COAL AGE

McGRAW-HILL COMPANY, INC.
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Devoted to the Operating, Technical and Business Problems of the Coal-Mining Industry

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Engineering Editor

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Outside the Four Walls

INDUSTRIES grow too largely from within. Outside progress and ideas are slow in reaching them. Manufacturers outside the industry do not know its needs, problems and opportunities; engineers in the industry do not know what has been done outside to solve their problems. The function of a technical paper is not to tell alone what the industry has done or is doing but to go a little afield and show what other industries are doing with kindred problems.

That is why *Coal Age* recently described a limestone strip pit where overburden was being removed by a steam shovel and a conveying system, and this week, describes a system of protection at the Anaconda copper mines which prevents a motorman from starting his locomotive when he is not aboard.

All the tricks and ingenuity in our industry are not of the coal man's own devising and we, mindful of that fact, are letting a few beams of inquiry circle over the surrounding fields. Where points of interest are developed we shall leave the spotlight on them for a while.

Need for Cleaner Coal

NOTHING can convince the public that an unattached piece of slate has any place in a consignment of anthracite; that it is justifiable to find such an impurity in coal that has been subjected to the cleaning process.

So long as such slate is found in small quantities or large, the feelings of the public will be unfavorable, no matter what the specifications may condone or permit. Campaigns to convert the public to a kindly perception of the difficulties of coal mining cannot make their way around that piece of slate, try as they will. Operators may tell about the vast expenditures for breakers, but that chunk of slate negatives every argument.

The impurity of industrial anthracite has made the price of that commodity low and its movement sluggish; it has given the bituminous operators a chance to get into the market; it has made a wide breach for oil. In earlier days only jigs were available for treating this fine material, and they were inefficient. Today we have better jigs and many other cleaning devices, and there is no reason why fine coal should enter the market unprepared or improperly prepared. When the freight, delivery and ash-removal rates are so large a part of the cost of the coal, careful cleaning at the mine should and does pay.

The foundation for good relations with the public lies in quality. It would pay the companies in the end to get possession of all old culm banks so as to prevent improperly cleaned culm-bank coal from reaching the market to be mixed by dishonest retailers with the better product shipped by the many ethical companies.

Too many corporations there are who regard the terms of a specification as an end to be sought. It would be better if they entirely eliminated slate, no matter how large a tolerance the specifications might permit.

Why Foremen Fail

AN ANALYSIS of the fatal accidents in Pennsylvania mines due to falls of rock for the first eight months of the year show that 60 per cent of these accidents occurred between the hours of 7 and 11 a.m. during which time mine officials made only 35 per cent of their visits to the working places.

As has been suggested, some of this trouble might possibly be avoided if the mine foreman who has to look after the safety of the workings made his inspections soon after the mine started. This he could do if he did not have any economic burdens, if all he had to do was to inspect and direct the manifold jobs of the mine workers so as to produce the maximum safety.

Unfortunately, in the morning, safety is not the mine foreman's first consideration, and he cannot so arrange his work that he can give it that predominance. Too often he finds that places have not been cut, the cutters having been sick or having absented themselves for other reasons. Consequently the loaders have to be shifted around, also the drivers. Some machine may have failed during the night leaving places uncut. Then again in mines with low coal about half the cars in the morning are full of rock loaded from headings during the previous night. Nothing can be done till the cars are emptied. Men must be deputed to help in this work, and a little supervision, it has been observed, helps hurry the process. Some men, also, have failed to appear so a miner has to be requisitioned to drive a locomotive or possibly a mule. A pump has failed or a flood of water has drowned out places, and men have to be shifted by reason of this untoward happening.

Furthermore there is a long line of men with complaints. They leave the presentation of their cases for either morning or evening when they will be passing the boss' office and they will be sure to find him around. Now, when the morning is still young, they find him and beset him from every side.

Thus, much of the morning passes without opportunity for activity in promoting safety unless there are safety bosses or shift bosses to take the burden and make inspections for the foremen. Even they are likely to be asked to carry messages to help the much beleaguered mine foreman get the work started, and he is indeed fortunate if all his troubles are at the mine mouth and he can avoid having to handle a difficult problem at the tipple. Cars have just been put in by the railway locomotive. In the winter some of them may be full of snow, frozen gravel, manure or sand. The foreman must provide men to clean them out. All the year round also comes the question of broken railroad cars and finding men and material for their repair.

Furthermore the cars are not always arranged to meet the needs of the mine and provisions have to be made to get the right kind and size of car spotted in the correct place so as to satisfy the market or the railroad.

Until there are more men engaged in supervision and until the foreman is prepared to delegate authority the difficulty will continue. The officials at the office should give the foreman a minimum of interference in the early morning, though that is a counsel of perfection, for they cannot get him later, if they delay getting him then.

Mechanical failures that give the mine foreman so much trouble should be removed. Cutters, loaders and daymen should be given a sense of discipline so that they will report at least, if they are going to lay off.

But all this is not as valuable as having real safety bosses who will visit the mines early and who will put safety first. It might be well to make them punch a clock inside the mine so that no orders or pleas of the mine foreman will prevent them from going to the mine at whistle blow. Otherwise they might be found coaxing a pump, removing ice, dumping rock, patching a railroad car or doing any of those many jobs which sometimes only a boss will consent to do.

Union Hostility to Development

THE USE of loading machines has been abandoned in rooms at Orient No. 2 because the men who operated them, though paid a high wage, refused to load the cars to capacity or to do their utmost to obtain a good tonnage. They deliberately refused to live up to their contract. A loafing day is as deliberately dishonest as a short ton. The man who acts "ca'canny" at his work is as crooked as the grocer who puts sand in his sugar.

Dishonest merchants soon have to close their stores. That condition faces the mine workers of Illinois. If they will not act fairly in their business relations they will soon be without work, for they will have no companies to work for. Already the coal of western Kentucky is passing through southern Illinois to points in the middle West. A brave attempt was made by capital to put in machinery that would enable southern Illinois to stay in the market despite high wages and severe competition. Labor failed to appreciate this effort. The very expenditure of money was regarded as a proof that there were millions in the coal industry. The huge stake which was ventured was proof, they thought, that the venture could not fail.

Thus convinced the miners did their worst. As they thought that profits were inevitable and could not be jeopardized by any folly, however gross, they decided that nothing they could do could lose them their jobs. They will find only too late that by their act they have closed the door of opportunity. No one can battle with such obstacles as high wage rates, labor privileges and coal of low thermal value except by efficiency in operation. That efficiency the operators were willing to assure by the investment of millions in machinery. The mine workers on the other hand were not even willing to make an honest attempt to assist in their program. They would not even undertake to put in the contracted sixty seconds in the minute or the sixty minutes in the hour.

The mining fields are permeated with the idea that wages are not payment for work but are doles to be paid whether the work is done or not. The miners cannot conceive that as they pay others only for services rendered, so others will pay them only in return for service. As they look for low prices so also do others. They alone cannot set the price and demand that others pay it.

The attempt to set up state lines in purchasing will not succeed, at least so long as the home state miner shows such arrogance in setting his wages and restricting his services that the purchaser loses heavily if he buys the local product. The average resident in Illinois or Ohio is little impressed by the mine worker of his state and is not willing to pay heavily to assist him in maintaining his unreasonable attitude.

Going After Team Work

ONE WAY to reduce the cost of producing coal—a process that is essential in most coal-mining companies that expect to endure and declare dividends—is to foster greater efficiency in mine labor. One way to secure this efficiency is to prove to the men that good team work between employer and employee works both ways: it definitely benefits both. Lack of it positively damages both, especially in times like the exact present. Useless as it usually has been to preach team work in a union field, there are periods in which reasoning union miners will listen. This winter is one of them. Therefore, concerns, such as the Southern Coal, Coke & Mining Co. in Illinois, which are crusading for co-operation are on the right track and headed for the main bottom.

But nobody familiar with union field conditions underestimates the difficulty encountered. That is the reason why many a company has not even made a start. It is well known that an employer's magazine which tries to put over the lesson of team work, is going to be reviled by straw-boss officials of the union as "insidious propaganda." Messages, printed or verbal, from the head of the company intended to impress "team work" upon the men, are sneered at by the union as deceit. Continued company effort, by one plan or another, to encourage good feeling on the part of the men toward the company usually draws "don't-be-fooled-by-this-bunk" sarcasm. If this is not sufficiently counteractive, then more positive steps sometimes have been taken by the union to keep miners from "fraternizing with the enemy."

Miners too well satisfied are a menace to unionism. Men who practice "team work" and deliver a full day's labor for a full day's pay are beating somebody out of a job, as the union code would prove. So it is indeed hard to improve the efficiency of union members by winning their friendship and convincing them that they have a duty to perform toward their employer. But if a company is wholehearted and sincere in its effort it can proceed in spite of discouragement and refuse to be soured by disappointing results.

Developing a deep human interest in the welfare of its men ought to be regarded by every company as an obligation. That attitude if persistently adhered to, is bound to improve team work and raise efficiency in coal mines. The industry needs just this sort of thing.

The Illinois company is striving for it, declaring frankly that it is not out to reduce wages but to raise efficiency so as to help its men "preserve their jobs at the present wage scale if that is possible." And it appears to us that the company is making a good case. More power to it.

Bumps and Shocks Disturb Johnson Colliery

Destructive Sudden Rock Movements Occur with Unpleasant Regularity — No Adequate Reason for Their Occurrence Is Assigned but New Theory May Be Solution of This Riddle

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For several years past a train of serious and fatal accidents has been occurring with discomforting regularity in the No. 2 Dunmore bed of the Johnson Colliery, operated by the Scranton Coal Co. near Dickson City, Pa. These have been the result of bumps or shock waves produced by ground or rock movement. Three of these accidents resulted in loss of life, others caused serious injuries, and yet others have occurred when no one was present in the workings affected. As usual in the case of such disturbances, the exact cause of the ground movements is impossible to determine positively but an interesting theory is advanced later in this article.

At a time when working places appeared to be normal and all other conditions safe, a sudden terrific crash would herald the occurrence of a bump or shock and one or more men might be killed or crippled. Exploration of the workings immediately following such an occurrence would show no apparent reason why such an accident should occur. Yet everything in the path of the bump would be displaced and possibly torn to pieces. Nevertheless, the roof, floor and ribs would appear to be in as sound a condition as before.

Three such accidents will be described. The first, shown in Fig. 1, occurred at the point marked 9 on the map, Fig. 4. Two men were mining the upper left-hand pillar shown in the figure. A skip had been taken from the pillar along the right side of the working place. Two cogs had been built for roof support 10 ft. apart with the mine track between them. After the bump when the rescue party arrived they found the roof, floor and ribs, so far as visual indications were concerned, in their normal condition, but the cogs instead of being 10 ft. apart were only 3½ ft. apart yet were intact. The track between them was nearly on edge instead of lying flat. Both the miner and his helper were killed.

When work had been resumed in this place after the removal of about 125 cars of coal from the pillar on which the men had been working, a channel or crevice 5 ft. wide at the top and about 2 ft. wide at the bottom was found within the pillar as shown in Fig. 1. Careful study and consideration of this phenomenon revealed no apparent reason for this fatal mishap.

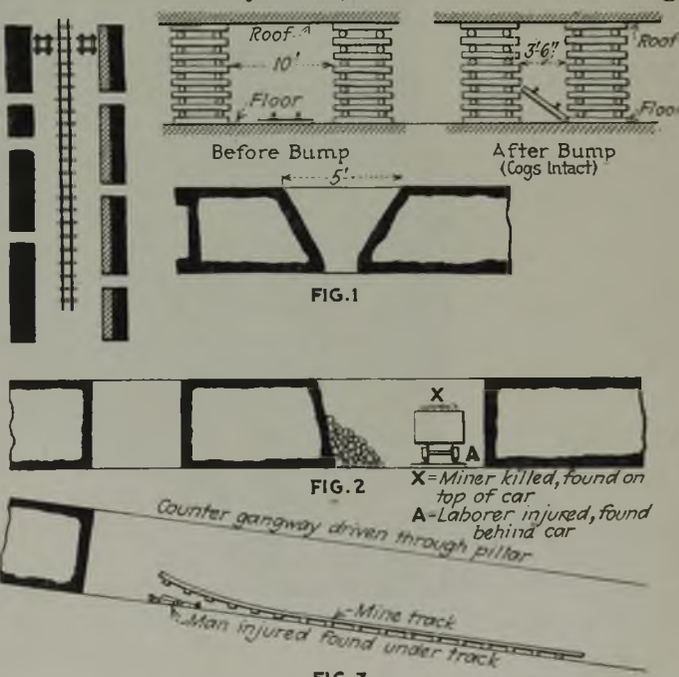
Bumps Seem to Occur During Pillar Operations

In the second accident men again were robbing a pillar. At the time the bump occurred they were in the act of loading a car. When the place was explored after the accident the roof, floor and ribs appeared to be in normal condition. Some loose coal, a comparatively small amount, was lying along one rib. The miner was dead and lying on top of the car where he had evidently been thrown or blown. His laborer, seriously injured, was lying between the car and the rib as shown in Fig. 2. This accident occurred at the point marked 10 on the map, Fig. 4. Again no plausible cause for this mishap could be assigned.

The third accident was not fatal. A miner was driving a gangway through a pillar when the bump occurred. When the rescue party reached him, the roof, the floor, and the ribs were apparently normal, but the end of the mine track was sticking up in the air and the miner lying under it. This accident is illustrated in Fig. 3 and, as in the other two cases, no explanation for its occurrence was forthcoming.

Men who have been at work in a section where a bump or shock took place state that anything and everything in the direct line of the bump is destroyed. The direction of the force is marked. One man was walking along his room and had one foot in the air in the act of taking a step forward when a bump occurred. The only blow that he felt was one administered to the foot that was raised in taking the forward step. His leg was broken but no other part of his body was injured.

These bumps have been attributed to a number of causes. When they have been thoroughly investigated, however, the explanations advanced seem totally inadequate. It was believed by some at first that the ground movement might arise from an accumulation of gas or from the escape of air imprisoned under high pressure. No gas, however, has been found in any quantity in this coal bed. It is known to exist in the No. 2 Dunmore bed immediately above, but there are no workings



Figs. 1, 2 and 3—Scenes of Three Bump Accidents

In Fig. 1 the cogs shown were moved toward each other a distance of 6½ ft. yet remained intact. A wide fissure was later found in the rib. In Fig. 2 a small amount of coal was spalled from the left-hand rib. After the accident the miner was found, dead, on top of the car and his helper, badly injured, was lying between the car and the right rib. After the accident shown in Fig. 3 the miner was found lying under the uplifted end of the track. This accident was not fatal.

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in this measure so far as is known and no connection or break exists between the two beds. All the other overlying measures have been first-mined on this property. In the areas where the bumps or shocks occurred tests were made to detect the presence of gas after each bump or shock had taken place, but no gas has been found. Only once has gas been detected in these workings and this will be mentioned later.

It was thought also that there might possibly be something in the strata underlying this bed that might have some effect upon these ground movements. Accordingly two boreholes, *A* and *B*, were drilled to a small bed corresponding possibly to the No. 4 Dunmore which lies below the one being worked. A section of these boreholes is shown in Table I.

Table I—Sections of Strata Penetrated by Boreholes

Borehole A		Borehole B	
Sandstone	24 ft. 6 in.	Sandstone	31 ft. 6 in.
Coal	3 in.	Coal	1 ft.
Sandstone	2 ft. 9 in.	Slate	2 ft. 6 in.
Coal	11 in.		
Slate	2 ft. 2 in.		
Coal	5 in.		
Slate	2 ft. 6 in.		
Sandstone	1 ft.		

The strata penetrated by the boreholes revealed nothing that obviously could have any effect upon the occurrence of bumps or shocks.

When going into territories that have been affected by bumps, the miners have found it possible to remove props by hand, which prior to the occurrence of the bumps were wedged tightly in place. This would indicate that a movement of the roof had occurred and that the weight on the prop had been lifted.

Before entering into a discussion as to the probable cause of the accidents above enumerated, it might be well to describe in detail the conditions as they exist at present or have existed in the past. A section of the strata from the surface to the third Dunmore bed is indicated in Table II.

Table II—Cross-Section of Strata Above Dunmore No. 3 Coal Bed

Wash	90 ft.	Top—fire clay
Rock	30 ft.	Bottom—soft sandstone—89 ft.
Diamond Bed	5 ft. 8 in.	Top slate 10 ft.
Rock	99 ft.	Bottom sand-rock
Big Vein	6 ft.	Top sandstone
Rock	185 ft.	Bottom sandstone
Clark Bed	1 ft. 8 in.	Top sandstone
Rock	238 ft.	
No. 2 Dunmore bed	2 ft.	Bottom sandstone
Rock	28 ft.	Top 4 ft. fire clay to sandstone
No. 3 Dunmore bed	7 ft.	Bottom sandstone
Rock	20 ft.	Top sandstone
A bed	1 in.	

The property in which this mine is located slopes from the mountain down to the Lackawanna River. About 4,400 ft. from this stream occurs an anticline shown on the map, Fig. 4, by the line marked 6. About 1,600 ft. from the river occurs another anticline which is shown by the line marked 4.

The coal in this bed shows the analysis set forth in Table III. A cross-section of the coal bed at the point where the sample analyzed was taken is shown in Table IV.

Just north of the anticline marked 4 on the map at

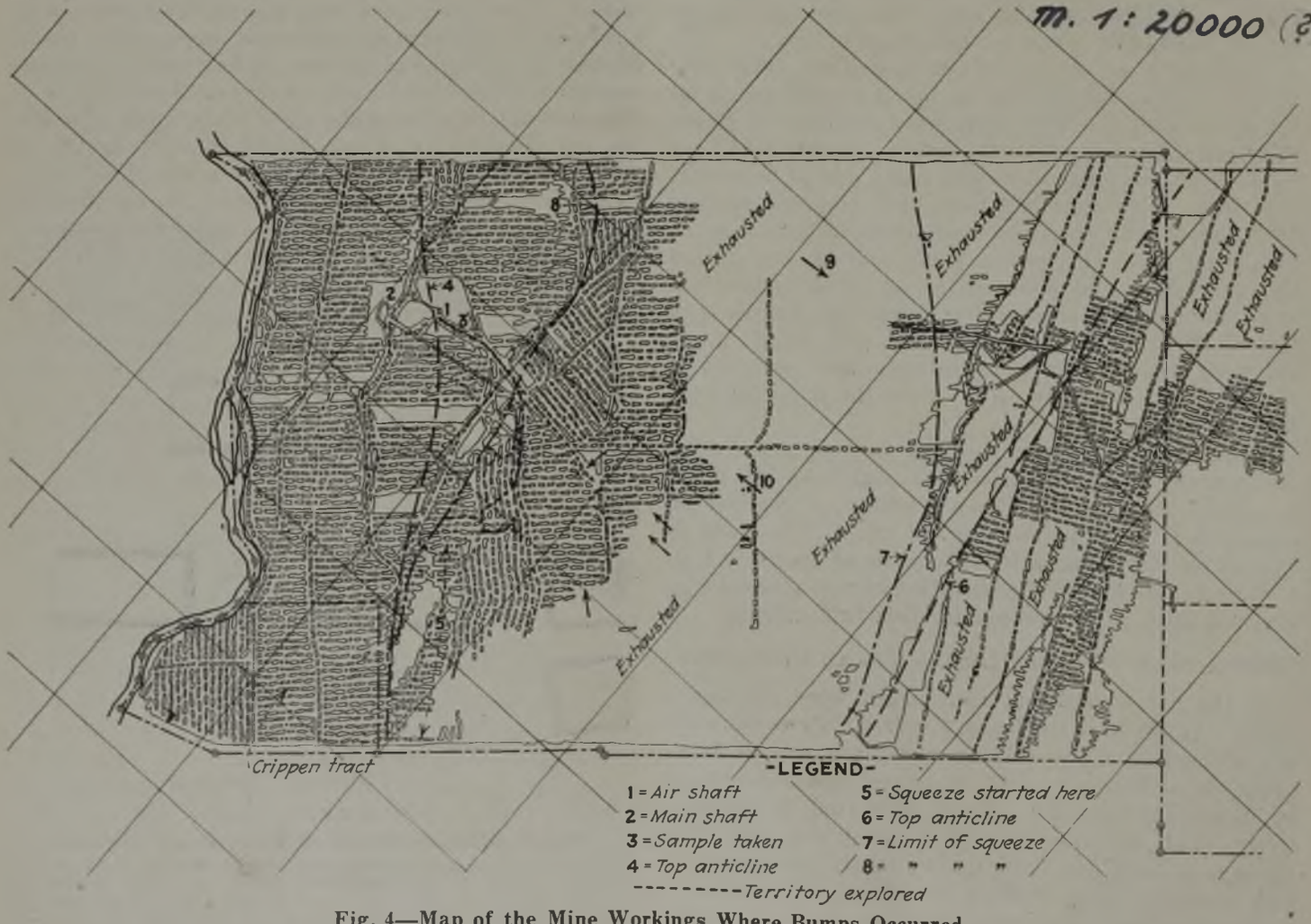

Fig. 4—Map of the Mine Workings Where Bumps Occurred

Much of the area covered by this mine has been mined out and completely exhausted. A squeeze beginning in the region marked 5 spread throughout the central portion of the mine. The locus of the bumps has also shifted until now they occur in an entirely different region from that where they were first noted. The direction of the force exerted by them, although not always clearly defined, is indicated as far as possible by the arrows.

Table III—Analysis of Coal Mined

Coal, Air Dried Basis		Coal as Received Basis
Moisture	1.9 per cent	4.4 per cent
Volatile matter	7.1 per cent	7.0 per cent
Fixed carbon	79.2 per cent	77.1 per cent
Ash	11.8 per cent	11.5 per cent
Total	100 per cent	100 per cent

the extreme easterly edge of the property a layer of soft graphitic material locally known as "buck" occurred immediately under the coal. After first mining, this buck squeezed out from below the pillars under the action of the 700 ft. of overburden. This movement brought a squeeze upon the coal. This squeeze began in the territory marked 5 on the map and then traveled in a northeasterly direction across

Table IV—Cross-Section of Coal Bed

Roof	Sandstone	Rock	1 in.
Coal	5 in.	Coal	8 in.
Rock	12 in.	Slate	1 in.
Coal	48 in.	Total coal	5 ft. 6 in.
Soft slate	2 in.	Total refuse	1 ft. 4 in.
Coal	5 in.		
Total thickness			7 ft.

the property. Its boundaries are shown by the lines 7 and 8 on the map. A break occurred in the measures at approximately the edges of the squeezed area as shown by the lines 7 and 8. It was in the course of second mining that the series of bumps above described occurred, resulting in the loss of five lives.

Direction of Bump Force Not Always Determinate

The indicated direction of the force of these bumps as determined by observation of the engineers is shown on the map by the various arrows. Unfortunately, it was not possible in all cases to determine this direction.

At the time the squeeze occurred in this bed between the two anticlines a heavy accumulation of gas was noted. But since this was removed there have been no indications so far as can be determined that any gas exists in this measure.

When I visited this colliery a large portion of the coal had been worked out and the accessible area that I was able to visit is shown by the dotted lines on the map. Bumps and shocks have occurred in this territory until quite recently, but none transpired during my visit.

As has been stated much second mining has been done in this property and the territory along the extreme edge between the two anticlines has been completely mined out, no pillars being left. Lately the bumps and shocks have occurred more frequently in the old workings on the western side of the property than on the eastern side.

Although considerable study has been directed toward determining the cause of these bumps nothing tangible has resulted. A new suggestion, however, recently has been offered which may throw some light upon the situation. No bumps were noted prior to the squeeze, but afterwards two breaks in the overburden occurred, extending across the property. None, however, took place on the ends, that is, along the property lines. This signifies that a great mass of rock about 3,000 ft. wide was supported at both ends but not along the sides. This left the mass resting on a coal bed where first mining had been completed and consequently one wherein roof support had been appreciably reduced.

The strata pitch at an inclination of 9 per cent toward the river and, as a consequence, have a tendency to move in that direction. As a result two strains were set up in them. One is a tendency to move down hill causing a tension horizontally in the strata as both ends are supported. This caused the center to bow down the slope. The other is a movement of the rock mass, which is about 700 ft. thick at the thickest point, in a vertically downward direction. The vertical movement was held back by the rock being supported at both ends and, as the measures did not break, they were subjected to a stretching action producing an internal tension. This stress was modified by the tendency of the roof to move down the slope. By the robbing of the pillars roof support was removed. Strains in the overburden were thus released or set up in a different direction to those previously acting. It is believed that this release of internal stresses, which probably was instantaneous in most cases, caused the bumps.

Relief of Rock Tension Appears to Cause Bumps

As may be readily appreciated, any slight movement, amounting to only a small fraction of an inch, in this great mass of rock would cause the instantaneous release of a terrific force. One highly important indication that the force causing these bumps and shocks was tension is the fact that after one has taken place the props were found to be loose, showing that tension in the rock mass had been released and that the strata have gone back to their normal position.

Because mining has been completed along the eastern side of the property the bumps and shocks have ceased in the eastern portion of the territory and are now occurring nearer the western side. This change in the location of the bumps indicates that the fracture of the overlying strata along the eastern edge of the property has relieved the tension existing in them and, consequently, in this section no bumps or shocks now take place. In the western side of the property, on the other hand, as no breaks have occurred in the overburden, the tension still exists and bumps and shocks continue. They will probably persist until robbing has progressed to a point where the overlying strata fracture along the western boundary.

A further indication that this theory is plausible is the fact that when a bump or shock has occurred it has been felt on the surface as great a distance as two miles or more from its origin underground. This indicates that the action of the rock movement is similar to that experienced during an earthquake.

TO GET WORK, a group of union miners bought Goat Hill mine in Ohio. To get out of the soup line, a second group of union miners accepted jobs therein. To get efficiency, the first group fired the second. To get even, the second had the first fired out of the union for disloyalty. Naturally, this shut down Goat Hill mine. Both groups were jobless again. And now to get correct answers to the great cross-word puzzle: "Who in Sam Hill is the blinkety-blank goat of Goat Hill?" we offer two tons of strictly fresh gob, a new pair of ohms, six slightly used sticks of dynamite, and other valuable prizes.

WE SOLEMNLY WARN Hon. Andy Gump, cartoon candidate for President, that his "helpless-as-a-fish-in-a-coal-mine" joke is going to beat him. Everybody knows coal mine fish are the ablest in the world. Thousands of good 7-ft. shot holes are sunk in solid coal every day by fish tails.

Factors Which Control the Choice of a Fan

Starting Problems and Their Solution—Slip-Ring Motor Better Than Squirrel-Cage—Synchronous Motors Should Have Pull-In Equal to Full-Load Torque—Super-Synchronous Motor Designed to Meet Difficulty—Variable-Speed Fans*

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THE LOAD characteristics of a fan are similar to those of most centrifugal apparatus, the power required by a given mine fan being approximately proportional to the cube of the speed. The normal speed of large fans varies from 75 r.p.m. to 350 r.p.m. or even higher, depending on the size and design of the fan.

The starting load of large fans differs from most other loads in that it increases rapidly with the speed. Fans cannot be bypassed advantageously. It is impractical to close the intake or outlet because of its size and the consequent pressure that would result. Furthermore, could either or both of these openings be closed, it would only reduce the load at full speed to about 75 per cent of full load. Many operators demand variable-speed fans, for they believe that at times it may be necessary to increase the speed and at other times it may be advisable to reduce it. I think, however, that mines which run their fans at constant speed delivering sufficient air at all times to keep the mine free from dangerous gases are much more numerous than those that require fans that can be run at variable speed.

With the constant-speed fan, the problem is largely one of starting. The drive may be an induction motor of the squirrel-cage type or one of the slip-ring type, geared, belted, or having a chain drive. Due to the peculiar starting conditions it would seem that the slip-ring motor has a distinct advantage over the squirrel-cage motor. If, however, the squirrel-cage motor be used, very high percentage voltage taps must be provided in the starting compensator, otherwise the motor will be thrown across the line when it is running much below full speed, thus putting an excessive stress on the apparatus and the system. With the slip-ring motor, the torque can be controlled nicely, and the speed increased gradually as required.

Synchronous Motors Used Successfully

Synchronous motors have been suggested for fan drive, but the pull-in torque would generally have to be 100 per cent of full-load torque if the motor is just large enough to drive the fan. To meet this requirement it would be necessary to include certain features of design which would be detrimental to other desirable characteristics in the motor. Synchronous motors have been installed, however, using a motor considerably larger than is actually necessary to drive the fan. This provides sufficient pull-in torque, but on the other hand it gives the operator a motor too large for normal service. Synchronous motors have been successfully installed on fan drives using a clutch between the rotor and the load. The motor is brought up to speed with the clutch disengaged, and the load is picked up by the clutch. Some installations as large as 750 hp. have been so made.

To overcome the starting troubles on fans and other similar devices such as mills and crushers where there would be a decided advantage accruing from the use of a synchronous motor, one large manufacturing company has developed what it chooses to call a super-synchronous motor. This motor has, as far as the load is concerned, a starting torque equal to the breakdown torque of the motor. This is accomplished by mounting both the stator and the rotor on bearings and placing a large brake around the outside of the stator.

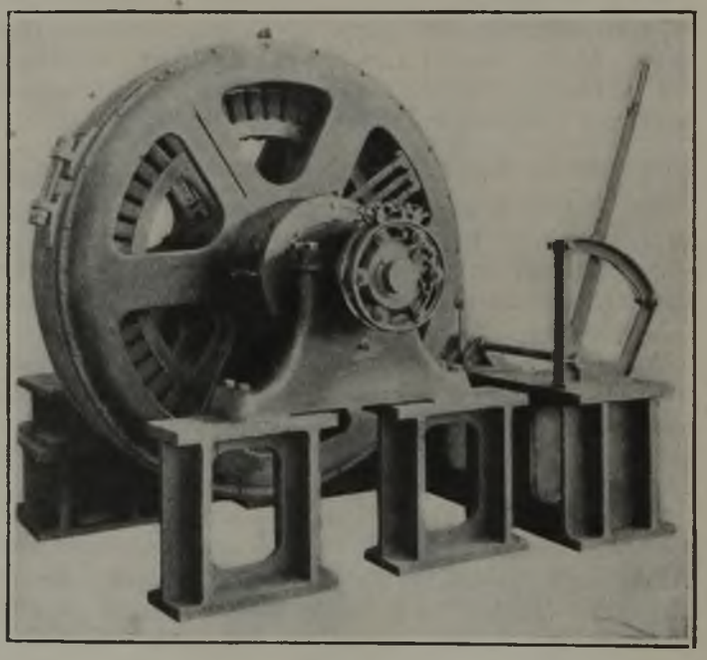


Fig. 1—Motor That Will Give High Pull-In Torque
The stator of this motor revolves when power is first applied to it. The brake mechanism is used to stop the rotating stator and thus permit the motor to exert its pull-out torque to start a load.

To start a fan with such a motor the brake is released and power is applied to the stator. This begins to revolve and comes to synchronous speed with no load upon it. The field is then put on the rotor and the brake applied to the stator. When the braking effort is sufficient the stator begins to slow down, but simultaneously the rotor and load begin to accelerate, increasing in speed as the stator is slowed down. The sum of the two speeds is always equal to the synchronous speed of the motor. Finally, the stator is brought to rest and the rotor and load are at synchronous speed. I do not know of any such installation having been made on a fan, but about fifty of these machines have been installed in cement and metal mills with excellent results. One of these motors is illustrated in Fig. 1.

*From paper, entitled "Electricity in Mines," presented at Pacific Coast Convention of American Institute of Electrical Engineers, Pasadena, Cal., Oct. 13-17.

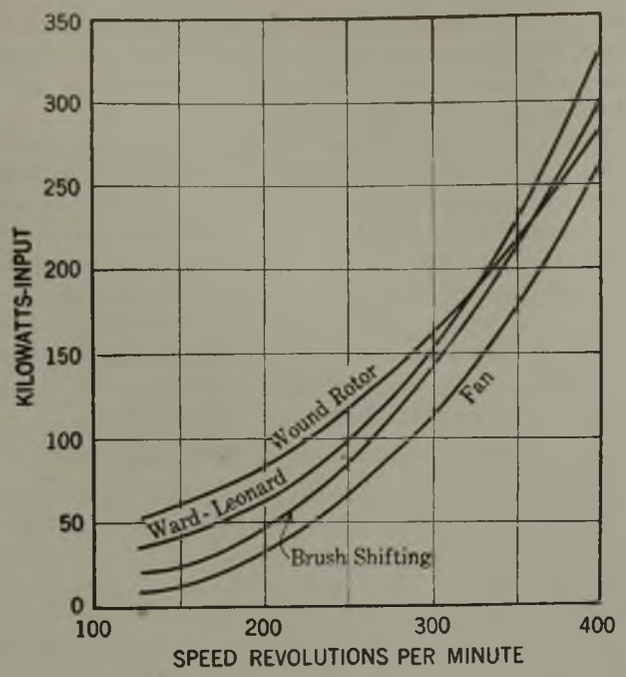


Fig. 2—Operating Curves of Fan Drives

The ventilating system of a mine offers opportunity for application of many different types of motors. In each case the particular operating conditions and load requirements must be studied. Power-factor corrective equipment here may be quite serviceable.

The synchronous motor also lends itself much better to direct connection to the fan than the induction motor on account of the low power factor of the latter at the slow speed which the fan requires. In view of the fact that rewards are provided for high power factors by many power companies, it would not be surprising, as the work of electrification proceeds, to see many more synchronous-motor drives for fans installed.

Variable-speed fans present an added problem. The starting conditions are similar to those of the constant-speed fan, but we have the additional problem of the variable-speed control. Where two or possibly three fixed speeds are sufficient and these speeds are some common fraction of full speed, such as one-half and three-quarters, a pole-changing squirrel-cage induction motor may be used. On large drives, however, wherever variable speed is required, intermediate speeds are usually necessary. This makes the use of a squirrel-cage motor impossible.

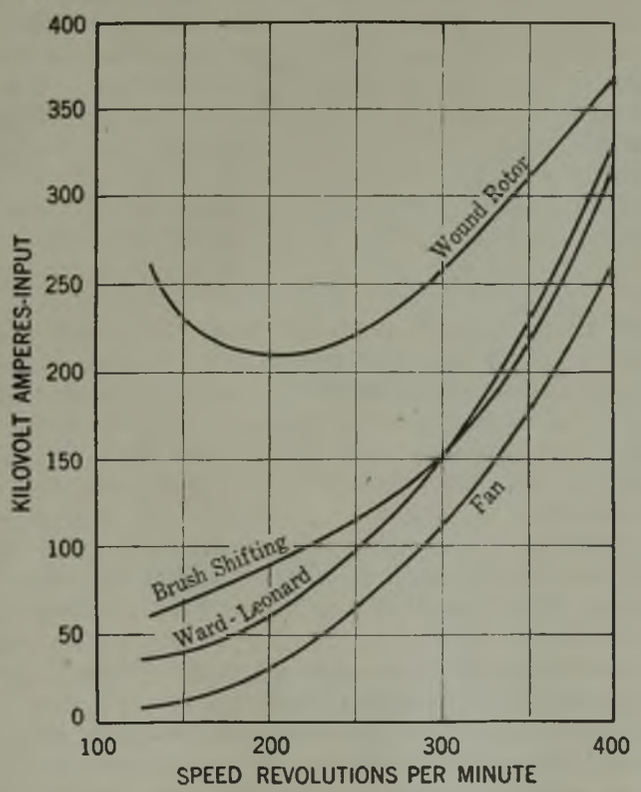


Fig. 3—Operate Fan Motors Near Full Load

The power factor of an induction motor when operated at slow speed is unusually poor. Its use is therefore best suited to fans which always run at the same speed. These curves compare various types of drives.

For variable-speed fan drives, we have the slip-ring motor with controller and resistance, the brush-lifting alternating-current motor, the Scherbius and Cramer systems of drive with various modifications and perhaps the Ward-Leonard control.

Operating Curves Compare Motors

Fig. 2 shows the power required at the fan shaft for a given fan at various speeds from minimum to maximum. On the same sheet are shown the powers consumed to drive this fan at the various speeds using first the slip-ring induction motor, second the brush-lifting motor and third the Ward-Leonard system of control. As the power factor of the slip-ring motor falls quite rapidly at light loads, curves are also shown in Fig. 3 giving the kilovolt-ampere input under the same conditions. Other sizes of fans and other speed variations may change the relative values of these curves. It is only necessary to capitalize the saving of one over the other to determine which is the cheapest form of drive.

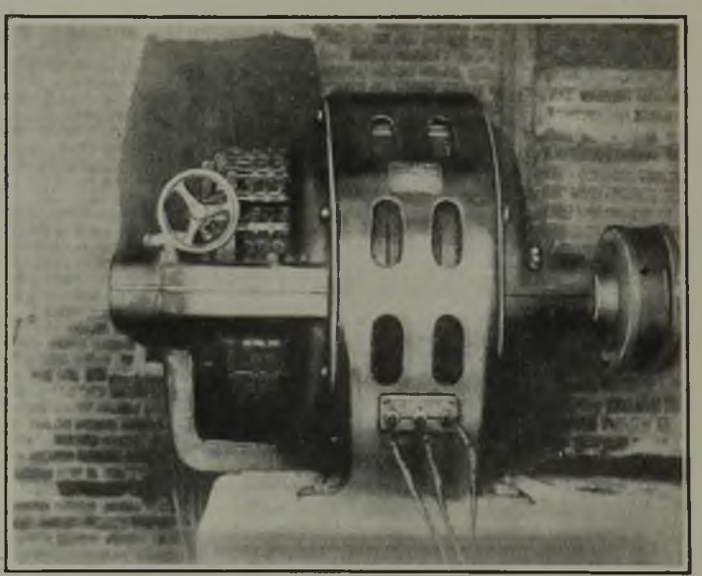


Fig. 4—High Power Factor Type of Fan Drive

This motor is designed to give good power factor even when operated at slow speed. By shifting the brushes on a specially designed commutator many different speeds are obtainable.

Reliability is, in many installations the controlling factor in the choice. The slip-ring motor perhaps has a little the best of this argument, there being only one motor involved and no commutators or other mechanism beyond the control and resistance. The other systems, however, are reliable and have been installed on a large number of fans.

The curves shown in Figs. 2 and 3 do not take into account the efficiency of the fan proper. This efficiency is just as important as the efficiency of the motor. For instance, the majority of fans will increase in efficiency up to a certain speed and beyond this speed the efficiency falls off rapidly. Thus a most efficient motor might be selected, but because the fan was being operated at a speed at which it was inefficient the

overall efficiency of the installation might be low. The prospective purchaser is strongly urged to make a thorough analysis of his fan and drive requirements before obligating himself beyond recall. A small percentage difference in efficiency is much more serious in the case of a fan than in almost any other motor application about the mine. The fan runs continuously and therefore the kilowatt-hours consumed pile up at an amazing rate so that a small per cent saved by improving the efficiency of this drive nets the operator a large return over the year.

Automatic Operation for Fan Drives

In this day of automatics, fan drives have received their share of attention. They may now be built to start automatically upon the return of power after an interruption and to shut down and notify the officials in case of hot bearings or excessive temperatures in any part of the apparatus. They can be started and stopped by remote control.

Motor-driven fans, if properly designed and installed, are thoroughly reliable and economical pieces of machinery. The fan load is ideal from the power-supply standpoint. It is usually steady for 24 hr. a day and seven days a week. From the operator's standpoint it helps materially to improve his load factor. Fig. 4 shows a brush-shifting motor directly coupled to a high-speed fan.

Britain Drastically Revises Its Shotfiring Rules

Shotfirers Must Be Certified and Must Not Be Paid Tonnage Rate—Coal Dust Must Be Treated Before Shooting

CONVINCED by the explosions at the Haig, St. Helens, East Plean and Wheldale mines that the laws relating to shot-firing need amendment, the Board of Trade of Great Britain, that has what amounts to legislative powers, has amended the "Explosives in Coal Mines Order" of Sept. 1, 1923, and the rules now provide that persons engaged in shotfiring must be competent and appointed in writing by the manager to perform that task. No shot shall be fired by any other person.

Men are disqualified if their wages depend on the tonage of coal gotten, and no shotfirer not employed in that manner prior to the order being put in force shall be qualified for appointment unless he is the holder of a first- or second-class certificate of competency under the Coal Mines Act, 1911, or is 23 years of age or upwards and has had at least five years practical experience underground in a mine of which not less than two years have been at the face of the workings of a mine. Furthermore he must have obtained like certificates, as to his ability to make accurate tests for flammable gas and as to his eyesight, as are required in the case of firemen, examiners or deputies by section 15 of the Act. However, where flammable gas is not known no such requirements shall be made.

And now as to shots, the order says that no shot shall be fired unless, immediately before the shot is fired, the shotfirer has examined, with a locked flame safety lamp of approved type or with other apparatus approved for the purpose by the Board of Trade, the place where the shot is to be fired and all contiguous accessible places within a radius of 20 yd. from the place and has found them clear of flammable gas and in all respects safe for firing.

This examination should be extended to ascertain if any flammable gas is issuing from the shothole or from any break within a radius of 20 yd. If within that radius there is any cavity that may contain flammable gas and cannot be examined, or any break where an examination cannot be made for flammable gas issuing from it (other than inaccessible cavities or breaks in the gob, goaf or waste) the shot shall not be fired. These requirements also shall not apply to mines in which flammable gas is not known.

Thorough Dust Treatment Required

Another provision requires that no shot shall be fired until the place, floor, roof and sides of all contiguous accessible places within a radius of 5 yd. from the place where the shot is to be fired have been throughly treated with incombustible dust or with water or in such other manner as the Board of Trade may approve. If the place where the shot is to be fired is in or near the coal face and not more than 10 yd. from a road which has been so treated under the General Regulations of July 30, 1920, the treatment shall, in addition, be made continuous from the road to the shothole.

There are exceptions, however, that come into effect if the manager or undermanager has satisfied himself as regards any part of the mine that the natural conditions for the time being in respect to the presence of incombustible dust and moisture render any coal dust harmless. In that case he may give the shotfirers concerned special permission in writing to dispense with the foregoing precautions in that part of the mine. But to make it clear that the precautions are not being taken, a copy of every such permission must be posted at the head of the shaft and the copy must be forwarded to the inspector of the division at least seven full days before the permission becomes operative. If any question arises as to what dust is harmless the decision of the inspector of any division shall be final, subject to an appeal to the Chief Inspector of Mines, and pending the settlement of the question no permission given shall be operative without the consent of the inspector of the division.

Forbids Unnecessary Shooting

Furthermore it is provided that two or more shots shall not be fired in the same place simultaneously and that if two or more shotholes shall have been placed in such a manner that the firing of one shot would be likely to relieve any part of the work to be done by another, each shot shall be fired before any other of the shotholes is charged.

However, if the shots are placed in a longwall face and are fired between shifts and for their shooting require more time than the working shift affords this rule does not apply.

These rules about the shooting of two or more shots concurrently or charging two or more at one time when one depends for its action partly on the work of another does not apply in the driving of rock headings or in sinking shafts provided that the regular precautions are taken and that in rock headings no more than three shots are fired simultaneously unless they are fired electrically in series.

Planning an Efficient Rock Pulverizing Unit

It Should Have a Preliminary Crusher, Possibly a Dryer, and a Pulverizer of at Least 1 Ton Per Hour Capacity Producing Dust of 95 Per Cent 60-Mesh and 60 Per Cent 200-Mesh Fineness

By L. H. Sturtevant
Boston, Mass.

So MUCH interest now centers on rock dusting of coal mines that many mining men are considering the vexing question: How fine should we grind rock for our use? What sort of equipment should we install? How elaborate a plant is essential? To aid in the solution of these problems the opinion is here expressed that for an average mine, 95 per cent of the rock dust produced should be of 60-mesh fineness and 60 per cent of it should pass through a 200-mesh screen. The preparation equipment to produce it should include a preliminary crusher, possibly a dryer, and a pulverizer of at least one ton per hour capacity driven at slow speed by a motor of about 25-hp. rating. The whole plant might be housed in an 18x24-ft. building. The reasons for adopting such equipment will be explained later in this article.

Experience both here and abroad has proven conclusively that the principle involved in protecting coal mines with rock dust is a sound one and should be adopted wherever coal is produced by underground mining methods. This should be done not only on humanitarian grounds but for economic reasons as well—saving the expense caused by explosions, reducing the high cost of insurance and for other considerations.

Many varieties of rock when suitably pulverized are adapted to this purpose. In order to be suitable, however, such rock should be free from carbonaceous matter and contain only a small amount of free silica, which is injurious to the health of workers. It should preferably be of a light color so as to aid in mine illumination, but above all it should be ground to a fineness sufficient so that when distributed throughout the mine it may be thrown into a cloud in the air under the action of an explosive wave. Limestone, gypsum, anhydrite, talc and shale, provided they are free from sand or flint, answer the purpose admirably.

Rock after pulverization should be applied to all haulage roads, cross entries, secondary entries, room necks, rooms, airways and, in fact, wherever coal dust lodges. It should also be installed in barriers at the mouths of panels, cross entries and other strategic positions. The amount that should be applied is that quantity necessary to dilute the coal dust already deposited to such an extent that the combustible content of the resulting mixture will not exceed 45 per cent. After the first application of rock dust careful sampling will determine the proper interval of time that should elapse between redustings. It also will show the amount of dust required to reduce the combustible content to the permissible maximum.

In gaseous operations from 5 to 10 per cent excess of rock dust should be applied for each per cent of methane present in the mine atmosphere. No definite rule can be laid down as to the actual quantity of dust required per square foot of mine area. But for the average operation a grinding plant producing from 1 to 2 tons per hour should be of ample size. As a matter of fact this is about the smallest reliable grinding plant procurable. Mines usually require from 2 to 3 tons of dust per mile of heading or room treated.

One to Two Tons per Hour Should Be Enough

Should the capacity of such a grinding plant be too great for individual requirements if operated constantly, it might be run a sufficient portion of the time to produce the necessary dust rather than to install an inferior equipment or one not rugged or strong enough to withstand continuous service. One attendant to feed the rock to the primary crusher is all that should be necessary to operate a unit of this or even a larger size.

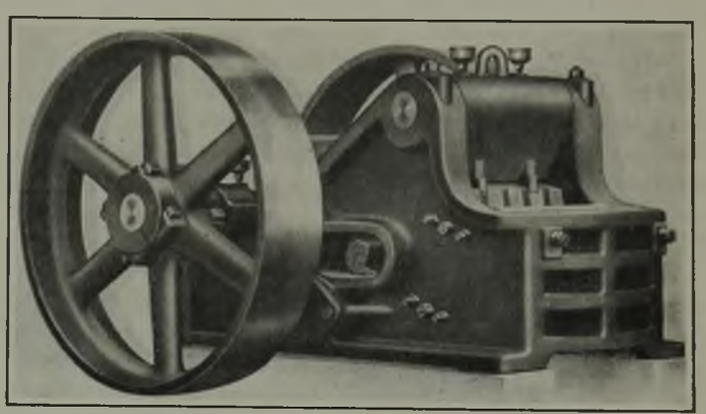


Fig. 1—Jaw Crusher Making First Reduction

Unless the rock comes to the crushing plant in small pieces it is advisable to pass it through the crusher as a first operation. Such a crusher as here shown reduces the rock to suitable size for the pulverizer and saves the labor necessary to break down the rock by means of hand sledges.

If the rock coming to the crusher plant contains much over 2 per cent of moisture it sometimes becomes necessary to install and operate a dryer between the crusher and pulverizer.

Some difference of opinion has been expressed regarding the fineness to which rock dust should be ground. English coal operators specify that 100 per cent shall pass a 28-mesh screen and that 50 per cent shall pass a 250 mesh screen. American opinion regarding this requirement varies from 100 per cent passing 20-mesh screen, of which 50 per cent should pass a 200-mesh, to 100 per cent passing a 50-mesh screen, and 70 per cent passing a 200-mesh sieve. Some recommendations in fact specify much finer dust than has been named.

There seems to be every reason to believe that the finer the dust is ground the more readily can it be applied and the more easily will it be raised in the air along with the coal dust to prevent the propagation of flame. The finer the dust is ground, however, the more costly it is to produce. So that all things considered it is believed that 95 per cent passing a 60-mesh screen, of which approximately 60 per cent will pass a 200-mesh screen, is a practical fineness. This is also one that is reasonably cheap to produce, easy and effec-

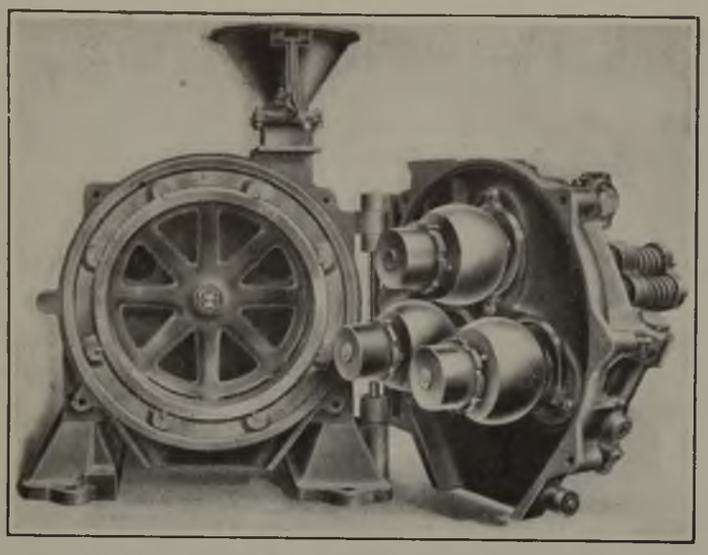


Fig. 2—Pulverizer Giving Ready Access to Internal Parts

In this machine material to be ground is fed to the inner surface of a steel ring against which it is held by centrifugal force. The heavy rollers shown to the right are pressed against the material by means of springs. As they never touch the steel raceway they grind the rock by crushing it upon itself.

tive in application and efficient in preventing catastrophies.

While different rocks vary greatly in the amount of 200-mesh dust yielded in the pulverizer, it is believed that in most instances it will be necessary to grind to at least 50 or 60 mesh, in order to secure the required amount of 200-mesh "floats" in the product. Consequently it would be unwise to install any equipment that would not meet these specifications.

Any new proposition offering remunerative possibilities brings forth innumerable devices guaranteed to fulfill all requirements at small cost. Rock dusting will be no exception to this general rule. As a matter of fact the specifications above outlined form a definite proposition which is not altogether unusual. Standard equipment therefore can and should be utilized if long experience in rock grinding is to be taken advantage of.

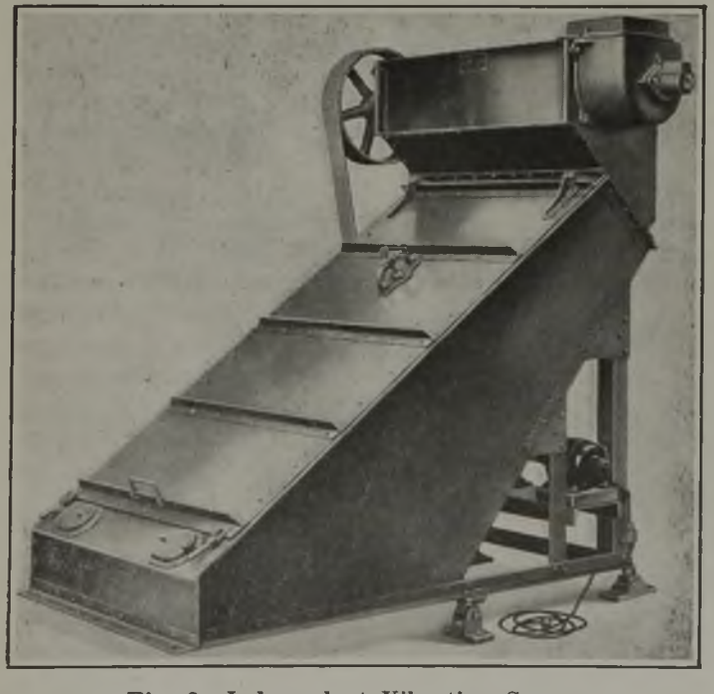


Fig. 3—Independent Vibrating Screen

After the material has been reduced to proper size in the crusher it is passed over a screen of this kind or subjected to air separation. Either device separates the material of proper fineness from the oversize which is returned to the crusher for retreatment, while the dust goes to a suitable storage bin. This latter device is inclosed and made dust-tight.

Certain lines of pulverizers are already on the market which represent many years of experience and which are favorably known throughout the world. Several varieties and types of grinding machines of this kind have been developed. These embrace devices ranging all the way from the ancient millstone down to the most modern hammer and roll mill. They can be had in high, low and medium speeds and consequently any reasonable requirement may be fulfilled without difficulty.

Pulverization to 60 or 80 Mesh Desirable

After a careful study of the situation and the results desired, particularly in view of the great desirability of securing a dust of 60 mesh or finer, in order to save installation costs as well as in view of probable government regulations as to fineness, it would appear wise to install a pulverizer that attains its maximum effi-

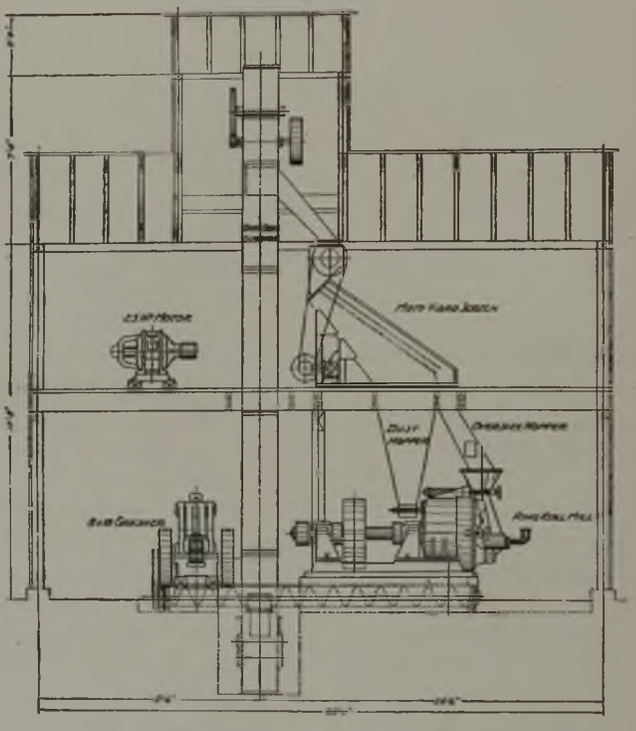


Fig. 4—Longitudinal Section of a Dust Plant

All equipment necessary to fulfill the dust-grinding requirements of the ordinary mine, including crusher, elevators, pulverizer, screen, spouting and bins, can be housed in a building 18x24 ft. in plan and 15 ft. high to the square. If a drier must be interposed between crusher and pulverizer more space will be necessary.

ciency when producing from 60- to 80-mesh material. At the same time, however, the machine should consume a minimum of power, require only occasional repairs and be as nearly foolproof as possible so that it may be operated by any intelligent man. To meet these requirements slow speed is a primary essential, for this in itself signifies durability. An example of a machine of this type is the open door ring-roll mill, shown in Fig. 2. This machine is fitted with a ring revolving at a comparatively slow speed onto the inner surface of which incoming material is fed. Here it is held by centrifugal force resulting from the ring's rotation.

Upon this layer of material either one or three rolls are strongly pressed and are revolved by the friction against the material itself. They never come in contact with the inner surface of the ring and as a result the material is crushed by pressure upon itself and is free to discharge from either side of the ring into an elevator by which it is carried to an independent inclined screen electrically vibrated, or to an air separator.

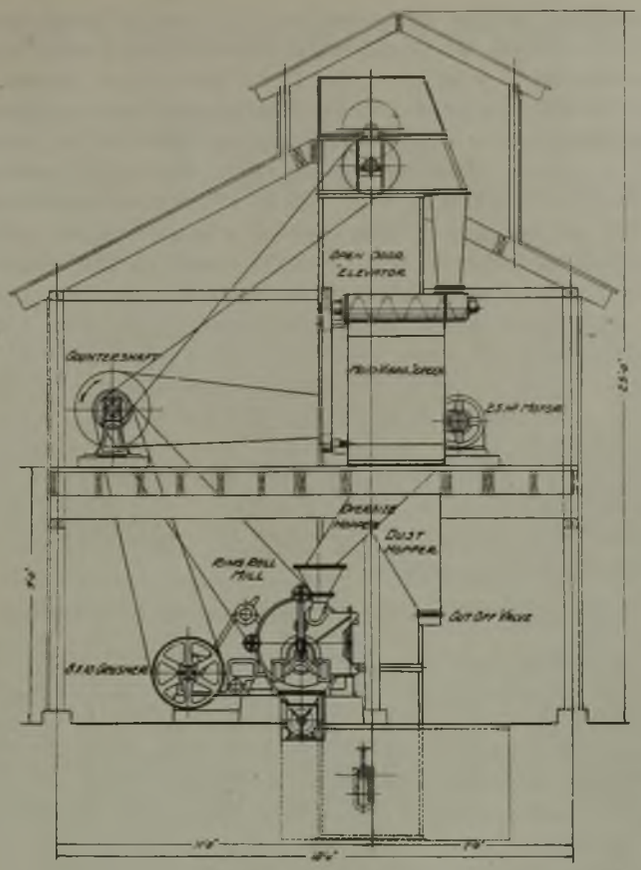


Fig. 5—Transverse Section of Dust Plant

The extremely simple arrangement of machinery is here apparent. All the various machines may be driven from one countershaft. One man, who feeds the rock to the crusher, is all that is required to operate a plant of this type.

Either machine will remove the fine material made by the pulverizer, the oversize being returned to the mill for repulverization.

When treated by this method a reasonable amount of moisture in the rock does not seriously affect the grinding capacity of the plant. Furthermore, each machine working independently of the other operates with maximum efficiency. Each is completely accessible for inspection or repair. Inasmuch as the finished product must necessarily be elevated in any case in order to be placed in a hopper or bin at sufficient height to permit its easy withdrawal when needed, no additional expense is necessary for carrying it to such a container, as the discharge from the screen or air separator leads directly to it.

Only 25 hp. Required for Rock Pulverization

Such a plant is capable of reducing all the rock to 20 mesh and finer. On the other hand it can be made to produce a 300-mesh product by simple adjustment. Consequently, through the installation of such a pulverizing unit at the present time, any future regulations by government agencies either national or state can readily be complied with.

Whatever pulverizer is used, a preliminary crusher should be installed to reduce the initial rock to suitable size and thus save the amount of labor necessary for sledging large pieces. A crusher having a jaw opening of not less than 8x10 in. should be employed, as this is about the minimum size that will eliminate hand labor. A complete plant, therefore, will consist of one 8x10-in. crusher, one No. 0 Ring-Roll mill, or its equivalent, one elevator and one vibrating screen or an air separator, of a capacity of from 1 to 3 tons per hour depending upon the rock treated and the fineness of the finished output desired. Such a plant would require a motor of about 25 hp. for its efficient operation. On the other hand a unit might be installed with any reasonable size of machines or any reasonable capacity, grinding to almost any fineness. If no dryer is necessary between crusher and pulverizer a plant of the size I have mentioned could be placed in a building approximately 18x24 ft. in plan with a height of 15 ft. to the square.

Naturally other equipment not mentioned here should be installed in any plant of this kind. This would include such items as airtight spouts, hoppers and connections, electric wiring, possibly transformers and the like. Standard design for such equipment has, however, been perfected and demands for these various items, including even buildings, labor supervision, erection, installation and preliminary operation, can be filled by a single company. The entire responsibility for both design and results may thus be confined to one concern of wide experience in the manufacture and operation of crushing and grinding machinery.

Europe Is Developing Some New Methods for Washing Coal

Most Promising Ones Employ Pulsating Jig with Double Rock Discharge, an Oil Froth in Vacuum or an Air Suction Dryer

By C. H. S. Tupholme
London, England

ONE NATURAL result of the shortage and high price of coal in Europe has been the development of a number of coal-washing devices. Many of these have not yet progressed beyond the experimental stage, but the colliery owner who would keep pace with modern progress in coal-cleaning methods must devote a large portion of his day to digesting reports, articles and patent specifications in order to be in a position to distinguish between the practical and the purely theoretical. One or two processes, however, are now being tried out that promise some degree of commercial success.

One of these, according to the Ateliers de Construction de la Basse Sambre, of Belgium, possesses certain marked improvements over the general run of pulsating or plunger-type washers. In this device a single screen is located at some distance from both the front and rear walls of the washer body, the object of the new machine being to secure a regular discharge of the heavier refuse immediately at the rear of the screen, the discharge of the lighter pieces of rock at the front of the screen, and a uniform operation of the plant irrespective of the rate of feed of the raw coal.

Adjustable Gates Control Rock Discharge

These results are achieved by providing gates of adjustable height at either end of the screen. The heaviest pieces of rock are discharged automatically at the end near the pulsating plunger while the lighter refuse is discharged similarly at the other end of the screen. These two classes of rock form a barrier against the coal in front of each of the gates and pass into separate compartments filled with water to the same level as that in the screen compartment. Thus the washer is never allowed to run dry. The washed

coal is discharged over the barrier composed of the lighter rock.

Fig. 1 is a cross-section of the washer, and Fig. 2 a partial section along the line *A-B* of Fig. 1, looking toward the front of the washer. Feed reaches the machine by way of the chute 1, located above the plunger chamber. This delivers the raw coal to the washing bed on the screen, 3. Communication between the piston chamber and the screen is made by way of the openings, 10.

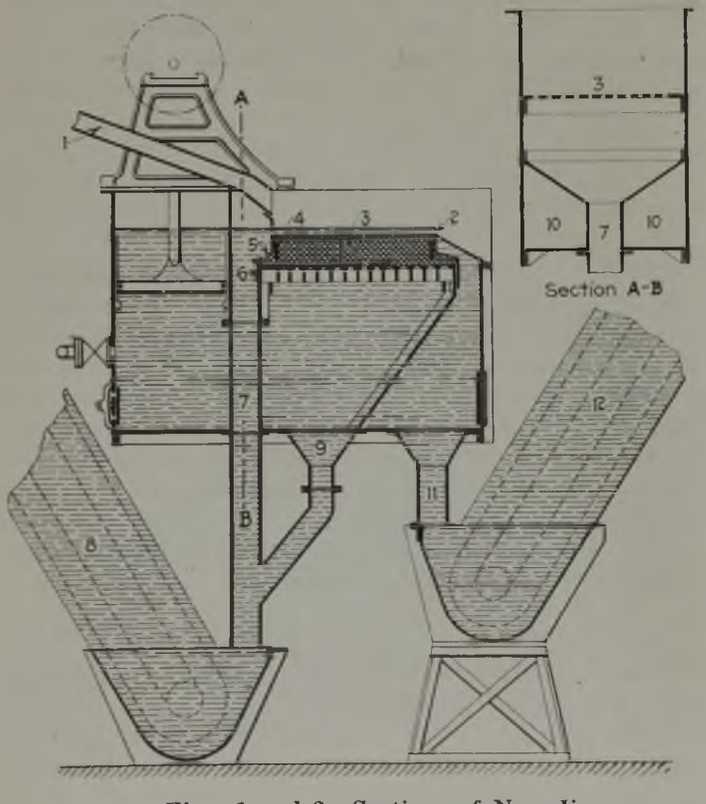
Coal Discharged Automatically

Discharge of the coal is effected automatically by the adjustable gate, 2. This is approximately V-shaped with one branch vertical, the height being controllable for varying the thickness of the bed on the screen. The heavier pieces of rock are separated immediately at the rear end of the screen and pass out under the adjustable gate, 4. Such pieces form a barrier the height of which is determined by that of the gate in front of the lip, 6.

Each piece of rock as it arrives at the gate drives out another at the top which then drops into the funnel-shaped pipe, 7, by which it is discharged to the bucket elevator 8 which withdraws it from the machine. Inasmuch as the heavy pieces of rock are discharged immediately on entering the machine, a more homogeneous washing bed and more uniform water pulsations are secured. This results in an improved yield.

Since the gates extend across the full width of the washer the liability of the machine becoming obstructed by foreign bodies is eliminated. Material passing through the screen, 3, is discharged at the bottom of the washer by way of the pipe, 9.

The lighter refuse, which ultimately is rewashed, is discharged at the front end of the screen by passing under a gate, identical with that at the rear, and passing by way of the pipe 11 to the bucket elevator, 12. Since the products are discharged into separate compartments which are themselves filled with water to the same level as the washer itself, the main machine cannot be emptied in the course of normal operation.



Figs. 1 and 2—Sections of New Jig

This washing device is peculiar in that it has two points or gates through which slate and other refuse is discharged. One of these is at the front of the machine and through it the heavier and larger pieces of rock escape. The other is at the rear of the screen and through it the smaller and lighter pieces of refuse find their way. This relieves wear on the screen as well as resulting in a cleaner and more uniform product.

The advantages of this type of washer may be summarized as follows: (1) The discharge of the heavier rock particles is effected at the rear end of the screen so that wear upon it is minimized. (2) The rock chutes have the same width as the washer so that a piece of iron or other foreign material can easily pass away. (3) The quality of the finished product is consistent irrespective of the feed of raw coal because the outlets are so dimensioned that the washer does not become choked with waste material. (4) Washing is regulated by adjusting the gates to a height that will yield the desired results.

Coal Trapped in Oil-Froth Created in Vacuum

In another process, invented by a British engineer, an oil is employed which coats the coal particles and permits their separation from waste. This method is applicable to the separation of coal from finely-divided refuse through the medium of a froth in which the coal particles are trapped but from which the gangue is excluded.

Finely crushed material is mixed with water and an oil miscible with water such as cresol, paraffin oil, or wood tar. The mixture is then violently agitated in a closed chamber within which a partial vacuum is maintained. In some cases also air or gas is introduced into the mixture. By this means the coal particles become thoroughly coated with oil in which condition they are discharged to a tank containing water under atmospheric pressure. Here the coal particles entrapped in bubbles of froth rise to the surface while the rock particles settle to the bottom. The agitator employed in this process is a simple rotary stirrer.

Chemical Reagents Entirely Unnecessary

The advantages claimed for this process are: The elimination of all chemical reagents required in similar processes to effect a thorough wetting of impurities and prevent their rising into the froth with the coal. The reagents most commonly used in processes of this kind are, sodium silicate, caustic soda or similar substances of an alkaline nature. In the method just described such reagents are unnecessary because of the partial vacuum under which agitation is conducted. By this means the small rock particles are as thoroughly bared and wetted as in processes employing an alkaline reagent.

Still a third method of fine coal recovery is a German invention and is intended to effect the reclamation of fine coal from the sludge of colliery washeries. In most cases considerable difficulty attends the drying and recovery of such fine coal as it forms a compact mass that holds water tenaciously.

In this process the fine material is flushed onto a perforated floor or platform, in many instances in successive layers, the finest material being on the top. Creating a partial vacuum above the bed of material thus formed draws air upward through it. By this means the fine material can be dried to any desired degree.

No Unnecessary Pipe Fittings in This Pump Station

Single-Stage Centrifugal Pumps Are Connected in Series — Units Rated 400 H P., 4,200 Gallons Per Minute, 285-Ft. Head— Brick Lined Duct Connects Pump House with 60-Acre Sump

By J. H. Edwards
Associate Editor, *Coal Age*
Huntington, W. Va.

ABOUT EIGHTEEN months ago the Keystone Coal and Coke Co., of Greensburg, Pa., put into operation the first two units of its new central pump station. Simplicity and reliability were the prime factors governing the design and installation. The plant has attracted attention not only because of the mechanical features but also because of its large sump area, and the extensive territory drained.

The new pumping station is located at the Crows Nest mine which is at the lowest point of the Greensburg basin and very close to its center. This coal area is about twelve miles long, and its greatest width is approximately four miles. All mines except one in this Greensburg district are operated by the Keystone Coal and Coke Co., and in the territory the Pittsburgh seam, which is the one being mined, pitches gradually from all directions toward the center. This affords natural drainage to the central pump station from all mine workings, some of which are six miles distant. Before plans were made for a new pumping plant the possibility of a tunnel to secure natural drainage was considered, however, this was found impractical due to the fact that the method would require a tunnel over eight miles in length.

Although located at a point which makes it possible, it was not the intention to have the new plant displace any of the other six pumping stations, but rather to have it act as a reinforcement to all. It regularly handles the water from the Crows Nest mine and, in addition, any surplus from the other mines which may be caused by excessive inflow or failure of other pumps to operate.

The large sump capacity at the new pump station is a noteworthy feature. Nearly sixty acres of mined-out area is used for this purpose. The station is located some distance from the low point, a duct 10 ft. wide and 1,500 ft. long being used to carry the water by gravity to the sump which supplies the large centrifugal pumps.

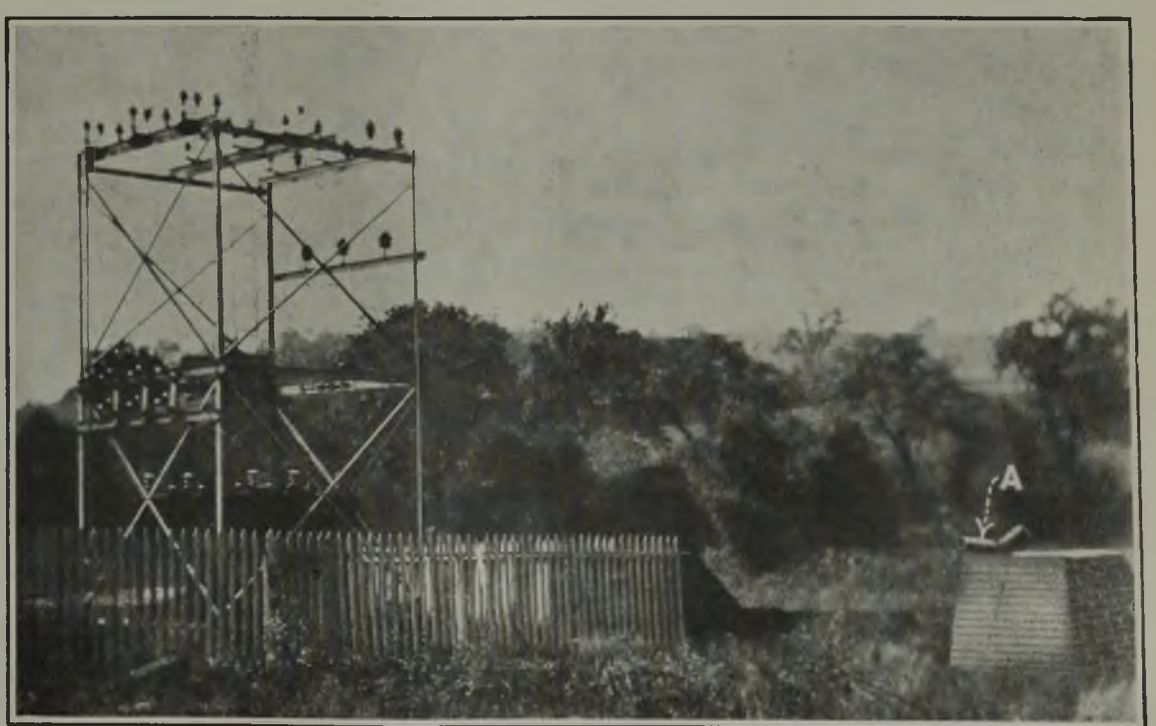
The pumproom was designed for an ultimate installation of five units. However, up to the present, space for only four is provided and of these only two have been installed. The walls of the sump, pump room, and check valve compartments are built of brick, 13 in. thick except in the compartments where 9 in. was considered sufficient. Concrete was used for the bottom of the sump and for the floor and foundation in the pump room. The roof is made of brick laid between 4-in. steel I-beams which in turn are supported by 12-in. I-beams, 20 ft. long, set about 5 ft. apart. The room was made 13 ft. high, this in order to accommodate a traveling crane the runway of which is supported by steel brackets set in the brick side walls.

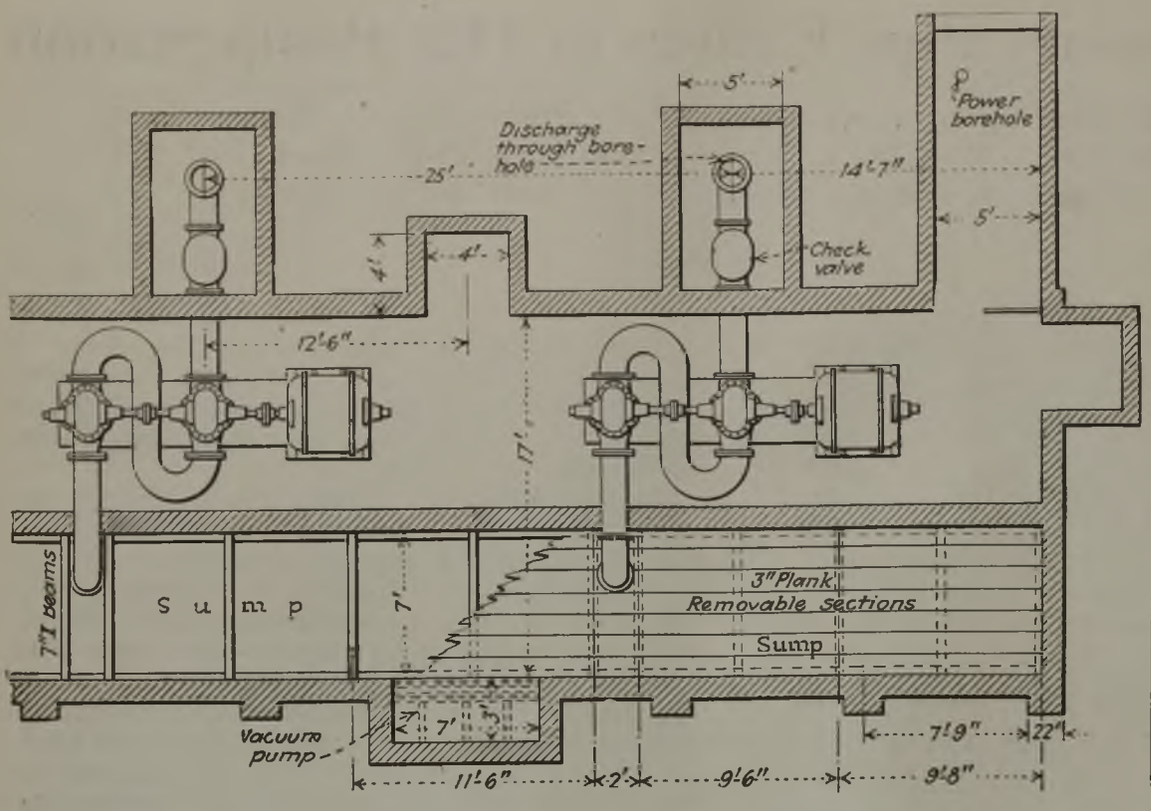
Arrangement Facilitates Repairing

Direct-connected, motor-driven centrifugal pumps are used. These units are rated as follows: 4,200 gallons per minute, 285-ft. head, 1,150 r.p.m., 400 hp., 77 per cent pump efficiency. The motors are 2,300-volt, squirrel cage, 40-degree type and are controlled by hand-operated auto-transformer starters, equipped with ammeters for checking pump performance. In keeping with the simplicity and reliability of the whole design, multi-stage pumps are not used, but instead each unit is made up of two single-stage pumps with the shafts connected by flexible couplings so as to be driven by the one motor. This arrangement facilitates repairing and by keeping in stock one single-stage pump almost

Pump Station Top Equipment

The object "A," lying on the wooden cover of the brick borehole top, is a 6-ft. section of corroded 14-in. casing which was forced out through a 14-in. elbow and discharged into the sluiceway. This casing, which was of extra heavy steel pipe, has been reduced to a mere shell in less than two years. Wires leading to the power borehole can be seen at the right of the steel structure.





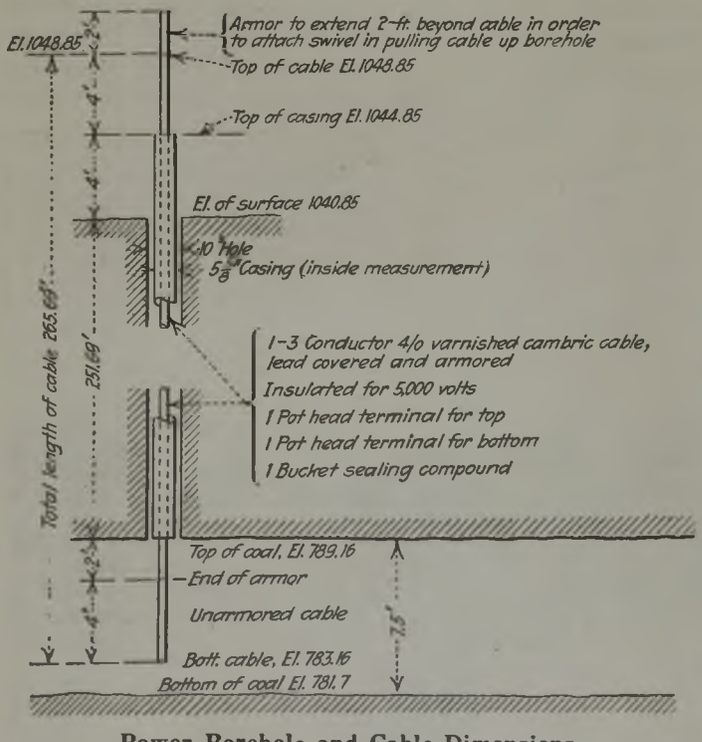
Pumps at New Station

Two interchangeable single-stage centrifugal pumps connected together make up each unit. There is a good sized opening around the discharge line into the valve stall, allowing ample room for making repairs. Plans call for a room 129 ft. long, accommodating five pumps. Space for four has been completed, but only two units are installed.

certain protection is provided against long shut down due to a pump failure.

The high acid content of the mine water made necessary special precautions to minimize the effect of corrosion. The pumps are built of acid-resisting bronze. Wood lined 14-in. cast-iron pipe is used between the pump discharge and the bronze spud which enters the borehole. Plain cast-iron pipe forms the 14-in. suction lines. The bronze spud mentioned is 6 ft. long, and somewhat over 4 ft. of it is cemented into the rock.

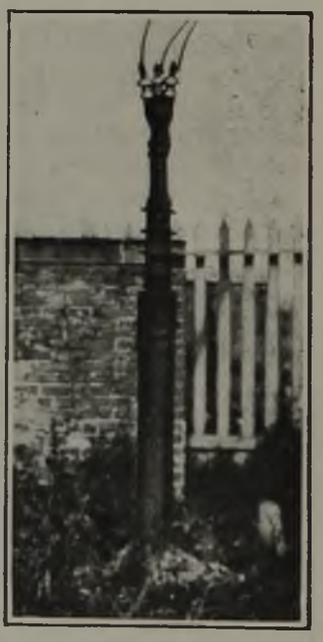
The two 256-ft. discharge holes were drilled approximately 18 in. in diameter, then cased with 14-in. extra heavy steel pipe clear down to the bronze spud. The casing was then surrounded by concrete for the entire length, providing a smooth concrete duct to serve if the casing rusts away. Extra heavy pipe was used as casing for the sole reason that it was on hand, having been removed from discontinued power plants.



Power Borehole and Cable Dimensions

This sketch was made from the drawing and bill of material which was submitted to the manufacturer who furnished the cable and pot head. Note that the details of armor length at the cable ends are carefully specified.

When the photographs here reproduced were being taken it was a surprise to find a 6-ft. length of mere shell of the 14-in. pipe lying in the wooden sluiceway which conducts the discharged mine water to a near-by creek. This shell was so thin that the force of the water had crushed and bent it sufficiently to make it pass out through the elbow of 14-in. radius at the top of the hole. The complete destruction of this extra heavy pipe after less than two years' service indicates the acid condition encountered.



Cable Pot Head

A thick coating of pitch covers the pot head on this 2,300-volt armored cable and its junction with the 5⅛-in. casing.

Returning to a consideration of the pump room arrangement we see several features of interest. All foot valves, gate valves and the like are eliminated from the main lines. The only ones used are special, heavy-type check valves connected in the discharge. This check valve of each unit is located in a separate brick compartment, as a precaution against possible wetting of the electrical equipment in case of a break. In the valve compartment all draw slate and loose material was taken down so that the bronze borehole spud could be cemented into solid sandstone.

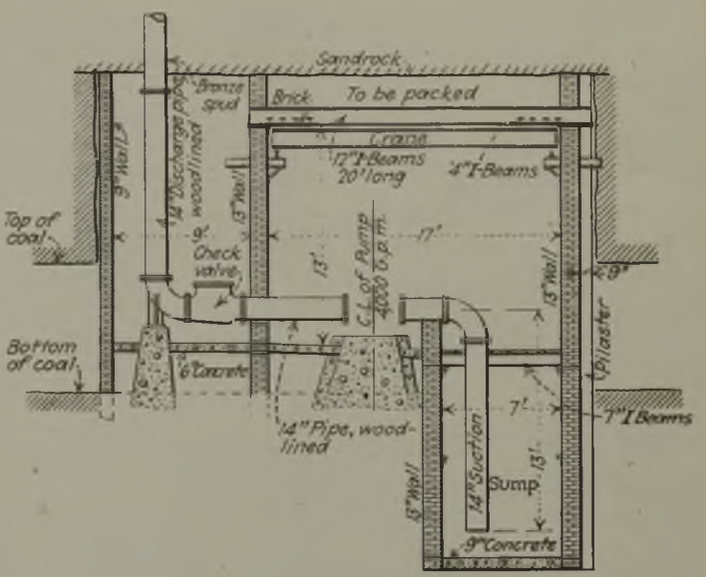
Priming of the 14-in. centrifugal pumps is accomplished by a 3-hp. chain-driven, vertical vacuum pump. It is the intention to equip the station with another

similar pump at a later date after one or two more of the large units are installed. The average suction head on the pumps is 10 ft., and the discharge 259 ft., making a total of 269 ft., not including the added resistance due to friction.

As mentioned before, each motor starting panel is equipped with an ammeter. The scale of each is marked with a red line at the point of normal efficiency for that pump. Assuming that the regular current taken by a motor is 25 amp., then a change in demand to 22 or 23 amp. indicates a decrease in pumping efficiency probably due to a worn pump or pipe line obstruction. Such meters are being used in the older pumping stations as well as in the one here described.

Electric power for the two 400-hp. motors is carried down through a borehole at 2,300 volts. The 25,000-volt to 2,300-volt step-down transformers are located within a few feet of the hole. A three-conductor, No. 0000 B. & S. gage varnished cambric, lead covered and armored cable is used, and is suspended from a pot head which in turn is supported by being mounted directly on top of the 5⅝-in. casing. The borehole, which is 251 ft. deep, was drilled 10 in. in diameter to allow space for a 2-in. thickness of concrete which was poured in the hole to surround the casing for its entire length.

The upper pot head, being out in the weather, was covered with a thick coating of pitch to prevent water from entering the casing. Apparently every reasonable precaution has been taken to insure reliability; however, it is the intention to install a duplicate cable.

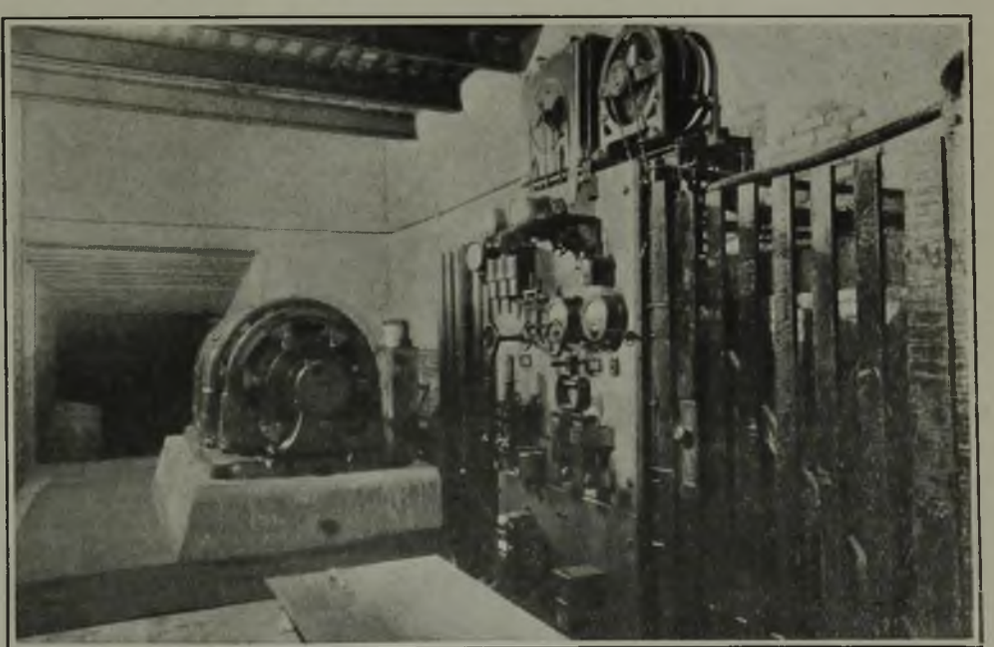


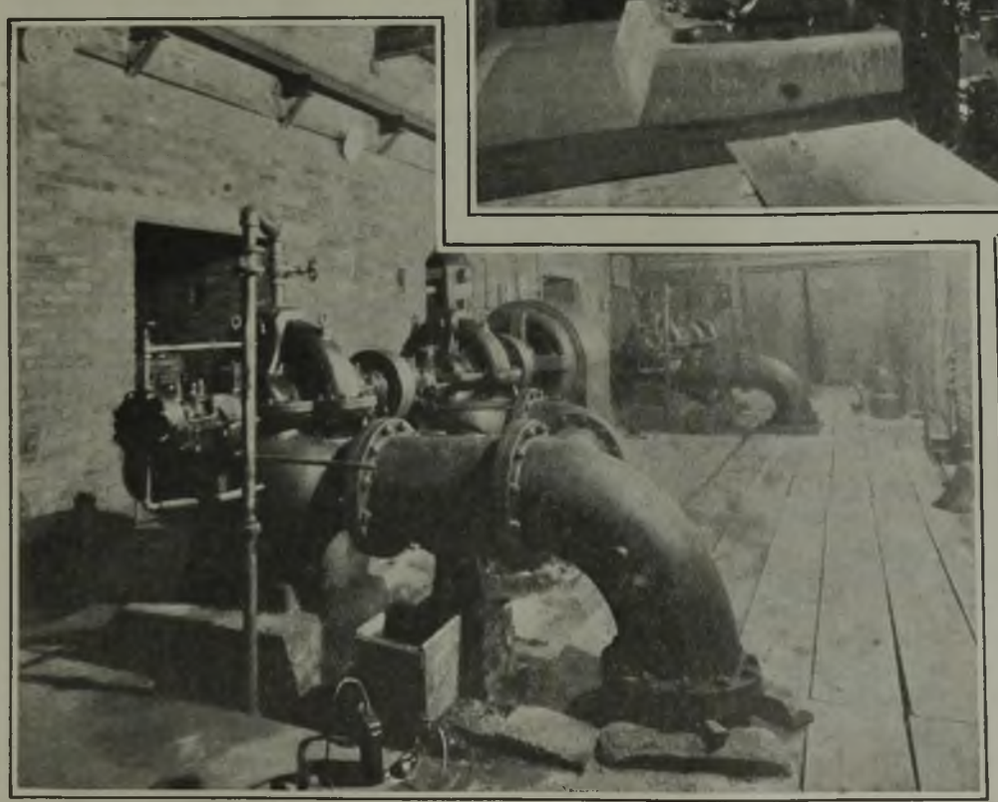
There Is Only One Valve Per Unit Here

The check valve is in a separate brick compartment. This minimizes the chance of wetting the electrical equipment, should the valve body break. The 13-ft. ceiling allows ample clearance for taking full advantage of the overhead traveling crane when repairing equipment. The roof is made of brick laid between 4-in. I-beams. The weight is taken by 12-in. I-beams set about 5 ft. apart, the roof span being 17 ft.

Substations and Pumps Are Co-ordinated To the Best Advantage

If the pumping load of a mine can be applied during off-peak periods large savings can be realized in power bills. At the Keystone Coal and Coke Co.'s mines every effort has been made to do the pumping either during the night or when power demands are low during the day. Accurate records are kept at all the substations to determine when the pumps can be run and yet not unduly raise the maximum demand.





Bronze Pumps and Wood-Lined Pipes Necessary for this Water

Each pump consists of two single-stage units designed so that they can be repaired as easily as possible. There is no need to disturb the whole pump when any part must be examined or replaced. Squirrel cage motors drive each of the two pumps now installed, thus the control equipment has been made simple and easy to operate. A vacuum pump is used to prime the units whenever the sump must be pumped down.

In order to check present performance and to predict future requirements, daily records are made of rainfall and pumping. The pump station records, which are kept of the new central plant and of the old stations as well, include gallons pumped, also total hours and actual periods of the day each pump is in use. Table I

Table I—Pumping Capacity at Greensburg Operations

Mine	Gal. Per Minute
Crows Nest (Central Pumps)	8,400
Crab Tree	7,800
Hannastown	12,900
Forbes Road	3,400
Salem	7,900
Keystone Shaft	10,900
Hempfield	9,000
Seaboard Shaft	13,000
Total	73,300

Maximum gallons pumped in one month, 862,000,000.
Minimum gallons pumped in one month, 400,000,000.

indicates the volume of water which is pumped from the Keystone mines in the Greensburg basin. It has been found that the effect of a rain is noted by increased pumping beginning 12 to 48 hours after, this period, depending on the amount of rainfall and condition of the soil.

An effort is made to do all pumping at hours of off-peak electric load. Pump station operators are instructed to this effect and in case an argument arises regarding the correctness of their reports, the chart of the main graphic demand meter for that mine is consulted. The pump motors are all of such size that the addition of their continuous loads to the fluctuating mine loads can be distinguished on the meter charts without difficulty. Only at rare intervals are pumps operated simultaneously with the peak day-load, these occurrences being caused by emergency or by the carelessness or misunderstanding of the operators.

Mine pumping appears to have received its due share of attention from the officials of the Keystone Coal and Coke Co. The new central pump station here described was built because the men of the company realized the necessity of having reliable drainage equipment that would meet emergencies.

Old Workings at Cassidy, B. C., Flushed with Fine Rock

Hope to Prevent Spontaneous Combustion—Borehole Sunk Through Quicksand and Solid Rock—Stowing Material Carried Underground by Flume

By James B. Touhey
Resident Manager, Granby Consolidated Mining, Smelting & Power Co., Cassidy, B. C.

AT THE COAL mines of the Granby Consolidated Mining, Smelting & Power Co., some of the old workings are being flushed with broken rock to prevent spontaneous combustion. Support of surface and recovery of 100,000 tons of pillar coal by skipping and further flushing are expected to be the outcome of the experiment.

For many years mine workings have been hydraulically stowed in Europe. This method of surface support, however, has never found much favor in British Columbia, or, for that matter in any part of North America, probably because the workings have a life far shorter than those of Great Britain or Continental Europe.

When surface structures, such as railroads, towns and the various buildings necessary to coal-mine operation, are to be protected, it has been necessary to leave substantial pillars of coal to prevent subsidence of the surface. This is often inconvenient and at times expensive because of the great length of narrow work that must be driven in order to leave such supports. Within obvious limits also the nearer the coal lies to the surface, the larger must be the pillars that are left. If a river, creek or other stream crosses a property, it is always a hazardous operation to remove the pillar coal beneath it because rarely is the depth of gravel and glacial drift underlying such a stream definitely known. Of course, if a sufficient distance intervenes between the coal and the solid bed of the watercourse, no danger is to be anticipated from fractures extending upward to the water-bearing gravel.

At Cassidy, B. C., which is situated on the island of Vancouver, the mines are entered from the surface by means of three slopes having an average pitch of 20 deg. The coal on Vancouver Island is quite liable to spontaneous combustion, and this forms one of the greatest dangers to be guarded against in mine operation.

When the mines at Cassidy were opened, advantage was taken of experience that had been gained at other operations in this regard, and a modified system of panel work was adopted, so that if a fire should start from spontaneous combustion or other cause in any particular panel or district, it could be quickly and effectively sealed without seriously interfering with the operation of the mine as a whole.

Ventilation and Stowage Reduce Fire Hazard

The mine was provided with ascensional ventilation so that all the old workings in each district could be ventilated by the return air from that district. Thus the returning air assisted in keeping to a minimum any heat that might otherwise be generated in the crushing of pillars.

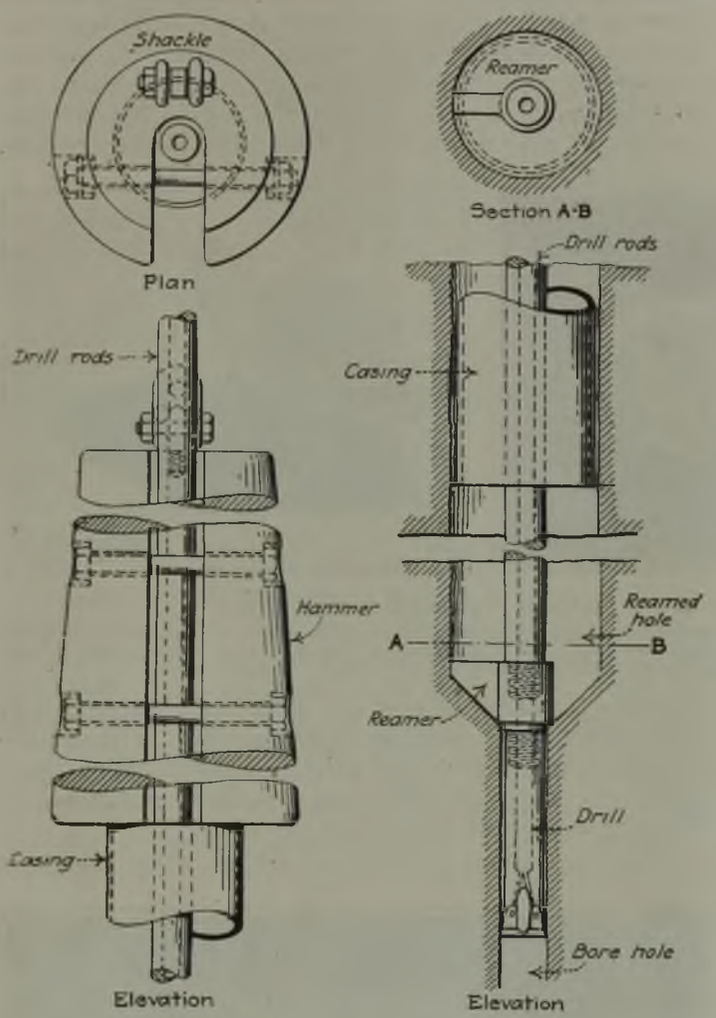
It was finally decided as an extra precaution to stow the workings by hydraulic means. With this end in view, a slope 9 ft. wide by 7 ft. high was driven to within 63 ft. of daylight. It was planned to sink a small shaft from the surface to the face of this incline. This plan was abandoned, however, owing to the shaft encountering 11 ft. of quicksand. It was then decided to sink a borehole and case it with 6-in. steel pipe.

A suitable drill rig was accordingly erected, and a hammer weighing 400 lb. was used to drive the first length—10 ft. of 6-in. pipe—through the surface soil and gravel. The hollow drill rod standing in the middle of the pipe served as a guide for this hammer, which was raised by a small compressed-air hoist and allowed to fall by its own weight.

This device was manipulated as follows: The first length of pipe was put in position with a small framework about 6 ft. high holding it vertical. Water was next forced through the hollow drill rod by a 4x6-in. high-pressure pump. The rod inside the pipe with the hammer weight straddling it is shown in Fig. 1. A 1¼-in. hemp rope, attached to the hammer, was

passed three times around the small drum of a hoist. In this manner the hammer was lifted about 10 in., and allowed to fall by giving slack to the rope, the hoist meanwhile being operated continuously. The force of water in the hollow guide rod was 45 lb. per square inch. This was sufficient to force the sand and gravel to the top of the pipe as it was driven downward. This method of sinking the casing was continued by attaching additional lengths of pipe until a depth of 43 ft. had been attained. Here, hardpan was encountered.

It became necessary at this point to drill the remaining 20 ft. through hard shale. The hole must, of course, be of such size as to allow the casing to follow it down to the coal. An ordinary drill bit was made 2⅛ in. in diameter. Four ⅜-in. holes were drilled from the flanks of the cutting edge to the hollow center. Through these streams of water were forced continually to keep the borings coming to the surface. A 2⅛-in. hole was thus drilled to the coal and was then reamed out by an extra cutting bit fastened to the drill rod 1 ft. above the regular bit, this arrangement being shown in Fig. 2. The reaming bit extended 3½ in. on one side only from the center of the drill rod. It was lifted and dropped in the same manner as the hammer, thus cutting the sides of the original hole out to 7 in. in diameter, the smaller bit serving as a guide.



Figs. 1 and 2—Driving Casing and Reaming Hole

Through the surface drift the casing was driven by forcing water under pressure through the hollow drill steel and raising and dropping a heavy weight on the top of the casing as shown in Fig. 1. Fig. 2 shows how the drill hole was enlarged to the proper size to receive the casing. The hole was reamed by a "wing" bit attached to the side of the drill rod, the drill itself serving as a pilot and guide.

Inasmuch as the reaming bit extended to one side of the rod only, it allowed the two bits to be hoisted out of or lowered into the hole as required, passing up through the 6-in. pipe, the lower end of which was raised a sufficient distance above the bottom of the reamed portion of the hole to allow the 2⅛-in. advance bit, which now served as a guide, to swing over out of a concentric position. In lowering this device back into the hole, the advance or guide bit, when it encountered the slant surface made by the reamer, would slide over into the smaller hole where it again acted as a guide, so that chopping with the reamer might be continued.

Water Transports Washery Refuse to Borehole

The casing was pulled up 15 in. above the hardpan and allowed to remain in this position until the hole was reamed to the bottom. It was then lowered to the coal and secured in position on the surface. A small wooden hopper with a capacity of about two tons was next built above the borehole, the casing forming its vertex.

A flume was next constructed to carry the washery refuse to this hopper. This was made of 2x12-in. planks and lined on the bottom with ⅛-in. iron sheets. It had a grade of 1 in 30. About eight parts of water to each part of solids was found necessary to keep the refuse flowing in this flume. Three feet away from the hopper a short length of copper screen was inserted in the bottom of the flume, after the plank had been cut out. The perforations in this plate were ⅛x½ in., and sufficient water was drained out by this screen to prevent an excessive quantity of water passing underground. The ratio of water to solids was now about 4:1, and the slope within the mine was sufficient to carry this mixture along without the aid of fluming except where the direction of flow of the stowage material was changed or where levels had to be crossed. At present this material is being deposited in an old slope 1,100 ft. from the borehole. From this a number of rooms had been worked where because of the excessive roof and side pressure and the close proximity to a creek, pillars could not be extracted.

When this portion of the mine has been flushed full it is the intention to extract these pillars by skipping them, that is by taking slices off the sides and then filling up again after each slice. It is also planned later on to install a small rock crusher above the hopper and to crush all rock coming from the mine, which amounts to about 125 tons per day. This crushed rock —which will be less than one inch in diameter—will drop into the hopper where it will mix with the water and solids coming from the washery. This will increase the quantity of solids passing into the mine to approximately 250 tons per 8-hr. shift.

The entire cost of labor entailed in this installation, including that for drilling, was about $350. The quantity of pillar coal that will eventually be extracted as the process of hydraulic stowage proceeds, will be approximately 75,000 to 100,000 tons. The primary object sought in stowing in this mine is the prevention of mine fires arising from spontaneous combustion in crushed or shattered pillars. Stowage will, however, prevent any appreciable surface subsidence arising from pillar extraction, shorten the distance the ventilating current must travel and prevent possible accumulations of methane.

Coal Balls—The "Finger Prints" That Identify Coal

In These Limestone Nodules Fossil Plants Unerringly Establish Age and Character of Each Seam of Coal Says Noé

By F. L. Clark
McGregor, Iowa

A SEARCH for "coal balls" in the coal measures of Illinois, Indiana, Kentucky and Iowa has been a particular feature of a geologic survey advanced during the past summer by Dr. Adolph Noé, paleobotanist at the University of Chicago. The first of these to be discovered in America was found in Illinois in 1922 and since then Dr. Noé has been working to develop a fund of knowledge about "coal balls" and their value to the coal industry.

"Coal balls" are rounded limestone nodules found in the coal bed. They contain perfectly preserved fossil plants of the kind that formed coal beds of the world during the carboniferous age. These peculiar formations have been found in European coal measures since 1836 and have given to science an accurate knowledge of the plants that lived on the earth during the period when the coal beds were being laid down.

When one of these coal balls found by Dr. Noé, near Harrisburg, Ill., in 1922, was examined microscopically the discovery was made that it contained the stem of a flowering plant similar to a present-day cornstalk. This discovery appears to relegate to the discard previously conceived theories of the age of the earth, as the coal balls of Europe had revealed only club mosses, horsetails and other of the lowest forms of plant life. The discovery in a coal ball of a flowering plant, a type of life that science had believed had been developed only millions of years after the coal beds were formed, indicates that the world is a few hundred million years more or less older than it had previously been believed to be.

Whether or not Dr. Noé will find duplicates of his "King Tut of plants," as it might be called, in the explorations which he proposes to make during coming seasons in the Midwest coal fields, may be a matter of doubt. In any case such a discovery would be of interest to science if not to coal operators.

The significance of this work to the coal producer lies in the fact that the coal beds of America may now be given the same careful search for "coal balls" that has been made in the coal beds of England, France and Germany for a long time. Thus Dr. Noé's investigation leads him to believe that coal balls probably are fairly common in Iowa, Kansas, Missouri, and Indiana, and presumably are present in the Pennsylvania coal fields. Some of these nodules were recently found in Texas and forwarded to Dr. Noé for examination.

Of the commercial value of the discovery of coal balls of American coal-field origin and their examination Dr. Noé says, "Fossil plants, which are found in the coal fields are, as a rule, connected with definite seams, each seam having a flora of its own. Therefore, whenever fossil plants are discovered in or about a coal bed, that bed can be identified by them. It is of the utmost importance that this should be done because the commercial value of coal differs from bed to bed and the prospector must know what measure he has before him. In many instances he does not possess this information. Coal mines have been worked for years without the operators really knowing what beds they had or they gave the beds only local names without reference to the distribution of a particular coal.

"Coal balls contain materials which, when examined

Figs. 1, 2 and 3—Plant Remains Found in and in Close Proximity to Coal Beds

Heretofore it has been believed that the coal beds were formed from dense masses or bogs of ferns, club mosses, horsetails and other plants of a low order of vegetation. Note, however, the shamrock-like plant appearing in Fig. 3. This shows a distinctly higher order of plant development than the other two, indicating formation of coal in a different era.

Fig. 4—What Is the Story Here?

This particular coal forming plant is of an unusual type and might indicate the formation of the coal in a time varying from that usually assigned. The jointed stem of the plant, evidently is endogenous—the species which develops from the core instead of by adding outer layers—and resembles a corn stalk.

Fig. 5—Coal Ball Split Through Its Center

Here can be seen the beautifully preserved fossil plants inside. Each coal bed has its characteristic flora. Consequently the fossil plants in a coal deposit serve as a means of identification. Coal measures thus may be recognized as unerringly by their fossils as criminals are by their finger prints.

with a microscope can be identified with great accuracy. The fossil plants that appear in a coal bed are mere impressions in the shale or sandstone but if well preserved they can be closely identified. These are the occasions when fossil plants play a practical role. It can be easily imagined that in prospecting for coal beds in regions which have not been defined or drilled, special attention must be given to those fossils which are invariably found associated with that particular coal."

The accompanying illustrations are made from photographs of fossil plants found in the No. 2 coal bed of Illinois. This particular measure is of high commercial importance because of its chemical qualities. It produces an excellent fuel for the steel industry.

Spitzbergen, the New Coal Bin of Norway

THE hitherto little known group of Spitzenbergen islands off the coast of Norway have suddenly assumed great commercial prominence due to the discovery by Dr. Adolf Hoel, of the University of Christiania, of the great extent of its coal deposits.

According to the survey just completed there are in this area over 8,000,000,000 tons of high-grade coal of which quantity 1,500,000,000 tons are of Carbonaceous formation, 1,500,000,000 tons are of Calcareous formation, the remainder of the deposit being of the Tertiary formation. Though all this coal does not belong to Norway the large quantity that does belong places her in a promising position. Considering only that part of the tonnage held by the largest operating company and entirely overlooking other Norwegian companies and the possibilities of further extensions of the known fields she possesses an average of 600 tons of coal per inhabitant .

Many Norwegian companies are operating in these fields and others are being formed for the purpose. It is understood that there will be no objection to the introduction of outside capital, provided that the companies are organized under the Norwegian laws and administered in Norway. A few years ago a group of Hollanders negotiated for the development of certain of these areas in this manner. Last year Norwegian and other companies employed 1,192 men in working their holdings, and this year a larger number of workers will be engaged. Most of the miners are Norwegians, the government doing all in its power to make the men and their families content by establishing hospitals, schools, churches and libraries. The workingmen are given six months' contracts and are housed in modern homes.

Last year this little group of islands exported 340,000 tons of coal as against 19,000 tons in 1916. Of this quantity Norwegian-owned mines were responsible for 229,596 tons and foreign-owned miles for 113,346 tons. Up to date about $20,000,000 have been expended in the development of these mines, but the next year will probably witness a material increase in the capital invested in this work.

At present the largest operating company is Norwegian, its holdings containing approximately 1,500,000,000 tons of coal. This organization, known as Store Norske Spitzenbergen Kulkompani, is both progressive and aggressive and is in the market for modern coal-mining machinery of all classes. Plans have been under way for some time to open two new mines at Green Harbor, which it is understood will have an annual output of 300,000 tons each.

Can Run Mine Cars on Railroad Track

By C. E. Reynolds
Superintendent, Allegheny-Pittsburgh Coal Co.
Logans Ferry, Pa.

In the supply yard at the Springdale mine of the Allegheny-Pittsburgh Coal Co., Logans Ferry, Pa., heavy oak planks are laid in and around a 70-deg. crossover of mine and railroad tracks, thus forming the platform shown in the accompanying illustration. The

Platform Flush with the Rails

Any piece of heavy mine equipment may be unloaded from the railroad car, moved to this platform and transferred with ease to the mine track.

railroad track is provided with a third rail at mine-track gage, which extends from the secondary tipple to the crossover.

Mine cars, locomotives and cutting machines are lifted from open railroad cars by means of a block hung from the tipple structure. They are then lowered to the rails laid at mine gage. Next they are moved from the unloading point to the crossover platform. This is flush with the top of the rails and facilitates slueing the car during its transfer from one track to the other.

News Of the Industry

Coal Trade Fails to Realize Importance Of Oil Competition

Overproduction of Petroleum Presents Problem Similar to That Facing Coal Industry—Leadership in Power Output Claimed by Oil Producers Questioned, but Margin Is Close

By Paul Wooton
Washington Correspondent of *Coal Age*

To bring to all branches of the coal trade a keen realization of the proportions of oil competition is one of the crying needs of the day, in the opinion of those deeply interested in the welfare of this industry. The conditions which brought about the production of 730,000,000 barrels of petroleum in 1923 are thoroughly unsatisfactory to the oil industry. It represented a glut of overproduction on a scale never before known.

Coal mines can be shut down, but the only way oil production can be checked is through an agreement among all producers in an entire field. This cannot be done legally under the interpretation which the courts are placing on the anti-trust statutes. This overproduction of oil, which is flooding the market, bursting storage facilities and building up unprecedented stocks of surplus crude and gasoline, does not spell prosperity to the oil industry. It means ruinously low prices—prices so low that the industry is forced to displace coal in order to realize anything from its surplus. Not only is coal suffering from the same trouble as oil but coal has an additional interest in some agreement that will halt overproduction in that surplus oil must be sold in displacing an enormous amount of coal.

Standard Oil Co. Boasts

Those who are studying the effect of oil competition on coal are convinced that the industry itself lacks a clear realization of the extent of the inroads being made. The Standard Oil Co. just at this time is boasting in newspaper advertising that oil now is the chief source of power in the United States. The inference is that it definitely has displaced coal from the head of the list. An analysis of the situation indicates that the claim of the Standard Oil Co. is not justified but it also shows that while coal probably still is in first place the margin between it and oil is a very narrow one. By narrowing the comparison to power—excluding heat—it is necessary to include gasoline as well as fuel oil in the calculation.

The 730,000,000 barrels of petroleum produced last year is equivalent to 200,000,000 tons of coal. The 1923 output of anthracite and bituminous coal combined was 657,000,000 tons, so that at first glance the ratio of coal to oil still would seem to be three and one-half to one even on a B.t.u. basis. Out of the 657,000,000 tons of coal, however, a considerable deduction must be made since a part of it is not used in power production. In round numbers these deductions would be: Anthracite, 70,000,000 net tons; bituminous coal used as domestic fuel, 60,000,000 tons; coal for coke, 80,000,000 tons; exports and bunker, 30,000,000 tons; heating requirements of the industries, including cement and brick manufacture, metallurgical and other uses, as well as that necessary to keep factories warm, 50,000,000 tons; gas works, 6,000,000 tons. This leaves a balance used for power of not more than 360,000,000 tons.

Oil Has High Thermal Efficiency

This would seem to indicate that coal still had a lead of almost two to one over oil, even when power uses only are considered. However, consideration must be given to the fact that more power is squeezed out of oil than is produced from coal. While it is true that the ordinary gasoline engine falls far short of the 35 per cent thermal efficiency which it gives theoretically, in actual performance it does much better than the ordinary steam plant burning coal and makes a locomotive look sick in comparison. The gasoline engine delivers at least 15 per cent over-all thermal efficiency, whereas the locomotive, considering standby losses, has less than 5 per cent efficiency. When allowance is made for the superior efficiency of gas engines over steam engines in getting power units out of fuel units considerable of the lead of coal is overcome.

Since no accurate calculations have been made of the average efficiency of steam plants, only approximations can be used. In all probability an assumption of 7 per cent of the average thermal efficiency of the coal-burning power producing equipment is high. A corresponding assumption of 10 per cent for the petroleum-using power producing equipment (including gasoline engines) probably is low. The coal industry then will be willing to accept the following equation:

$$360{,}000{,}000 \times 7\% = 25{,}200{,}000$$
$$200{,}000{,}000 \times 10\% = 20{,}000{,}000$$

Now the comparison has shrunk to proportions of 25,200,000 for coal to 20,000,000 for oil. Under the most favorable conditions this is all of the lead which coal has as a power producer. The petroleum industry, of course, will insist that steam efficiency is less than 7 per cent and would raise the 10 per cent assumed for petroleum products.

While this calculation is rough it serves to point out the extraordinary inroads which oil has made in the field of power production. The coal-burning equipment includes most of the 65,000,000 hp. represented by steam locomotives. It includes most of the 20,000,000 hp. of the central stations and most of the 30,000,000 hp. of prime movers in industry and most of the 6,000,000 hp. employed in mines. This represents some 120,000,000 hp., but the power plants of automotive vehicles alone greatly exceeds that total. There are 16,000,00 motor vehicles in the country with an average actual horsepower which is certainly not less than twenty-five. On that basis the installed capacity would be 400,000,000 hp., more than three times the figure for coal-burning equipment.

The coal industry still is strongly entrenched in the heating field, but even there the small oil burner is winning favor. Any frank appraisal of the situation leads to the conclusion that coal must join hands with oil in a determined effort to eliminate the wastes of overproduction.

"Back to Coal" Movement Still On

A recent report of the Young Men's Christian Association of Boston in reference to the heating of its building contains this interesting statement:

"We are glad to call attention to the fact that we are now burning coal in the heating plant at a very distinct reduction in the heating price at the present time over oil. The decision to change from oil to coal-burning was made after careful study of the situation, in which we were greatly helped by the engineering school. If the present prices prevail, we should show a saving of several thousand dollars during the year by using coal in our heating plant."

186 Miners Lose Lives in September Mine Accidents; Nine Months' Total 1,821

Accidents at coal mines in the United States in September, 1924, resulted in the death of 186 men, according to reports furnished by State mine inspectors to the U. S. Bureau of Mines. The number of fatalities reported includes 39 deaths in an explosion at Sublet, Wyo., on Sept. 16 and 5 deaths in an explosion at Rains, Utah, on Sept. 21. As the output of coal in September was 48,624,000 tons, the fatality rate for the month was 3.83 per million tons mined, as compared with 3.97 in the previous month and 2.94 for September last year, during which month no large disasters occurred, and an average rate of 3.60 for September during the 10-year period 1914-1923. For bituminous mines alone the reports showed 157 lives lost and a fatality rate of 3.83 per million tons, as compared with a rate of 2.70 for September last year and a ten-year average rate for September of 3.30. For anthracite mines alone, the number of fatalities in September was 29 and the fatality rate was 3.82, as compared with 6.86 for September last year and a ten-year average rate for September of 5.57.

Reports covering the first nine months of 1924 show a total of 1,821 lives lost in accidents at coal mines, as compared with 1,942 in the corresponding months last year. The fatality rate for 1924 to the end of September stands at 4.51 per million tons, as compared with 3.89 for the same period last year. For bituminous mines alone the average rate in 1924 for nine months was 4.34, as against 3.59 in 1923. For anthracite mines alone the 9-month average rate was 5.34 as compared with 5.68.

The two explosions in September brought the total number of "major" disasters in 1924 to 9 with a loss of 452 lives, as compared with 7 similar disasters and 254 lives lost during the first nine months of 1923. The fatality rate per million tons based exclusively on the number of lives lost in accidents killing five or more men during the first three-quarters of 1924 was 1.12 as compared with 0.51 in 1923.

Comparing the causes of the fatal accidents in 1924 to the end of September with those for the same period in 1923, the record shows that explosions of gas and coal-dust continue to be the only class of accidents with increased fatality rates.

Mule 20 Years "Below"

Frequent mention has been made of the faithful old mine mule which has been kept underground for a term of years, then retired to old age by the mining company. The Penwell Coal Mining Co., of Pana, Ill., has just removed a mule to the surface which has been underground for more than twenty years. He has been retired to pasture on an old-age pension. As might be expected, he was blinded when he first saw the light of day, but his sight gradually returned.

Italy Imports More Coal from United States and Germany

Italy's imports of coal and coke during the first six months of the current year, according to the official figures given out by the Ministry of Finance, amounted to 3,666,690 tons against 3,818,962 in the corresponding period of 1923 and 3,065,491 in 1922, says Assistant Trade Commissioner J. A. Palmer, Rome, in a report to the U. S. Department of Commerce. In addition, 1,474,246 tons was received on account of reparations from Germany, compared with 950,628 tons in 1923. These figures, although official, do not coincide with those issued by the Reparations Commission under date of July 21, which placed the quantity of coal and coke shipped to Italy during the first half of 1924 on reparation account at "about two million tons."

Imports of American coal continue to grow, averaging about 47,000 tons per month during the first six months of this year against an average of only 20,000 tons during the same period last year. Germany's shipments of non-reparation coal also shows a substantial increase over last year, being in excess of arrivals from the United States whereas in the past, they were smaller. Shipments from France continue to decline.

Imports of British coal and coke, which, as a result of the reduction in reparation deliveries, were unusually high during the first six months of 1923 (3,398,385 tons), fell back to 2,831,543 tons in 1924, or about the same level as in 1922.

Coal-Mine Fatalities During September, 1924, by Causes and States

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

State	Underground											Shaft					Surface						Total by States	
	Falls of roof (coal, rock, etc.).	Falls of face or pillar coal.	Mine cars and locomotives.	Explosions of gas or coal-dust.	Explosives.	Suffocation from mine gases.	Electricity.	Animals.	Mining machines.	Mine fires (burned, suffocated, etc.).	Other causes.	Total.	Falling down shafts or slopes.	Objects falling down shafts or slopes.	Cage, skip, or bucket.	Other causes.	Total.	Mine cars and mine locomotives.	Electricity.	Machinery.	Boiler explosions or bursting steam pipes.	Railway cars and locomotives.	Other causes.	Total.	1924	1923
Alabama	2		1		1		2					6													6	7
Alaska																									0	0
Arkansas																									0	0
Colorado	1	2										3													3	2
Illinois	8		1									9													9	19
Indiana	2											2													2	6
Iowa																									0	2
Kansas																									0	2
Kentucky	9		1		1		2					13													13	8
Maryland			1									1													1	0
Michigan																									0	0
Missouri	2											2													2	1
Montana	1										1	2													2	8
New Mexico	2											2													2	2
North Dakota																									0	0
Ohio	6	1	5									12				1	1								13	13
Oklahoma			1									1													1	2
Pennsylvania (bituminous)	5	1	7		1		1		2			17			1		1		1					1	19	32
South Dakota																									0	0
Tennessee		1									2	3													3	1
Texas																									0	0
Utah	1		2	5								8													8	2
Virginia	2						1					3													3	1
Washington																									0	1
West Virginia	13		8				3	1			2	27							1					1	28	28
Wyoming		1	2	39								42													42	0
Total (bituminous)	54	6	29	44	3		9	1	2		5	153			1	1	2		2					2	157	129
Pennsylvania (anthracite)	11	2	4	*3	1	1	2				3	27						1					1	2	29	20
Total, Sept., 1924	65	8	33	47	4	1	11	1	2		8	180			1	1	2	1	2				1	4	186	
Total, Sept., 1923	84	4	24	6	5		9	2	2		2	138	2		1		3	1	1	1			5	8		149

*Gas explosions only.

Industrial Board Probes Trade-Association Work

The policy of the government toward co-operation and combination in private business enterprise, as expressed in the anti-trust laws, judicial practice, and the activities of the Federal Trade Commission, present difficulties and unsolved problems of the greatest public importance, says the National Industrial Conference Board in a statement just issued.

A lack of a clear and definite expression of public policy toward certain forms of business activity which have grown up out of changing economic conditions jeopardizes business and industrial development, the board says, and raises questions of vast importance to the public and the business community.

In this connection it was made known that the National Industrial Conference Board has been engaged for over a year in an intensive study of the development and present status of public policy toward private business enterprise, with special reference to the application of the anti-trust laws. This study, it was announced, covers the legal and economic aspects of the development and regulation of industrial combinations and the control of various forms of business co-operation and trade practices, the financial and economic aspects of business combinations, the relation of anti-trust laws to labor and the bearing of industrial combinations upon foreign trade and international affairs.

The purpose of the whole investigation, states the board, is to clarify for the public and the business community the present situation with respect to governmental policy so as to provide a sounder and more scientific basis for discussion of the vital issues which have arisen out of that situation. The investigation is being carried out by the research staff of the board in co-operation with a group of legal and economic authorities of national eminence in this field, and a large body of industrial and business leaders.

Coal Stock Excites Utah

In Utah vigilance committees of the Cache County Farm Bureau and the Logan City Chamber of Commerce are waging a vigorous war on coal stock salesmen. It is asserted there are salesmen for four different coal companies in the county selling stock that is not a desirable investment. A widow is said to have been persuaded to part with $2,000 of insurance money for some of it.

Those behind the anti-coal-stock-salesman movement are telling the people that too much coal is being produced already and that buying stock keeps more useless mines open, reducing working time and thus is responsible for keeping up the price. "Can't you see the handwriting on the wall?" says one message. "Let the big coal operators who have their money invested and are prepared to supply the coal put up the money. Don't sink your hard earned money in a coal or other mining scheme. It will never pay." It is understood that the attack is on the several mutual companies that are springing up.

The board's announcement says that since the whole issue of public policy has been raised recently in connection with the effort of the Secretary of Commerce and the Attorney General to define what trade associations may or may not do, the first report resulting from the board's investigations is a comprehensive survey and analysis of "Trade Associations and Their Activities." This report, to be issued soon, analyzes the development of trade associations and the legal status and economic importance of their activities, and will focus national attention on the place of trade associations in our industrial economic structure.

Pennsylvania Abandons Plan To Lease N. & W.

After negotiations extending over nearly the last year, announcement was made Oct. 28 by the Norfolk & Western Ry. and the Pennsylvania R.R. that plans for a long-term lease of the Norfolk & Western property by the Pennsylvania had been abandoned because a financial basis could not be agreed upon.

The statement, issued by A. C. Needles, president of the Norfolk & Western, said: "The Pennsylvania Railroad Co. has been unable to make a proposition for a long term lease of the Norfolk & Western property on a financial basis which in the opinion of the Norfolk & Western directors would be satisfactory to its stockholders, and all negotiations for such lease have therefore been concluded. The conclusion of these negotiations will not affect the friendly relations existing for a long time between the two companies and which have been to their mutual benefit and to the advantage of the territories served by both."

Lewis Sure of Re-election

The re-election of John L. Lewis as international president of the United Mine Workers is being forecast in Indianapolis. Nominations for international officers have been closed, and while ballots have not been prepared officially and it is not known exactly who, if anyone, will oppose Mr. Lewis for the presidency, it was said at international headquarters that Mr. Lewis seems to have almost a clear field. Likewise there is no formidable opposition to the re-election of Philip Murray as international vice-president, and William Green as international secretary-treasurer. In former years Mr. Lewis has met with formidable opposition when radicals led by Alex Howat, then president of the Kansas district, and Frank Farrington, president of the Illinois district, sought to capture control of the international organization.

Output and Value of Coal from Kansas, Maryland and Michigan Mines in 1923

(Compiled by U. S. Geological Survey)

State and County	Loaded at Mines for Shipment (Net Tons)	Sold to Local Trade and Used by Employees (Net Tons)	Used at Mines for Steam and Heat (Net Tons)	Made Into Coke at Mines (Net Tons)	Total Quantity (Net Tons)	Total Value	Average Value per Ton	Number of Employees — Underground — Miners, a	Underground — All Others	Surface	Total	Average Number of Days Worked
Kansas:												
Cherokee	611,296	6,522	17,479	.....	635,297	$1,884,000	$2.97	382	99	249	730	162
Crawford	2,974,563	61,527	63,918	.....	3,100,008	9,987,000	3.22	4,429	991	659	6,079	142
Leavenworth and Osage	101,503	48,903	668	.....	151,074	616,000	4.08	630	155	64	849	192
Linn	30,854	2,800	210	.....	33,864	119,000	3.50	93	24	10	127	98
Total, excluding wagon mines	3,718,216	119,752	82,275	.....	3,920,243	12,606,000	3.22	5,534	1,269	982	7,785	149
Wagon mines served by rail..	115,161	.....	.....	.....	115,161	375,000	3.26	.....	.....	.....	.....	...
Grand total	3,833,377	119,752	82,275	.....	4,035,404	12,981,000	3.22	.....	.....	.....	.....	...
Maryland												
Allegany	1,433,420	62,512	11,733	.....	1,507,665	4,852,000	3.21	1,563	551	366	2,480	198
Garrett	725,619	15,311	14,682	.....	755,612	1,976,000	2.62	797	263	185	1,845	137
Total, excluding wagon mines	2,159,039	77,823	26,415	.....	2,263,277	6,828,000	3.02	2,360	814	551	3,725	178
Wagon mines served by rail..	22,649	.....	.....	.....	22,649	83,000	3.66	.....	.....	.....	.....	...
Grand total	2,181,688	77,823	26,415	.....	22,85,926	6,911,000	3.02	.....	.....	.....	.....	...
Michigan												
Bay	384,669	3,992	15,342	.....	404,003	1,927,000	4.77	485	246	79	810	231
Calhoun and Shiawassee	23,250	2,500	.....	.....	25,750	92,500	3.59	8	34	4	46	97
Saginaw	678,129	9,743	54,300	.....	742,172	3,525,000	4.75	720	300	101	1,121	220
Total, excluding wagon mines	1,086,048	16,235	69,642	.....	1,171,925	5,544,500	4.73	1,213	580	184	1,977	222
Wagon mines served by rail..	150	.....	.....	.....	150	500	3.33	.....	.....	.....	.....	...
Grand total	1,086,198	16,235	69,642	.....	1,172,075	5,545,000	4.73	.....	.....	.....	.....	...

a Includes also loaders and shotfirers.

Campaign for Clean Coal Meeting with Success, Ohio Engineers Report

The report of the committee on the evaluation of coal, appointed at the January meeting, was the main subject at the sixth annual meeting of the Southern Ohio Pig Iron & Coke Association, held at Columbus, Oct. 17 and 18, jointly with the Ohio Section of the American Institute of Mining & Metallurgical Engineers. W. W. Stevenson, Semet-Solvay Co., Detroit, chairman of the coal evaluation committee, reviewed the committee's work, stating that the evaluation of coal was such a large subject that the committee felt that for the present at least it would be well for it to consider only the evaluation of coal for blast-furnace use.

The committee took the analysis of coke agreed upon by the Southern Ohio Pig Iron & Coke Association as a basis for discussion, and a recommendation was made that the base coal to be used for byproduct coking purposes should have approximately 6.5 per cent of ash on a dry basis and a volatile matter content such that 1.45 tons of coal would be required for one ton of coke. The tentative recommendation also was made that moisture should not be over 3 per cent, and sulphur no greater than 0.75 per cent, with a penalty for sulphur above 1 per cent. The recommendations of the committee were made after full discussion, aided by charts showing experiments conducted by L. R. Forest, Semet-Solvay Co., Syracuse, which showed the advance in the cost of producing pig iron from high-ash coal.

Try to Evolve Base Coal Analysis

Following discussion of the committee report it was recommended that the committee continue its deliberations, taking in also the evaluation of coal for gas-producer and steam use and endeavor to arrive at a base coal analysis similar to that used in the iron-ore trade, and above which a premium would be paid for coal, with a penalty for coal below the base grade.

The clean-coal campaign inaugurated by the association two years ago, President Sweetser said in his address, was having wonderful success. He declared that since the matter had been brought to their attention the coal operators were determined to set their house in order without interference from outside sources, and cited the change in advertising methods of many companies, in which clean coal was stressed. Whereas two years ago it was almost impossible to get clean coal, today coal can be bought on a guaranteed basis. The campaign was an educational one, and it is getting down to the miners themselves, as in a recent agreement signed in an Ohio district the miners agreed to take every means in their power to mine clean coal.

The question of sampling coal was taken up in a report by C. B. Murray, secretary of the Ohio Section of the American Institute of Mining & Metallurgical Engineers, in which he cited a number of methods of sampling, and recommended that the proper place for sampling was at the mines. Coal analysis was discussed by Prof. D. J. Demorest, Ohio State University, who said that the only inspection necessary in cases where output of certain mines is purchased is for ash and sulphur. When buying from the jobber, all tests must be made, and in the case of coal for gas-producer use a check of the B.t.u.'s also was necessary.

John H. Jones

President of the Bertha-Consumers Co. and well known as a pioneer in the creation of the modern mining town.

A discussion of the methods of sampling and inspection followed a report by G. W. Coughlin, American Rolling Mill Co., Ashland, Ky., in which he described the value of the visual inspection carried on by his company at its mines. The main reason for this inspection is to check up the mines. The company has set up a quality standard for each section of mines. A complete visual inspection checked by a 20 per cent analysis made a complete but not costly standard. Referring to the value of the inspection department, Mr. Coughlin said that for a six months' period the ash content of coal mined in the various sections where inspectors were employed had dropped approximately 50 per cent.

Discussion of the report revolved about the establishment of control laboratories at coal mines, from which a quick report could be obtained as to the analysis of coal being mined. It was felt that if it were possible to have control laboratories established, it would be a very profitable investment for the producer. Prof. H. E. Nold, of the Mining Department of Ohio State University, stated that with such a laboratory the producer would be in a position to know just what kind of a contract to accept, thus eliminating the danger of having coal rejected on reaching destination.

Further discussion on the question of rating of mines, grading of mines, grading of coal, education of miners, producers and consumers, and of waste took place before the meeting adjourned, but no action was taken on any definite recommendation, it being felt that the association should make only tentative recommendations until the question of evaluating coal be more thoroughly discussed.

Efforts to Merge More Mines Continue in Kentucky

Large expansive talk about a ten million dollar merger of western Kentucky mines floods the region these days, due mainly to the activities of a scattered group of financial men such as L. H. McHenry, a surety bond holder agent of Louisville, Ky.; P. B. VerPlanck, George E. Hutchinson, Joseph A. Howorker and R. S. Morriss, of Chicago; R. J. Jones, of Columbus, Ohio, and Edward C. Larkin, of Dayton, Ohio. But up to date no merger has progressed beyond the stage of engineering appraisals and a general feeling out of the situation by banking groups.

Seven mines are under option that is reported to expire Nov. 4. The seven are all in the Muhlenberg field, near Central City, Ky., and are all strike bound at the present time. It is reported that the deal involves two mines of the W. G. Duncan Coal Co., at Graham and Luzerne; the mine of the Wickliffe Coal Co. at Browder; two mines of the Greenville Coal Co., at Powderly and Martlewick; a mine of the Pacific Coal Co. at Mercer and a mine of the Nelson Creek Coal Co. at Nelson Creek.

Most of these properties have long been known to be for sale because of the troublous conditions in Muhlenberg County, but nobody has been able to offer enough to buy them and those who have the money to buy at a reasonable price have been afraid of the whole thing because of the strike which has kept the whole of the county tied up since last spring. However, there is a chance of the union strength of the county dissolving soon. Already a half dozen small mines in the county are working on an open-shop basis at the 1917 scale and it looks as if the rest of the county might slip out of the union strangle hold within a few weeks. This may open the way for a mine merger.

Western Canadians Work Despite Close Vote

With reference to the recent settlement of the coal strike in District 18, United Mine Workers, it is interesting to note that there were majorities against a settlement in most of the coal mining centers of the Province of Alberta. British Columbia, however, was so overwhelmingly in favor of accepting the recommendations of the miners' representatives that the scale was decisively turned in favor of returning to work. The vote by districts is given unofficially as follows with "yea" vote given first: Drumheller, 527 to 1,105; Lethbridge, 220 to 235; Fernie, B. C., 495 to 63; Michel, B. C., 195 to 115; Coleman, 425 to 113; Edmonton, 1 to 39.

During the past week, however, reports indicate that the atmosphere is clear in all the coal fields both of eastern British Columbia and Alberta. The miners have accepted the verdict of the majority, taken up their tools, and returned to work on the terms of the agreement recommended to them. Production both in British Columbia and in Alberta from this date may be expected to reach substantial tonnages.

Midwestern Engineers Visit Coal Mines of South Illinois Field

The annual autumn meeting of the St. Louis section of the American Institute of Mining and Metallurgical Engineers terminated at Duquoin, Ill., Sunday afternoon Oct. 19 after two days spent inspecting coal properties of southern Illinois. More than 100 men, many of them prominent in the mining of Illinois, Missouri, Oklahoma, Kansas, Indiana, Kentucky and Tennessee, attended. The local committee, under the chairmanship of Dr. L. E. Young, of St. Louis, general manager of the Union Colliery Co., arranged the program.

The visitors assembled at 8 a.m. Saturday at the St. Louis end of the Free Bridge, where cars awaited them. Their route was over the state hard road to Duquoin, a short stop being made at the new strip mine of the Gayle Coal Co., just north of Duquoin. This pit is one of the largest in Illinois. At Duquoin the party had luncheon at the St. Nicholas Hotel and spent the afternoon inspecting the large Kathleen mine at Dowell, owned by the Union Colliery Co., and the new strip mine of the Black Servant Coal Co., at Elkville. Returning, the visitors enjoyed an informal dinner at the St. Nicholas Hotel.

At 8 p.m. Saturday the men assembled in the dining room of the hotel, where for two hours they listened to a number of informal talks. J. D. Robertson, of St. Louis, well known mining engineer, presided over the meeting, and Walter E. McCourt of the Washington University of St. Louis, served as secretary.

Tells Early Mining History

The first speaker was Arthur Hatcher, of St. Louis, who spoke at length on the geology of the mining district. James Forester, of Duquoin, superintendent of the Paradise Coal Co., told of the early mining history of southern Illinois. He was connected with the Halliday mining interests when they operated the old Hallidayboro mine, then one of the largest in the state. Prof. H. E. Culver, of Urbana, Ill., assistant state geologist for Illinois, in an interesting address dwelt upon the geology of the Duquoin anticline.

Charles F. Spencer of Pittsburg, Kan., spoke briefly of the mining conditions in that state. He is one of the pioneers in the strip mining industry in Kansas. "Doc" Shelton, of Marion, Ohio, a representative of the Marion Steam Shovel Co., enlightened the engineers on the mechancial principles of steam shovels now in general use in strip mines. Fred L. Shimer, division manager for the Central Illinois Public Service Co., spoke at length on the power situation of the southern Illinois coal fields. His company supplies seventy-two coal mines in the district with power and is now building a power plant at Grand Tower, Ill., on the Mississippi River.

Eugene McAuliffe, president of the Union Pacific Coal Co., with headquarters in Omaha, Neb., and former president of the Union Colliery Co., talked about mining conditions in the West, particularly in the State of Wyoming, where most of his company's property is located. John Garcia, of Chicago, a member of the firm of Allen & Garcia, gave an interesting résumé of present mining conditions. J. E. Jones, of the Old Ben Coal Corporation, told the assembled guests how his company has successfully employed rock dust in combating explosions.

Sunday morning the party left in automobiles for a 75-mile trip through the principal coal mining towns of Franklin and Williamson counties, including an inspection trip underground in the new monster Orient No. 2 mine of the Chicago, Wilmington & Franklin Coal Co., near West Frankfort. The men returned to Duquoin at 2 p.m., when the party dispersed.

Will West Kentucky Ruin Unionism?

With the strike in Muhlenberg County, western Kentucky, crumbling, now that six mines there are operating open shop on the 1917 scale, another solemn warning, following that of the resigning district president, Lonnie Jackson, has been uttered by County Attorney W. O. Smith, former district president of the miners. Smith says in a public statement that if the union does not make a deal with the operators of the district at a reduced wage, non-unionism is going to spread to a point where all the coal the country needs can be produced by non-union mines and that therefore the United Mine Workers will crumble. The organization, by refusing to modify the Jacksonville agreement, is cutting its own throat, he says. Wise observers of the region predict that the whole of western Kentucky will be operating either non-union or open shop before Christmas.

Figures on the amount of coal consumed by certain industries now being made public by the Bureau of the Census as the returns from the 1923 census of manufacturers are becoming available show the following: Malleable iron castings, 891,981 tons; mucilage, paste and other adhesives, 11,187 tons; bookbinding and blank book making, 22,428 tons; artificial flowers, 3,221 tons; jewelry and instrument cases, 4,398 tons; soda water apparatus, 17,368 tons; window shades and fixtures, 58,450 tons; billiard and pool tables, bowling alleys and accessories, 14,407 tons; sand and emery paper and cloth, 31,110 tons; dressed furs, 60,895 tons; chewing gum, 16,215 tons; leather gloves and mittens, 13,030 tons; lead pencils, 108,078 tons; artists' materials, 16,022 tons; wool scouring, 39,905 tons; silversmithing and silverware, 15,048 tons; malt, 88,969 tons; matches, 65,019 tons; cigars and cigarette holders and pipes, 4,376 tons; trunks, suitcases and bags, 21,431 tons; foundry supplies, 64,771 tons.

Sproul Consolidation Of Hard-Coal Companies Practically Completed

Scranton, Pa., Oct. 31. — Following closely on the heels of the announcement by Frank W. Childs, New York financier, that a $20,000,000 consolidation of anthracite properties was nearing completion, comes the authoritative statement the negotiations are being closed for another consolidation of a number of independent anthracite companies. William C. Sproul, former Governor of Pennsylvania, is interested in the latest merger.

The consolidation now announced centers around the Von Storch Collieries Co. and the Legitts Creek Anthracite Co., with four smaller companies also involved. Warren T. Acker, owner of the Von Storch company, admitted to interviewers that the deal would be closed within a few days, but declined to furnish other details.

For the last several months there has been talk of consolidating a number of local independent companies. Late in August former Governor Sproul visited the city, but denied his trip had anything to do with a proposed consolidation.

It was reported that Mr. Acker will be the president and general manager of the new company, although this could not be verified. Mr. Acker has had much experience in the coal business and is highly regarded among men actively associated with the industry.

The latest consolidation has no bearing on the one which Mr. Childs announced several days ago. Included in this proposed merger are the Kingston Coal Co. and the Jermyn Coal Co., together with several other smaller companies. Originally the consolidation being engineered by Mr. Childs included the Von Storch and Legitts Creek properties. The last named concern is owned by New York and Cleveland interests.

Heavier Coal Traffic Likely On Ohio River Soon

Extensive plans are being made by coal producers to use the Ohio River for water-rail shipments. One large coal producing company already has made extensive use of the Ohio by sending its coal to Cincinnati by water and there transferring the cargoes to rail carriers. A material saving is made in the transportation charge. By the end of the year the task of providing locks and dams between Pittsburgh and Cincinnati will have been completed. This will provide a 9-ft. channel at ordinary low water. This is expected to stimulate greatly the water-rail coal business, as well as the shipment in that manner of steel and other commodities.

General Edgar Jadwin, Assistant Chief of Engineers, who just has returned from an inspection of the work on the Ohio below Louisville, reports that flood progress is being made in that sector, although there still is four years of work to be done before that portion of the project will be complete. The last of the plant that will be needed for the work is being assembled at Louisville.

Practical Pointers For Electrical And Mechanical Men

Motorman Cannot Operate Locomotive Unless Stationed Inside Cab*

Device Eliminates Possibility That Operator May Start Motor and Let It Run Wild—Three Accidents of This Kind Had by One Company

By J. L. Boardman
Safety Engineer, Anaconda Copper Mining Co.
Butte, Mont.

A MOTORMAN at one of the mines of the Anaconda Copper Mining Co., alighted from his locomotive and wishing to take up some slack in his trip proceeded to operate the controller from the ground. The locomotive got away from him, and in endeavoring to get aboard he was knocked down between cars and timbers, the trip running over and seriously injuring him. The locomotive continued to the "turn sheet" on which cars are switched at the shaft. There it became derailed. A shift foreman finding the locomotive went back to the point where the trips were normally loaded and found the man lying by the cars.

Soon after this accident another of a similar nature occurred. Publicity was given to both mishaps, but a few days later a third accident of a like kind happened and the electrical engineers were asked to devise some method that would make such accidents impossible.

The device consists of a movable motorman's seat connected by a system of levers to the tripping mechanism of a standard overload circuit breaker mounted under the seat. The seat is connected also by a chain to a foot lever mounted on the floor. When the motorman's weight is on either the seat, or the foot lever, it allows the standard circuit breaker to be closed, but if this weight is removed the circuit breaker is automatically opened and cannot be closed until the seat or foot lever is again depressed. This cannot be done until the motorman is in the cab of the locomotive. Thus power cannot be applied to the motor if the motorman is not on the seat or does not have his foot on the treadle which is placed in the "pit" of the locomotive.

The seat *A* is hinged at the back and elevated in the front by the springs *F*. When pressure is applied to the seat it compresses the springs *F* and forces down the plunger *K*. This plunger operates the pin *E* through the lever *D* and releases the pressure on the overload circuit-breaker tripping device *H* allowing the circuit breaker to be closed by the reset lever *C*. Pressure on the seat can be provided by the motorman sitting upon it or by his pressing the treadle with the foot when standing.

If the motorman should leave the locomotive cab, thereby releasing the pressure on the seat, the pin *E* is forced in by the spring *L* and strikes against the tripping device *H* on a standard circuit breaker; this opens the circuit to the locomotive motors. The device does not prevent the standard overload circuit breakers from functioning on overload.

The movable seat can be adopted to electric operation of the circuit breaker by removing the levers connecting the seat to the breaker and installing an auxiliary contact or switch under the seat. This contact would control the opening or closing of the main circuit breaker and would have this advantage over mechanical operation that the breaker could be placed anywhere in the cab. The device was developed by J. M. Fine, superintendent of the electrical department and T. J. Little, foreman of the electrical shop of the company at Butte, Mont.

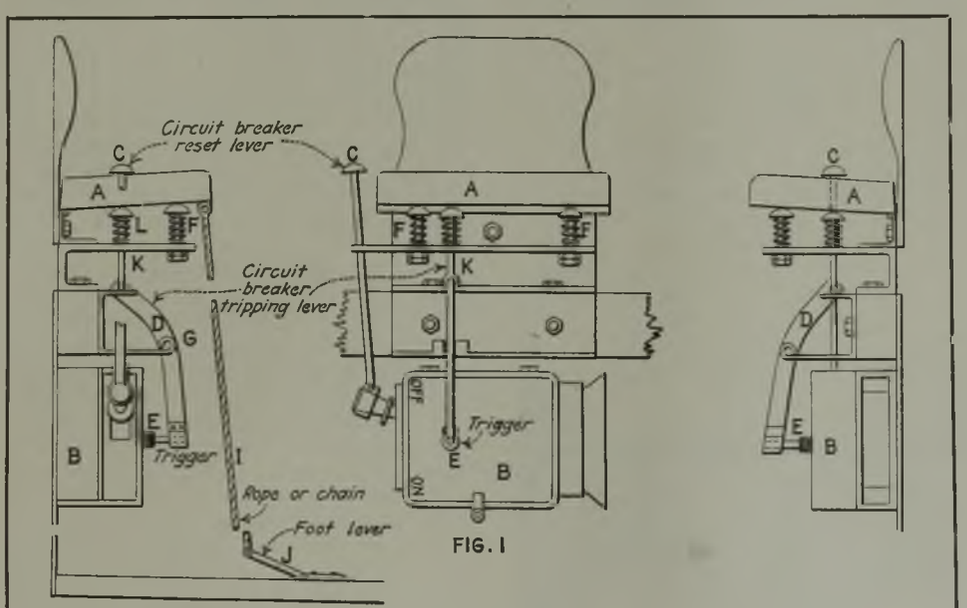


FIG. 1

Motorman Must Be on Seat or Have Foot on Lever

No, the motorman does not sit on the circuit breaker and hold it closed against an overload. When he sits on the seat or holds his foot on the lever the trigger is reset and the breaker can be closed. Just as soon as the motorman releases the trigger by getting off his seat and at the same time freeing the foot lever, the circuit breaker opens and power cannot be applied to the motors. This little safety feature was put on a locomotive so that the motors cannot be operated unless the motorman is in his cab and in proper position.

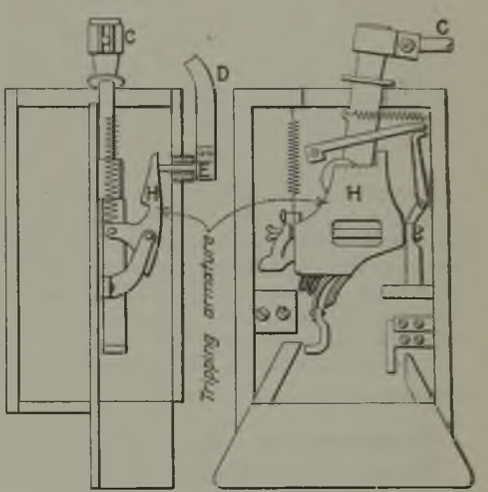


FIG. 2

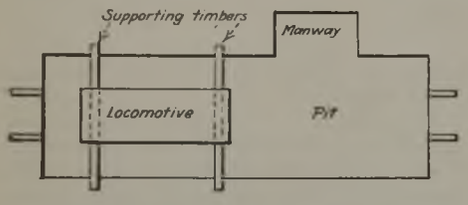
Circuit Breaker Is Not Locked In

The pin *E* is forced against the tripping armature *H* and the circuit opened when the motorman steps out of the locomotive and releases the pressure on the seat or foot lever. The device does not prevent the circuit breaker from functioning when an overload is placed upon the locomotive.

*Contribution to Mining Section, National Safety Council, Sept. 30.

A Cost-Saving Method of Changing Wheels

The arrangement of a well-equipped locomotive barn is one of the main factors that keeps the repair bills to a minimum and is worthy of consideration. In most cases it has been my experience that when a locomotive is to be repaired, the necessary time that should be allowed is not available and



Where Quick Changes Are Made

This pit is large enough to accommodate three sets of wheels and still leave ample room for the workmen. It is arranged so that the rails are taken from under the wheels. It is not necessary to raise the locomotive more than a few inches because the old set of wheels is dropped from the bottom and the new set raised from the floor of the pit.

consequently the job is rushed through in great haste and no accurate work has been performed, however, the motor has been put back in service. This is indeed a bad practice and can be largely avoided by the proper arrangement of the repair shop.

Take, for instance, the retrucking of a locomotive. This can be done in a reasonably short space of time if the pit in the locomotive barn is properly designed. I have in mind a pit that I believe is worth mentioning. It will save time and money enough on a few jobs to pay for itself. This pit is so designed that a set of new trucks may be placed in it. The locomotive is then run over the pit and raised only enough to make up the difference in the size of the old wheels and the new ones. Then the locomotive is blocked up at each end of the frame with timbers long enough to reach across the pit. The rails are then removed from under the locomotive. A chain block is fastened to the center of the axle or preferably at each end close to the wheels and the weight taken on the chain blocks. All bolts and cap screws are loosened after the motor frame has been made secure. The set of wheels is then lowered into the pit where a new one is ready to be raised and bolted properly to the frame and motor. After this operation has been repeated for the other axle the rails are placed under the wheels. When the blocking has been removed from under the frame the locomotive is ready for oiling and going to work.

This kind of a pit may be slightly expensive to build but this is not to be compared with the savings which may be made in a few months. The entrance to the pit is at one side near the end.

J. H. BLAIR.

Moundsville, W. Va.

Systemmatic Handling of Motor Parts Reduces Costs

System is a byword in the mechanical and electrical departments of the Island Creek Coal Co. of Holden, W. Va. It is applied in practice to every step incident to the handling and repairing of equipment, both at the mines and in the central repair shops. Needless delays are avoided and greater efficiency is procured from the repair men by adhering to approved methods.

When an armature, for instance, is removed for repairs from either a cutting machine or a locomotive, the repair men at the mines are instructed not to take time to remove the spur gear or the bearing housings from the shaft. A spare armature is provided with these parts in position to replace the defective one. Consequently, little time is spent in replacing an armature as all adjustments are made in the central shops and not at the mine.

Fig. 1 shows a number of armatures in various stages of dismantlement in

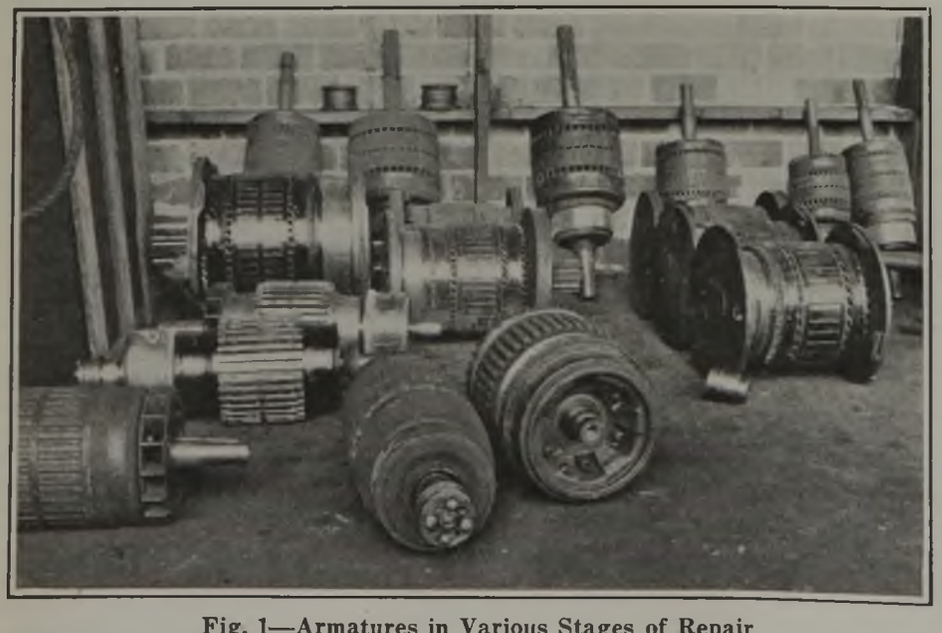


Fig. 1—Armatures in Various Stages of Repair

Repair men at the mines of the Island Creek Coal Co. do not remove the gears and bearing housings from an armature shaft when replacing armatures—there is plenty of time for that in the central repair shop where this picture was taken.

Fig. 2—Boxes for Armatures

These boxes are strongly built to protect the armatures they are intended to carry from injury caused by falls or jolts. Frequently rough handling may cause serious damage unless an armature is carefully crated.

the winding room of the central shops. When the tires or a gear on a locomotive axle is in need of repair the unit—wheels, axle and gear—is sent to the central shops, a spare unit having been made available in advance to replace the one removed.

L. D. Thompson, who has charge of this company's direct-current equipment, remarks, "The shop men are not rushed for time while overhauling and adjusting equipment parts. They can do their work with the care that ample time alone insures. On the other hand the mine repair men are pressed for time and the mine is temporarily crippled should the breakdown occur during the day shift. Therefore every feasible measure should be taken to shorten delays to equipment."

In order to guard against injury while motor parts are being handled to and from the shops and mines, the armatures are carried in strongly constructed boxes. The type of box for carrying a cutting-machine armature is shown in Fig. 2. It is built of wood and reinforced by two iron straps which are bent around the bottom and sides. The ends of these straps project above the sides of the box and through slots in a sheet iron cover. A hole is drilled in the ends of each strap for the reception of a cotter pin which holds the cover in place. Handles project from each end of the box to facilitate transportation. A somewhat similar box is provided for carrying locomotive armatures. These boxes have been known to roll and tumble down a hillside after being carelessly loaded on an incline car, without causing damage to the armature.

Each mine is provided with a spare armature for every type of machine and the central shops carry a few extras, not including those being repaired. When a defective armature is received at the central shops it is marked with a brass tag bearing the mine number for identification purposes.

Production And the Market

Continuance of Extremely Mild Weather Causes Coal Market to Mark Time

Continued mild weather is playing hob with the efforts of the coal industry to get under headway, the trade still being in the throes of the reaction that set in two weeks ago after a gradual but promising revival that lasted seven weeks. The usual pre-election hesitancy also has been a complicating symptom in the disorder that has the business temporarily in its grasp, buying for the time being having settled down in most instances to a strictly hand-to-mouth basis. The prolonged spell of unseasonably warm weather has not been entirely without consolation for the coal producer, however, for the drought in some sections has caused such a scarcity of water that hydro-electric power plants have been forced to use coal to keep going.

Confident Undertone Prevails

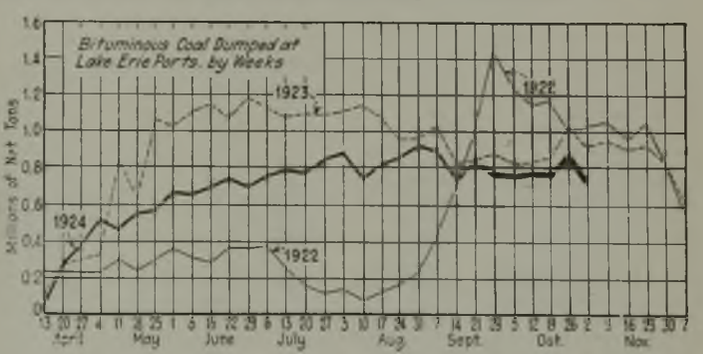
With the election out of the way and general industry in the attitude of "business as usual," activity from now on promises to be a weather proposition pure and simple, the coal trade in the meantime hankering for the welcome whistle of wintry winds. A confident tone pervades general business conditions, reflected by record-breaking movement of freight on the railroads, increasing iron and steel orders, progress in the textile industry and improvement in the automobile trade.

Coal Age Index of spot prices of bituminous coal, after a long gradual upward climb, flopped badly last week, standing on Nov. 3 at 171, the corresponding price for which is $2.07, a drop of 5c. from Oct. 27.

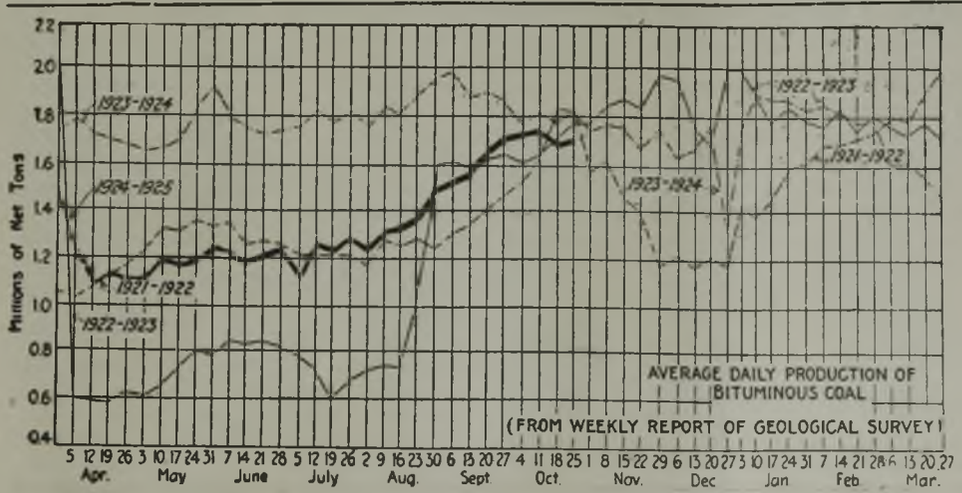
Activity at Hampton Roads underwent a slight reaction last week, dumpings of coal for all accounts during the seven-day period ended Oct. 30 totaling 363,818 net tons, compared with 384,268 tons the week before.

Coal movement up the lakes is in the wane, dumpings at Lake Erie ports during the week ended Nov. 2, according to the Ore & Coal Exchange, being as follows: For cargo, 688,548 net tons; for fuel, 38,272 tons, compared with 819,869 and 39,998 tons the previous week.

Bituminous coal output took a turn for the better during the week ended Oct. 25, when, according to the Geological Survey, 10,298,000 net tons was produced. This was a gain of 37,000 tons over the preceding week, according to revised figures, but was 255,000 tons less than the total for the week ended Oct. 11. Anthracite production, after three weeks of curtailment due to floods and other setbacks at the mines, came close to the capacity of the mines during the week ended Oct. 25, when 1,927,000 net tons was produced.



The anthracite market has suffered considerable of a setback from the weather after business had reached promising proportions, but the shrinkage in demand has been offset to a considerable extent by a falling off in production during the past week, brought about by the observance of Mitchell Day and a church holiday as well as by another local strike which kept about 10,000 miners idle for several days. Egg is moving more easily, some consumers taking it when unable to obtain stove, which leads in demand, as usual. Chestnut is holding up fairly well, but pea is rather slow. Trade in steam sizes is only fair. Independent prices are still firm, due to curtailed output rather than the volume of demand. The effects of the flood at the mines a few weeks ago are no longer much of a factor as far as production is concerned.



Estimates of Production

(Net Tons)

	1923	1924
BITUMINOUS		
Oct. 11	10,953,000	10,553,000
Oct. 18 (a)	10,694,000	10,261,000
Oct. 25 (b)	10,919,000	10,298,000
Daily average	1,820,000	1,716,000
Cal. yr. to date (c)	454,278,000	373,459,000
Daily av. to date	1,799,000	1,475,000
ANTHRACITE		
Oct. 11	1,943,000	1,737,000
Oct. 18	1,978,000	1,750,000
Oct. 25	2,001,000	1,927,000
Cal. yr. to date	77,493,000	74,690,000
COKE		
Oct. 18 (a)	286,000	147,000
Oct. 25 (b)	276,000	140,000
Cal. yr. to date (c)	15,608,000	8,011,000

(a) Revised since last report. (b) Subject to revision. (c) Minus one day's production to equalize number of days in the two years.

Midwest Prays for Cold

Summer weather during late October may be hard on football teams but it is harder on coal men. The Midwest coal trade is gasping for breath, wiping the sweat out of its eyes and yearning for the whistle—of north winds. Domestic business is distinctly hard to handle, for householders are not buying heavily and mine tracks are filling with prepared sizes. There are no marked changes in circulars from such strong fields as southern Illinois, but western Kentucky is beginning to unload domestic sizes at 10 and 15c. off.

Of course small coal and steam sizes are in trouble. However, production in some of the Illinois and Indiana fields has been reduced, storage on the ground continues, and as a result not much drop in steam prices is noticeable except in the "off grade" fields. Everybody knows that cold weather is bound to come before long and the thing to do is hold on to slow sizes until then. Some mighty cheap coal has been traded from day to day on the Chicago market, where buyers are keen for all the advantages there are. Any good southern Illinois screenings that reach there without a buyer cannot hope to bring more then $1.25. In the country, however, $1.40 and $1.50 are prevailing prices.

Eastern coal is not reaching the Midwest in any great volume because of this soft condition, but that which does is selling a little under circular. Pocahontas, always popular in recent years around Chicago, has weakened a little.

The situation in the Carterville field continues fair for lump. Most mines are pretty well oversold. They are caught up on egg and are long on No. 1 nut, and the other sizes below that are a drag on the market. Mountains of screenings are stored on the ground near many of the mines in southern Illinois and it is only a question of a short time now until all storage capacity will be filled.

Railroad tonnage is fairly good and a considerable portion of this is coming from strip mines which seem to be working full time on account of the unusually pleasant weather and the fact that they can sell their coal in competition with western Kentucky non-union and also most anything else that they may have to compete with. In the Mt. Olive district warm weather has slumped off the domestic demand although there is still some moving and the steam sizes are pretty well taken care of on contract. In the Standard district it is still a day to day proposition with coal selling at cost or below. A car shortage has been developing recently. This was noticeable first on the L. & N. and is beginning to show up on points of the Pennsylvania, B. & O. and Illinois Central.

At St. Louis warm weather has eased up the domestic movement of coal. The trade is principally in the better grades. The movement of Standard and Mt. Olive will not reach its maximum until real cold weather sets in. Wagon-

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

Low-Volatile, Eastern	Market Quoted	Nov. 5 1923	Oct. 20 1924	Oct. 27 1924	Nov. 3 1924†
Smokeless lump	Columbus	$5.85	$4.50	$4.50	*$4.25@$4.50*
Smokeless mine run	Columbus	2.30	2.35	2.35	*2.15@ 2.35*
Smokeless screenings	Columbus	1.35	1.30	1.30	1.25@ 1.35
Smokeless lump	Chicago	6.10	4.60	4.60	4.50@ 4.75
Smokeless mine run	Chicago	2.50	2.00	2.00	*1.75@ 2.00*
Smokeless lump	Cincinnati	5.75	4.35	4.25	*4.00@ 4.25*
Smokeless mine run	Cincinnati	2.10	2.10	2.25	*2.00*
Smokeless screenings	Cincinnati	1.60	1.15	1.15	1.10@ 1.25
*Smokeless mine run	Boston	4.40	4.40	4.45	**4.45@ 4.50**
Clearfield mine run	Boston	2.05	2.05	2.00	*1.65@ 2.10*
Cambria mine run	Boston	2.50	2.60	2.40	*2.00@ 2.45*
Somerset mine run	Boston	2.25	2.05	2.15	*1.85@ 2.25*
Pool 1 (Navy Standard)	New York	3.00	2.75	2.75	2.50@ 3.00
Pool 1 (Navy Standard)	Philadelphia	3.05	2.70	2.70	2.50@ 2.90
Pool 1 (Navy Standard)	Baltimore		2.60	2.60	*2.20@ 2.70*
Pool 9 (Super. Low Vol.)	New York	2.30	2.10	2.10	2.00@ 2.25
Pool 9 (Super. Low Vol.)	Philadelphia	2.30	2.15	2.15	1.95@ 2.35
Pool 9 (Super. Low Vol.)	Baltimore	2.15	1.90	1.90	*1.75@ 1.90*
Pool 10 (H.Gr.Low Vol.)	New York	2.00	1.90	1.90	1.80@ 2.00
Pool 10 (H.Gr.Low Vol.)	Philadelphia	1.85	1.75	1.75	1.65@ 1.90
Pool 10 (H.Gr.Low Vol.)	Baltimore	2.10	1.70	1.70	*1.65@ 1.70*
Pool 11 (Low Vol.)	New York	1.65	1.60	1.60	**1.55@ 1.75**
Pool 11 (Low Vol.)	Philadelphia	1.55	1.45	1.45	1.35@ 1.60
Pool 11 (Low Vol.)	Baltimore	1.90	1.60	1.60	*1.50@ 1.60*
High-Volatile, Eastern					
Pool 54-64 (Gas and St.)	New York	1.60	1.55	1.55	*1.40@ 1.65*
Pool 54-64 (Gas and St.)	Philadelphia	1.60	1.50	1.50	1.40@ 1.60
Pool 54-64 (Gas and St.)	Baltimore	1.75	1.50	1.50	*1.45@ 1.60*
Pittsburgh Sc'd gas	Pittsburgh	2.55	2.40	2.40	2.30@ 2.50
Pittsburgh gas mine run	Pittsburgh	2.25	2.10	2.10	2.00@ 2.25
Pittsburgh mine run (St.)	Pittsburgh	1.90	1.85	1.85	1.75@ 2.00
Pittsburgh slack (Gas)	Pittsburgh	1.05	1.20	1.20	1.15@ 1.25
Kanawha lump	Columbus	3.00	2.55	2.55	2.35@ 2.75
Kanawha mine run	Columbus	1.85	1.50	1.50	**1.40@ 1.75**
Kanawha screenings	Columbus	.80	1.00	1.00	*.85@ 1.10*
W. Va. lump	Cincinnati	3.25	3.10	3.00	*2.50@ 3.25*
W. Va. gas mine run	Cincinnati	1.50	1.50	1.55	1.50@ 1.65
W. Va. steam mine run	Cincinnati	1.50	1.35	1.45	*1.40@ 1.50*
W. Va. screenings	Cincinnati	.85	.95	.95	*.80@ 1.00*
Hocking lump	Columbus	2.95	2.55	2.55	**2.40@ 2.75**
Hocking mine run	Columbus	1.85	1.55	1.55	**1.50@ 1.70**
Hocking screenings	Columbus	.80	.85	.90	*.65@ .85*
Pitts. No. 8 lump	Cleveland	2.55	2.40	2.40	**2.00@ 2.85**
Pitts. No. 8 mine run	Cleveland	1.85	1.85	1.85	1.85@ 1.90
Pitts. No. 8 screenings	Cleveland	.85	1.05	1.00	*.95@ 1.05*

Midwest	Market Quoted	Nov. 5 1923	Oct. 20 1924	Oct. 27 1924	Nov. 3 1924†
Franklin, Ill. lump	Chicago	$4.10	$3.35	$3.35	$3.25@$3.50
Franklin, Ill. mine run	Chicago	2.60	2.35	2.35	2.25@ 2.50
Franklin, Ill. screenings	Chicago	1.45	1.35	1.35	1.25@ 1.50
Central, Ill. lump	Chicago	3.10	2.85	2.85	2.75@ 3.00
Central, Ill. mine run	Chicago	2.10	2.20	2.20	2.15@ 2.25
Central, Ill. screenings	Chicago	1.05	1.15	1.15	*1.00@ 1.25*
Ind. 4th Vein lump	Chicago	3.35	3.10	3.10	3.00@ 3.25
Ind. 4th Vein mine run	Chicago	2.60	2.35	2.35	2.25@ 2.50
Ind. 4th Vein screenings	Chicago	1.20	1.30	1.30	1.25@ 1.35
Ind. 5th Vein lump	Chicago	2.50	2.85	2.85	2.75@ 3.00
Ind. 5th Vein mine run	Chicago	2.10	2.10	2.10	2.00@ 2.25
Ind. 5th Vein screenings	Chicago	.80	.95	.95	.80@ 1.10
Mt. Olive lump	St. Louis	3.10	2.85	2.85	**3.00**
Mt. Olive mine run	St. Louis	2.25	2.50	2.50	*2.25@ 2.50*
Mt. Olive screenings	St. Louis	1.00	1.35	1.35	*1.00@ 1.25*
Standard lump	St. Louis	3.05	2.85	2.85	*2.75*
Standard mine run	St. Louis	2.05	2.20	2.20	*1.90@ 2.00*
Standard screenings	St. Louis	.55	.80	.80	*.50@ .70*
West Ky. lump	Louisville	2.60	3.35	3.10	*3.00@ 3.15*
West Ky. mine run	Louisville	1.65	1.70	1.65	*1.50@ 1.75*
West Ky. screenings	Louisville	.65	.70	.65	*.60@ .70*
West Ky. lump	Chicago	2.60	2.75	2.75	2.50@ 3.00
West Ky. mine run	Chicago	1.75	1.65	1.65	1.35@ 1.95
South and Southwest					
Big Seam lump	Birmingham	3.85	3.00	3.10	2.75@ 3.50
Big Seam mine run	Birmingham	1.95	1.60	1.60	1.50@ 1.75
Big Seam (washed)	Birmingham	2.35	1.85	1.85	1.75@ 2.00
S. E. Ky. lump	Chicago	3.00	2.85	2.85	2.75@ 3.00
S. E. Ky. mine run	Chicago	2.25	1.60	1.60	1.50@ 1.75
S. E. Ky. lump	Louisville	3.00	3.35	3.25	3.00@ 3.50
S. E. Ky. mine run	Louisville	1.85	1.60	1.60	*1.35@ 1.60*
S. E. Ky. screenings	Louisville	.75	.90	.85	**.85@ 1.10**
S. E. Ky. lump	Cincinnati	3.35	3.35	3.10	*2.75@ 3.25*
S. E. Ky. mine run	Cincinnati	1.50	1.55	1.55	*1.35@ 1.75*
S. E. Ky. screenings	Cincinnati	.85	1.00	1.00	*.75@ 1.10*
Kansas lump	Kansas City	5.00	5.00	5.00	5.00
Kansas mine run	Kansas City	3.50	3.50	3.10	3.00@ 3.25
Kansas screenings	Kansas City	2.25	2.00	2.00	2.00

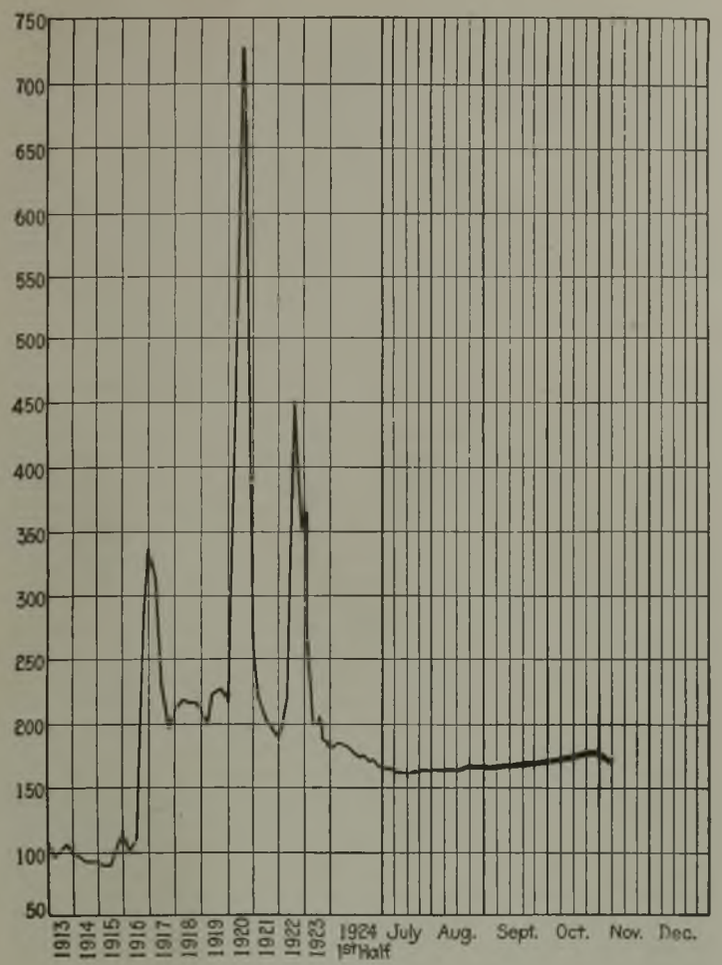
* Gross tons, f.o.b. vessel, Hampton Roads.

† Advances over previous week shown in **heavy type**, declines in *italics*.

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

	Market Quoted	Freight Rates	Nov. 5, 1923 Independent	Nov. 5, 1923 Company	Oct. 27, 1924 Independent	Oct. 27, 1924 Company	Nov. 3, 1924† Independent	Nov. 3, 1924† Company
Broken	New York	$2.34	$9.60@10.50	$8.00@$9.25		$8.00@$9.25		$8.00@$9.25
Broken	Philadelphia	2.39				9.15		9.15
Egg	New York	2.34	9.85@12.25	8.75@ 9.25	$9.25@$9.75	8.75@ 9.25	*$9.00@$9.75*	8.75@ 9.25
Egg	Philadelphia	2.39	9.85@12.20	8.75@ 9.25	9.25@ 9.75	8.80@ 9.25	9.25@ 9.75	8.80@ 9.25
Egg	Chicago*	5.06	9.60@12.50	8.00@ 8.35	8.17@ 8.27	8.14@ 8.20	8.17@ 8.27	8.14@ 8.20
Stove	New York	2.34	9.85@12.25	8.75@ 9.25	10.00@10.50	8.75@ 9.50	*10.00@10.25*	8.75@ 9.50
Stove	Philadelphia	2.39	9.85@12.20	8.90@ 9.25	9.85@10.25	9.15@ 9.50	9.85@10.25	9.15@ 9.50
Stove	Chicago*	5.06	9.60@12.50	8.00@ 8.35	8.63@ 8.75	8.50@ 8.64	8.63@ 8.75	8.50@ 8.64
Chestnut	New York	2.34	9.85@12.25	8.75@ 9.25	9.50@10.25	8.75@ 9.25	9.50@10.25	8.75@ 9.25
Chestnut	Philadelphia	2.39	9.85@12.50	8.90@ 9.25	9.65@10.00	9.15@ 9.25	9.65@10.00	9.15@ 9.25
Chestnut	Chicago*	5.06	9.60@12.50	8.00@ 8.35	8.26@ 8.40	8.44@ 8.60	8.26@ 8.40	8.44@ 8.60
Pea	New York	2.22	6.76@ 8.25	6.15@ 6.65	5.25@ 5.50	5.50@ 6.00	5.00@ 5.50	5.50@ 6.00
Pea	Philadelphia	2.14	6.75@ 9.00	6.35@ 6.60	5.75@ 6.35	5.75@ 6.00	5.75@ 6.35	5.75@ 6.00
Pea	Chicago*	4.79	6.00@ 6.75	5.40@ 6.05	5.13@ 5.45	5.36@ 6.20	5.13@ 5.45	5.36@ 6.20
Buckwheat No. 1	New York	2.22	2.00@ 3.00	3.50	2.25@ 2.75	3.00@ 3.15	2.25@ 2.75	3.00@ 3.15
Buckwheat No. 1	Philadelphia	2.14	3.00@ 3.50	3.50	2.50@ 3.00	3.00	2.50@ 3.00	3.00
Rice	New York	2.22	1.50@ 2.15	2.50	1.80@ 2.15	2.00@ 3.25	1.80@ 2.15	2.00@ 2.25
Rice	Philadelphia	2.14	2.00@ 2.50	2.50	2.00@ 2.25	2.25	2.00@ 2.25	2.25
Barley	New York	2.22	1.00@ 1.50	1.50	1.25@ 1.50	1.50	1.25@ 1.50	1.50
Barley	Philadelphia	2.14	1.25@ 1.50	1.50	1.50	1.50	1.50	1.50
Birdseye	New York	2.22		1.60	1.35@ 1.60	1.60	1.35@ 1.60	1.60

*Net tons, f.o.b. mines. † Advance over previous week shown in **heavy type**, declines in *italics*.



Coal Age Index of Spot Prices of Bituminous Coal F.O.B. Mines

	1924			1923
	Nov. 3	Oct. 27	Oct. 20	Nov. 5
Index	171	176	176	183
Weighted average price	$2.07	$2.12	$2.12	$2.21

This diagram shows the relative, not the actual, prices on fourteen coals, representative of nearly 90 per cent of the bituminous output of the United States, weighted first with respect to the proportions each of slack, prepared and run-of-mine normally shipped, and second, with respect to the tonnage of each normally produced. The average thus obtained was compared with the average for the twelve months ended June, 1914, as 100, after the manner adopted in the report on "Prices of Coal and Coke; 1913-1918," published by the Geological Survey and the War Industries Board.

load steam shows some improvement, while carload steam is lagging and somewhat slow and hard to find. There is very little country steam business and country domestic is slow. There is practically no anthracite demand, smokeless has dropped off and coke is unusually slow.

Kentucky Keeps Busy

Due to the fact that Kentucky is producing coal on a non-union basis, it has been possible to market production quite freely and over a wider radius than usual, in spite of mild weather, but prices are weaker. The top of the eastern Kentucky quotations to retailers is around $3.50 for best block and $3.15 for western Kentucky. Good coal can be had as low as $3 in either field. Mine run is $1.50@$1.75 in either field, and screenings are 60@70c. in western Kentucky and 85c. to around $1.10 in eastern Kentucky.

Western Kentucky production has been increasing because several former unionized mines that were on strike have resumed operations. The lower end of the field is now running quite well, and it looks as if it will be only a short time before the Central City section of the field will show developments favoring production in a number of mines that have been down for nearly seven months.

Northwest Trade Rather Dull

Trade remains dull at Duluth, the only feature being the demand for coal from North Dakota to take the place of cheap lignite used there last year. The good crop, and consequent financial affluence, together with the fact that lignite has not proved popular has tended to help bring back the market. Despite the lack of trade, prices are strong all along the line. There has been no change since last quoted. Coke is coming into popularity as it is priced at $8.50. Smokeless coals continue popular. The problem now is to find an outlet for soft coal screenings. The commercial buildings are being urged to use them, but of course they can do so only when they stoke by hand. The docks are trying to work up a trade in buckwheat for commercial heating, which trade was lost during the war when only bituminous was available.

Twenty-nine cargoes arrived at Duluth last week, of which only one was hard coal. Twelve are on the way from lower lake ports, of which one is hard coal. The drop off in anthracite seems to be in direct ratio to the demand, which is at low ebb.

The all-rail coal trade at the Twin Cities is shifting somewhat from southern Illinois to the other sections of that state and to Indiana, because of freight rates. Coal buyers seem to be adhering to all-rail coal, as far as they are buying at all, for there seems to have been little or no changing to dock since the extra 28c. on freight from southern Illinois became effective.

Railroad consumption in the Northwest has been materially increased in the last 60 days, for the grain movement has been the heaviest in a number of years. The roads have done excellent work in keeping traffic moving, but embargoes have been necessary to allow a cleanup twice.

The driest October in the history of Wisconsin and one of the warmest Octobers in the meteorological records has put the coal trade at Milwaukee in the doldrums. Wholesalers and retailers report no change in conditions from a week ago. But when colder weather does come—as it must—they expect a rush of orders, with increasing difficulty in getting supplies of certain grades because of the sold-up conditions at the mines, and also further trouble as to shipping equipment, as gondolas are short here.

Coal is coming to Milwaukee quite steadily by lake. The receipts during October, up to the 29th, were 104,640 tons of anthracite and 317,984 tons of bituminous coal, making the totals for the year thus far 677,294 tons of anthracite and 2,013,294 tons of bituminous coal. The receipts for the lake season of 1923, up to Oct. 29, inclusive, were 757,824 tons of anthracite and 2,522,101 tons of bituminous coal.

Warmth Retards Western Business

In the Southwest a continuation of warm weather is causing the surplus of all grades to mount. Dealers have shown an unwillingness to lay in heavy supplies against the midwinter demand, so it is considered likely that with the arrival of winter it will be necessary to open more mines to take care of orders. Reports from Arkansas continue pessimistic. There several mines have been closed down entirely, due principally to the extreme difficulty of moving screenings. Kansas City prices are unchanged.

The market in Colorado is moving along fairly well with production continuing to show a slight increase each week. The extreme warm weather, however, is hard on domestic trade. Colorado mines worked on an average of thirty hours last week and, according to reports from the operators, only 23 per cent of the working time lost was attributed to "no market."

The car situation in Utah grows worse daily. Salt Lake City orders are cared for, but there is not enough of the right equipment for other markets. "We are getting very short of box cars and dump cars," said an official of one big wholesale company. This company has had to hold up an Idaho order for a week as a result of the car situation. The sugar beet harvest is largely responsible for the shortage. The market for Utah coal on the Pacific Coast is holding up better now than any other for Utah producers.

Ohio Business Wilts in Warm Weather

Mild weather has caused the Cincinnati market to flop. Southeastern Kentucky operators are holding a stiff upper lip, but only a few ask $3.25 for block and some sales of pretty good stuff are being made at $2.75. West Virginia producers are settling around a $3 asked price with sales down to $2.50 for the low grades. Less and less interest is being displayed in egg and 2-in. as the end of the lake season nears. Run of mine is even stronger than a month ago. Good grades of gas are selling around $1.50 with some Harlan and choicer grades up to $1.75. Splints are around $1.40 and in between grades are no lower than $1.35. Slack has retreated a little on low grades with the better stuff holding firm. Smokeless prices show considerable divergence. River business has been hard hit by drought.

Dullness in steam business and hesitancy on the part of dealers to stock up further in the face of milder weather

sums up the situation at Columbus. Buying is limited to immediate wants and the trade is waiting. The domestic trade is wholly a weather proposition and until lower temperatures prevail there will not be a great deal doing.

The coal business at Cleveland is pretty much at a standstill so far as demand is concerned. Inquiries have been noticeably absent during the week, awaiting the outcome of the election. Should the result adversely affect business conditions, some softening in prices may be the outcome, but even if the result be favorable to business, prices are not likely to advance. Mild temperature has had a deterrent effect upon domestic demand and prices on smokeless fuels have receded about 50c. per ton. The steam buyer is content to continue a hand-to-mouth program.

Demand Tapers Off at Pittsburgh

Demand seems to have decreased a little further at Pittsburgh in the past week, this being attributed to the influence of the election and mild weather. Production is holding at fully 50 per cent, the increased operation being largely in shipments by producers to regular customers. There has been a smaller increase in the turnover in the open market, in spot and prompt lots. Prices continue to show no change, the steadiness causing comment. On account of heavy production of domestic coal, slack has been pressing on the market, but prices hold fairly well.

Business is quiet all along the line at Buffalo; everybody is complaining. Some shippers say that their October trade will not show up as well as September did and but few find it to have been really better.

New England Notes Favorable Undertone

In New England the undertone is favorable, but as yet there has been little change in prices. Buyers who postponed their purchases were finally obliged to enter the market, but aside from these there is no demand strong enough to support any pronounced upward swing.

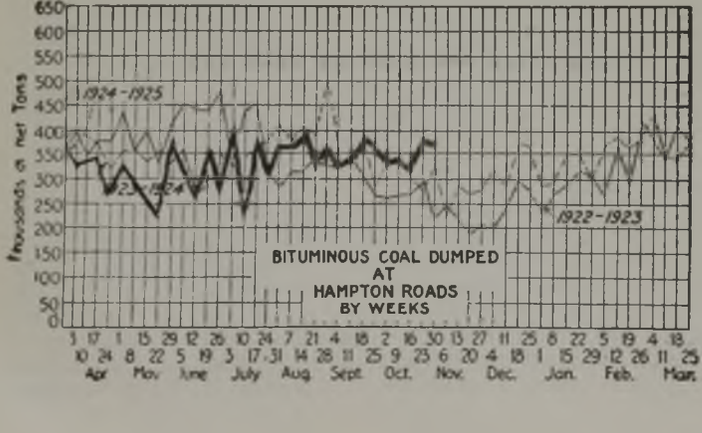
At Hampton Roads smokeless coals are being held at $4.45@$4.50 per gross ton f.o.b. vessel for No. 1 grade. Current receipts at the piers are being absorbed either on contract or on a spot basis close to the figures named. Mild request off-shore together with extra business coastwise has taken care of current restricted output, but in the judgment of many a material lift in prices would again paralyze what buying power there is.

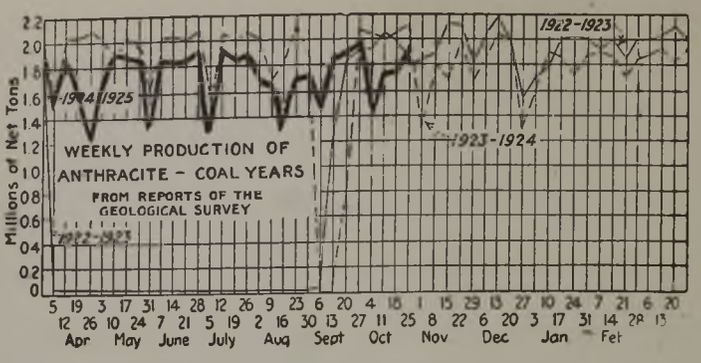
On cars Boston, Providence and Portland there is a fair spot demand with prices averaging around $5.50 per gross ton for coals on the Navy acceptable list. At Providence and Portland, especially at the latter port, a few factors are asking $5.75, and for single car lots as high as $5.90, but there is no great urgency on the part of buyers.

Shippers of quality coals in central Pennsylvania for delivery all rail are gradually picking up 30- to 60-day business at the minimum price basis established some months ago; $2.25 for good "B" vein is about the level, but one has only to make a rough computation to see how far out of line such a figure is with Pocohontas and New River in the non-union area.

Atlantic Markets Slow Down

Buying of soft coal is lower at New York. Consumers were believed to be holding off until after election day, but with that out of the way operators are wondering when the market will improve. Much depends on weather conditions. Consumers claim to have plenty of coal on hand and do not seem to be worrying over a possible car shortage or difficulty in getting coal when they want it. Prices continue to show a wide range, but are holding to a steady level despite





heavy production and the opening of additional mines in the Pennsylvania field.

The Philadelphia market has slowed down a trifle though there are reports of better business in most lines of industry. Prices still refuse to rise and with a greater number of mines operating on a non-union basis this alone will be sufficient to hold down spot quotations. Railway fuel is moving along at a fairly good rate. Slack appears in good supply, with all industries that use this fuel still willing to stock up on it. Tide shipments are better.

Increased demand at Baltimore about ten days ago caused an upward price movement for both better grade steam and gas coals. The resultant movement of fuel caused a drop in prices. The market has slumped off, and there have been offerings of exceptional advantage to buyers. Exports of coal have dropped behind those of September.

Some improvement in industrial demand is reported at Birmingham with gradual trend toward steadier operations at plants. Current requirements are being taken care of by buyers at present, with little tonnage for reserves. Bunker trade has improved with a fairly good tonnage being handled at Mobile, Pensacola and New Orleans from this district. Foreign shipping is taking the bulk of the fuel bunkered. Steam prices are steady and domestic quotations are due to show some changes in November.

Mild Weather Handicaps Anthracite Trade

Encouraged by weather conditions, New York consumers of anthracite continue to buy slowly. Wholesalers and producers are kept busy endeavoring to prevent an accumulation of the various sizes and persuading retailers to take additional tonnages of sizes for which the demand is slow. Independent quotations remain steady, but this is attributed in most part to smaller receipts due to the mines being idle on Mitchell Day and All Saints' Day and to intermittent labor troubles. Egg is moving better than for several weeks, due to consumers taking it in place of stove when informed of the shortage of the latter size. Pea and chestnut continue in slow demand. There is plenty of the former to be had and several loaded boats dot the New York harbor.

Activity in the retail trade at Philadelphia quickly fell off during the week owing to the mild temperature. The mines are fast recovering from the flood, but are far behind on orders for stove and nut. Retailers have fair stocks. Pea and egg are quiet; barley is well taken, and buckwheat and rice are in easy supply. Company producers have not made any price increase for November. Independents have been slow to announce prices, but they probably will add something to stove and nut.

A reminder of winter at Baltimore has brought increased ordering from householders. Dealers report the demand for stove as the most active, with egg and chestnut running next in demand. The usual difficulties of disposing of pea and buckwheat for household use are being encountered.

Buffalo retailers are concerned over the number of oil-burning homes in the city, though natural gas is eating into the hard-coal trade most of any of its competitors. Nevertheless there is the usual shortage of stove coal and the consumer refuses to be convinced that he can use any other size in place of it. The demand for coke does not improve much in spite of the effort to push it.

Car Loadings

	Cars Loaded	
	All Cars	Coal Cars
Week ended Oct. 18, 1924	1,102,336	191,449
Previous week	1,088,462	198 154
Week ended Oct. 20, 1923	1,072,881	192,864

Foreign Market And Export News

General Outlook Better in British Market But Steam Coals Still Lag

The Welsh steam coal trade is not more active though there are signs of a probable improvement in the near future. Anthracite is in demand, and collieries producing this coal cannot keep pace with the requirements in spite of the fact that output is mounting. The depression is confined almost entirely to steam coals. Many of the steam coal collieries are still working less than half time, and several pits have been stopped for as much as eight or nine days in succession, although not definitely closed down. The general outlook has improved slightly, because buyers, who have been holding off for a long time in the hope of forcing prices lower, are now coming on the market.

A few inquiries have been circulating in Newcastle during the past week, but none is sufficient to alter the general position of the market, which remains dull and easy with ample supplies of coal. The Bordeaux Gas Works has placed contracts through French firms for the supply of about 8,000 tons of Durham gas coals. The Egyptian State and Sudan railways are in the market for 200,000 tons; Sao Paulo Ry. 85,000; the British Admiralty, 300,000 to 400,000; the French navy, 43,000. The Palermo Gas Works has invited tenders for 5,000 tons of Holmside or Wear special gas coals for shipment to Palermo during early December.

The Northumberland coal mining ascertainment of the proceeds and costs in the months of June, July and August, which regulate wages in October, shows that there was a surplus of £228,216, of which 88 per cent, or £200,830, was applicable to wages and 12 per cent, or £27,386, to profits. The total wages for the current month would equal 75.58 per cent on the 1879 basis, but under the National Agreement wages cannot be lower than 100 per cent on that basis.

Production by British collieries during the week ended Oct. 18, a cable to *Coal Age* states, was 5,147,000 tons, according to the official reports. This compares with 5,088,000 tons during the week ended Oct. 18.

Hampton Roads Market Weak; Foreign Movement Gains

The market at Hampton Roads is somewhat weaker, with a falling off in movement and with demand generally reported somewhat lighter, due to mild weather and other causes. Foreign movement shows a slight increase, but coastwise and bunker trades are barely holding their own.

Dealers report that the market probably would not hold even its present strength but for the slow-up in shipments from the mines to tidewater. Accumulations at the piers are below normal, due more to lack of shipments than to undue demand for cargoes.

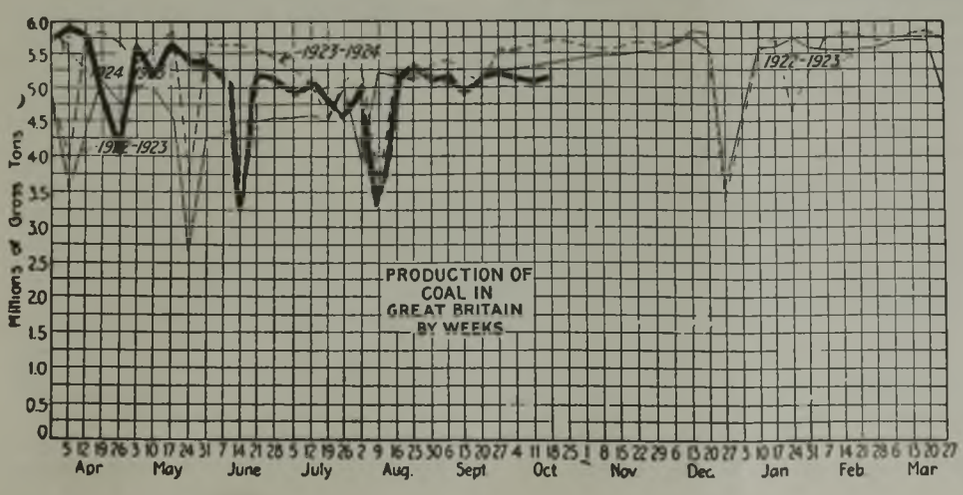
The outlook for better business is bright, but dealers do not anticipate any material change in prices.

French Coal Consumption Low But Prices Are Steady

In the French market the consumption of industrial coals remains slack and that of domestic fuels slightly lower, but stocks are not important and prices keep steady.

Imports of Cardiff coals during the week have been below normal. Despite the pressure of exchange, slight concessions have been made on c.i.f. prices, but they are still too high to attract much business. Purchases of house and anthracite coals are extremely limited.

The recent decline of 10 per cent in the mine price of German coal caused some apprehension for a while in the French collieries, as it was feared that the market would be overrun with the German product, but German prices are still too high to bring any dangerous competition. Now that the Franco-Belgian régie has ceased to operate, however, it is likely that transportation costs will be cut by the Germans, and thus increase competition.



Export Clearances, Week Ended Nov. 1, 1924

	Tons
FROM HAMPTON ROADS	
For Argentina:	
Ital. Str. Sile for Buenos Aires	9,281
For Brazil:	
Amer. Str. Orinoco for Rio de Janeiro	6,019
For Canada:	
Nor. Str. Gunnar Heiberg for Montreal	3,622
For Egypt:	
Br. Str. Cyclops for Part Said	2,216
For France:	
Fr. Str. P. L. M. 20 for Dunkirk	8,364
For Italy:	
Ital. Str. Morro Castle for Porto Ferrajo	2,767
Ital. Str. Maria Enrica for Porto Ferrajo	10,668
For Peru:	
Nor. Str. Herakles for Callao	1,472
Peru, Str. Perene for Iquitos	254
For West Indies:	
Dan. Str. Norslys for Fort de France	5,917
Swed. Str. Freja for Kingston	1,905
FROM PHILADELPHIA	
For Newfoundland:	
Dan. Str. Nordkap, for Corner-Brook	——
For Trinidad:	
Am. Schr. A. Ernest Mills, for Galien and Trinity Bay	——
For Cuba:	
Br. Str. Muncove, for Havana	——
FROM BALTIMORE	
For Italy:	
Ital. Str. Caroline for Trieste	3,159
For West Indies:	
Am. Schr. T. N. Barnsdale for Fort de France	994
For Cuba:	
Am. Schr. Virginia Dare for Caibarien	2,417

Hampton Roads Pier Situation

N. & W. Piers, Lamberts Pt.:	Oct. 23	Oct. 30
Cars on hand	897	947
Tons on hand	55,076	60,376
Tons dumped for week	120,512	123,808
Tonnage waiting	10,000	5,000
Virginian Piers, Sewalls Pt.:		
Cars on hand	1,244	1,434
Tons on hand	85,400	98,950
Tons dumped for week	118,360	98,183
Tonnage waiting	17,487	18,455
C. & O. Piers, Newport News:		
Cars on hand	1,913	1,734
Tons on hand	101,455	98,041
Tons dumped for week	104,225	102,847
Tonnage waiting	8,815	2,195

Pier and Bunker Prices, Gross Tons

PIERS	Oct. 25	Nov. 1†
Pool 9, New York	$4.80@$5.10	*$4.75@$5.00*
Pool 10, New York	4.65@ 4.80	*4.65@ 4.80*
Pool 11, New York	4.40@ 4.55	4.40@ 4.55
Pool 9, Philadelphia	4.90@ 5.25	4.90@ 5.25
Pool 10, Philadelphia	4.45@ 4.70	4.45@ 4.70
Pool 11, Philadelphia	4.30@ 4.50	4.30@ 4.50
Pool 1, Hamp. Roads	4.35@ 4000	*4.80*
Pool 2, Hamp. Roads	4.15	4.15
Pools 5-6-7 Hamp. Rds.	4.00@ 4.10	*4.00*
BUNKERS		
Pool 9, New York	$5.05@$5.35	*$5.00@$5.25*
Pool 10, New York	4.90@ 5.05	4.90@ 5.05
Pool 11, New York	4.65@ 4.80	4.65@ 4.80
Pool 9, Philadelphia	4.90@ 5.25	4.90@ 5.25
Pool 10, Philadelphia	4.75@ 4.95	4.75@ 4.95
Pool 11, Philadelphia	4.50@ 4.70	4.50@ 4.70
Pool 1, Hamp. Roads	4.50	*4.40*
Pool 2, Hamp. Roads	4.25	4.25
Pools 5-6-7 Hamp. Rds.	4.10	4.10

Current Quotations British Coal f.o.b. Port, Gross Tons

Quotations by Cable to *Coal Age*

Cardiff:	Oct. 25	Nov. 1†
Admiralty, large	27s.@27s.6d.	27s.@27s.6d.
Steam smalls	15s.6d.@16s.	**16s.**
Newcastle:		
Best steams	18s.6d.	**17s.6d.@22s.6d.**
Best gas	20s.6d.@21s.	*20s.6d.*
Best bunkers	17s.6d.@18s.6d.	**18s.6d.@19s.**

†Advances over previous week shown in **heavy type**, declines in *italics*.

News Items From Field and Trade

ALABAMA

The Pittsburg & Southern Coal & Iron Co. has sold to C. M. Green, of Birmingham, approximately 600 acres of mineral lands in Sec. 6, Tp. 16, Range 2 West, and in Sec. 1, Tp. 16, Range 3 West, located near New Castle, Jefferson County, for a consideration of $50,000.

The long drought in the Birmingham district is causing a serious problem in coal-mining operations where washeries are employed. The supply of water from the smaller creeks and branches is insufficient to meet the needs at many points, and inconvenience and delay are being experienced in the coal fields on this account.

ALASKA

A heavy coal deposit in northern Alaska, north of the Endicott range, has been reported to Washington by Philip S. Smith, geologist for the U. S. Geological Survey, who has recently returned from a long exploration trip in that region. The foothills and valleys north of the Endicott range contain great bodies of coal, indicating that Alaska, in past ages had a temperate, if not subtropical climate producing coal-forming vegetation unknown in the region now, he concluded in an interview at Seattle just after returning.

COLORADO

Wm. B. Lewis of New York City president of the Oakdale and Alamo Coal companies, was in Colorado last week, where he inspected his holdings in this state, which included the Oakdale and the new Alamo mines in the Walsenburg district. The latter mine is considered the most up-to-date mine west of the Mississippi.

ILLINOIS

The Niantic Coal Co., operating a mine ten miles west of Decatur has resumed operations.

The Fallon Coal Co. with mining property at O'Fallon, is in trouble with certain of its stockholders who live in and near Bay City, Mich. They have filed a petition in the Tuscola County district court asking an accounting of the funds and a dissolution of the company.

In a prize name contest the new employees magazine of the Southern Coal, Coke & Mining Co. gets the title "Yours and Mine." Several hundred names were suggested by employees, customers and friends of the company. The magazine evidently aims to be a real employees' paper, for it publishes even kicks of employees against the company, together with fitting answers. The November issue is to be "election number."

The Valier mine, in southern Illinois, built by Carl Scholz and owned and operated by the Burlington R.R., is hanging up new production records which are worthy of note. On Oct. 29 this mine, long rated in the 6,000-ton class, hoisted 7,704 tons, which is its own "farthest north." On the Monday previous it had set a new record for itself by producing 7,127 tons. And to prove that the men did not hold back a lot of coal on the day before the grand burst of Oct. 29, it is reported that the mine hoisted on the 28th 7,096 tons, which would not leave much chance for a charge that the mine had been "loaded" for the big run next day. On the big day 1,740 pit cars were dumped in an 8-hour day in which 38 minutes time was lost. F. F. Green is superintendent of this mine and Charles E. Anderson, underground manager.

A large mule barn was burned down Saturday night, Oct. 25 at the Paradise Coal Co.'s mine at Duquoin. Luckily the wind was low and the fire did not spread to any of the adjoining top buildings. Several tons of hay and a number of mine mules were lost.

George Adams, of Matherville, has been appointed as mine manager for the mine of the Rex Coal Co., at Coal Valley, filling a vacancy caused by the death of Thomas Mills.

The weigh office in the tipple and a portion of the tipple itself at the Harco mine, near Harrisburg, was destroyed by fire Oct. 23. Several hundred men employed at the plant will be idle until repairs can be made.

Frank F. Tirre was recently appointed general manager and is in charge of the St. Louis office of the Mulberry Hill Coal Co. The company is now handling its own distribution. Its property is the Mulberry Hill mine near Belleville.

According to reports compiled by County Mine Inspector John O'Brien, of La Salle County, a total of 575,652 tons of coal was mined in that county last year. The men employed in the mines during the period numbered 971, the mines working an average of 166 days during the year.

The total output of mines in Illinois was 72,308,655 tons during the fiscal year ending June 30, 1924, according to reports compiled by Martin Bolt, Director of the State Department of Mines and Minerals of Illinois, at Springfield. The report indicates that over 70,000,000 tons was produced by shipping mines, the balance by local and wagon mines in small amounts.

A small loss was sustained by the Scott-Smith Coal Co. Oct. 26 when the office and weigh room of its strip mine, near Duquoin, was burned. The fire was of unknown origin.

KENTUCKY

It was reported from Owensboro on Oct. 18 that one man was killed and four injured, in a heavy slate fall at the Rockport Coal Co. mine at Centertown. It was stated that the cage fell, and in doing so dislodged a lot of slate from the sides of the shaft.

MASSACHUSETTS

The Island Creek Coal Co. reports net profit of $478,900 for the third quarter of 1924, compared with $623,634 in the corresponding period of last year. For the nine months the company earned $1,915,774 available for the common stock, compared with $1,984,864 last year. The company mined 1,424,409 tons of coal in the third quarter of this year, compared with 854,728 last year, but its gross profit was only $747,420 in 1924, compared with $859,985 in 1923.

MONTANA

Meagher County is considerably wrought up over a report that Eastern capital, possibly Henry Ford's, has bought up a large acreage of iron land in the Sheep Creek territory and that a blast furnace and steel mill will soon be erected either in Meagher County or in Great Falls, consuming a heavy tonnage of Montana coal.

OHIO

The Kentucky River Coal Sales Co., with headquarters in Chicago, has closed the Cincinnati branch office it had maintained for nearly two years on the sixth floor of the Dixie Terminal Building.

Paul Barnott, formerly a banker in the Logan (W. Va.) district, is now associated with the Cincinnati office of the Raleigh Smokeless Coal Co. learning the business end of the coal industry.

Foreclosure proceedings have been instituted by the bondholders on the property of the Maynard Coal Co., of Columbus, which was forced into the hands of receivers about six months ago. The bondholders will soon obtain an order of sale and the various prop-

erties will be advertised by the receivers. W. S. Harmon and Frank L. Stein. The properties consist of large coal mines in the Pomeroy field, Ohio, and the Hazard field in Kentucky.

Under order of court the property of the Dean Coal & Coke Co., which had offices in Columbus, were offered for sale by Receiver Ralph E. Marburger Nov. 3. The property, which was forced into the hands of receiver about eight months ago, was appraised at $20,516.50.

The Sixty-Eight Mining Co., recently chartered with 750 shares of stock, no par value designated, has been organized by the election of A. R. Jones, president, George Gibbs, vice-president and H. E. Cleary, secretary-treasurer. The company has two operating mines near Athens in the Hocking Valley field. Offices are located in the Stoneman Building, Columbus.

PENNSYLVANIA

On October 27 the blacksmith shop of the Connellsville Central Coke Co.'s Herbert plant was completely destroyed by fire. The plant had been idle for several months, but the shop will be rebuilt at once.

The Derry No. 1 plant of the Latrobe-Connellsville Coal & Coke Co., located at Bradenville, resumed operations Oct. 27 after a shutdown of almost a year. The plant was scheduled to resume operations last spring when an order for railroad coal was obtained, but after placing the order the railroad deferred taking any coal. The mine has been put in first-class condition and has been equipped with coal-cleaning apparatus. The mine will give employment to a large number of men, most of whom are former employees.

Mining operations at the No. 10 slope of the Lehigh Valley Coal Co. near Drifton are to be discontinued in the near future. The men now employed there will be given jobs at other plants of the company.

Purchase of coal lands in North and East Union Townships by the South Penn Collieries Co., of Philadelphia, according to the revenue stamps on the deeds, recorded Oct. 25, involved $400,000. The sellers were as follows: Jennie J. Dull, in East Union Township, for which was paid $172,000; William H. Shepp, in North and East Union Townships, for $140,000; Rachael Deeber, in East Union for $88,000.

For the first time in the history of district 9, every man and boy employed in and about the mines is enrolled as a member of the United Mine Workers, President Golden of the district reports. The 100 per cent enrollment is attributed to the shift made two years ago from local unions to colliery locals, the change permitting a closer supervision of the various employees.

The Pennsylvania Coal & Coke Corp. for the quarter ended Sept. 30, 1924, reports a deficit of $147,547 after depreciation and depletion, but before federal taxes, against a surplus of $159,957 in the third quarter of 1923. The deficit for the first nine months of 1924 totaled $288,655 after charges, but before federal taxes, against a surplus of $741,963 in the same period of 1923. Federal taxes for nine months are estimated at $8,000.

The first labor temple to be erected by the United Mine Workers in the anthracite field was dedicated on Mitchell Day, Oct. 29, at Olyphant. The building was purchased and remodeled to serve the purposes of the union, by four locals in the town of Olyphant at a cost of $25,000. District President Thomas Kennedy, of District 7, made the dedication address.

Visitors from various parts of the United States, Canada, Great Britain and Czechoslovakia recently inspected the gravity coal-cleaning plant that serves several mines of Peale, Peacock & Kerr, Inc., one of the largest producers in the district.

Boyd C. Osler, chief engineer of the Hazle Brook Coal Co., Hazleton, has resigned to become general superintendent of the newly organized Shamokin Coal Co., which is reopening the old Neilson colliery, near Shamokin.

All of the collieries in the anthracite field were idle on election day. The miners were instructed to get out and work for labor candidates in the various districts during the day. The political activities by the union men were especially manifested in District 1.

The Harleigh Coal Co., which is erecting a washery at Harleigh, is preparing to have the steel work installed. The Lehigh Valley R.R. is extending its tracks to the washery. Once the plant starts to operate the refuse is to be dumped into the abandoned strippings near by. The Harleigh Coal Co. is composed of Freeland, Scranton, and New York capitalists.

A high powered electric engine has been installed in No. 4 slope, Alaska mine, of the Philadelphia & Reading Coal & Iron Corporation in Shamokin. This slope is 2,400 ft. long. The present engine is able to haul but three cars up the slope and ten minutes is required to finish the trip. The more powerful engine will haul four cars and will complete the trip in two minutes. Officials expect that with the increased pulling power the output of the mine will be greatly increased.

E. Kent Davis, chief engineer of Peale, Peacock & Kerr, at St. Benedict, will speak at the next session of the Pennsylvania Coal Mining Institute, which will be held Nov. 21. The announcement was made at the opening session of the fall and winter season at Johnston last week.

Secretary James W. McAndrew, of District 9, United Mine Workers, at a session of the biennial convention of the district at Shenandoah, reported that the district membership of the organization on Dec. 1, 1923, broke all records, reaching a total of 56,440½ paid-up members and an exoneration list of 2,796, making a grand total of 59,209½. The two-year average of the union was announced at 37,309, with an exoneration list of 3,073. The district collected a total of $227,468.46 with expenses of $158,379. The balance in the treasury of the district Oct. 1, this year, was $142,759.45. The change from local unions to colliery locals resulted in the reduction of the total number of locals from 162 to 89.

Unity of practically all major interests in the central Pennsylvania field in the matter of labor policy is assured by the announcement that the Pennsylvania Coal & Coke Corporation and the Clearfield Bituminous Coal Corporation are again members of the Bituminous Coal Operators' Association of Central Pennsylvania.

Union officials from both the anthracite and bituminous fields of the state will meet in Harrisburg Nov. 12 and 13 to draft a program for presentation at the next session of the Legislature. The miners want an old age pension law as well as certain changes in the mine safety laws and the workmen's compensation act.

General Office and Bank, Phelps Dodge Corporation
Located at the coal mines of the company, in Dawson, N. M., it conforms in degree with the style of architecture of old Mexico.

UTAH

The Consumers' Mutual Coal Co. is planning to mine and ship coal from its property in Carbon County about Dec. 13. It owns 1,800 acres of coal land in the county. The mine will be equipped to produce 2,000 tons daily, it is stated, but the initial production will be far less than that. Loading machines and belt conveyors will be used. There will be no cars, except for carrying supplies. The Consumers' is the newest coal mining concern to be started here on the mutual plan. It purchased the yard of

the Dunyon Coal Co., of Salt Lake City, for the purpose of distributing its coal locally.

The application of the Diamond Coal Co., of Salt Lake City, for permission to sell 100,000 shares of stock at 10c. a share has been held up by the Utah Securities Commission until sufficient work has been done on the company's property to show the grade of coal and the thickness of the bed. The property is located in the American Fork Canyon, Utah County.

The State Industrial Commission has placed two men on duty in the Spring Canyon district, where the Rains mine blew up in September, and it is stated they will be kept there until rock dusting and the erection of rock barriers in all mines in that district have been completed. These men are making regular inspections of the mine, it is stated, and by co-operating with the operators are keeping the men keyed up on safety. The mine department of the commission, which is consolidated with the local office of the federal Bureau of Mines, has not yet issued its report concerning the cause of the Rains explosion.

WASHINGTON

The new mine of the Black Carbon Coal Co., near Buckley, got into operation with a formal opening Oct. 15. It is electrically equipped and has a capacity of approximately 300 tons a day. A washery is located at the mine. Fraser H. Lantz is president and general manager and David Gray is superintendent.

An attempt to interest English shipping interests in coaling ships at the Pacific Coast Coal Co. bunkers in Seattle has taken Wylie Hemphill, sales manager of the coal company, to England on a trip on which he is accompanied by Mrs. Hemphill.

WEST VIRGINIA

The name of the Waddles Run Coal Co. has been changed to the Washington Heights Improvement Co.

The Beluan Coal Co., chartered under the laws of Ohio, of which C. A. McFadden of Wheeling is president, has been authorized to transact business in West Virginia, as has the Consolidated Coal & Oil Corporation, chartered under the laws of Delaware.

The following West Virginia coal concerns have surrendered their charters to the Secretary of State of West Virginia: Guyan Coal & Coke Co., Corrado Fairmont Coal Co. and the D. T. S. Coal Co.

The Quincy Coal Co. has moved its principal office from Charleston to Quincy.

The United Mine Workers has instituted suit in the Circuit Court of Marion County for $50,000 damages against the Brady-Warner Coal Corporation, charging that the coal company was responsible for the destruction by fire on June 19 of the present year of the miners' hall at Brady. The hall burned down during a clash between union miners and men engaged in guarding the company's property. It is contended by the union that the company guards set fire to the building. There are two separate suits of $25,000 each.

The Pocahontas Fuel Co. has announced a resumption of operations at its Itmann mine, in Wyoming County, which has been shut down for several months. This is one of the largest operations in Wyoming County and the company recently completed construction work on a model store building, constructed of native stone taken from the mountains surrounding the property.

Several companies which recently began operations in the Kanawha field on an open-shop basis are increasing production. The Campbells Creek Coal Co., which has been operating union mines for several years, is now shipping about 800 tons a day out of the Campbells Creek field via Dana, and the New Export Coal Co. has a production of about 400 tons a day. The Winifrede Coal Co. also is managing to increase production inasmuch as it is now loading about 1,000 tons a day at its mines out of Winifrede Junction on the Kanawha River.

The Philadelphia-Cleveland Coal Co. has just completed a new coal-loading dock and tipple in Huntington representing an outlay of $250,000. The dock will have a capacity of 5,000 tons per ten-hour day and more than a million tons a year. In loading coal from cars to barges the company uses a large stationary conveyor, a movable conveyor and a pan conveyor. The company has its own dummy engine for placing loaded coal cars. All machinery is operated by electricity.

WYOMING

The old mine at Point of Rocks, east of Rock Springs on the Union Pacific, is to be opened again. M. Mitter, of Denver, head of the Rock Springs Coal & Mining Co., says he has a contract for 140,000 tons of coal and will start the mine soon. A spur track must be rebuilt to the mine if any coal is to be taken out. The mine has been operated for short periods by several owners in the past.

CANADA

Roy M. Wolvin, of Besco, president of the British Empire Steel Corporation, intimated during his recent visit to Cape Breton, that he would welcome early negotiations with the coal miners for a new wage scale to take the place of the one that expires Jan. 25.

It has been decided by the Toronto Board of Education to install coal-burning furnaces instead of oil heaters in the new High School of Commerce. C. J. Doughty, superintendent of maintenance for the schools, stated that if coal were used instead of oil throughout the schools it would effect a saving averaging $500 a year for each school.

Importation of bituminous coal into Canada from the United States fell from 15,729,578 tons during the twelve months ended September, 1923, to 13,319,130, during the twelve months ended last month. Anthracite importation fell, during the same comparative periods, from 5,090,567 tons to 3,897,662 tons. Owing largely to industrial conditions in Alberta the exportation of Canadian coal to the United States fell from more than 7,000,000 tons during the twelve months ending September, 1923, to 2,325,676 tons during the past twelve months.

Some important changes have been made in the directorate of the British Empire Steel Corporation and constituent companies. Senator Lorne C. Webster, of Montreal, has been appointed a member of the board, and Viscount Furness and Benjamin Talbot, two of the British directors, have resigned. The reason assigned is that they are unable to attend the board meetings.

It having been alleged that the coal dealers of Winnipeg have entered into a price regulating agreement, under which customers have to pay more than they otherwise would, and are engaged in a movement to eliminate competition by cutting off sources of supply to those refusing to maintain a fixed price, an inquiry has been ordered under the Combines Investigation Act. D. Campbell, K.C., of Winnipeg, has been appointed a commissioner to investigate the alleged combine.

Coal production in the Telkwa Valley, northern British Columbia, again is promised. With the coming of winter and the increased domestic demand in Prince Rupert and other communities along the line of the Canadian National Ry. some of the Telkwa coal seams will be exploited. The Telkwa Coal Mines, it is reported, already has started work and expects to be in a position to supply most of the local requirements.

Trade Literature

The Lincoln Greasing System for Mine Cars. Lincoln Steel & Forge Co., St. Louis, Mo. Pp. 7; 8 x 11 in.; illustrated. An outstanding feature of this system is that it permits a central greasing station either underground or on top where the cars may be greased in trips as they pass the greasing machine.

K and K Flotation Machine. Southwestern Engineering Co., Los Angeles, Calif. Catalog D. Pp. 36; 7 x 10 in.; illustrated. The special features of this machine are described and pictures of it in operation are shown.

Hyatt Roller Bearings for Conveyors. Hyatt Roller Bearing Co., Newark, N. J. Bulletin No. 1015. Pp. 23; 8 x 11 in.; illustrated. Describes the part these bearings have and will play, when properly selected and assembled, in reducing to a minimum the operating expenses of a conveying system.

Electric Elevator Control Equipment. The Cutler-Hammer Mfg. Co., Milwaukee, Wis. Publication 3082. Pp. 48; 8 x 11 in.; illustrated. Different types of elevator control apparatus for passenger and freight elevators are described.

American H. S. Fans. American Blower Co., Detroit, Mich. Bulletin No. 1103. Pp. 35; 8 x 11 in.; illustrated. Some of the distinguishing features of these fans which are described include the streamlike design of air entering orifices or blower inlets; the impellers or wheels are designed so as to keep a uniform velocity of air through the wheel, thereby reducing wheel loss; two single-inlet impellers or wheels to each blower of the double inlet type; specially designed scroll or casing with expanding outlet, so proportioned as to afford maximum recovery from velocity pressure to static pressure with the least amount of turbulence. Curves, specification sheets and tables are included.

Traffic

B. & O. Assails Indiana's Low Intrastate Rates

Copies of the complaint by the Baltimore & Ohio R.R. and other steam roads operating in Indiana, against the Indiana Public Service Commission's reduced schedule of intrastate coal rates now effective in that state, which has been filed before the Interstate Commerce Commission, have been received by Governor Branch of Indiana and the Indiana commission. The roads charge in their new attack on rate schedules on coal, which they failed to displace by court appeals, that the rates cause undue discrimination against interstate commerce. An investigation has been ordered by the Interstate Commerce Commission and it is expected that a date will be fixed in December for a hearing by an examiner, probably in Indianapolis. The Indiana Public Service Commission, as principal defendant, will work for the dismissal of the new case filed by the roads.

Freight Rate on Coal Reduced In Clarksburg District

The West Virginia Public Service Commission has issued an order reducing the freight rate on coal in the Clarksburg and first freight zone of West Virginia, effective Dec. 1. This is the second reduction within the last two years. Directly the new rate applies to the Baltimore & Ohio, Pennsylvania, Monongahela and Western Maryland railroads, but other railroads in the state are affected indirectly as well.

The case was known as No. 1,307 on the docket of the commission and was brought before the commission on the petition of the Domestic Coke Co., of Fairmont, to investigate and determine the reasonableness of rates now in effect on the transportation of all kinds and classes of freight, including coal and coke, by carriers on steam railroads between points within the state on short hauls. Under the ruling of the commission all the railroads above enumerated are required to put into effect on Dec. 1 a rate not to exceed 55c. per net ton on coal transported from mine or point within the first zone to another point within that zone. The Baltimore & Ohio is required to put into effect a rate not to exceed 42c. per net ton on coal transported within the Clarksburg district and the same road also is required to put into effect a coking-in-transit rate not to exceed 40c. per net ton within the first zone.

Industrial Notes

The Newark Wire Cloth Co., Newark, N. J., has established a new branch office in the New England States at 66 Hamilton St., Cambridge, Mass., with John G. Loring in charge. A new factory of over 30,000 sq.ft. ground area has just been completed on Verona Avenue in Newark.

The Conveyors Corporation of America, 326 West Madison Street, Chicago, announces the appointment of W. P. MacKenzie Co., 1234 Callowhill Street, Philadelphia, as its sales representatives in southeastern Pennsylvania and southern New Jersey. This organization will handle the sale of steam jet ash conveyors, cast-iron storage tanks, airtight doors for ash-pits and boiler settings, and other specialties. Associated with W. P. MacKenzie in the sales organization are John Beard, J. E. Fulweiler, S. T. MacKenzie and W. R. Lunn.

New Companies

The Dozier-Dimond Coal Co. has been incorporated in Madisonville, Ky., with a capital stock of $20,000, by W. B. Dozier, Jesse Dimond and E. W. Dozier. Jesse Dimond previously was moving spirit in the Southern Gem Coal Co. in Illinois, now defunct.

The Gregory Branch Coal Co. has been incorporated in Grays, Ky., with a capital stock of $50,000, by J. T. Gray, H. E. Hubbard and others.

The Elliott & Day Coal Co. has been incorporated in Pikeville, Ky., with a capital stock of $10,000, by W. K. Elliott, P. W. Day and others.

W. R. J. Zimmerman, of Charleston, W. Va., well known in the coal business, has just launched a new company to be known as the **Zimmerman Coal Co.** Associated with him in the new concern are: R. S. Spillman, F. L. Thomas, H. H. Corri and H. D. Battle, all of Charleston. The company has an authorized capital stock of $50,000.

A charter has been issued by the Secretary of State of West Virginia to the **Beury Brothers Coal Co.**, capitalized at $100,000. T. C. Beury, John A. Thayer, Beverly Broun, Edward Hart and George R. Bullock are the incorporators. The property to be operated is a part of the old Beury lease near Echo, W. Va., and is said to contain a large amount of good coal.

A state charter was issued recently at Harrisburg, Pa., to the **Clift Coal Co.**, of Wilkes-Barre, the purpose of which is mining, shipping, selling, purchasing, leasing and dealing in coal. The capital stock of the company is $500,000 and the incorporators are W. O. Washburn, 51 North River Street, Wilkes-Barre, treasurer; Charles E. Clift and W. J. Fowler, Wyoming.

Association Activities

At the third semi-annual meeting of the **Moshannon Coal Mining Institute** held in Philipsburg, Pa., late in October, President Thomas A. Mather presented an interesting program of talks on mining problems. H. I. Smith, of the U. S. Bureau of Mines, gave a highly interesting discussion on the subject of leasing of government coal lands. Officers were elected as follows: President, R. H. George, Winburne; vice presidents, W. A. Gould, Philipsburg; Albin Lindberg, Allport, and Thomas A. Mather, Tyrone; secretary-treasurer, Thomas F. Morgan, Philipsburg; assistant secretary-treasurer, William George, Philipsburg; executive board, Summerville Eastment, Philipsburg; Thomas Gallagher, Houtzdale; Joseph Knapper, Philipsburg; H. McD. Lorain, Philipsburg, and James Marshall, Houtzdale. There were 133 members and guests present.

Coming Meetings

Illinois Mining Institute. Annual meeting, Nov. 22, Elks Building, Springfield, Ill. Secretary, Martin Bolt, Springfield, Ill.

American Society of Mechanical Engineers. Annual meeting, Dec. 1-4, Engineering Societies Building, 29 West 39th St., New York City. Secretary, Calvin W. Rice, 29 West 39th St., New York City.

West Virginia Coal Mining Institute. Annual meeting, Dec. 2-3, Welch, W. Va. Secretary, R. E. Sherwood, Charleston, W. Va.

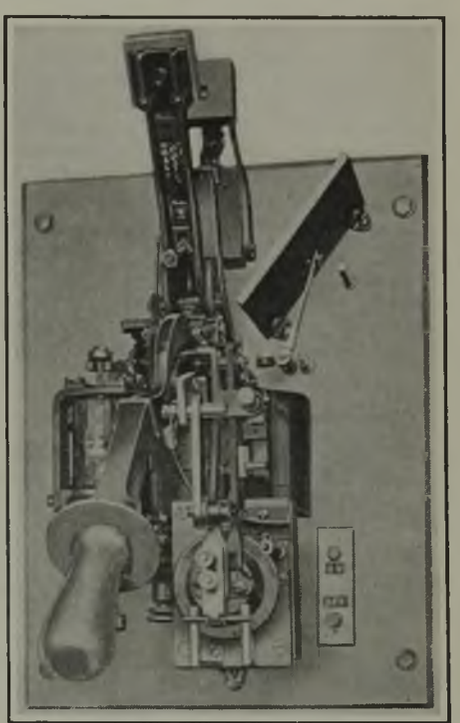
Coal Mining Institute of America. Annual meeting, Dec. 3-5, Chamber of Commerce Bldg., Pittsburgh, Pa. Secretary, H. D. Mason, Jr., Box 604, Ebensburg, Pa.

West Virginia-Kentucky Association of Mine, Mechanical and Electrical Engineers. Fourth annual convention, Dec. 12 and 13, Huntington, W. Va. Secretary-Treasurer, Herbert Smith, Huntington, W. Va.

New Equipment

Automatic Reclosing Breaker Operated Manually

Automatic reclosing circuit breakers have long since emerged from the class of new devices. In certain fields, notably in coal mines and electric railways, they have an established place as one of the devices essential to efficient operation. In other fields and in industrial plants generally, were interruptions due to overloads and short circuits are not so frequent, automatic



Reclosed Automatically or Manually

Should this breaker fail to function because something has gone wrong with the automatic reclosing control features it may easily be operated manually.

reclosing circuit breakers have not been so generally adopted. The reason for this probably has been that the advantage of the automatic reclosing feature has not been sufficiently apparent to offset the thought that an automatic reclosing circuit breaker is more complicated than a manually operated breaker. Also, no doubt, there has been considerable hesitancy in the past in applying automatic reclosing breakers to important feeders in mills and industrial plants because of some doubt as to what should be done in the event that the circuit breaker failed to operate automatically.

In order to overcome these objections and obstacles to the more extended use of automatic reclosing breakers, The Automatic Reclosing Circuit Breaker Co., of Columbus, Ohio, has recently developed a circuit breaker which normally is full automatic in its operation but it may at any time be operated in the same manner as a manually operated breaker.

When operating as an automatic re-

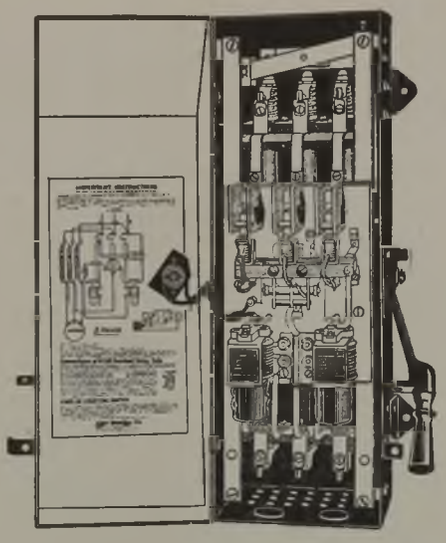
closing circuit breaker, it is under the control of a double-pole push button switch. When this switch is in the "off" position, all of the control circuits of the breaker are completely disconnected and the breaker remains open. When the switch is in the "on" position, the control circuits of the breaker are connected and the breaker closes, provided conditions on the line are proper for it to do so. On overload, it opens automatically, remains open a short time interval regardless of load conditions, and at the expiration of the predetermined period recloses, providing the overload or short circuit which caused it to open has been removed.

When for any reason whatever it is desired to operate the circuit breaker manually, the control switch is thrown in the "off" position and the operating handle attached to the breaker. The breaker is then closed in the usual manner by depressing the handle. It will open on overload or voltage failure if provided with no-voltage release. The operating handle is removed when the breaker is again placed in automatic operation.

Thus refinements of automatic control are attained, coupled with assurance of high-grade circuit breaker protection at all times and under all conditions. At the present time, breakers of this type are available in capacities up to and including 2,000 amp.

Semi-Automatic Starter

A new and improved resistance starter for squirrel-cage motors up to 30 hp., 220 volts and 50 hp., 440 to 550 volts has lately been brought out by the Allen-Bradley Co., Milwaukee. Stepless acceleration and smooth increase in starting torque without excessive starting current is provided by using the well-known graphite compression resistors which provide a starting cycle smoother than is obtained with any form of transformer compensator. The motor is started by lifting the starting handle quickly to the mid position. From that point the handle is slowly lifted and the magnetic switch closes, thus throwing the motor on the line without opening the motor circuit. Arc shields and blowouts are provided in all phases.



Stepless Motor Starter

Smooth starting characteristics are obtained by compression of graphite resistor disks. The motor is thrown across the line without breaking the starting circuit.

Well-Balanced Air Compressor Mounted on Mine Car

A marked advance in portable equipment for underground mining, and one in which coal-mine operators, particularly, are showing considerable interest, has been made in the newly designed Type 20 mine-car air compressor recently placed on the market by the Ingersoll-Rand Co.

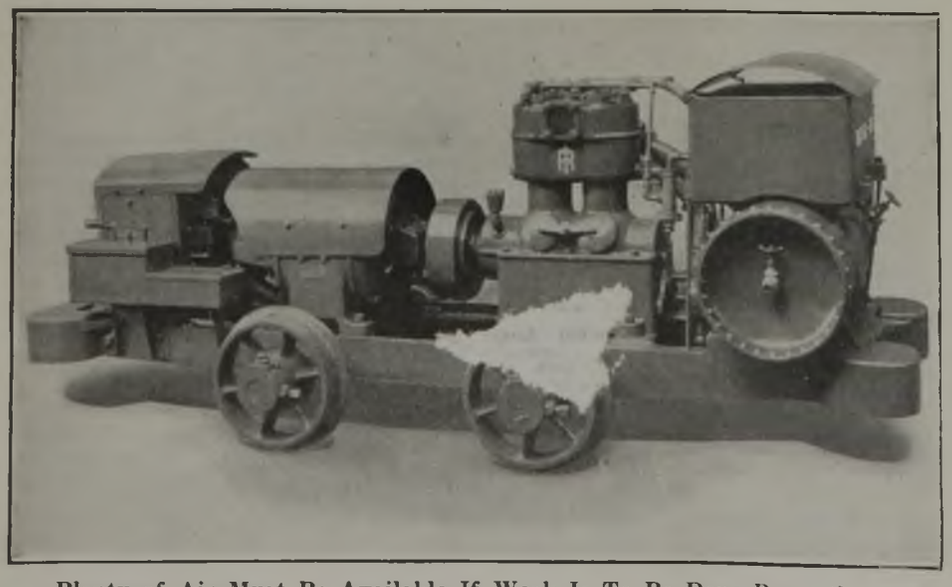
The first mechanical air compressors, which were placed on the market within the memory of the present generation, were huge, slow-speed, low-capacity machines, expensive to build and equally expensive to run. They were very heavy, needed a lot of floor space, and had to be supported by a massive foundation to assure alignment. By comparison, subsequent stationary units were of much lighter weight, of higher speed and of greater capacity. Furthermore, they required less floor space; and a simple foundation sufficed to assure their alignment.

With a gradual improvement of the air compressor, its value to industry increased; and it was inevitable that there should arise a demand for a portable machine—one that could be moved easily and quickly from place to place and that would always be ready for service. The usefulness of compressors of this type need not be elaborated here.

Portable mine-car compressors are nothing new; but, appreciating the exacting nature of the work, the company in question set itself the task of carefully studying the conditions under which machines of this sort have to operate and then of designing equipment that would best meet those requirements. The new Type 20, electrically driven, mine-car air compressor is the result.

The compressor is of the vertical, duplex type. Its natural tendency to vibrate is along the vertical plane, and this has been counteracted by centering the compressor over one of the axles—giving it, in effect, a solid foundation. The electric motor, which is of extra-heavy construction and built to resist vibration, is connected to the compressor by means of a quickly detachable coupling. The whole equipment is mounted on a rigid, cast-steel frame, to the underside of which are attached mine-car wheels on short centers to permit taking sharp curves.

This self-contained mine-car compressor is being manufactured in three sizes, namely: 91, 160, and 230 cu.ft. per minute piston displacement.



Plenty of Air Must Be Available If Work Is To Be Done Promptly

Pressure losses and delays caused by long pipe lines are obviated by setting-up the compressor near where hammers and drills are used. A short wheelbase truck is always essential on such equipment so that it can turn short curves. However, the compressor and drive must be well balanced to prevent vibrations.

New Plymouth Gasoline Locomotive

The Fate-Root-Heath Co., formerly the Plymouth Locomotive Works, Plymouth, Ohio, has just brought out a new gasoline locomotive. It weighs eight tons and is equipped with a Climax four-cylinder engine developing 85 hp. at 900 r.p.m. Bosch high-tension magneto with impulse couplings, Simms 12-volt starter, Willard storage battery, Stromberg carburetor, United air cleaner and built-in governor.

Cooling is by a means of a Modine sectional-core radiator and a 22-in. gear-driven fan. The radiator is protected by a heavy guard. The power transmission is the well-known sliding-gear type providing four speeds forward and one reverse.

Axles are of alloy steel, heat treated and of extra large diameter. Wheels are rolled steel, 24 in. in diameter. Brakes are of the lever type to all four wheels and sand is applied by hand to all four wheels.

This locomotive is built with a high cab, the height over all being 84 in., enabling the operator to see over industrial cars. The cab is provided with a side entrance with sliding steel doors, avoiding the danger from exit between the locomotive and car, as in the case of rear-opening types.

The operating speeds are 2½, 4, 8, and 12 miles per hour, with an engine speed of 900 r.p.m. The drawbar pull at 2½ m.p.h. with sand is 6,000 lb.