marshall G. Moore, 77, formerly general superintendent of mines at the coal properties of the Bethlehem Steel Co., died suddenly July 15 at his home near Lebanon, Pa. Graduated from Rensselaer Polytechnic Institute in 1884, he entered the employ of the Lackawanna Iron & Coal Co. the same year. A year later he was named assistant engineer in the mining department of the Cambria Iron Co., and in 1889 was made mining engineer. He was appointed chief engineer in 1893 and served successively under the Cambria Steel Co., Midvale Steel Co. and Bethlehem Steel Co.

Warren T. Acker, 52, president, Centralia Collieries Co., Scranton, Pa., died in a Scranton hospital on July 3 as the result of injuries sustained nearly a week previous when thrown from his mount at a horse show.

Mine Fatality Rate Reaches Lowest Level Since 1913

Coal-mine accidents caused the deaths of 44 bituminous and 14 anthracite miners in May last, according to reports furnished the U. S. Bureau of Mines by State mine inspectors. With a production of 28,541,000 tons, the bituminous death rate in May was 1.54 per million tons, the lowest for any month since 1913. This compares with 2.67 in the preceding month, when 30,318,000 tons was mined, and 2.76 in May, 1935, in mining 26,790,000 tons. The anthracite fatality rate in May last was 3.06, based on an output of 4,577,000 tons, as against 3.23 in the preceding month, when 4,336,000 tons was produced, and 6.10 in May, 1935, when production was 4,919,000 tons. For the two industries combined, the death rate in May last was 1.75, compared with 2.74 in the preceding month and 3.40 in May, 1935.

Comparative fatality rates for the first five months of 1935 and 1936, by causes, are given in the following table:

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

Cause	Bituminous: Number killed	Bituminous: Killed per million tons	Anthracite: Number killed	Anthracite: Killed per million tons	Total: Number killed	Total: Killed per million tons
January–May, 1935						
Falls of roof and coal	213	1.339	62	2.695	275	1.510
Haulage	87	.547	12	.522	99	.544
Gas or dust explosions:						
Local explosions	7	.044	5	.217	12	.066
Major explosions	...	.....	13	.565	13	.072
Explosives	15	.094	8	.348	23	.126
Electricity	11	.069	...	.....	11	.060
Mining machines	11	.069	...	.....	11	.060
Other machinery	...	.....	...	.....	...	.....
Miscellaneous:						
Minor accidents	13	.082	5	.217	18	.099
Major accidents	6	.038	...	.....	6	.033
Shaft:						
Minor accidents	5	.031	1	.044	6	.033
Major accidents	...	.....	7	.304	7	.038
Stripping or opencut	2	.012	5	.217	7	.038
Surface	14	.088	14	.609	28	.154
Total	384	2.413	132	5.738	516	2.833
January–May, 1936						
Falls of roof and coal	225	1.316	58	2.488	283	1.457
Haulage	53	.310	7	.300	60	.309
Gas or dust explosions:						
Local explosions	6	.035	11	.472	17	.088
Major explosions	8	.047	...	.....	8	.041
Explosives	15	.088	7	.300	22	.113
Electricity	8	.047	4	.172	12	.062
Mining machines	8	.047	...	.....	8	.041
Other machinery	4	.023	1	.043	5	.026
Miscellaneous:						
Minor accidents	14	.082	10	.429	24	.124
Major accidents	...	.....	...	.....	...	.....
Shaft:						
Minor accidents	3	.018	4	.172	7	.036
Major accidents	...	.....	...	.....	...	.....
Stripping or opencut	5	.029	4	.172	9	.046
Surface	12	.070	9	.386	21	.108
Total	361	2.112	115	4.934	476	2.451

*All figures subject to revision.

WHAT'S NEW

In Coal-Mining Equipment

MOTOR STARTER

Further simplicity and larger clearances are among the features cited by the Ohio Brass Co., Mansfield, Ohio, for its redesigned Type DRT motor starter. The unit is offered for automatically starting and protecting shunt- or compound-wound d.c. motors on conveyors, fans, pumps and other mining machinery.

A larger case, it is stated, allows more clearance for parts and permits mounting all equipment in one case. An improved resistance unit, consisting of one continuous wire wound on an asbestos form, makes the unit foolproof and eliminates deterioration and breakdowns from heating which result when several short coils are used. Latch rollers, latches and steel pins of the circuit breaker are now made rustproof by chrome-plating them, adding to life and increasing accuracy. The panel, it is further stated, is made of a moisture-proof non-carbonizing material with high dielectric properties.

The DRT starter uses a relay-type starting mechanism, which starts the motor on resistance and then throws it across the line when it attains sufficient speed. When power comes on following an interruption or a severe voltage drop, the motor is restarted automatically on resistance. Overload and short-circuit protection are provided by an automatic circuit breaker fitted with a thermal element set for overloads of 25 per cent for 3 minutes. No fine adjustments of any part are necessary, it is asserted. The starter is furnished regularly for 250- to 600-volt motors, 2 to 50 hp., but is available in larger sizes.

OILS

Standard Oil Co. of Indiana, Chicago, offers the new "Stanoil Sextette," a new series of six grades of oil (Nos. 16, 25, 30, 35, 50 and 95), which it states can meet the needs formerly filled by 24 other types of industrial oils, as well as many "special" oils. This versatility, the company states, has been attained by combining in each grade more desirable qualities than any of the individual oils it displaces. Other features are high stability, excellent demulsibility, low carbon - forming tendency, excellent color, good viscosity index and low pour test, the company points out.

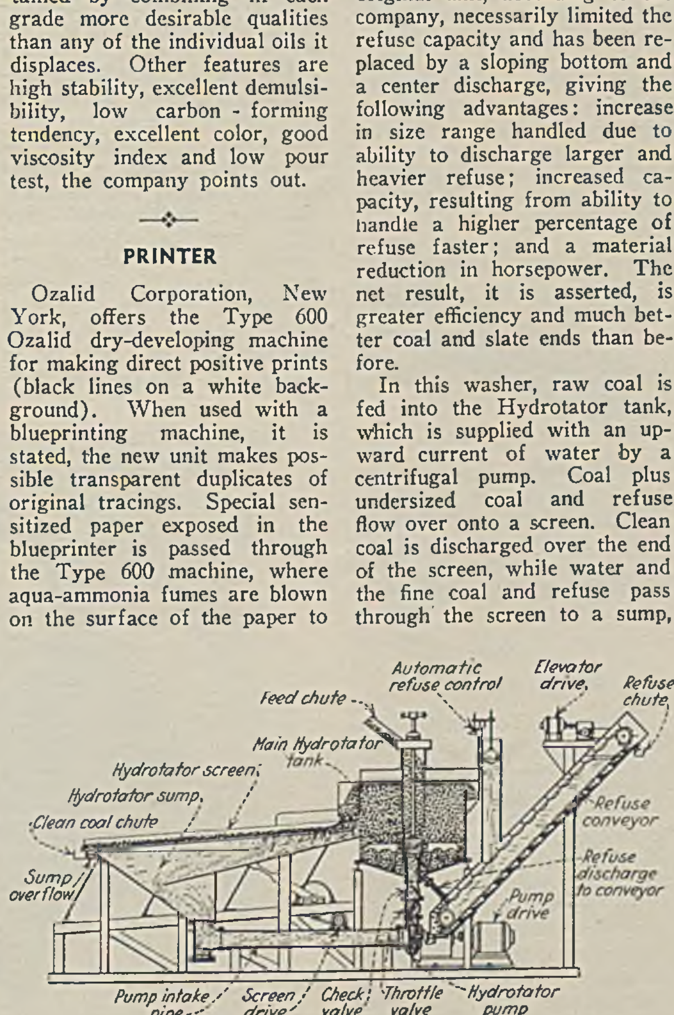
PRINTER

Ozalid Corporation, New York, offers the Type 600 Ozalid dry-developing machine for making direct positive prints (black lines on a white background). When used with a blueprinting machine, it is stated, the new unit makes possible transparent duplicates of original tracings. Special sensitized paper exposed in the blueprinter is passed through the Type 600 machine, where aqua-ammonia fumes are blown on the surface of the paper to develop the print. The printer accommodates 36-, 42- and 54-in. paper. Development rate is 18 in. per minute. Height of the machine is 12 in.; width is 10 in.; and the length is 46½, 52½ or 62½ in. Weights are respectively 60, 65 and 70 lb.

COAL CLEANER

Wilmot Engineering Co., Hazleton, Pa., offers an improved Wilmot-Hydrotator coal cleaner. The flat bottom of the original unit, according to the company, necessarily limited the refuse capacity and has been replaced by a sloping bottom and a center discharge, giving the following advantages: increase in size range handled due to ability to discharge larger and heavier refuse; increased capacity, resulting from ability to handle a higher percentage of refuse faster; and a material reduction in horsepower. The net result, it is asserted, is greater efficiency and much better coal and slate ends than before.

In this washer, raw coal is fed into the Hydrotator tank, which is supplied with an upward current of water by a centrifugal pump. Coal plus undersized coal and refuse flow over onto a screen. Clean coal is discharged over the end of the screen, while water and the fine coal and refuse pass through the screen to a sump, from which it is returned to the tank by the pump through the rotating agitator. Refuse passes down through a pipe against an upward current of water. Changes in the density in the tank cause the water to rise and fall in the elevator, in turn actuating a float which controls the rate of flow of water up through the refuse discharge, thus throttling down or speeding up the rate of discharge in accordance with density changes.



TUBING

Fabrikoid Division, E. I. du Pont de Nemours & Co., Inc., Fairfield, Conn., announces the new non-collapsible "Ventube" for mine-ventilation service. Features outlined by the company include: economical and time-saving ventilation of shafts with an exhaust fan and short lengths of the tubing; adaptability to ventilation by the induction method; suitability under unusual conditions for use with regular Ventube for supplying fresh air to the tunnel face, using the non-collapsible type and an exhaust fan at the tunnel mouth for evacuating the bad air; elimination of up to 50 per cent of the installation changes through lightness and flexibility; adaptability to construction of 45-deg. turns without loss of time, as well as to installation behind props; suitability to being telescoped back from the face when blasting; elimination of loss of time in dismantling because of increased flexibility; and adaptability to successful use without fans in diverting air.

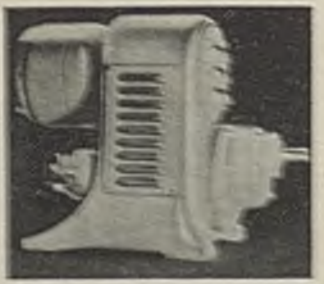
FIRST-AID

Davis Emergency Equipment Co., New York City, offers the "Brac-Kit" first-aid kit for permanent installation, it states, in any given place with instant availability of contents and protection from contamination and damage when treatment is being applied. The kit consists of two baked-enamel steel cases, the outer of which is attached permanently to the wall by screws. The inner case normally is placed in the outer and held by a simple lock. When needed, the inner case can be unlocked by a twist of the handle and carried, with its contents, to the scene of the accident.

The Greene traction splint especially designed for application to broken legs is another new Davis product, for which the company claims quick and easy application after a few minutes of training. Weight of the splint is 7½ lb., and it can be compactly packed in a flat case. When applied, says the company, the injured man can be carried on a stretcher, or even in men's arms, and can be transported in a car without discomfort.

VARIABLE DRIVE

U. S. Electrical Mfg. Co., Chicago, now offers the "U.S. Varidrive" variable-speed motor unit in the upright design, for which it points to a saving in lateral space as compared with the horizontal design. The



upright design also offers the user the option of having the take-off shaft in either the high or low position. Infinite speed variations with local or remote control is the principal characteristic cited for the Varidrive motor by the manufacturer.

HAND GUARD

Mine Safety Appliances Co., Pittsburgh, Pa., offers the new M-S-A hand guard for preventing injuries in cutting cap pieces, stakes, wedges, etc. The guard can be worn on either hand and permits free use of the hand in holding the material to be cut, it is stated.

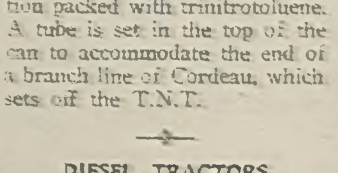
TIME RECORDER

Stromberg Electric Co., Chicago, offers a new electric time recorder (Model 15) which requires only one hand to operate

and, while less than one-fourth the size of former models, takes full-sized standard time cards. The unit is equipped with a Telechron motor and can be plugged into a socket or used with a control clock.

PRIMER

To increase the safety of "Nitramon," E. I. duPont de Nemours & Co., Wilmington, Del., offers a Cordeau-T.N.T. primer as a substitute for the dynamite primer originally used. T.N.T. being much less sensitive to shock than nitroglycerin dynamite of the grade used to set off a column load of Nitramon, the possibility of accidental detonation is substantially reduced. The new primer



consists essentially of a can of Nitramon with its upper section packed with trinitrotoluene. A tube is set in the top of the can to accommodate the end of a branch line of Cordeau, which sets off the T.N.T.

DIESEL TRACTORS

Caterpillar Tractor Co., Peoria, Ill., announces four new diesel tractors bearing the designations RD-8, RD-7, RD-6 and RD-4 in addition to a spark-ignition machine bearing the designation "Thirty." The first three models, the company states, succeed the diesel "Seventy-Five," "Fifty" and "Forty," respectively, with which they compare in everything except that engine power has been substantially increased. Drawbar and belt horsepower of the five new models are:

	Horsepower Drawbar	Horsepower Belt
RD-8	95	110
RD-7	61	70
RD-6	45	51
RD-4	35	41
Thirty	35	41

TRUCKS

A new line of dump-type trucks is offered by the Reo Motor Car Co., Lansing, Mich., in a wide variety of wheelbases, tonnage capacities and prices for all classes of heavy-duty transportation of coal and like materials. Features include optional engines, 5-speed transmission in certain models, 2-speed rear axles and double-reduction axles, de luxe cabs, forward drive and low-priced drop-frame models. Certain chasses and equipment, the company states, are being offered at reduced prices. Transmissions are built with standard power take-off openings—one on the smaller and two on the large models.

LOCOMOTIVES

For light railroad switching and industrial-plant transportation, the Euclid Road Machinery Co., Cleveland, Ohio, offers a new line of Euclid "Standardized" diesel-electric locomotives for standard-gage service. Features cited by the company include great strength, power and high mechanical and electrical efficiencies, and unusual simplicity, resulting in low maintenance, fuel and over-all operating costs. The locomotives are built in four-wheel units of from 35 to 55 tons each and may be operated singly or in multiples of two by one engineer from either cab. Maximum tractive efforts while starting range from 21,000 lb. for the 35-ton single unit up to 66,000 lb. for the multiple 110-ton unit of two 55-ton units in tandem. For switching, maximum speeds with light load range from 22 to 26 m.p.h.

DUST COLLECTOR

The Bartlett-Snow "Froth Flotation" dust-collector is a new product of the C. O. Bartlett & Snow Co., Cleveland, Ohio. In this unit, dust-laden air is drawn through ducts to the equalizing chamber. It is then passed upward through "bubble caps" into a water bath covered with an oil carpet, and is then removed from the upper chamber by a fan. Larger dust particles are removed in the water and the fines in the oil carpet. Repeated tests, the company states, show an efficiency of not less than 99.80 per cent by weight on dust with 25 per cent passing through a 200-mesh screen (75 per cent ranging from 2 to 10 microns in size). The units may be suspended from building members or mounted on the floor or on the roof, according to the company; are inexpensive to operate; automatic in performance; require minimum maintenance; eliminate fire hazards; and are available in sizes handling from 1,000 to 30,000 c.f.m.